

# **Programme Structure** BACHELOR OF TECHNOLOGY

in

Computer Science & Engineering (CSE) with Specializations

Program Code: SET0101

**Department of Computer Science & Engineering** 

Sharda School of Engineering & Technology

(Batch: 2023 - 2027)



## **Programme Structure**

of

**Bachelor of Technology- Computer Science & Engineering** 

B.Tech (CSE) with Specialization in Artificial Intelligence & Machine Learning

B.Tech (CSE) with Specialization in Artificial Intelligence of Things (AIoT)

B.Tech (CSE) with Specialization in Augmented and Virtual Reality

B.Tech (CSE) with Specialization in Banking & Insurance

**B.Tech (CSE) with Specialization in Block chain Technology** 

**B.Tech (CSE) with Specialization in Business Analytics** 

B.Tech (CSE) with Specialization in Cloud Technology and Virtualization in association with AWS

B.Tech (CSE) with Specialization in Data Science & Analytics B.Tech (CSE) with Specialization in Cyber Security & Forensics in association with Microsoft

**B.Tech (CSE) with Specialization in Full Stack Web Development in association with Xebia Academic Alliance** 



**1. Standard Structure of the Program at University Level** 

1.1 Vision, Mission and Core Values of the University

### Vision of the University

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

### Mission of the University

- 1. Transformative educational experience
- 2. Enrichment by educational initiatives that encourage global outlook
- **3.** Develop research, support disruptive innovations and accelerate entrepreneurship
- 4. Seeking beyond boundaries

#### **Core Values**

- Integrity
- Leadership
- Diversity
- Community



## Vision of the School

To become a globally acclaimed institution of higher learning in engineering and technology promoting excellence in research, innovation and entrepreneurship

## Mission of the School

- 1. To impart quality education with strong industry & academic connectivity in the expanding fields of Engineering and Technology in a conductive and enriching learning environment.
- 2. To product technocrats equipped with technical & soft skills and experiential learning required to stay current with the modern tools in emerging technologies to fulfill professional responsibilities and uphold ethical values.
- **3.** To inculcate a culture of interdisciplinary research, innovation and entrepreneurship to provide sustainable solutions to meet the growing challenges and societal needs.
- 4. To foster collaborative learning and to play adaptive leadership role in professional career and pursuit of higher education through effective mentoring and counseling.

#### **Core Values**

- Industry & Academic Connectivity
- Experiential learning
- Interdisciplinary research
- Global



**1.2 Vision and Mission of the Department** 

### Vision of the Department

To be recognized as the fountainhead of excellence in technical knowledge and research in computer science and engineering to attract students and scholars across the globe

### **Mission of the Department**

- 1. To strengthen core competency of students to be successful, ethical, effective problem solver in Computer Science & Engineering through analytical learning.
- 2. To promote interdisciplinary research & innovation-based activities in emerging areas of technology globally
- **3.** To facilitate and foster the industry-academia collaboration to enhance entrepreneurship skills and acquaintance with corporate culture.
- 4. To inculcate in them a higher degree of social consciousness and moral values towards solving interdisciplinary societal problems using industry-academia collaboration

#### **Core Values**

- Competency
- Global
- Entrepreneurship Skills
- Interdisciplinary research



#### **1.3 Programme Educational Objectives (PEO)**

#### **1.3.1** Writing Programme Educational Objectives (PEO)

The Program Educational Objectives (PEOs) of UG Program in Computer Science & Engineering are:

**PEO-1** The graduates will establish themselves as professionals by solving real-life problems using exploratory and analytical skills acquired in the field of Computer Science and Engineering.

**PEO-2** The graduates will provide sustainable solutions to ever changing interdisciplinary global problems through their Research & Innovation capabilities.

**PEO-3** The graduates will become employable, successful entrepreneur as an outcome of Industry-Academia collaboration.

**PEO-4** The graduates will embrace professional code of ethics while providing solution to multidisciplinary social problems in industrial, entrepreneurial and research environment to demonstrate leadership qualities



#### **1.3.2** Map PEOs with Mission Statements:

			-		
DEPARTMENT	1. The	2. The	3. The	4. The graduates	
PEOs	graduates will	graduates will	graduates will	will be able to	
	establish	be able to	become	embrace	
	themselves as	provide	employable,	professional code	
	professionals	sustainable	successful	of ethics while	
	by solving	solutions to	entrepreneur	providing solution	
DEPT OF	real-life	ever changing	and innovator	to	
CSE	problems	interdisciplina	as an outcome	multidisciplinary	
MISSION	using	rv global	of Industry-	social problems in	
STATEMENTS	exploratory	problems	Academia	industrial.	
	and analytical	through their	collaboration	entrepreneurial	
	skills acquired	Research &	condooration.	and research	
	in the field of	Innovation		environment to	
	Computer	canabilities		demonstrate	
	Science and	capaonnues.		leadership	
	Engineering			qualities	
	Engineering.			quanties.	
1. To strengthen core					
competency of students to be					
successful, ethical, effective	3	3	2	2	10/12
problem solver in Computer	•	·	-	-	10/11
Science & Engineering					
through analytical learning.					
2. To promote					
interdisciplinary research &					
innovation-based activities in	2	2	2	2	0/12
emerging areas of technology	2	3	2	2	9/12
globally.					
3. To facilitate and foster the					
industry-academia					
collaboration to enhance			_		
entrepreneurship skills and	2	2	3	3	10/12
acquaintance with corporate					
culture					
A: To inculcate in them a					
H. TO incurcate in them a					
approximation and an an and an					
consciousness and moral	•	•	•		0/12
values towards solving	2	2	2	3	9/12
interdisciplinary societal					
problems using industry-					
academia collaboration					
	9/12	10/12	9/12	10/12	83%

Correlation levels 1, 2, or 3 as defined below:

1. Slight (Low) 2. Moderate (Medium) 3. Substantial (High)

If there is no correlation, put "-"



#### **1.3.3 Program Outcomes (PO's)**

	Engineering	Apply the knowledge of mathematics science engineering fundamentals and
PO1:	knowledge.	an engineering specialization to the solution of complex engineering problems
	Kilowicuge.	Identify formulate review research literature and analyze complex
PO2.	Problem analysis.	angineering problems reaching substantiated conclusions using first principles
102.	i i obiem analysis.	of mathematics, notural sciences, and angingering sciences
		of mathematics, natural sciences, and engineering sciences.
	<b>.</b>	Design solutions for complex engineering problems and design system
PO3:	Design/developme	components or processes that meet the specified needs with appropriate
	nt of solutions:	consideration for the public health and safety, and the cultural, societal, and
		environmental considerations.
	Conduct	Use research-based knowledge and research methods including design of
PO4·	investigations of	experiments analysis and interpretation of data and synthesis of the
104	complex	information to provide valid conclusions
	problems:	
	Madam 4aal	Create, select, and apply appropriate techniques, resources, and modern
PO5:	Modern tool	engineering and IT tools including prediction and modeling to complex
	usage:	engineering activities with an understanding of the limitations.
		Apply reasoning informed by the contextual knowledge to assess societal,
PO6:	The engineer and	health, safety, legal and cultural issues and the consequent responsibilities
	society:	relevant to the professional engineering practice.
		Understand the impact of the professional engineering solutions in societal and
PO7:	Environment and	environmental contexts and demonstrate the knowledge of and need for
10/1	sustainability:	sustainable development
		Apply ethical principles and commit to professional ethics and responsibilities
PO8:	Ethics:	and norms of the engineering practice
	Individual and	Function effectively as an individual and as a member or leader in diverse
PO9:	toom work.	tooms and in multidisciplinery settings
		Communicate effectively on complex engineering estivities with the
		communicate effectively on complex engineering activities with the
PO10	<b>Communication:</b>	engineering community and with society at large, such as, being able to
		offective presentations, and give and receive clean instructions.
	<b>D</b> • 4	effective presentations, and give and receive clear instructions.
<b>DO11</b>	Project	Demonstrate knowledge and understanding of the engineering and management
POII:	management and	principles and apply these to one's own work, as a member and leader in a team,
	finance:	to manage projects and in multidisciplinary environments.
	Life-long	Recognize the need for, and have the preparation and ability to engage in
PO12:	learning:	independent and life-long learning in the broadest context of technological
		change.
PSO1.		Experiment and prepare programming concepts and provide new ideas and
1501		innovations towards research and societal issues.
		Analyse and develop computer programs in the areas related to algorithms,
DSO2.		system software, cloud computing, artificial intelligence & machine learning,
1502;		bioinformatics, big data analytics, block chain, cyber security and networking
		for efficient design of computer-based systems of varying complexity.
		Apply standard Software Engineering practices and strategies in software
PSO3:		project development using open-source programming environment to deliver a
		quality product for business success.



1.3.4 Mapping	of Program	Outcome	Vs Program	Educational	Objectives
	0	0	· · · · · · · · · · · · · · · · · · ·		o ~joon vo

Mapping	PEO1	PEO2	PEO3	PEO4
PO1	3	3	2	1
PO2	3	3	3	1
PO3	2	2	3	3
PO4	2	2	3	2
PO5	2	3	2	2
PO6	1	2	2	3
PO7	1	1	2	3
PO8	1	1	2	3
PO9	1	2	3	1
PO10	1	1	3	2
PO11	3	2	3	1
PO12	2	3	1	1
PSO1	2	3	1	3
PSO2	3	3	2	2
PSO3	3	3	2	2

1. Slight (Low)

2. Moderate (Medium)

3. Substantial (High)



## **1.3.5 Program Outcome Vs Courses Mapping Table<sup>1</sup>:**

		nt	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Course Code	Course Name	Course Outcome Stateme	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication:	Project management and finance	Lifelong learning	Familiarity and practical proficiency	Understand, analyze and develop	Apply standard Software
		CO1	1	2	2						2				1	2	
		CO2	2		3	2	2				1		1		2	2	
CSE112	Programming for	CO3	3		2	1					3					2	
CSEIIS	Problem Solving	CO4	1		2	1					1					3	
		CO5	1		1											1	
		CO6	3	3	3	2					2		2		2	3	1
		CO1	3	3	2	2	3	1				1	1	1			
		CO2	3	3	3	2	2	2				1	1	2			
MTH142	Calculus and	CO3	3	3	2	2	2	1				1	1	1			
WIIII42	Abstract Algebra	CO4	3	3	2	2	2	1				1	1	1			
		CO5	3	3	2	2	2	1				1	1	2			
		CO6	3	3	2	3	2	2				1	1	2			
PHV125	Engineering	CO1	3	3	2	2	2	1	1	1	2	1	1	1			
1111123	Physics-I	CO2	3	3	2	3	3	2	1	1	1	1	1	1			

<sup>&</sup>lt;sup>1</sup> Cel value will contain the correlation value of respective course with PO.



		CO3	3	3	2	3	3	2	1	1	1	1	1	1			
		CO4	3	3	3	2	3	2	1	1	1	1	1	1			
		CO5	3	3	3	2	3	2	1	1	1	1	1	1			
		CO6	3	3	3	3	3	2	1	1	1	1	1	1			
		CO1	2	2	3	3	3	3									
		CO2	2	2	2	2	2	3									
CVI 102	Environmental	CO3	2	2	3	2	3	3									
CVL105	Studies	CO4	2	2	3	2	3	3									
		CO5	2	2	2	2	3	3									
		CO6	2	2	3	2	2	3									
		CO1										3		3			
		CO2								2	2	2		3			
A DD101	Communicative	CO3				2				2	2			3			
ARP101	English-1	CO4		2	2							2	2	3			
		CO5		3	2	2								2			
		CO6		2										3			
		CO1	2		3	2	2				2				3	2	2
		CO2	3		3	2	2				3				3	3	1
CSD112	Programming for	CO3	2		3	1	2				2				2	3	2
CSPIIS	Lab	CO4	1		2	1	1				2				2	2	
	2.00	CO5	2		3	2	2				3				3	2	2
		CO6	3		3	3	1				2				2	3	2
		CO1	3	2										3	3		3
CSD101	Introduction to	CO2	3	2										3		3	2
CSPIUI	and Engineering	CO3	3	2										3		2	3
CSP101 Co ar		CO4	3											3		3	2



		CO5	3					2		2				3		3	3
		CO6															
		CO1	2	2	2		3							3	3	3	
		CO2	2	2	2		3							3	3	3	
MED106	Computer Aided	CO3	2	2	2		3							3	3	3	
MEP100	Design & Drafting	CO4	2	2	2	2	3				2	2		3	3	3	
	2100008	CO5	2	2	2	2	3				2	2		3	3	3	
		CO6	2	2	2	2	3				2	2		3	3	3	
		CO1	2	2	2	1	1	1	2	3	3	3	2	3	2		
		CO2	2	2	2	1	1	1	2	3	3	3	2	3	2		
DUV162	Dhysics Lab	CO3	2	2	2	1	1	1	2	3	3	3	2	3	2		
PH I 102	Physics Lab	CO4	2	2	2	1	1	1	2	3	3	3	2	3	2		
		CO5	2	2	2	1	1	1	2	3	3	3	2	3	2		
		CO6	2	2	2	1	1	1	2	3	3	3	2	3	2		
							Semes	ster II									
	Application based	CO1	2	1	1					2				2		1	
CSE114	Programming in	CO2	2	2	2	1				2				2		2	1
	Python	CO3	2	2	1					2				2	1	2	1



		CO4	2	2	2	2	1	2		2				2	1	2	2
		CO5	2	2	2	2	3	2		2				2	2	2	1
		CO6	3	3	2	2	2	2		2				2	2	3	2
		CO1	3	3	2	2	3	1				1	1	1			
		CO2	3	2	3	2	2	2				1	1	2			
MTU145	Probability and	CO3	3	3	2	2	2	1				1	1	1			
WIIII43	Statistics	CO4	3	2	2	2	2	1				1	1	1			
		CO5	3	3	2	2	2	1				1	1	2			
		CO6	3	3	2	3	2	2				1	1	2			
		CO1	3	3	2	2											
	Principles of	CO2	1	1	2												
FFF112	Electrical and	CO3	2	2	1												
	Electronics	CO4	2	1	2								1				
	Engineering	CO5	3	2	1								1				
	Engineering	CO6	2	2	3	1							1				
		CO1	1	1	1	1	2	1	2			2	3	1	1	3	
		CO2	1	3	2	2	1	3	1	1	2		3	3	2	2	1
	Human Value &	CO3		2	2	2		2	2		1		1		1	3	2
HMMIII	Ethics	CO4	1		1	2	3				2	3		2			1
		CO5		3		1	2	3	2	1		2	2	1	3	1	
		CO6	2		1			1			1	1				2	3
		CO1										3		3			
		CO2										3		3			
	Communicative	CO3										3		3			
ARP102	English -2	CO4										3		3			
		CO5								3		3		3			
		CO6								3		3		3			



		CO1	3	3		3					3	3	2	3	2	2	1
		CO2	3	2		3			2		3	3	2	3			1
CCD105	Design and	CO3	3	2			2				3	3	2	3	2	2	
CSP105	creativity Lab	CO4	3	3				2			3	3	2	3		2	
		CO5	3	3	2	2	2	2	3	3	3	3	2	3	2	2	
		CO6	3	3		3					3	3	2	3			1
		CO1	1	1	1	1				2				2		1	
		CO2	2	2	1	1	2			2				2		1	1
CCD114	Application based	CO3	2	2	1	1	1	1		2				2	1	2	1
CSP114	Programming in Python	CO4	2	2	2	2	1	1		2				2	2	2	1
	1 9 011011	CO5	2	2	2	2	2	2		2				2	2	2	2
		CO6	3	3	2	2	2	3		2				2	2	2	2
		CO1	1					2						2			
		CO2	1				1	2						1	1		1
MED105	Mechanical	CO3	2		1		1	2						2	1		1
MEP105	Workshop	CO4	2		1		2	2						2	1		1
		CO5	2		1		2	2						2	2		1
		CO6	2		1		2	2						2	2		1
		CO1	3	3	2	2											
	Principles of	CO2	1	1	2												
EED112	Electrical and	CO3	2	2	1												
EEP112	Electronics	CO4	2	1	2								1				
	Engineering	CO5	3	2	1								1				
		CO6	2	2	3	1							1				
095242	Dete Streeters	CO1	2		2						2				2	2	
CSE242 D	Data Structures	CO2	1	2	3						1				3	1	2



		CO3	2	3	3	2				2			2	3	
		CO4			2					3		1	2	2	
		CO5	3	2	3	2	1			2			3	2	2
		CO6	2		3	3	2			1			2	3	3
		CO1	2	2	3					3		2	3	2	2
		CO2	3	2	2	2	2			2			2	3	3
CSD242	Data Structures	CO3	3	1	3	3				3		1	3	2	2
CSP242	Lab	CO4	3	2	3	2				2		2	2	3	2
		CO5	2	2	2								1	2	2
		CO6	3	3	2	3				3			2	3	2
		C01		2			Semes	ter III			2	3		3	
	Computer	$CO^2$	2	2	2	2	3				2	3		3	
CSE252	Networks	CO2	3	2	2	2	5	2			2	5	2	5	2
		CO4	5	2	2	2		2	 				2	2	2
		CO4	2	2	2	2								2	2
		CO5	2	2	2	2			2		2			2	
CSE245		C00	2	3	3	ے 1		2	۷	3	 L	3	3	2	
USE243		COI	Z	3	3	1		3		3		3	3	3	



		CO2	2	2	3			2						3	3	2	
		CO3	3	2	3	3	3				2					3	2
	Discrete	CO4	2	2	3	3	3						3	3	3		3
	Structures	CO5	2	2	2	3		3			3		3	3		2	3
		CO6	1	2	1	2	3				3		3		3	3	2
		CO1	3	1	1			2						2		1	3
		CO2	3	3	3			3						3		2	3
CSE247	Computer	CO3	3	2	3			2						3		2	3
CSE247	Architecture	CO4	3	2	2			1						3		3	2
	Thomas and the second sec	CO5	3	3	3			2						3		2	2
		CO6	3	3	3			2						3		1	2
		CO1					2							2			
		CO2					2										
CSE252	Object Oriented	CO3	2	3	3		2				3			2	2	3	
CSE255	Using Java	CO4					2										
	C	CO5					2										
		CO6	3	3	3		2	3	2		3		2	3	3	3	2
		CO1	3	3	3	3				2	2	1	2	1	3	2	2
		CO2	3	2	3	3				2	2	2	1	1	2	3	2
CSF254	Principles of	CO3	3	3	3	3				1	1	1	3	2	3	2	1
000234	Operating System	CO4	2	2	2	2	1			2	3	3	3	1	2	2	2
		CO5	2	2	3					3	3	1	2		3		
		CO6	3	2								2	3		2	2	
		CO1	-	-	-	-	1	-	-	-	2	-	2	3	-	-	-
CSE255	Introduction of	CO2	1	1	2	3	3	3	-	-	-	-	-	-	-	-	-
CSE255	Entrepreneurship	CO3	-	-	-	-	-	-	-	-	-	3	2	3	-	-	-
		CO4	-	-	-	-	-	-	-	-	-	1	3	1	-	-	-



		CO5	-	-	-	1	-	-	3	-	-	-	-	2	-	-	-
		CO6	-	1	3	2	1	-	-	-	-	-	1	2	-	-	-
		CO1		2	3												
		CO2						2		2	3						
A D D 207	Logical Skills	CO3								2	2						
AKF 207	Skills	CO4									2			3			
		CO5										2					
		CO6		2													
CSP252		CO1		2									2	3		3	
		CO2	2		2	2	3						2	3		3	
	Computer	CO3	3	2		2		2							2		2
	Networks Lab	CO4		2	2											2	2
		CO5	2	2	2	2										2	
		CO6	2			2				2			2			2	
		CO1					2							2			
		CO2					2										
CGD2 42	Object Oriented	CO3	2	3	3		2				3			2	2	3	
CSP243	Programming Using Java	CO4					2										
	o bing suvu	CO5					2										
		CO6	3	3	3		2	3	2		3		2	3	3	3	2
		CO1	3	3	3	3				2	2	1	2	1	3	2	2
		CO2	3	2	3	3				2	2	2	1	1	2	3	2
CCD2 44	Principles of	CO3	3	3	3	3				1	1	1	3	2	3	2	1
CSP244	Operating System	CO4	2	2	2	2	1			2	3	3	3	1	2	2	2
	Lao	CO5	2	2	3					3	3	1	2		3		
		CO6	3	2								2	3		2	2	



		CO1	3	3		3					3	3	2	3	2	2	1
		CO2	3	2		3			2		3	3	2	3			1
	Project Based	CO3	3	2			2				3	3	2	3	2	2	
CSP254	Learning (PBL) -	CO4	3	3				2			3	3	2	3		2	
	Ĩ	CO5	3	3	2	2	2	2	3	3	3	3	2	3	2	2	
		CO6	3	3		3					3	3	2	3			1
		CO1	2														
		CO2		3	2		2								2	2	
CEDDOO	Summer	CO3	2	2	3						3				1		
CSP292	Internship-I	CO4										3					
		CO5						2		3							
		CO6												2	1		
							Semes	ter IV									
		CO1	3	1				1	3					3			
	Introduction to	CO2	3	2				2						3			
BTY223	Biology for	CO3	3	3	3	1	1	3	3	2	1	3		3	1	1	
	Engineers	CO4	3	2				2	2	3	1	2		3	1		
		CO5	3	1	1	1	3	1	3	2	1	2	1	3	1	1	



		CO6	3	3	1	1	2	3	5	1	1	1		3	1		
		CO1	3					2						3	3	3	
		CO2	2				3	2			2			3	3	3	
CSE240	Data Base	CO3	3	3	3		3	2						2	2	3	
CSE249	System	CO4	3	3	3	3		2		2	3			2			3
		CO5	2	3	2		2	2		2				1		3	
		CO6	3	3	3	3	3	3		3	3	3	2	3			3
		CO1	3	3	3	3	2				3			3	3	2	
		CO2	3		3	3	2				2			2		3	2
CSE251	Theory of	CO3	3	3	3	3					2				3	2	
CSE251	Computation	CO4	2	2	2		2				3			2			3
		CO5	3	3	3	3	3							3	3	2	2
		CO6	3	2	3	3	3				2			3	3	3	2
		CO1	2	1	2	2	2	2		2	1	3			1	1	2
		CO2	1	1	2	2	1	2	1			2	2	1	1	1	2
HMM305	Management for	CO3	3	1	1	2	3	2		2			1	2	1	2	2
11101101303	Engineers	CO4		2	2	1		1		1		2	1		1	1	2
		CO5		1	2	2		2	3	1	2			1	2	2	1
		CO6	1	2	1	1	2	2	2		1			1	2	2	2
		CO1	3	2											2		
		CO2	2	3	1	1	1		1			1	2	1	1	1	
CSF011	Mathematical	CO3	3	1	1	1			1			2	1	1	3	1	
COLOTT	Techniques	CO4	2	3	2	1	1		1			1	1	1	2	1	
		CO5	1	1	1	2	2		1			1	2	1	2	1	
		CO6	3	1	3	1	2		2			2	2	3	3	1	
CSE012		CO1	3	3	2	2	1	2	2			2	1	2	3	1	
CSE012		CO2	3	3	3	2		1	1			1		2	3	1	



		CO3	1	3	1	3	2	2				1		2	2	2	
	Introduction to	CO4	1	3	1	3	1	1				2		1	3	2	
	its Applications	CO5	2	2	2	3	2	1				1		2	1	2	
	no rippilourono	CO6	1	1	2	3	1	2				2		2	1	2	2
		CO1															
		CO2															
051	Oner Election 1	CO3															
OEI	Open Elective – I	CO4															
		CO5															
		CO6															
		CO1								2		3		3			
	Quantitative and	CO2										2					
A D D 200	Qualitative	CO3									2	2					
ARP208	Aptitude Skill	CO4										2					
	Building	CO5										2					
		CO6		2	2						2						
		CO1	3				2								2	3	2
		CO2		3	3	3	2				3				2	3	3
CGD2 40	Data Base	CO3		2	2	2	2				3				2	2	3
CSP249	System Lab	CO4		2	2	2	2				3				2	2	3
	bystem Lab	CO5		2	2	2	2				3				2	2	3
		CO6		2	3	2	3				3			2	3	3	3
		CO1	3	3		3					3	3	2	3	2	2	1
CGD207	Project Based	CO2	3	2		3			2		3	3	2	3			1
CSP29/	Learning (PBL) -	CO3	3	2			2				3	3	2	3	2	2	
	-	CO4	3	3				2			3	3	2	3		2	





		CO4	3	3	3	3	-	3	-	-	3	-	3	3			
		CO5	2	-	3	2	3	-	3	3	2	3	3	2			
		CO6	3	-	-	3	2	2	2	2	2	2	2	3			
		CO1	2	3	1	2											
		CO2	2	2	2	3											
CSE021	Introduction to	CO3	1	3	1	2										2	3
CSE021	Cloud Computing	CO4	3	1	2	2										3	2
		CO5	2	2	3	1										2	2
		CO6	1	3	1	2									2	3	3
		CO1					3				2			1			2
		CO2					3				2			1			2
CSE023	Android Application	CO3			2		3				2			1	2		2
CSE023	Development	CO4					3				2		2	1			2
	1	CO5			2	3	3		2		2		2	1			2
		CO6	1	2	3	3	3	3	3		3		3	1	3	3	3
		CO1					1									1	
		CO2					3							1		1	
CSE024	Web	CO3		1	3		2	1			2				1	2	2
CSE024	Technologies	CO4		1	3		1	1			2				1	2	2
		CO5					2									1	
		CO6	2	3	3	1	3	3	1		3		2	2	1	2	3
		CO1															
		CO2															
		CO3															
OE-2	Open Elective – 2	CO4															
		CO5															
		CO6															



		CO1						2			2			3			
	Personality	CO2						2			2			3			
A DD205	Development and	CO3									2	2		3			
ARP305	Decision making	CO4						2	2		2			3			
	Skills	CO5						2	2		2			3			
		CO6		2	2												
		CO1	3	3	2	3	1				2				2	3	3
		CO2	2	3	3	2	2				2				3	2	2
C6D250	Design and	CO3	3	2	2		3				1				2	1	
CSP350	Analysis of Algorithm Lab	CO4	2	3	3	3	1				3				3	3	1
	i iigoittiini Euo	CO5	3	2	2	3	2				2				2	3	2
		CO6	2	3	3	1	3				1				3	2	3
		CO1	3	3		2		1		1	2		2	1	2	2	3
		CO2	3	2	2	2	2			1	2		2	1	2	1	1
	Project Based	CO3	3	2	2	2	2	3		1	2		2	1	2	2	
CSP354	Learning (PBL) -	CO4	3	3	2	2	3			1	2			1	2	2	2
	5	CO5	3	2			3			1	2			1	2	2	
		CO6		1		1				2	2	3	3	3	1		1
		CO1	3	-	2	-	-	-	-	1	2	3	-	3	1	-	2
	Software	CO2	3	3	2	3	3	-	-	1	2	3	2	3	2	-	3
CSD255	Engineering and	CO3	3	2	3	3	3	-	-	1	2	3	1	2	2	-	3
CSP355	Testing	CO4	3	1	-	1	3	2	2	3	3	2	3	2	-	-	3
	Methodologies	CO5	3	1	3	3	3	3	2	3	3	1	3	1	3	-	3
		CO6	2	-	-	1	3	-	1	2	2	2	2	2	3	-	3
CSD022		CO1					3				2			1			2
CSP023		CO2					3				2			1			2



		CO3			2		3				2			1	2		2
	Android	CO4					3				2		2	1			2
	Application Development Lab	CO5			2	3	3		2		2		2	1			2
	Development Eus	CO6	1	2	3	3	3	3	3		3		3	1	3	3	3
		CO1					1				2					1	
		CO2		1	1		3				2			1		1	2
CSD024	Web	CO3			1		2	1			2					1	2
CSP024	Technologies Lab	CO4					1	1									
		CO5		1			2				2			1		1	2
		CO6	2	3	3	1	3	3			3		2	2	1	2	3
		CO1	2	2		3	2		1	1	1				1	2	2
		CO2	1	2	1	2	2		1	1	1				1	2	
CSD201	Summer	CO3	2		2	2	2			1	3		1	1	1	2	2
CSP391	Internship-II	CO4								1		3					
		CO5						2		3							
		CO6												2	2	2	
		CO1	1		1		2							1	1	2	1
	Technical Skill	CO2	1		1		2					2		1	1	2	1
CSD205	Enhancement	CO3	1	2	1		2							1	1	2	1
CSP393	Course-1	CO4	1		1		2							1	1	2	1
	Simulation Lab	CO5	1		1		2							1	1	2	1
		CO6	2	2	3	3	2	2	1		2	3	2	2	2	3	1
		CO1										2	3	3	3	2	1
ECC201	Community	CO2					1		1		2	3	3	3	3		
ECC501	Connect	CO3	2		2		2		2	2					1		
		CO4			1			3							3		



		CO5									2				1		
		CO6									3	3	3				
							Semes	ter VI									
		CO1	3				3				2			3	2	1	
		CO2	2	2	3	3	2							2	3	2	
CSE252	Commilan Design	CO3	3	3	3										3	2	
CSESSS	Compiler Design	CO4	1	2	3	3	3				3					3	2
		CO5	1	1	2	3	2				3			3	1	2	2
		CO6	2		3	3	2				3			3	3	2	3
		CO1	1	2	3	2	2					2		2	3	2	2
		CO2	2	3	3	2	3					2		2	3	3	2
CSE472	Artificial	CO3	3	3	3	3	2	1	1			1	2	3	3	2	3
CSE472	Intelligence	CO4	3	3	3	3	2	2	1			2	1	3	3	2	3
		CO5	2	3	3	3	3	2	2	2	3	2	2	2	3	3	2
		CO6	2	3	3	3	3	2	2	2	3	2	2	2	3	3	2
	Digital Image	CO1	3	3	3	3	1	1	1	1	1	2	1	3	2	3	1
CSE031	Processing	CO2	3	3	3	3	2	1	1	1	1	2	1	3	2	3	2
	Trocessing	CO3	3	3	3	3	2	1	1	1	1	2	1	3	3	3	2



		CO4	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
		CO5	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
		CO6	3	3	3	3	2	3	3	1	3	2	1	3	3	3	3
		CO1	3	2											3	1	
		CO2	2	3	2	1									3	2	
CSE022	Cryptography and	CO3	2		2		3								2	2	1
CSE052	Network Security	CO4	2			2		2	2						2	2	
		CO5					2			2	2	2			1		
		CO6										2	2	2	2		2
		CO1	3		1		1				3	2	3	2			2
		CO2	2		2		2				3	3	3	3			2
CSE041	Software Project	CO3	2		3		2			1	3	2	3	3			3
CSE041	Management	CO4	2		2		2			1	3	2	3	3			3
		CO5	1		3		2	3		1	3	3	3	3			3
		CO6	2		3	3	2	2		1	3	3	3	2			2
		CO1	2	1								3		2			3
		CO2	3	3	3	2	3	1		1	2	3		2	2		3
CSE042	Software Testing	CO3	3	3	3	2	2	2		1	2	3		2	2		3
CSE042	Software Testing	CO4	3	3	3	2	3	1		1	2	3		2	2		3
		CO5	3	3	2	2	2	2		1	2	3		2	2		3
		CO6	3	3	3	2	3	2	3	2	3	3	3	3	2		3
		CO1	3		3					1							2
	XX7: 1	CO2	3	2	3					1							2
CSE051	w ireless Networks	CO3	3	2	3					1							2
Netwo	THE WORKS	CO4	3	2	3					1							2
		CO5	3	2	3	2	2			1							3



		CO6	3	2	3	2	2			1							3
		CO1	3						1					1	2		
		CO2	2	2		3	2			1	2	1	1	1			2
CSE052	Dist Management	CO3	2								2			1	1		
CSE052	KISK Management	CO4	1		2		3				2	2	2				1
		CO5	2	2		2	1		1		2	1	1				1
		CO6	2	2	2				1		2	1	1	1		1	
		CO1	3	3	3	3				2	2	1	2	1	3	2	2
		CO2	3	2	3	3				2	2	2	1	1	2	3	2
CSE052	Advanced	CO3	3	3	3	3				1	1	1	3	2	3	2	1
CSE055	Operating System	CO4	2	2	2	2	1			2	3	3	3	1	2	2	2
		CO5	2	2	3					3	3	1	2		3		
		CO6	3	2								2	3		2	2	
		CO1															
		CO2															
		CO3															
OE-3	Open Elective – 3	CO4															
		CO5															
		CO6															
		CO1						2	2		2	3		3			
		CO2						2	2		2	3		3			
	Campus to	CO3						2	2		2	3		3			
ARP306	Corporate	CO4						2	2		2	3		3			
		CO5						2	2		2	3		3			
		CO6		2	2												
CSP353		CO1	3				3				2			3	2	1	



		CO2	2	2	3	3	2							2	3	2	
	~ ~ ~ .	CO3	3	3	3										3	2	
	Compiler Design	CO4	1	2	3	3	3				3					3	2
	Lab	CO5	1	1	2	3	2				3			3	1	2	2
		CO6	2		3	3	2				3			3	3	2	3
	T 1 1 1 01 11	CO1	1		1		2							1	1	2	1
	Enhancement	CO2	1		1		2					2		1	1	2	1
CSD206	Course-	CO3	1	2	1		2							1	1	2	1
CSP390	2(Application	CO4	1		2		2							1	1	2	1
	Development	CO5	2		1		2							1	1	2	1
	LaU)	CO6	2	2	3	2	2	2	1		2	3	2	2	2	3	1
		CO1	3	3		2		1		1	2		2	1	2	2	3
		CO2	3	2	2	2	2			1	2		2	1	2	1	1
CSD209	Project Based	CO3	3	2	2	2	2	3		1	2		2	1	2	2	
CSP398	Learning (PBL) - 4	CO4	3	3	2	2	3			1	2			1	2	2	2
		CO5	3	2			3			1	2			1	2	2	
		CO6		1		1				2	2	3	3	3	1		1
		CO1	1	2	3	2	2					2		2	3	2	2
		CO2	2	3	3	2	3					2		2	3	3	2
CSD472	Artificial	CO3	3	3	3	3	2	1	1			1	2	3	3	2	3
CSP472	Intelligence Lab	CO4	3	3	3	3	2	2	1			2	1	3	3	2	3
		CO5	2	3	3	3	3	2	2	2	3	2	2	2	3	3	2
		CO6	2	3	3	3	3	2	2	2	3	2	2	2	3	3	2
							Semest	er VII									



					1			r	1	1	1	[	1	[	1	1	
		CO1	3	3		2	3					2			3	2	
		CO2	3	3		2	3					2			3	2	
CSE062	Mobile	CO3	3	3		2	3					2			2	3	
CSE002	Computing	CO4	3	3		2	3					2			3	2	
		CO5	3	3		2	3					2			2	2	
		CO6	3	3		2	3					2			2	2	
		CO1	3	3			2			3				3			3
		CO2	3	3	2												3
CSE063	Quantum	CO3	3	3	2		2				2			2	3		
CSE005	Computing	CO4	3	3		3	2	3		2						3	
		CO5	3	2	3					3	3					3	
		CO6	3	3		3	3	3	3			3	3		3		
		CO1	3	1	1			2	1					3	3		
		CO2	2	2	1			1	3					3	3		
CSE071	Introduction to	CO3	3	1	1	2		2	1					3	3		
CSE071	Internet of Things	CO4	3	3	3	3	2	2		3	3	3	3	3	2	2	3
		CO5	3	3	3	3	3	2	3					3	3		
		CO6	2	2	2	2	3	2	3					3	3		
CSE072		CO1	3	3			2			3				3			3
CSE072		CO2	3	3	2												3



		CO3	3	3	2		2				2			2	3		
	Parallel	CO4	3	3		3	2	3		2						3	
	Algorithms	CO5	3	2	3					3	3					3	
	- ingointining	CO6	3	3		3	3	3	3			3	3		3		
		CO1	3	3			2			3				3			3
		CO2	3	3	2												3
CSE072	3D Printing and	CO3	3	3	2		2				2			2	3		
CSE073	Software Tools	CO4	3	3		3	2	3		2						3	
		CO5	3	2	3					3	3					3	
		CO6	3	3		3	3	3	3			3	3		3		
		CO1															
		CO2															
054		CO3															
OE4	Open Elective – 4	CO4															
		CO5															
		CO6															
		CO1	2	2		3	2		1	1	1				1	2	2
		CO2	1	2	1	2	2		1	1	1				1	2	
CODIOC	Summer	CO3	2		2	2	2			1	3		1	1	1	2	2
CSP496	Internship-III	CO4								1		3					
	Internsnip-III	CO5						2		3							
CSP497 Capstone – 1	CO6												2	2	2		
	CO1	3	3	3	2	2	2	2	1	2	1	1	2	2	3	3	
		CO2	3	3	3	3	2	1	1	1	2	1	1	2	3	3	3
	Capstone – 1	CO3	3	1	3	3	2	1	1	1	2	1	1	2	3	3	3
		CO4	1	1	2	1	2	3	3	1	2	3	1	2	1	2	3



		CO5	1	2	2	1	2	1	1	1	2	2	1	2	1	2	3
		CO6	2	1	2	1	3			1	2	3	1	2	3	3	3
							Semest	er VIII									
		CO1	2	1	2	2	3	2	2	2	2	2	2	2	3	3	3
	Capstone - 2	CO2	2	2	3	2	3	2	2	2	2	2	2	2	11	3	3
CSD409		CO3	3	3	3	3	3	2	2	2	2	2	2	1	1	3	3
C3F490		CO4	2	2	2	2	3	2	2	2	2	3	2	1	1	2	2
		CO5	1	2	2	1	3	2	2	2	2	3	2	1	1	2	2
		CO6	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
B.Tech-Computer Science & Engineering with specialization in Artificial Intelligence & Machine Learning																	



		CO1	3	3	3	1	2	1	1	1	2	3	1	3	2	3	1
		CO2	3	3	3	1	2	3	3	1	2	3	1	3	2	3	2
CS A 102	Introduction To AI & ML	CO3	3	3	3	1	2	3	3	1	3	3	3	3	3	3	3
CSA105		CO4	3	3	3	1	2	3	3	1	3	3	3	3	3	3	3
		CO5	3	3	3	1	2	3	3	1	3	3	3	3	3	3	3
		CO6	3	3	3	1	2	3	3	3	3	3	3	3	3	3	3
		CO1	3	3	3	3	3	3	2	1	1	3	1	3	2	2	1
		CO2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
CS A 202	Concept of	CO3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
CSA202	Machine Learning	CO4	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
		CO5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Concept of Machine Learning Lab	CO1	3	3	3	3	3	3	2	1	1	3	1	3	2	2	1
		CO2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
CAL 201		CO3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
CAL201		CO4	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
		CO5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
		CO2	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CS A 203	Concepts of	CO3	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
CSA205	Neural Networks	CO4	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
		CO5	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
		CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CSA301	Soft Computing	CO1	3	3	1	1	1	1	1	1	2	1	1	3	1	3	1



		CO2	3	3	3	3	2	3	2	2	2	2	3	3	3	3	3
		CO3	3	3	3	3	3	3	1	2	2	2	3	3	3	3	3
		CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
		CO5	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
		CO6	3	3	3	3	3	1	3	2	3	2	3	3	3	3	3
		CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
		CO2	3	3	3	3	2	3	1	1	3	3	1	3	3	3	3
CS A 202	Pattern	CO3	3	3	3	3	2	2	2	1	2	3	1	3	3	3	3
CSA502	Recognition	CO4	3	3	3	3	2	2	2	1	2	3	1	3	3	3	3
		CO5	3	3	3	3	2	3	1	1	2	3	1	3	3	3	3
		CO6	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3
	Pattern Recognition Lab	CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
		CO2	3	3	3	3	2	3	1	1	3	3	1	3	3	3	3
CAL 202		CO3	3	3	3	3	2	2	2	1	2	3	1	3	3	3	3
CAL502		CO4	3	3	3	3	2	2	2	1	2	3	1	3	3	3	3
		CO5	3	3	3	3	2	3	1	1	2	3	1	3	3	3	3
		CO6	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3
		CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
		CO2	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CE A 202	Deep Learning	CO3	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
CSA303	Applications	CO4	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
	- PP	CO5	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
		CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
	Deep Learning	CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
CAL303	and Its	CO2	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
	Applications Lab	CO3	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3



		CO4	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
		CO5	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
		CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
		CO1	3	3	3	3	3	1	2	3	1	3	1	3	3	3	1
CSA402	Applications of	CO2	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
	AIML in	CO3	3	3	3	3	3	2	2	3	2	3	3	3	3	3	3
	Computer	CO4	3	3	3	3	3	2	2	3	2	3	3	3	3	3	3
	Networks	CO5	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
		CO6	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CSA401		CO1	3	3	3	3	1	1	1	1	1	2	1	3	2	3	1
	Computer Vision	CO2	3	3	3	3	2	1	1	1	1	2	1	3	2	3	2
		CO3	3	3	3	3	2	1	1	1	1	2	1	3	3	3	2
		CO4	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
		CO5	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
		CO6	3	3	3	3	2	3	3	1	3	2	1	3	3	3	3
	Computer Vision	CO1	3	3	3	3	1	1	1	1	1	2	1	3	2	3	1
		CO2	3	3	3	3	2	1	1	1	1	2	1	3	2	3	2
CAL 401		CO3	3	3	3	3	2	1	1	1	1	2	1	3	3	3	2
CAL401	Lab	CO4	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
		CO5	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
		CO6	3	3	3	3	2	3	3	1	3	2	1	3	3	3	3
		CO1	3	3	2	2	1	1	1	1	1	2	1	3	2	2	1
	u c í	CO2	3	3	3	3	2	1	1	1	1	2	1	3	2	3	2
CSA021	Human Computer	CO3	3	3	3	3	2	1	1	1	1	2	1	3	3	3	2
	moraction	CO4	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
		CO5	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2



		CO6	3	3	3	3	2	1	1	1	1	2	1	3	3	3	3
		CO1	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
	Introduction to	CO2	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
CS 4 022	Cloud Computing with Machine learning	CO3	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
CSA022		CO4	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
		CO5	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
		CO6	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
		CO1	3	3	3	3	3	1	1	1	1	3	1	3	2	3	1
		CO2	3	3	3	3	3	1	1	1	1	3	1	3	3	3	2
CS A 0/1	Introduction to	CO3	3	3	3	3	3	2	1	1	1	3	1	3	3	3	1
CSA041	Natural Language Processing	CO4	3	3	3	3	3	1	2	1	1	3	1	3	3	3	3
		CO5	3	3	3	3	3	2	2	1	2	3	1	3	3	3	3
		CO6	3	3	3	3	3	3	3	1	3	3	2	3	3	3	3
	Recommender Systems	CO1	3	3	2	3	2	1	1	1	2	1		3	3	2	2
		CO2	3	3	3	3	3	2	2	1	2	2		3	3	3	2
CS 4 05 1		CO3	3	3	3	3	3	3	3	1	3	2		3	3	2	2
CSA051		CO4	3	3	3	3	3	2	2	1	3	2		3	3	3	2
		CO5	3	3	3	3	3	3	3	1	3	2		3	3	3	2
		CO6	3	3	3	3	3	3	3	1	3	3		3	3	3	3
		CO1	3	3	3	3	3	1	1	1	1	2	3	2	3	3	1
		CO2	3	3	3	3	3	1	2	1	2	2	3	2	3	3	2
CS A 0 6 1	Robotics and	CO3	3	3	3	3	3	2	1	1	2	2	3	3	3	3	3
CSA001	Systems	CO4	3	3	3	3	3	1	1	1	2	2	3	2	3	3	3
	Systems	CO5	3	3	3	3	3	1	1	1	2	2	3	2	3	3	3
		CO6	3	3	3	3	3	2	2	2	3	3	2	2	3	3	3
CSE011		CO1	3	2											2		



		CO2	2	3	1	1	1		1			1	2	1	1	1	
		CO3	3	1	1	1			1			2	1	1	3	1	
	Mathematical	CO4	2	3	2	1	1		1			1	1	1	2	1	
	reeninques	CO5	1	1	1	2	2		1			1	2	1	2	1	
		CO6	3	1	3	1	2		2			2	2	3	3	1	
		CO1	2	3	1	2											
		CO2	2	2	2	3											
	Introduction to	CO3	1	3	1	2										2	3
CSE021	Cloud Computing	CO4	3	1	2	2										3	2
		CO5	2	2	3	1										2	2
		CO6	1	3	1	2									2	3	3
	Android Application Development	CO1					3				2			1			2
		CO2					3				2			1			2
CCEO22		CO3			2		3				2			1	2		2
CSE022		CO4					3				2		2	1			2
		CO5			2	3	3		2		2		2	1			2
		CO6	1	2	3	3	3	3	3		3		3	1	3	3	3
		CO1	3	3	3	3	1	1	1	1	1	2	1	3	2	3	1
		CO2	3	3	3	3	2	1	1	1	1	2	1	3	2	3	2
CC 4 021	Digital Image	CO3	3	3	3	3	2	1	1	1	1	2	1	3	3	3	2
CSA031	Processing	CO4	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
		CO5	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
		CO6	3	3	3	3	2	3	3	1	3	2	1	3	3	3	3
		CO1	3		3					1							2
CSA051	Wireless	CO2	3	2	3					1							2
	Networks	CO3	3	2	3					1							2


		CO4	3	2	3					1							2
		CO5	3	2	3	2	2			1							3
		CO6	3	2	3	2	2			1							3
		CO1	3	3		2	3					2			3	2	
		CO2	3	3		2	3					2			3	2	
CSE062	MOBILE	CO3	3	3		2	3					2			2	3	
CSE002	COMPUTING	CO4	3	3		2	3					2			3	2	
		CO5	3	3		2	3					2			2	2	
		CO6	3	3		2	3					2			2	2	
		CO1	3	1	1			2	1					3	3		
		CO2	3	1	1	2		2	1					3	3		
0	Basics of Internet	CO3	2	1	1		3	1	1		1	1	2	2	1	1	
0	Raspherry Pi	CO4	2	2	2		3	2	2	2	1	1	1	2	3	2	2
		CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
		CO1	3	1	1			2	1					3	3		
		CO2	2	2	1			1	3					3	3		
COLLOA	Introduction to	CO3	3	1	1	2		2	1					3	3		
CS1104	IoT	CO4	3	2	3	2		1	2					3	3		
		CO5	3	3	3	3	3	2	3					3	3		
		CO6	2	2	2	2	3	2	3					3	3		
	]	B.Tech-(	Com	puter S	cience w	vith Spe	cializati	on in A	rtificial	Intellige	ence of T	Things (	AIoT)				



		CO1	3	1	1	-	-	2	1	-	-	-	-	3	3	-	-
		CO2	2	2	1	-	-	1	3	-	-	-	-	3	3	-	-
CS1104	Introduction to	CO3	3	1	1	2	-	2	1	-	-	-	-	3	3	-	-
C31104	IoT	CO4	3	2	3	2	-	1	2	-	-	-	-	3	3	-	-
		CO5	3	3	3	3	3	2	3	-	-	-	-	3	3	1	-
		CO6	2	2	2	2	3	2	3	-	-	-	-	3	3	1	-
		CO1	3	-	-	-	-	1	1	-	-	-	-	3	-	1	-
		CO2	3	2	-	-	3	-	-	-	2	2	1	3	2	2	-
CS1201	Embedded	CO3	3	3	I	2	2	I	2	-	2	2	-	3	2	1	-
CS1201	System	CO4	3	3	3	3	3	2	3	2	3	3	3	3	3	2	3
		CO5	3	-	2	2	-	-	-	-	2	2	-	3	-	-	-
		CO6	3	3	3	3	3	3	3	2	3	3	2	3	3	3	3
		CO1	3	-	-	1	1	1	1	-	3	1	-	3	1	1	1
		CO2	3	2	2	2	3	-	2	2	2	2	1	3	2	2	2
	Embedded	CO3	3	3	2	2	2	-	2	2	2	2	3	3	2	-	3
CIP201	System Lab	CO4	3	3	3	3	3	1	3	2	3	3	3	3	3	2	3
		CO5	3	-	2	2	-	-	1	1	2	2	3	3	2	-	-
		CO6	3	3	3	3	3	3	3	2	3	3	2	3	3	3	3
	ІоТ	CO1	2	-	-	-	-	-	-	-	1	-	-	2	-	2	-
CRIDOD	Architecture	CO2	2	-	-	-	-	-	-	-	2	-	-	2	2	2	_
CS1202	and	CO3	2	3	2	3	3	-	2	1	2	3	-	2	3	2	_
	Programming	CO4	2	-	-	2	2	-	2	-	2	2	-	2	-	2	-



		CO5	2	2	-	-	3	-	-	-	2	3	-	2	-	2	2
		CO6	3	3	3	3	3	2	3	3	3	3	2	2	3	3	3
		CO1	2	2	1	2	2	2	2	-	2	1	3	3	2	2	-
	IoT	CO2	2	2	2	1	2	-	-	-	2	-	2	3	2	2	-
CID202	Architecture	CO3	2	2	2	1	2	-	-	-	2	-	3	3	2	2	-
CIP202	and Programming	CO4	2	2	2	1	2	-	-	2	2	-	3	3	2	2	-
	Lab	CO5	2	2	2	2	2	-	-	2	2	-	3	3	3	3	-
		CO6	2	2	2	2	2	3	2	2	3	1	3	3	3	3	2
		CO1	2	-	-	1	2	2	-	-	1	1	1	2	2	1	1
	Programming	CO2	2	2	2	1	2	2	2	-	1	1	1	2	2	1	1
001201	with	CO3	2	2	2	2	3	2	2	-	2	2	2	2	3	2	1
C\$1301	SENSEnuts	CO4	2	3	2	2	3	2	2	-	2	2	2	2	3	2	1
	IoT Platform	CO5	2	3	3	3	3	2	2	2	2	2	2	2	3	3	1
		CO6	3	3	3	3	3	2	2	3	3	3	3	3	3	3	2
		CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
	Programming	CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
CID201	with	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
CIP301	SENSEnuts	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
	Lab	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
		CO1	2	1	1	1	1	1	1	1	-	1	-	2	1	-	-
		CO2	2	2	1	1	1	2	2	1	2	2	2	2	2	1	1
COLOO	IoT: Sensing &	CO3	2	2	1	1	1	2	3	1	2	2	2	2	2	1	1
CS1302	CSI302 Actuator –	CO4	2	2	1	1	1	2	1	1	2	2	2	2	2	1	1
	Devices	CO5	2	2	1	1	1	2	1	1	2	2	2	2	2	1	1
		CO6	3	3	3	3	2	3	2	1	3	3	3	3	3	3	2



		CO1	3	2	2	2	3	1	1	-	3	3	3	2	1	-	-
		CO2	3	3	2	2	3	2	2	-	3	3	3	2	2	2	-
CID202	IoT: Sensing &	CO3	3	3	2	2	3	2	3	-	3	3	3	2	2	2	-
CIP302	Actuator Devices Lab	CO4	3	3	2	2	3	2	1	-	3	3	3	2	2	2	-
		CO5	3	3	2	2	3	2	1	2	3	3	3	2	2	2	-
		CO6	3	3	3	3	3	3	2	2	3	3	3	3	3	3	2
		CO1	3	-	2	-	-	-	-	-	1	2	-	1	-	-	-
		CO2	3	2	-	-	-	-	-	1	1	2	-	1	-	-	-
CG1202	Wireless	CO3	3	2	-	2	-	-	-	2	2	2	2	2	-	-	-
C\$1505	for IoT	CO4	3	2	2	-	-	-	-	2	2	2	2	2	-	-	-
	101 10 1	CO5	3	2	-	2	3	-	3	2	3	2	3	3	2	-	-
		CO6	3	3	3	3	3	-	3	3	3	3	3	3	2	3	3
		CO1	3	3	-	-	2	-	-	-	2	-	-	3	-	-	-
		CO2	3	3	2	-	3	3	-	-	2	-	-	3	3	2	-
CID202	Wireless	CO3	3	3	3	2	3	3	-	-	3	-	2	3	3	2	-
CIP305	for IoT Lab	CO4	3	3	3	2	3	3	-	-	3	-	2	3	3	2	-
	101 10 1 200	CO5	3	3	3	2	3	3	-	-	3	-	3	3	3	3	-
		CO6	3	3	3	3	3	3	-	-	3	-	3	3	3	3	-
		CO1	3	1	2	1	-	-	-	2	-	-	-	2	-	-	-
		CO2	3	1	1	1	-	-	-	2	-	-	-	2	-	-	-
CC1401	IoT Committee	CO3	3	2	2	2	2	-	-	2	-	-	-	2	-	-	-
C\$1401	101 Security	CO4	3	3	3	3	2	2	-	3	3	3	3	3	2	2	3
		CO5	3	3	3	3	2	2	-	1	2	-	2	3	2	-	-
		CO6	3	3	3	3	3	3	-	2	3	3	3	3	2	3	3
CC1022	Micro-	CO1	2	-	-	1	2	2	-	-	1	1	1	2	2	1	1
CS1025	controller	CO2	2	2	2	1	2	2	2	-	1	1	1	2	2	1	1



	programming	CO3	2	2	2	2	3	2	2	-	2	2	2	2	3	2	1
	using Arduino	CO4	2	3	2	2	3	2	2	-	2	2	2	2	3	2	1
		CO5	2	3	3	3	3	2	2	2	2	2	2	2	3	3	1
		CO6	3	3	3	3	3	2	2	3	3	3	3	3	3	3	2
		CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
	Micro-	CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
CID022	controller	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
CIP023	using Arduino	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
	Lab	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
		CO1	2	1	1	-	3	1	1	-	1	1	2	2	1	1	-
		CO2	2	2	2	-	3	2	2	2	1	1	1	2	3	2	2
CGI024	Raspberry Pi	CO3	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
CS1024	and its Programming	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
	Trogramming	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
		CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
	Raspherry Pi	CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
CID024	and its	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
CIP024	Programming	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
	Lab	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
		CO1	2	2	-	2	-	1	-	-	1	-	-	2	-	1	-
CG1021	Sensor-Cloud	CO2	2	2	-	2	-	1	-	-	1	-	-	2	-	1	-
CS1021	Things	CO3	2	1	1	2	-	1	-	-	1	1	-	2	-	2	-
	8-	CO4	2	2	1	2	-	1	2	-	2	1	-	3	-	2	-



		CO5	2	2	2	2	-	1	2	-	2	1	2	3	2	2	-
		CO6	3	3	3	2	3	2	2	2	2	2	2	3	3	3	2
		CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
		CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
CID021	Sensor-Cloud	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
CIP021	Tor Internet of Things Lab	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
	Things Luc	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
		CO1	2	2	-	2	-	2	-	-	1	-	-	2	-	1	-
		CO2	2	2	-	2	-	2	-	-	1	-	-	2	-	1	-
CGI022	Wireless	CO3	2	1	1	2	-	2	-	-	2	2	-	2	-	2	-
CS1022	Sensor Networks	CO4	2	2	1	2	-	2	2	-	2	2	-	3	-	2	-
	1 tet works	CO5	2	2	3	2	-	2	2	-	3	2	2	3	2	3	-
		CO6	3	3	3	2	3	2	2	2	3	2	2	3	3	3	2
		CO1	2	1	-	-	2	-	-	-	-	-	-	2	-	-	-
		CO2	3	2	1	1	3	-	2	-	1	1	1	2	1	2	2
CIDODO	Wireless	CO3	3	1	2	2	3	1	3	-	2	2	2	2	3	2	2
CIP022	Sensor Networks Lab	CO4	3	2	2	2	2	1	3	-	2	2	2	2	1	2	2
		CO5	3	2	2	2	3	2	3	-	3	3	3	3	2	3	3
		CO6	3	2	3	2	3	2	3	2	3	3	3	3	3	3	3
		CO1	3	-	-	-	-	-	-	2	-	-	-	2	-	-	-
		CO2	3	2	2	2	3	2	-	-	2	2	2	2	2	2	2
COLORI	Artificial	CO3	3	2	2	2	3	2	3	2	2	2	2	2	2	2	-
CS1031	Intelligence for	CO4	3	3	3	3	3	-	-	-	2	2	-	2	2	2	2
	101	CO5	3	3	3	3	3	3	3	2	2	2	3	3	2	3	2
		CO6	3	3	3	3	3	3	-	2	3	3	3	3	2	3	3



		CO1	2	2	1	-	3	1	1	-	2	2	2	2	1	1	-
		CO2	3	3	2	2	3	2	2	2	1	1	1	3	3	2	3
CID021	Artificial	CO3	3	2	2	2	3	2	2	2	3	3	3	3	3	2	3
CIP031	Intelligence for	CO4	3	3	2	2	3	2	2	2	3	3	3	3	3	2	3
	IOT Luc	CO5	3	3	2	3	3	2	2	2	3	3	3	3	3	2	3
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO1	2	3	-	2	-	-	-	-	-	-	-	2	-	1	-
		CO2	3	-	-	2	2	-	-	-	-	-	2	2	2	1	-
CG1022	Data Analytics	CO3	3	2	3	2	2	-	-	-	-	2	2	2	2	1	-
CS1032	for IoT	CO4	2	-	-	2	-	-	-	-	-	2	2	2	-	1	-
		CO5	3	3	3	2	2	3	2	-	2	2	2	2	2	2	-
		CO6	3	3	3	2	3	3	2	2	2	2	2	2	3	2	-
		CO1	3	-	-	-	2	-	-	2	-	-	-	2	-	2	-
		CO2	3	2	2	2	3	2	-	-	2	2	2	2	2	2	2
001022	Image	CO3	3	2	2	2	3	2	-	2	2	2	-	2	2	2	-
CS1033	with IoT	CO4	3	3	3	3	3	-	-	-	2	2	-	2	2	2	2
		CO5	3	3	3	3	3	3	-	2	2	2	-	3	2	3	2
		CO6	3	3	3	3	3	3	3	2	3	3	3	3	2	3	3
		CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
		CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
CID022	Image	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
CIP033	with IoT Lab	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
	with 101 Lub	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
C91011	Android with	CO1	2	-	-	-	2	-	-	-	-	1	2	2	-	-	-
CSI011	IoT	CO2	2	-	-	-	2	-	-	-	-	-	2	2	-	-	1



		CO3	2	2	-	2	2	2	3	-	2	2	2	3	-	-	-
		CO4	2	2	-	2	2	-	-	-	2	2	2	3	1	1	3
		CO5	2	2	2	3	2	3	2	2	3	3	2	3	3	3	3
		CO6	2	3	3	3	2	3	2	2	3	3	2	3	3	3	3
		CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
		CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
CID011	Android with	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
CIPUIT	IoT Lab	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
		CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
		CO1	2	2	-	-	-	-	-	-	-	-	-	2	-	-	-
		CO2	3	2	2	2	-	-	1	-	-	-	-	2	-	-	-
001041	Fog Computing	CO3	3	2	2	2	2	-	2	-	2	2	2	3	2	2	-
CS1041	in IoT	CO4	3	2	2	2	-	-	2	-	2	2	2	3	2	2	-
		CO5	3	3	3	2	3	2	2	3	3	3	3	3	2	2	2
		CO6	3	3	3	2	3	3	2	3	3	3	3	3	2	2	3
		CO1	1	-	-	-	-	1	2	2	-	-	-	2	-	-	-
		CO2	2	2	-	1	-	1	2	2	1	-	-	2	-	-	-
CS1042	Industrial IoT	CO3	2	1	-	1	2	1	2	2	2	1	2	2	1	2	-
CS1042	4.0	CO4	2	2	1	2	2	1	2	2	2	1	2	2	1	2	-
		CO5	2	2	-	2	2	1	2	2	2	2	2	2	2	3	2
		CO6	2	2	2	2	3	1	2	2	3	2	3	3	2	3	2
		CO1	3	2	2	-	2	3	3	2	2	2	2	3	2	2	-
CC1051	IoT in	CO2	3	3	3	2	2	3	3	2	2	3	2	3	2	2	-
C21021	Healthcare	CO3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	-
		CO4	3	3	3	3	2	3	3	2	3	3	3	3	3	3	-



		CO5	3	3	3	3	2	3	3	2	3	3	3	3	3	3	-
		CO6	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
		CO1	3	2	2	-	3	2	2	2	2	2	-	3	2	2	-
		CO2	3	3	3	2	3	3	3	2	2	3	-	3	2	2	-
001052	Durantin LaT	CO3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
CS1052	Drones in Io I	CO4	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
		CO5	3	3	3	3	3	3	3	2	3	3	3	3	3	3	-
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO1	2	2	2	2	-	2	2	-	-	1	-	2	-	-	-
		CO2	2	2	2	3	-	2	2	-	-	-	2	2	-	-	-
CSI061	Industrial IoT:	CO3	3	2	2	3	3	2	2	2	-	-	-	2	-	-	2
C31001	Manufacturing	CO4	3	2	2	3	-	2	2	-	-	2	2	2	-	-	2
	Munufacturing	CO5	3	2	3	3	-	2	2	-	2	2	-	2	-	-	-
		CO6	3	3	3	3	3	2	2	3	2	2	2	3	3	2	2
		CO1	3	3	2	3	3	3	3	2	3	3	3	3	3	2	2
		CO2	3	3	3	3	3	3	3	2	3	3	3	3	3	2	2
CEIOCO	IoT	CO3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
CS1062	Applications	CO4	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
		CO5	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
		CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
		CO1	3	3	2	3	3	3	3	2	3	3	3	3	3	2	2
		CO2	3	3	3	3	3	3	3	2	3	3	3	3	3	2	2
	IoT	CO3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
CIP062	Applications	CO4	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
	Lau	CO5	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
		CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2



		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Introduction to	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	& Laws	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
		CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Digital	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	Forensics	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
		CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	D: : 1	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Digital forensics Lab	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	Torensies Lab	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
		CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-

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		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Ethical	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	Hacking	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
		CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	ETHICAL	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	LAB	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
		CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	Security	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Threats	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	and Risk	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	Management	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
CSC202	Cryptography	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
CSC302	Security	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	Security	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
CCP302		CO1	3	3	-	-	2	-	-	3	-	-	3	-	-	3	3



		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
	Cryptography	CO3	3	3	2	-	2	-	-	-	2	-	2	3	-	-	3
	and Network	CO4	3	3	-	3	2	3	-	2	-	-	-	-	3	-	3
	Security Lab	CO5	3	2	3	-	-	-	-	3	3	-	-	-	3	-	3
		CO6	3	3	-	3	3	3	3	-	-	3	-	3	-	-	3
		CO1	3	3	-	-	2	-	-	3	-	-	3	-	-	3	3
	Intrusion	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
0	Detection and	CO3	3	3	2	-	2	-	-	-	2	-	2	3	-	-	3
0	Prevention	CO4	3	3	-	3	2	3	-	2	-	-	-	-	3	-	3
	System	CO5	3	2	3	-	-	-	-	3	3	-	-	-	3	-	3
		CO6	3	3	-	3	3	3	3	-	-	3	-	3	-	-	3
		CO1	3	3	-	-	2	-	-	3	-	-	3	-	-	3	3
	Intrusion	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
0	Detection and	CO3	3	3	2	-	2	-	-	-	2	-	2	3	-	-	3
0	Prevention	CO4	3	3	-	3	2	3	-	2	-	-	-	-	3	-	3
	System Lab	CO5	3	2	3	-	-	-	-	3	3	-	-	-	3	-	3
		CO6	3	3	-	3	3	3	3	-	-	3	-	3	-	-	3
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Introduction to	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	Security	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	Becanty	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	3	3	3	3	2	1	1	3	1	3	2	2	1
0	Machine Learning	CO2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
	Learning	CO3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3



		CO4	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
		CO5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
		CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		CO1	3	3	3	3	3	3	2	3		3	3	1	3	2	3
		CO2	3	3	3	2	2	2	3	2	2	3	2	3	3	2	2
0	Machine	CO3	3	3	2	3	2	1	2	2	2	3	2	2	2	3	2
0	Learning Lab	CO4	3	3	3	2	2	3	2	3	2	1	3	2	1	3	2
		CO5	3	3	2	2	1	3	2	1	3	2	1	3	2	1	3
		CO6	3	2	3	2	2	1	2	2	1	2	2	2	1	2	1
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	Open source	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Tools for	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	I	-
0	Cyber Security	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	& Forensics	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	Open source	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Tools for	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	& Forensics	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	Lab	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
		CO2	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
0	Packet	CO3	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
	Anarysis	CO4	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
		CO5	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3



		CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
		CO1	3	3	3	3				2	2	1	2	1	3	2	2
		CO2	3	2	3	3				2	2	2	1	1	2	3	2
0	Packet	CO3	3	3	3	3				1	1	1	3	2	3	2	1
0	Analysis Lab	CO4	2	2	2	2	1			2	3	3	3	1	2	2	2
		CO5	2	2	3	-	-	-	-	3	3	1	2	-	3	-	-
		CO6	3	2	-	-	-	-	-	-	-	2	3	-	2	2	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Mobile and	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	Security	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	Security	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0		CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	Exploit Writing	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
		CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
000 022	Malware	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
CSC-032	Analysis	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
		CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
0	Cloud Security	CO1															



		CO2															
		CO3															
		CO4															
		CO5															
		CO6															
		CO1		3	3	-	-	2	-	-	3	-	-	-	3	-	-
		CO2		3	3	2	-	-	-	-	-	-	-	-	-	-	-
0	Penetration	CO3		3	3	2	-	2	-	-	-	2	-	-	2	3	-
0	Testing	CO4		3	3	-	3	2	3	-	2	-	-	-	-	-	3
		CO5		3	2	3	-	-	-	-	3	3	-	-	-	-	3
		CO6		3	3	-	3	3	3	3	-	-	3	3	-	3	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Penetration	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	Testing Lab	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
		CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	Web	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
CSC-062	Application	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	Security	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	Disaster	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
CSC-022	Kecovery Management	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	management	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-



		CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Digital Water	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	Marking and Steganography	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	Stegunogruphy	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	2	2		-	-	-	-	-	-	-	-	-	2	2	-
	Information	CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	2	-
0	Security and	CO3	2	-	2	-	2	-	-	-	-	-	-	-	2	2	-
0	Audit	CO4	2	-	-	2	-	2	2	-	-	-	-	-	2	2	
	Monitoring	CO5	-	-	-	-	2	-	2	2	2		-	-	2	-	-
		CO6	-	-	-	-	-	-	-	-	-	2	2	2	2	-	2
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Network &	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	Even Experies	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	1 orensies	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
		CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
		CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
0	Data Privacy	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
0	and Protection	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
		CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
		CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-



## 1.3.5.2 COURSE ARTICULATION MATRIX<sup>2</sup>

		PO-	PO- 2	PO-	PO-4	PO-	PO-	PO- 7	PO-	PO- 0	PO- 10	PO-	PO-	PSO 1	PS O2	PSO3
Course Code	Course Name	Engineering knowledge	Problem analysis	Design/development of , solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication:	Project management and finance	Life-long learning	Familiarity and practical proficiency	Understand, analyse and develop	Apply standard Software
CSE113	Programming for Problem Solving	1.83	2.50	2.17	1.50	2.00				1.80		1.50		1.67	2.17	1.00
MTH142	Calculus and Abstract Algebra	3.00	3.00	2.17	2.17	2.17	1.33				1.00	1.00	1.50			
PHY125	Engineering Physics-I	3.00	3.00	2.50	2.50	2.83	1.83	1.00	1.00	1.17	1.00	1.00	1.00			
CVL103	Environmental Studies	2.00	2.00	2.67	2.17	2.67	3.00									
ARP101	Communicative English-1		2.33	2.00	2.00				2.00	2.00	2.33	2.00	2.83			
CSP113	Programming for Problem Solving Lab	2.17		2.83	1.83	1.67				2.33				2.50	2.50	1.80
CSP101	Introduction to Computer Science and Engineering	3.00	2.00				2.00		2.00				3.00	3.00	2.75	2.60
MEP106	Computer Aided Design & Drafting	2.00	2.00	2.00	2.00	3.00				2.00	2.00		3.00	3.00	3.00	
PHY162	Physics Lab	2.00	2.00	2.00	1.00	1.00	1.00	2.00	3.00	3.00	3.00	2.00	3.00	2.00		
			Sen	nester II												
CSE114	Application based Programming in Python	2.17	2.00	1.67	1.75	2.00	2.00		2.00				2.00	1.50	2.00	1.40
MTH145	Probability and Statistics	3.00	2.67	2.17	2.17	2.17	1.33				1.00	1.00	1.50			
EEE112	Principles of Electrical and Electronics Engineering	2.17	1.83	1.83	1.50							1.00				
CSE242	Data Structures	2.00	2.33	2.67	2.33	1.50				1.83			1.00	2.33	2.17	2.33

<sup>&</sup>lt;sup>2</sup> Each course outcome (Based on Blooms Taxanomy-CO1, CO2, CO3, CO4, CO5, and CO6) of the course needs to map with PO. This table evolves once faculty has mapped each course outcomes of their respective course with PO's.



HMM111	Human Value & Ethics	1.25	2.25	1.40	1.60	2.00	2.00	1.75	1.00	1.50	2.00	2.25	1.75	1.75	2.20	1.75
ARP102	Communicative English -2								3.00		3.00		3.00			
CSP105	Design and creativity Lab	3.00	2.67	2.00	2.75	2.00	2.00	2.50	3.00	3.00	3.00	2.00	3.00	2.00	2.00	1.00
CSP114	Application based Programming in Python	2.00	2.00	1.50	1.50	1.60	1.75		2.00				2.00	1.75	1.67	1.40
MEP105	Mechanical Workshop	1.67		1.00		1.60	2.00						1.83	1.40		1.00
EEP112	Principles of Electrical and Electronics Engineering	2.17	1.83	1.83	1.50							1.00				
CSP242	Data Structures Lab	2.67	2.00	2.50	2.50	2.00				2.60			1.67	2.17	2.50	2.17
			Sem	ester III												
CSE252	Computer Networks	2.25	2.00	2.00	2.00	3.00	2.00		2.00			2.00	3.00	2.00	2.40	2.00
CSE245	Discrete Structures	2.00	2.17	2.50	2.40	3.00	2.67			2.75		3.00	3.00	3.00	2.60	2.50
CSE247	Computer Organization and Architecture	3.00	2.33	2.50			2.00						2.83		1.83	2.50
CSE253	Object Oriented Programming Using Java	2.50	3.00	3.00		2.00	3.00	2.00		3.00		2.00	2.33	2.50	3.00	2.00
CSE254	Principles of Operating System	2.67	2.33	2.80	2.75	1.00			2.00	2.20	1.67	2.33	1.25	2.50	2.20	1.75
CSE255	Introduction of Entrepreneurship															
ARP207	Logical Skills Building and Soft Skills		2.00	3.00			2.00		2.00	2.33	2.00		3.00			
CSP252	Computer Networks Lab	2.25	2.00	2.00	2.00	3.00	2.00		2.00			2.00	3.00	2.00	2.40	2.00
CSP243	Object Oriented Programming Using Java	2.50	3.00	3.00		2.00	3.00	2.00		3.00		2.00	2.33	2.50	3.00	2.00
CSP244	Principles of Operating System Lab	2.67	2.33	2.80	2.75	1.00			2.00	2.20	1.67	2.33	1.25	2.50	2.20	1.75
CSP254	Project Based Learning (PBL) -1	3.00	2.67	2.00	2.75	2.00	2.00	2.50	3.00	3.00	3.00	2.00	3.00	2.00	2.00	1.00
CSP292	Summer Internship-I	2.00	2.50	2.50		2.00	2.00		3.00	3.00	3.00		2.00	1.33	2.00	
			Sem	ester IV												
BTY223	Introduction to Biology for Engineers	3.00	2.00	1.67	1.00	2.00	2.00	3.20	2.00	1.00	2.00	1.00	3.00	1.00	1.00	
CSE249	Data Base Management System	2.67	3.00	2.75	3.00	2.75	2.17		2.33	2.67	3.00	2.00	2.33	2.67	3.00	3.00
CSE251	Theory of Computation	2.83	2.60	2.83	3.00	2.40				2.40			2.60	3.00	2.40	2.25
HMM305	Management for Engineers	1.75	1.33	1.67	1.67	2.00	1.83	2.00	1.50	1.33	2.33	1.33	1.25	1.33	1.50	1.83
CSE011	Mathematical Techniques	2.33	1.83	1.60	1.20	1.50		1.20			1.40	1.60	1.40	2.17	1.00	
CSE012	Introduction to Graph Theory and its Applications	1.83	2.50	1.83	2.67	1.40	1.50	1.50			1.50	1.00	1.83	2.17	1.67	2.00
OE1	Open Elective – 1															



ARP208	Quantitative and Qualitative Aptitude Skill Building		2.00	2.00					2.00	2.00	2.20		3.00			
CSP249	Data Base Management System Lab	3.00	2.20	2.40	2.20	2.17				3.00			2.00	2.17	2.50	2.83
CSP297	Project Based Learning (PBL) -2	3.00	2.67	2.00	2.75	2.00	2.00	2.50	3.00	3.00	3.00	2.00	3.00	2.00	2.00	1.00
			Sen	nester V												
CSE354	Design and Analysis of Algorithm	2.00	2.17	1.83	2.40	2.00				2.17				2.50	2.00	2.25
CSE355	Software Engineering and Testing Methodologies															
CSE356	Research Methodology															
CSE021	Introduction to Cloud Computing	1.83	2.33	1.67	2.00									2.00	2.50	2.50
CSE023	Android Application Development	1.00	2.00	2.33	3.00	3.00	3.00	2.50		2.17		2.33	1.00	2.50	3.00	2.17
CSE024	Web Technologies	2.00	1.67	3.00	1.00	2.00	1.67	1.00		2.33		2.00	1.50	1.00	1.50	2.33
OE-2	Open Elective – 2															
ARP305	Personality Development and Decision making Skills		2.00	2.00			2.00	2.00		2.00	2.00		3.00			
CSP350	Design and Analysis of Algorithm Lab	2.50	2.67	2.50	2.40	2.00				1.83				2.50	2.33	2.20
CSP354	Project Based Learning (PBL) -3	3.00	2.17	2.00	1.80	2.50	2.00		1.17	2.00	3.00	2.25	1.33	1.83	1.80	1.75
CSP355	Software Engineering and Testing Methodologies															
CSP023	Android Application Development Lab	1.00	2.00	2.33	3.00	3.00	3.00	2.50		2.17		2.33	1.00	2.50	3.00	2.17
CSP024	Web Technologies Lab	2.00	1.67	1.67	1.00	2.00	1.67			2.20		2.00	1.33	1.00	1.20	2.25
CSP391	Summer Internship-II	1.67	2.00	1.50	2.33	2.00	2.00	1.00	1.40	1.67	3.00	1.00	1.50	1.25	2.00	2.00
CSP395	Technical Skill Enhancement Course-1 Simulation Lab	1.17	2.00	1.33	3.00	2.00	2.00	1.00		2.00	2.50	2.00	1.17	1.17	2.17	1.00
ECC301	Community Connect															
			Sem	ester VI	-											
CSE353	Compiler Design	2.00	2.00	2.80	3.00	2.40				2.75			2.75	2.40	2.00	2.33
CSE472	Artificial Intelligence	2.17	2.83	3.00	2.67	2.50	1.75	1.50	2.00	3.00	1.83	1.75	2.33	3.00	2.50	2.33
CSE031	Digital Image Processing	3.00	3.00	3.00	3.00	1.83	1.67	1.33	1.00	1.33	2.00	1.00	3.00	2.67	3.00	2.00
CSE032	Cryptography and Network Security	2.25	2.50	2.00	1.50	2.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.17	1.75	1.50
CSE041	Software Project Management	2.00		2.33	3.00	1.83	2.50		1.00	3.00	2.50	3.00	2.67			2.50
CSE042	Software Testing	2.83	2.67	2.80	2.00	2.60	1.60	3.00	1.20	2.20	3.00	3.00	2.17	2.00		3.00
CSE051	Wireless Networks	3.00	2.00	3.00	2.00	2.00			1.00							2.33



CSE052	Risk Management	2.00	2.00	2.00	2.50	2.00		1.00	1.00	2.00	1.25	1.25	1.00	1.50	1.00	1.33
CSE053	Advanced Operating System	2.67	2.33	2.80	2.75	1.00			2.00	2.20	1.67	2.33	1.25	2.50	2.20	1.75
OE-3	Open Elective – 3															
ARP306	Campus to Corporate		2.00	2.00			2.00	2.00		2.00	3.00		3.00			
CSP353	Compiler Design Lab	2.00	2.00	2.80	3.00	2.40				2.75			2.75	2.40	2.00	2.33
CSP396	Technical Skill Enhancement Course-2(Application Development Lab)	1.33	2.00	1.50	2.00	2.00	2.00	1.00		2.00	2.50	2.00	1.17	1.17	2.17	1.00
CSP398	Project Based Learning (PBL) -4	3.00	2.17	2.00	1.80	2.50	2.00		1.17	2.00	3.00	2.25	1.33	1.83	1.80	1.75
CSP472	Artificial Intelligence Lab	2.17	2.83	3.00	2.67	2.50	1.75	1.50	2.00	3.00	1.83	1.75	2.33	3.00	2.50	2.33
			Sem	ester VI	I											
CSE062	Mobile Computing	3.00	3.00		2.00	3.00					2.00			2.50	2.17	
CSE063	Quantum Computing	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
CSE071	Introduction to Internet of Things	2.67	2.00	1.83	2.50	2.67	1.83	2.20	3.00	3.00	3.00	3.00	3.00	2.83	2.00	3.00
CSE072	Parallel Computing Algorithms	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
CSE073	3D Printing and Software Tools	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
OE4	Open Elective – 4															
CSP496	Summer Internship-III	1.67	2.00	1.50	2.33	2.00	2.00	1.00	1.40	1.67	3.00	1.00	1.50	1.25	2.00	2.00
CSP497	Capstone – 1	2.17	1.83	2.50	1.83	2.17	1.60	1.60	1.00	2.00	1.83	1.00	2.00	2.17	2.67	3.00
			Seme	ester VII	I											
CSP498	Capstone - 2	1.83	2.00	2.33	2.00	2.83	2.00	2.00	2.00	2.00	2.33	2.00	1.50	3.17	2.50	2.50

	B.Tech-Computer Science & Engineeri	ng with	specia	lizatior	n in Art	ificial I	Intellige	ence &	Machii	ne Lear	ning					
CSA103	Introduction To AI & ML	3.00	3.00	3.00	1.00	2.00	2.67	2.67	1.33	2.67	3.00	2.33	3.00	2.67	3.00	2.50
CSA202	Concept of Machine Learning	3.00	3.00	3.00	3.00	3.00	3.00	2.83	2.00	2.00	3.00	2.67	3.00	2.83	2.83	2.67
CAL201	Concept of Machine Learning Lab	3.00	3.00	3.00	3.00	3.00	3.00	2.83	2.00	2.00	3.00	2.67	3.00	2.83	2.83	2.67
CSA203	Concepts of Neural Networks	3.00	3.00	3.00	3.00	2.83	2.33	2.33	1.17	2.33	3.00	2.67	3.00	3.00	3.00	2.67
CSA301	Soft Computing	3.00	3.00	2.67	2.67	2.50	2.33	2.17	1.83	2.33	1.83	2.67	3.00	2.67	3.00	2.67
CSA302	Pattern Recognition	3.00	3.00	3.00	3.00	2.17	2.33	1.50	1.17	2.17	3.00	1.33	3.00	3.00	3.00	2.67



CAL302	Pattern Recognition Lab		3.00	3.00	3.00	3.00	2.17	2.33	1.50	1.17	2.17	3.00	1.33	3.00	3.00	3.00	2.67
CSA303	Deep Learning and Its Applications		3.00	3.00	3.00	3.00	2.83	2.33	2.33	1.17	2.33	3.00	2.67	3.00	3.00	3.00	2.67
CAL303	Deep Learning and Its Applications Lab		3.00	3.00	3.00	3.00	2.83	2.33	2.33	1.17	2.33	3.00	2.67	3.00	3.00	3.00	2.67
CSA402	Applications of AIML in healthcare/ ICT/ Computer Netw	vorks	3.00	3.00	3.00	3.00	3.00	1.83	2.00	3.00	2.33	3.00	2.67	3.00	3.00	3.00	2.67
CSA401	Computer Vision		3.00	3.00	3.00	3.00	1.83	1.67	1.33	1.00	1.33	2.00	1.00	3.00	2.67	3.00	2.00
CAL401	Computer Vision Lab		3.00	3.00	3.00	3.00	1.83	1.67	1.33	1.00	1.33	2.00	1.00	3.00	2.67	3.00	2.00
CSA021	Human Computer Interaction		3.00	3.00	2.83	2.83	1.83	1.33	1.00	1.00	1.00	2.00	1.00	3.00	2.67	2.83	2.00
CSA022	Introduction to Cloud Computing with Machine learning		3.00	3.00	3.00	3.00	3.00	3.00	3.00	1.00	2.00	3.00	1.00	3.00	3.00	3.00	3.00
CSA041	Introduction to Natural Language Processing		3.00	3.00	3.00	3.00	3.00	1.67	1.67	1.00	1.50	3.00	1.17	3.00	2.83	3.00	2.17
CSA051	Recommender Systems		3.00	3.00	2.83	3.00	2.83	2.33	2.33	1.00	2.67	2.00		3.00	3.00	2.67	2.17
CSA061	Robotics and Intelligent Systems		3.00	3.00	3.00	3.00	3.00	1.33	1.33	1.17	2.00	2.17	2.83	2.17	3.00	3.00	2.50
CSE011	Mathematical Techniques		2.33	1.83	1.60	1.20	1.50		1.20			1.40	1.60	1.40	2.17	1.00	
CSE021	Introduction to Cloud Computing		1.83	2.33	1.67	2.00									2.00	2.50	2.50
CSE022	Android Application Development		1.00	2.00	2.33	3.00	3.00	3.00	2.50		2.17		2.33	1.00	2.50	3.00	2.17
CSA031	Digital Image Processing		3.00	3.00	3.00	3.00	1.83	1.67	1.33	1.00	1.40	2.00	1.00	3.00	2.67	3.00	2.00
CSA051	Wireless Networks		3.00	2.00	3.00	2.00	2.00			1.00							2.33
CSE062	MOBILE COMPUTING		3.00	3.00		2.00	3.00					2.00			2.50	2.17	
0	Basics of Internet of Things and Raspberry Pi		2.67	1.67	1.67	2.67	3.00	2.00	1.67	2.33	2.00	2.00	2.25	2.67	2.67	2.00	2.00
CSI104	Introduction to IoT		2.67	1.83	1.83	2.25	3.00	1.67	2.17					3.00	3.00		
	B.Tech-Computer Science &	k Engir	neering	with sp	pecializ	ation in	ı Intern	et of Tl	hings &	. Appli	cations						
CSI104	Introduction to IoT	2.67	1	.83	1.83	2.25	3.00	1.67	2.17					3.00	3.00		
CSI201	Embedded System	3.00	2	.75	2.67	2.50	2.75	2.00	2.25	2.00	2.40	2.40	2.00	3.00	2.50	2.00	3.00
CIP201	Embedded System Lab	3.00	2	.75	2.40	2.17	2.40	1.67	2.00	1.80	2.50	2.17	2.40	3.00	2.17	2.00	2.40
CSI202	IoT Architecture and Programming	2.17	2	.67	2.50	2.67	2.75	2.00	2.33	2.00	2.00	2.75	2.00	2.00	2.67	2.17	2.50
CIP202	IoT Architecture and Programming Lab	2.00	2	.00	1.83	1.50	2.00	2.50	2.00	2.00	2.17	1.00	2.83	3.00	2.33	2.33	2.00
CSI301	Programming with SENSEnuts IoT Platform	2.17	2	.60	2.40	2.00	2.67	2.00	2.00	2.50	1.83	1.83	1.83	2.17	2.67	2.00	1.17
CIP301	Programming with SENSEnuts IoT Platform Lab	2.33	2	.00	2.00	2.00	3.00	2.00	2.00	2.20	2.50	2.50	2.50	2.67	2.67	2.00	2.00
CSI302	IoT: Sensing & Actuator Devices	2.17	2	.00	1.33	1.33	1.17	2.00	1.67	1.00	2.20	2.00	2.20	2.17	2.00	1.40	1.20



CIP302	IoT: Sensing & Actuator Devices Lab	3.00	2	.83	2.17	2.17	3.00	2.00	1.67	2.00	3.00	3.00	3.00	2.17	2.00	2.20	2.00
CSI303	Wireless Technologies for IoT	3.00	2	.20	2.33	2.33	3.00		3.00	2.00	2.00	2.17	2.50	2.00	2.00	3.00	3.00
CIP303	Wireless Technologies for IoT Lab	3.00	3	.00	2.80	2.25	2.83	3.00			2.67		2.50	3.00	3.00	2.40	
CSI401	IoT Security	3.00	2	.17	2.33	2.17	2.25	2.33		2.00	2.67	3.00	2.67	2.50	2.00	2.50	3.00
CSI023	Micro-controller programming using Arduino	2.17	2	.60	2.40	2.00	2.67	2.00	2.00	2.50	1.83	1.83	1.83	2.17	2.67	2.00	1.17
CIP023	Micro-controller programming using Arduino Lab	2.33	2	.00	2.00	2.00	3.00	2.00	2.00	2.20	2.50	2.50	2.50	2.67	2.67	2.00	2.00
CSI024	Raspberry Pi and its Programming	2.33	2	.00	2.00	2.50	3.00	2.00	2.00	2.20	2.33	2.33	2.50	2.67	2.67	2.00	2.00
CIP024	Raspberry Pi and its Programming Lab	2.33	2	.00	2.00	2.00	3.00	2.00	2.00	2.20	2.50	2.50	2.50	2.67	2.67	2.00	2.00
CSI021	Sensor-Cloud for Internet of Things	2.17	2	.00	1.75	2.00	3.00	1.17	2.00	2.00	1.50	1.25	2.00	2.50	2.50	1.83	2.00
CIP021	Sensor-Cloud for Internet of Things Lab	2.33	2	.00	2.00	2.00	3.00	2.00	2.00	2.20	2.50	2.50	2.50	2.67	2.67	2.00	2.00
CSI022	Wireless Sensor Networks	2.17	2	.00	2.00	2.00	3.00	2.00	2.00	2.00	2.00	2.00	2.00	2.50	2.50	2.00	2.00
CIP022	Wireless Sensor Networks Lab	2.83	1	.67	2.00	1.80	2.67	1.50	2.80	2.00	2.20	2.20	2.20	2.33	2.00	2.40	2.40
CSI031	Artificial Intelligence for IoT	3.00	2	.60	2.60	2.60	3.00	2.50	3.00	2.00	2.20	2.20	2.50	2.33	2.00	2.40	2.25
CIP031	Artificial Intelligence for IoT Lab	2.83	2	.67	2.00	2.40	3.00	2.00	2.00	2.20	2.50	2.50	2.50	2.83	2.67	2.00	3.00
CSI032	Data Analytics for IoT	2.67	2	.75	3.00	2.00	2.25	3.00	2.00	2.00	2.00	2.00	2.00	2.00	2.25	1.33	
CSI033	Image Processing with IoT	3.00	2	.60	2.60	2.60	2.83	2.50	3.00	2.00	2.20	2.20	2.50	2.33	2.00	2.33	2.25
CIP033	Image Processing with IoT Lab	2.33	2	.00	2.00	2.00	3.00	2.00	2.00	2.20	2.50	2.50	2.50	2.67	2.67	2.00	2.00
CSI011	Android with IoT	2.00	2	.25	2.50	2.50	2.00	2.67	2.33	2.00	2.50	2.20	2.00	2.67	2.33	2.33	2.50
CIP011	Android with IoT Lab	2.33	2	.00	2.00	2.00	3.00	2.00	2.00	2.20	2.50	2.50	2.50	2.67	2.67	2.00	2.00
CSI041	Fog Computing in IoT	2.83	2	.33	2.40	2.00	2.67	2.50	1.80	3.00	2.50	2.50	2.50	2.67	2.00	2.00	2.50
CSI042	Industrial IoT 4.0	1.83	1	.80	1.50	1.60	2.25	1.00	2.00	2.00	2.00	1.50	2.25	2.17	1.50	2.50	2.00
CSI051	IoT in Healthcare	3.00	2	.83	2.83	2.80	2.00	3.00	3.00	2.17	2.67	2.83	2.67	3.00	2.67	2.67	3.00
CSI052	Drones in IoT	3.00	2	.83	2.83	2.80	3.00	2.83	2.83	2.17	2.67	2.83	3.00	3.00	2.67	2.67	2.33
CSI061	Industrial IoT: Smart Manufacturing	2.67	2	.17	2.33	2.83	3.00	2.00	2.00	2.50	2.00	1.75	2.00	2.17	3.00	2.00	2.00
CSI062	IoT Applications	3.00	3.	.00	2.83	3.00	3.00	3.00	3.00	2.00	3.00	3.00	3.00	3.00	3.00	2.67	2.00
CIP062	IoT Applications Lab	3.00	3	.00	2.83	3.00	3.00	3.00	3.00	2.00	3.00	3.00	3.00	3.00	3.00	2.67	2.00
	B.Tech-Computer Scier	nce & Er	ngineer	ing wit	h speci	alizatio	n in Cy	ber Sea	curity 8	z Foren	sics						
0	Introduction to Cyber Security & Laws	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.	.00



0	Digital Forensics	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	Digital forensics Lab	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	Ethical Hacking	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	ETHICAL HACKING LAB	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	Security Threats Intelligence and Risk Management	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
CSC302	Cryptography and Network Security	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
CCP302	Cryptography and Network Security Lab	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	2.50	3.00	3.00	3.00	3.00
0	Intrusion Detection and Prevention System	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	2.50	3.00	3.00	3.00	3.00
0	Intrusion Detection and Prevention System Lab	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	2.50	3.00	3.00	3.00	3.00
0	Introduction to IoT and It's Security	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	Machine Learning	3.00	3.00	3.00	3.00	3.00	3.00	2.83	2.00	2.00	3.00	2.67	3.00	2.83	2.83	2.67
0	Machine Learning Lab															
0	Open source Tools for Cyber Security & Forensics	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	Open source Tools for Cyber Security & Forensics Lab	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	Packet Analysis	3.00	3.00	3.00	3.00	2.83	2.33	2.33	1.17	2.33	3.00	2.67	3.00	3.00	3.00	2.67
0	Packet Analysis Lab	2.67	2.33	2.80	2.75	1.00			2.00	2.20	1.67	2.33	1.25	2.50	2.20	1.75
0	Mobile and Wireless Security	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	Exploit Writing	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
CSC-032	Malware Analysis	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	Cloud Security															
0	Penetration Testing		3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00
0	Penetration Testing Lab	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
CSC-062	Web Application Security	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
CSC-022	Disaster Recovery Management	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	Digital Water Marking and Steganography	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00
0	Information Security and Audit Monitoring	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
0	Network & Cyber Forensics	3.00	2.83	2.33	3.00	2.25	3.00	3.00	2.67	2.50	3.00	3.00	2.50	3.00	3.00	3.00



1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)



		Sharda School of Engineering	g & ]	ſech	nology		
		Department of Computer Scien	ce &	Enş	gineering		
		B.Tech-Computer Science &	k En	gine	ering		
		Batch: 2023 Onwards					TERM: I
S No	Course Code	Course	Te	Teaching Load		Credits	Pro-Requisite/Co Requisite
5.110.	Course Coue	Course	L	Т	Р	Creuits	Tre-Requisite/C0 Requisite
THEO	RY SUBJECTS						
1	CSE113	Programming for Problem Solving	3	0	0	3	
2	MTH142	Calculus and Abstract Algebra	3	1	0	4	
	PHY125	Engineering Physics-I	3	1	0	4	
3		OR					
	EEE112	Principles of Electrical and Electronics Engineering	2	1	0	3	
	CVL103	Environmental Studies				0	
4		OR	2	0	0		
	HMM111	Value & Ethics				2	
Practic	al/Viva-Voce/Ju	ury					
5	ARP101	Communicative English-1	1	0	2	2	
6	CSP113	Programming for Problem Solving Lab	0	0	2	1	
7	CSP101	Introduction to Computer Science and Engineering	0	0	2	1	
	MEP106	Computer Aided Design & Drafting	0	0	3		
8		OR				1.5	
	MEP105	Mechanical Workshop	0	0	3		
	PHY162	Physics Lab					
9		OR	0	0	2	1	
	EEP112	Principles of Electrical and Electronics Engineering					
TOTA	AL CREDITS					18.5/19.5	



		Sharda School of Engineerin	ng &	Tech	nology		
		Department of Computer Scie	nce ð	k Eng	gineering		
		B.Tech-Computer Science	& Er	ngine	ering		
		Batch: 2023 Onwards					TERM: II
S No	Course Code	Course	T	eachi	ng Load	Credits	Pro-Requisite/Co Requisite
5.110.	Course Coue	Course	L	Τ	Р	Creatts	Tre-Requisite/Co Requisite
THEO	RY SUBJECTS						
1	CSE114	Application based Programming in Python	3	0	0	3	
2	CSE242	Data Structures	3	0	0	3	
3	MTH145	Probability and Statistics	3	1	0	4	
	PHY125	Engineering Physics-I	3	1	0	4	
4		OR					
	EEE112	Principles of Electrical and Electronics Engineering	2	1	0	3	
	HMM111	Values and Ethics				2	
5		OR	2	0	0		
	CVL103	Environmental Studies				0	
Practic	al/Viva-Voce/J	ury					
6	ARP102	Communicative English -2	1	0	2	2	
7	CSP116	Design and creativity Lab	1	0	2	2	
8	CSP242	Data Structures Lab	0	0	2	1	
9	CSP114	Application based Programming in Python	0	0	2	1	
	MEP105	Mechanical Workshop	0	0	3		
10		OR			•	1.5	
	MEP106	Computer Aided Design & Drafting	0	0	3	-	
	PHY162	Physics Lab II	0	0	2		
11		OR				1	
	EEP112	Principles of Electrical and Electronics Engineering	0	0	2		
TOTA	AL CREDITS					21.5/ 22.5	



		Sharda School of Engineering & T	echnol	ogy			
		Department of Computer Science &	Engine	ering			
		B.Tech-Computer Science & Eng	gineerin	ıg		_	
		Batch: 2023 Onwards		TERM: III			TERM: III
S No	Course Code	Course	Tea	<b>Teaching Load</b>		Credits	Pre-Requisite/Co Requisite
5.110.	Course Coue	Course	L	Τ	P	Creans	Tre-Kequisite/Co Kequisite
THEO	RY SUBJECTS	8					
1	BTY223	Introduction to Biology for Engineers	2	0	0	2	
2	CSE245	Discrete Structures	3	1	0	4	
3	CSE247	Computer Organization and Architecture	3	0	0	3	
4	CSE252	Computer Networks	3	0	0	3	
5	CSE253	Object Oriented Programming Using Java	2	0	0	2	
6	CSE254	Principles of Operating System	2	0	0	2	
Practic	al/Viva-Voce/J	ury		•	r		
7	ARP207	Logical Skills Building and Soft Skills	1	0	2	2	
8	CSP243	Object Oriented Programming Using Java	0	0	2	1	
9	CSP244	Principles of Operating System Lab	0	0	2	1	
10	CSP252	Computer Networks Lab	0	0	2	1	
11	CSP254	Project Based Learning (PBL) -1	0	0	4	2	
12	CSP292	Summer Internship-I	-	-	-	2	
TOTA	L CREDITS					25	



		Sharda School of Engineering & Techn	ology				
		Department of Computer Science & Engine	neerir	ıg			
		B.Tech-Computer Science & Engineer	ring				
		Batch: 2023 Onwards					TERM: IV
S.	Course Code	Course	Tea	<b>Teaching Load</b>		Cre	Pre-Requisite/Co
No.	Course Coue	Course	L	Т	Р	dits	Requisite
THEO	RY SUBJECTS						-
1	CSE249	Data Base Management System	3	0	0	3	
2	CSE251	Theory of Computation	3	1	0	4	Discrete Structures
3	HMM305	Management for Engineers	3	0	0	3	
	PE-1	Program Elective-1					
	CSE011	Mathematical Techniques	2	0	0		
4	CSE012	Introduction to Graph Theory and its Applications	3	0	0	3	
	CSE014/	Advanced Iava Programming	2	0	2		
	CSP014		2	0	~		
5	OE1	Open Elective – 1	2	0	0	2	
Practi	cal/Viva-Voce/Ju	ry					-
6	ARP208	Quantitative and Qualitative Aptitude Skill Building	1	0	2	2	
7	IED001	Introduction to Entrepreneurship Development	0	1	2	2	
8	CSP249	Data Base Management System Lab	0	0	2	1	
9	CSP297	Project Based Learning (PBL) -2	0	0	4	2	PBL-1
ТОТ	AL CREDITS					22	



		Sharda School of Engineer	ing &	: Tech	nology		
		Department of Computer Sci	ence	& En	gineerir	ıg	
		B.Tech-Computer Science	e & E	ngine	ering	1	
	Ba	atch: 2023 Onwards		TERM: V			
<b>S.</b>	Course Code	Course	Tea	ching	g Load	Cred	Pre-Requisite/Co Requisite
No.			L	Τ	P	its	The Requisiter do Requisite
THEC	ORY SUBJECTS						
1	CSE354	Design and Analysis of Algorithm	3	0	0	3	Data Structure
2	CSE356	Software Engineering and Testing Methodologies	2	0	0	2	
	PE2	Program Elective-2					Operating System(3)
3	CSE021	Introduction to Cloud Computing	3	0	0	3	Object Oriented Programming using Java(Semester 3)
	CSE023/ CSP023	Android Application Development	2	0	2		
	CSE024/ CSP024	Web Technologies	2	U	2		
4	OE-2	Open Elective – 2	2	0	0	2	
Practi	cal/Viva-Voce/Jury						
5	ARP305	Personality Development and Decision making Skills	1	0	2	2	
6	BRM002	Research Methodology	0	1	2	2	
7	CSP350	Design and Analysis of Algorithm Lab	0	0	2	1	
8	CSP354	Project Based Learning (PBL) -3	0	0	4	2	PBL-2
9	CSP355	Software Engineering and Testing Methodologies	0	0	2	1	Data Structure Lab
10	CSP391	Summer Internship-II	-	-	-	2	Operating system, DBMS
11	CSP395	Technical Skill Enhancement Course-1 Simulation Lab	0	0	2	1	
12	ECC301	Community Connect	-	-	-	2	Summer Internship-I
T	OTAL CREDITS					23	
		Sharda School of Engineer	ring &	k Tec	hnology	,	



		Department of Computer Science & Engineeri	ng				
		<b>B.Tech-Computer Science &amp; Engineering</b>					
		Batch: 2023 Onwards					TERM: VI
<b>S.</b>	Course	Courso	<b>Teaching Load</b>			Credi	Pre-Requisite/Co
No.	Code	Course	L	Т	Р	ts	Requisite
THEO	RY SUBJECT	S					
1	CSE353	Compiler Design	3	0	0	3	
2	CSE472	Artificial Intelligence	3	0	0	3	
	PE3	Program Elective-3					
3	CSE031	Digital Image Processing	3	0	0	3	
	CSE032	Cryptography and Network Security					
	PE4	Program Elective-4					
4	CSE041	Software Project Management	3	0	0	3	
	CSE042	Software Testing					
	PE5	Program Elective-5					
5	CSE051	Wireless Networks	2	0	0	2	
5	CSE052	Risk Management	5	0	0	3	
	CSE053	Advanced Operating System					
6	OE-3	Open Elective – 3	3	0	0	3	
Practic	al/Viva-Voce/J	lury					
7	ARP306	Campus to Corporate	1	0	2	2	
8	CSP353	Compiler Design Lab	0	0	2	1	Operating system Lab
	CSP472	Artificial Intelligence Lab	0	0	2	1	
9	CSP396	Technical Skill Enhancement Course-2(Application Development Lab)	0	0	2	1	
10	CSP398	Project Based Learning (PBL) -4	0	0	4	2	PBL-3
TOTA	L CREDITS					25	



		Sharda School of Engi	neering & T	echno	ology					
		Department of Computer	r Science & I	Engir	neerii	ng				
		B.Tech-Computer Sc	ience & Eng	ineer	ing					
		Batch: 2023 Onwards						TERM: VII		
C No	Course Code	Course		Teacl	eaching Load		eaching Load		Cuadita	
5. NO.	Course Code	Course		L			Creans	Pre-Requisite/Co Requisite		
THEO	RY SUBJECTS									
1	CSE473	Machine Learning		3	0	0	3			
		Program Elective-6								
2	CSE062	Mobile Computing		3	0	0	3			
	CSE063	Quantum Computing								
		Program Elective-7								
2	CSE071	Introduction to Internet of Things		$\mathbf{r}$	0	0	2			
5	CSE072	Parallel Computing Algorithms		2	0	0	2			
	CSE073	3D Printing and Software Tools								
6	OE4	Open Elective – 4		3	0	0	3			
Practi	cal/Viva-Voce/	Jury								
7	CSP473	Machine Learning Lab		0	0	2	1			
8	CSP496	Summer Internship-III		-	-	-	2	PBL-4		
9	CSP497	Capstone – 1		-	-	-	2	Summer Internship-II		
TOT	AL CREDITS						16			



		Sharda School of Engineer	ing & '	Гechn	ology														
	Department of Computer Science & Engineering																		
		B.Tech-Computer Scienc	e & En	ginee	ring														
		Batch: 2023 Onwards					TERM: VIII												
S No	Course Code	Course	Teac	aching Load		<b>Teaching Load</b>		<b>Teaching Load</b>		<b>Teaching Load</b>		<b>Teaching Load</b>		eaching Load		aching Load	g Load	Cradita	Dro Doquigito/Co Doquigito
<b>5.</b> NU.	Course Coue	Course	L	Т	Р	Creans	Fre-Kequisite/Co Kequisite												
Practic	al/Viva-Voce/Ju	ry																	
1	CSP498	Capstone - 2	-	-	-	8	Major Project - 1												
ΤΟΤ	AL CREDITS					8													



## C. Course Modules



## TERM - I



Sc	chool: SET	Batch : 2023-27									
Pr	ogram: B.Tech	Current Academic Year: 2023-24									
Bı	ranch: ALL	Semester:1									
1	Course Code	CSE113 Course Name: Programming for problem solving									
2	Course Title	Programming for problem solving									
3	Credits	3									
4	Contact Hours	3-0-0									
	(L-T-P)										
	Course Status	Core									
5	Course Objective	1. Learn basic programming constructs –data	types,								
		decision structures, control structures in C									
		2. learning logic aptitude programming in c la	anguage								
		3. Developing software in c programming									
6	Course Outcomes	Students will be able to:									
		CO1: <b>demonstrate</b> the algorithm, Pseudo-code	e and flow								
		chart for the given problem.									
		CO2: develop better understanding of basic co	ncepts of								
		C programming.									
		CO3: <b>create</b> and implement logic using array a	ind								
		function.									
		CO4: construct and implement the logic based	on the								
		concept of strings and pointers.									
		CO5: <b>apply</b> user-defined data types and I/O op	erations								
		in file.									
		CO6: design and develop solutions to real wor	ld								
		problems using C.									
7	Course Description	Programming for problem solving gives the Unders	tonding of								
	Course Description	C programming and implement code from flo	wohort or								
		algorithm	wellant of								
8	Outline syllabus	algorithm	CO								
0	Outline synabus		Manning								
	Unit 1	Logic Building	Mapping								
	A	Flowchart: Elements Identifying and	CO1								
		understanding input/ output Branching and	001,								
		iteration in flowchart									
	В	Algorithm design: Problem solving approach(top	CO1								
	-	down/bottom up approach)	001								
	С	Pseudo Code : Representation of different	CO1								
		construct, writing pseudo-code from algorithm	001								
		and flowchart									
	Unit 2	Introduction to C Programming									
	Α	Introduction to C programming language, Data	CO2,								
		types, Variables, Constants, Identifiers and	CO6 <sup>°</sup>								
		keywords, Storage classes									
	В	Operators and expressions. Types of Statements:	CO2.								
		Assignment, Control, jumping.	CO6 <sup>°</sup>								



С	Control statements: Decisions, Loops, break,	CO2,
	continue	CO6
Unit 3	Arrays and Functions	
Α	Arrays: One dimensional and multi-dimensional	СОЗ,
	arrays: Declaration, Initialization and array	CO6
	manipulation (sorting, searching).	
В	Functions: Definition, Declaration/Prototyping	CO3,
	and Calling, Types of functions, Parameter	CO6
	passing: Call by value, Call by reference.	
С	Passing and Returning Arrays from Functions,	CO3,
	Recursive Functions.	CO6
Unit 4	Pre-processors and Pointers	
Α	Pre-processors: Types, Directives, Pre-	CO4,
	processors Operators (#,##,\), Macros: Types,	CO6
	Use, predefined Macros	
В	Pointer: Introduction, declaration of pointer	CO4,
	variables, Operations on pointers: Pointer	CO6
	arithmetic, Arrays and pointers, Dynamic	
	memory allocation.	
C	String: Introduction, predefined string functions,	CO4,
	Manipulation of text data, Command Line	CO6
	Arguments.	
Unit 5	User Defined Data Types and File Handling	
A A	Structure and Unions: Introduction, Declaration,	CO5,
A A	Structure and Unions: Introduction, Declaration, Difference, Application, Nested structure, self-	CO5, CO6
A A	Structure and Unions: Introduction, Declaration, Difference, Application, Nested structure, self- referential structure, Array of structures, Passing	CO5, CO6
A Durit 5	Structure and Unions: Introduction, Declaration, Difference, Application, Nested structure, self- referential structure, Array of structures, Passing structure in function.	CO5, CO6
A B	Oser Defined Data Types and File Handing         Structure and Unions: Introduction, Declaration,         Difference, Application, Nested structure, self-         referential structure, Array of structures, Passing         structure in function.         Files: Introduction, concept of record, I/O	CO5, CO6
A B	User Defined Data Types and File HandingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self-referential structure, Array of structures, Passingstructure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files:Laboration	CO5, CO6 CO5, CO6
A B	User Defined Data Types and File HandingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self-referential structure, Array of structures, Passingstructure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files:Indexed file, sequential file and random file,	CO5, CO6 CO5, CO6
A B C	User Defined Data Types and File HandingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self- referential structure, Array of structures, Passing structure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files: Indexed file, sequential file and random file,Creating a data file, Opening and closing a dataFile	CO5, CO6 CO5, CO6 CO5,
A B C	User Defined Data Types and File HandingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self-referential structure, Array of structures, Passingstructure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files:Indexed file, sequential file and random file,Creating a data file, Opening and closing a datafile, Various I/O operations on data files: Storing	CO5, CO6 CO5, CO6 CO5, CO6
A B C	User Defined Data Types and File HandingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self- referential structure, Array of structures, Passing structure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files: Indexed file, sequential file and random file, Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Detained file (1997)	CO5, CO6 CO5, CO6 CO5, CO6
A B C	User Defined Data Types and File HandingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self- referential structure, Array of structures, Passing structure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files: Indexed file, sequential file and random file,Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Retrieving, and updating Sequential file/random	CO5, CO6 CO5, CO6 CO5, CO6
A B C	User Defined Data Types and File HandingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self- referential structure, Array of structures, Passing structure in function.Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file, Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Retrieving, and updating Sequential file/random file.	CO5, CO6 CO5, CO6 CO5, CO6
A B C Mode of examination	User Defined Data Types and File HandingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self-referential structure, Array of structures, Passingstructure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files:Indexed file, sequential file and random file,Creating a data file, Opening and closing a datafile, Various I/O operations on data files: Storingdata or records in file, adding records,Retrieving, and updating Sequential file/randomfile.Theory	CO5, CO6 CO5, CO6 CO5, CO6
A A B C Mode of examination Weightage Distribution	User Defined Data Types and File HandingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self-referential structure, Array of structures, Passingstructure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files:Indexed file, sequential file and random file,Creating a data file, Opening and closing a datafile, Various I/O operations on data files: Storingdata or records in file, adding records,Retrieving, and updating Sequential file/randomfile.TheoryCAMTEETE	CO5, CO6 CO5, CO6 CO5, CO6
A A B C C Mode of examination Weightage Distribution Taxt healt/a*	User Defined Data Types and File HandlingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self-referential structure, Array of structures, Passingstructure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files:Indexed file, sequential file and random file,Creating a data file, Opening and closing a datafile, Various I/O operations on data files: Storingdata or records in file, adding records,Retrieving, and updating Sequential file/randomfile.TheoryCAMTE25%25%25%50%	CO5, CO6 CO5, CO6 CO5, CO6
A A B C Mode of examination Weightage Distribution Text book/s*	User Defined Data Types and File HandlingStructure and Unions: Introduction, Declaration, Difference, Application, Nested structure, self- referential structure, Array of structures, Passing structure in function.Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file, Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Retrieving, and updating Sequential file/random file.TheoryCACAMTE25%25%50%Kernighan, Brian, and Dennis Ritchie. The C Programming Language	CO5, CO6 CO5, CO6 CO5, CO6
A A B C C Mode of examination Weightage Distribution Text book/s* Other References	User Defined Data Types and File HandlingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self-referential structure, Array of structures, Passingstructure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files:Indexed file, sequential file and random file,Creating a data file, Opening and closing a datafile, Various I/O operations on data files: Storingdata or records in file, adding records,Retrieving, and updating Sequential file/randomfile.TheoryCAMTEETE25%25%50%Kernighan, Brian, and Dennis Ritchie. The C ProgrammingLanguage1. B.S. Gottfried - Programming With C - Schaum's	CO5, CO6 CO5, CO6 CO5, CO6
A A B C C Mode of examination Weightage Distribution Text book/s* Other References	User Defined Data Types and File HandlingStructure and Unions: Introduction, Declaration, Difference, Application, Nested structure, self- referential structure, Array of structures, Passing structure in function.Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file, Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Retrieving, and updating Sequential file/random file.TheoryCACAMTE25%25%25%50%Kernighan, Brian, and Dennis Ritchie. The C Programming LanguageLanguage1.B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition -	CO5, CO6 CO5, CO6 CO5, CO6
A A B C Mode of examination Weightage Distribution Text book/s* Other References	User Defined Data Types and File HandlingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self-referential structure, Array of structures, Passingstructure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files:Indexed file, sequential file and random file,Creating a data file, Opening and closing a datafile, Various I/O operations on data files: Storingdata or records in file, adding records,Retrieving, and updating Sequential file/randomfile.TheoryCAMTEETE25%50%Kernighan, Brian, and Dennis Ritchie. The C ProgrammingLanguage1. B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004.	CO5, CO6 CO5, CO6 CO5, CO6
A A B C Mode of examination Weightage Distribution Text book/s* Other References	Oser Defined Data Types and File HandlingStructure and Unions: Introduction, Declaration,Difference, Application, Nested structure, self-referential structure, Array of structures, Passingstructure in function.Files: Introduction, concept of record, I/OStreaming and Buffering, Types of Files:Indexed file, sequential file and random file,Creating a data file, Opening and closing a datafile, Various I/O operations on data files: Storingdata or records in file, adding records,Retrieving, and updating Sequential file/randomfile.TheoryCAMTEETE25%25%50%Kernighan, Brian, and Dennis Ritchie. The C ProgrammingLanguage1.B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004.2.E. Balagurusamy - Programming in ANSI C - Second Edition - Tata McGraw Hills 1999	CO5, CO6 CO5, CO6 CO5, CO6

## CO and PO Mapping


S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	<b>CO1:</b> demonstrate the algorithm, Pseudo-code and flow chart for the given problem.	PO1,PO2,PO3, PO9, PSO1,PSO2
2.	<b>CO2:</b> develop better understanding of basic concepts of C programming.	PO1,PO3, PO4, PO5, PO9, PO11,PSO1,PSO2
3.	<b>CO3:</b> : create and implement logic using array and function.	PO1,PO3,PO4, PO9, PSO2
4.	<b>CO4:</b> construct and implement the logic based on the concept of strings and pointers.	PO1,PO3,PO4, PO9, PSO2
5.	<b>CO5:</b> apply user-defined data types and I/O operations in file.	PO1,PO3,PSO2
6	<b>CO6:</b> design and develop solutions to real world problems using C.	PO1,PO2,PO3,PO4,PO9, PO11,PSO1 PSO2,PSO3

# PO and PSO mapping with level of strength for Course Name Programming for problem solving (Course Code CSE 113)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	2	2	_	_	-	_	_	2	_	_	_	1	2	_
CO2	2	_	3	2	2	-	_	_	1	_	1	_	2	2	_
CO3	3	_	2	1	_	_	_	_	3	_	_	_	_	2	-
CO4	1	-	2	1	-	_	_	_	1	-	-	_	_	3	_
CO5	1	_	1	_	-	_	_	_	_	_	_	_	_	1	_
CO6	3	3	3	2	-	-	_	_	2	-	2	_	2	3	1

Average of non-zeros entry in following table (should be auto calculated).



Sch	ool: SET	Batch : 2023-27					
Prog	gram: B.Tech.	Current Academic Year: 2023-24					
Bra	nch: CSE	Semester: I					
1	Course Code	MTH 145					
2	Course Title	Probability and Statistics					
3	Credits	4					
4	Contact Hours	3-1-0					
	Course Status	Compulsory					
5	Course Objective	The objective of this course is to familiarize the statistical techniques. It aims to equip the students concepts and tools at an intermediate to advanced level them well towards tackling various problems in the disc	students with with standard that will serve cipline.				
6	Course Outcomes	<ul> <li>CO1: Explain the concept of probability and Rand (K2,K3, K4)</li> <li>CO2: Explain the concept of distribution functions, probability distributions; illustrate discrete and probability distributions. (K1, K2, K3, K4)</li> <li>CO3: Describe the concept of moments, skewness evaluate correlation and regression – Rank correlation is distributions and their properties</li> <li>. (K1, K2, K5)</li> <li>CO4: Discuss the basic of Curve fitting by the met squares; evaluate straight lines, second degree parabolic general curves. (K1, K2, K5)</li> <li>CO5: Describe and use the concepts test of significance: test for single proportion, difference of proportions; camean, difference of means, and difference of standar (K1,K2,K3)</li> </ul>	om Variable. densities and continuous and Kurtosis; ation; discuss ethod of least blas and more Large sample alculate single rd deviations.				
		CO6: Explain the basic concepts of tests of small samp T test, Chi-square test for goodness of fit, and evalu (K2, K4, K5)	les- Student's ate the result.				
7	Course Description	This course is an introduction to the fundamental of Mathematics. The primary objective of the course is to develop the basic understanding of statistics including measures of central tendency, correlation and regression, statistical methods of data sampling, probability and random variables and various discrete and continuous probability distributions and their properties.					
8	Outline syllabu	s :Probability and Statistics	CO Mapping				
	Unit 1	Basic Probability					
	А	Probability spaces, conditional probability, Bayes' rule.	CO1				
	1						



В	Discrete random variables, Independent random variables	CO1
C	Expectation of Discrete Random Variables, Chebyshev's Inequality	CO1
Unit 2	<b>Discrete and Continuous Probability Distributions</b>	
А	Discrete Probability distributions: Binomial, Poisson.	CO2
В	Continuous random variables and their properties, distribution functions and densities.	CO2
С	Normal, exponential and gamma distribution.	CO2
Unit 3	Statistics	
А	Moments, skewness and Kurtosis.	CO3
В	Correlation and regression – Rank correlation.	CO3
С	Bivariate distributions and their properties.	CO3
Unit 4	Applied Statistics	
А	Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.	CO4, CO5
В	Test of significance: Large sample test for single proportion,	CO4, CO5
С	Difference of proportions, single mean, difference of means, and difference of standard deviations.	CO4, CO5
Unit 5	Testing Hypothesis	
А	Test for single mean, difference of means	CO6
В	test for ratio of variances	CO6
С	Chi-square test for goodness of fit and independence of attributes	CO6
Mode of examination	Theory	
Weightage	CA MTE ETE	
Distribution	25% 25% 50%	-
Text book/s*	1. Erwin Kreyszig, Advanced	-
	Engineering Mathematics. 9th	
	Edition John Wiley & Sons 2006	
	2 P. G. Hoel S. C. Port and C. I.	
	2. 1. O. Hoti, S. C. Folt and C. J.	
	Stone, Introduction to Probability	
	Theory, Universal Book Stall, 2003	
	(Reprint).	
	3. S. Ross, A First Course in	
	Probability, 6th Ed., Pearson	
	Education India, 2002.	
Other	1. W. Feller, An Introduction to	1
References	Probability Theory and its	



Applications, Vol. 1, 3rd Ed., Wiley,
1968.
2. B.S. Grewal, Higher Engineering
Mathematics, Khanna Publishers, 35th
Edition, 2000. Veerarajan T.,
Engineering Mathematics (for
semester III), Tata McGraw-Hill, New
Delhi, 2010.

## **COURSE OUTCOMES – PROGRAMME OUTCOMES MAPPING TABLE**

РО	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	<b>PO9</b>	<b>PO10</b>	PO11	PO12
СО	-											
CO1	3	3	2	2	3	1	-	-	-	1	1	1
CO2	3	2	3	2	2	2	-	-	-	1	1	2
CO3	3	3	2	2	2	1	-	-	-	1	1	1
CO4	3	2	2	2	2	1	-	-	-	1	1	1
CO5	3	3	2	2	2	1	-	-	-	1	1	2
CO6	3	3	2	3	2	2	-	-	-	1	1	2



## PHY125 Engineering Physics-I

Schoo	ol: School of	Batch : 2023-27						
Basic	Sciences and							
Resea	irch							
Progr	am: B.TECH.	Current Academic Year: 2023-24						
Brand	ch:	Semester: I						
CSE/	EC/EEE							
1	Course Code	PHY125						
2	Course Title	Engineering Physics-I						
3	Credits	4						
4	Contact Hours	3-1-0						
	(L-T-P)							
	Course Status	Compulsory						
5	Course	To make students proverbial with the fundamental co	oncepts of					
	Objective	Semiconductors materials and electromagnetism and the	ir real-life					
		applications for configuring various electronics devices.						
6	Course	After the completion of this course,						
	Outcomes	CO1: Students will learn the fundamental concents of	mobility					
		conductivity electrons and holes in an intrinsic semiconduct	nors Dopor					
		and Acceptor impurities (n type and n type semiconductor).	ormi lovala					
		and Acceptor impurities (ii-type and p-type semiconductor), i atc. Students will gain knowledge about the formation of deple	tion region					
		etc. Students will gain knowledge about the formation of depletion region,						
		CO2. Students will have a clear understanding of Coherent sources						
		interaction of radiation with matter (spontaneous and stimulated						
		emission) Finstein's relation population inversion and pumping Ruby						
		LASER He-Ne Laser and semiconductor Laser						
		CO3: Students will show that they have learned the basics of fiber						
		optics. Holography and its applications						
		CO4: Students will be able to understand the significance and						
		applications of Maxwell's equations						
		CO5: Students will be able to know about the short comings of classical						
		physics and will learn various quantum mechanical principles						
		CO6: Student will be familiar with the essential co	oncepts of					
		Semiconductors materials technology and their applications in	industries.					
7	Course	This course provides the basic foundation for understanding	electronic					
	Description	semiconductor devices and their applications and limitation	ons. It has					
	2 total priori	introductory elements of various concept of material science.	This course					
		is essential for students who desire to specialize their eng	ineering in					
		Computer Sciences Electronics and Electronics and Electric						
		engineering.						
8	Outline Svllab	us	СО					
			Mapping					
	Unit 1	Semiconductor Physics	-TT8					
	A	Classification of Solids on the basis of energy band, electrons	CO1					
		and holes concentration in intrinsic semiconductors. Fermi	201					
		levels, Mobility, conductivity.						



В	Donor and Acceptor	impurities (n-ty	pe and p-type	CO1					
	semiconductor), Drift an	d diffusion current, l	Hall effect,						
C	p-n junction, types of p-	n junction (step-grad	led and Linearly-	CO1,					
	graded junction), form	ation of depletion	region, barrier	CO6					
	potential, Zener diode, A	valanche and Zener	breakdown.						
Unit 2	Laser Physics and opto	Laser Physics and optoelectronic Sources							
А	Coherent sources, inte	raction of radiati	on with matter	CO2					
	(spontaneous and stimula	ated emission), Einst	ein's relation,						
В	population inversion and	pumping, active cor	nponents of laser,	CO2,					
	optical amplification or	gain, threshold co	ndition for laser	CO6					
	action, Ruby and He-Ne	lasers.							
C	Optoelectronic sources:	Light emitting dio	de (construction,	CO2,					
	basic working principle	), semiconductor la	ser (construction,	CO6					
	basic working principle)								
Unit 3	Fiber Optics and Holog	raphy							
А	Introduction, structure of	optical fiber, Light	guidance through	CO3					
	optical fiber, Acceptar	nce angle and A	cceptance cone,						
	Numerical aperture,								
В	Types of optical fibers, A	ttenuation and Disp	ersion in optical	CO3,					
	fiber, Applications of opt	ical fibers.		CO6					
C	Basic principle of hol	ography, Recording	g of holograms,	CO3,					
	Reconstruction process,	Reconstruction process, Applications of holography.							
Unit 4	Electromagnetism								
А	Gauss's theorem and its	applications, Elect	ric potential, and	CO4					
	potential difference, Bio	ot-Savart law and i	ts application to						
	current carrying circular	loop							
В	Ampere's law and its a	oplications to infini	tely long straight	CO4					
	wire, and solenoids. Elec	tromagnetic induction	on; Faraday's law						
C	Maxwell's equations in	n free space and	dielectric media,	CO4					
	Electromagnetic waves.								
Unit 5	Quantum Mechanics								
А	Inadequacy of classical	Physics, Wave par	ticle duality, de-	CO5					
	Broglie wavelength,								
В				CO5,					
	Davisson-Germer experi	ment, Schrödinger w	ave equation,	CO6					
С		-11		CO5,					
	particle in a 1-dimension	al box, harmonic os	cillator problem,	CO6					
Mode of	Theory								
Examination									
Weightage	CA	MTE	ETE						
Distribution	30%	20%	50%						
Text books	Integrated Electr Graw Hill	onics- Millman - H	Ialkias, Tata Mc						
Other	1. Semiconductor D	evices Physics and	Fechnology- S M						
References	Sze, John Wiley	& Sons							
	2. Semiconductor pl	hysics and devices: I	basic principles-						
	Donald A. Neam	en.	1 I						
	3. Laser and non-lin	ear optics by B.B. la	ud, New Age Int.						



4. Semiconductor Devices- Kanaan Kano, Pearson
Education.
5. Electronics devices and circuit theory by R.L.
Boylestad, Pearson.
6. Introduction to Electrodynamics, David J. Griffiths,
Pearson Cambridge University Press
7. Fundamentals of Electricity and Magnetism, D. N.
Vasudeva, S. Chand & amp; Co. New Delhi
8. Fundamentals of Physics, Halliday, Resnick and
Walker, John Wiley.
9. Concepts of Modern Physics, Beiser Arthur, McGraw-
Hill Education

### Mapping of CO Vs Pos:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	1	1	2	1	1	1
CO2	3	3	2	3	3	2	1	1	1	1	1	1
CO3	3	3	2	3	3	2	1	1	1	1	1	1
CO4	3	3	3	2	3	2	1	1	1	1	1	1
CO.5	3	3	3	2	3	2	1	1	1	1	1	1
CO6	3	3	3	3	3	2	1	1	1	1	1	1



Sch	ool: SET	Batch : 2023-27						
Pro	gram: B. Tech	Current Academic Year: 2023-24						
Bra	nch: All	Semester: I						
1	Course Code	CVL-103						
2	Course Title	Environmental Science						
3	Credits	02						
4	Contact	2-0-0						
	Hours							
	(L-T-P)							
	Course Status	Compulsory						
5	Course	1. Enable students to learn the concepts, principles	and					
	Objective	importance of environmental science						
		2. Provide students an insight of various causes of	natural					
		resource depletion and its conservation	h an insisht of					
		5. Provide knowledge of layers of atmosphere with role of climatic elements in dispersion of polluta	n an insignt of					
		4 Provide detailed knowledge of causes effects a	nd control of					
		different types of environmental pollution, solid	waste					
		management and its effect on climate change, gl	obal warming					
		and ozone layer depletion	-					
		5. Provide and enrich the students about social issues such as						
		R&R, water conservation and sustainability.						
6	Course	CO1.Understand the scope of environmental science with						
	Outcomes	knowledge about various types of natural resources and its						
		conservation						
		CO2. Study about the structure and composition of	atmosphere and					
		factors affecting weather and climate	entrol and solid					
		waste management	ontrol and solid					
		CO4. Effect of global warming and ozone layer depl	etion					
		CO5.Understand sustainable development, res	ettlement and					
		rehabilitation, impact of population explosion of	n environment					
		CO6.Understand overall environmental iss	ues and its					
		management						
7	Course	Environmental Science emphasises on various factors a	s					
	Description	1. Importance and scope of environmental science						
		2. Natural resource conservation						
		3. Pollution causes, effects and control methods an	d solid waste					
		management						
		4. Social issues associated with environment						
			1					
8	Outline syllabu	IS	CO					
			Mapping					
	Unit 1	General Introduction						
	A	Definition, principles and scope of environmental science	COI					
	В	Water Resources, Land Resources, Food Resources	CO1					
	С	Mineral Resources, Energy Resources, Forest	CO1					
		Resources						
	Unit 2	Atmosphere and meteorological parameters						



А	Structure and	composition	of atmosphere	CO2		
В	Meteorologic	al parameters	: Pressure, Temperature,	CO2		
	Precipitation,	, Humidity,				
С	Radiation, W	ind speed and	direction, Wind Rose	CO2		
Unit 3	Environmen	tal Pollution	(Cause, effects and			
	control meas	sures)				
А	Air, water, N	loise and Soil	pollution	CO3		
В	Case studies	on pollution		CO3		
С	Solid waste	management	: Causes, effects and	CO3		
	control measure	ures of urban a	and industrial wastes.			
Unit 4	<b>Climate Cha</b>	inge and its in	npact			
А	Concept of G	lobal Warmin	g and greenhouse effect	CO4		
В	Ozone layer	Depletion and	its consequences	CO4		
С	Climate chan	ge and its effe	ct on ecosystem, Kyoto	CO4		
	protocol and	IPCC concern	s on changing climate			
Unit 5	Social Issues	Social Issues and the Environment				
А	Concept of	sustainable	development, Water	CO5		
	conservation					
В	Resettlement	and rehabil	itation of people; its	CO5		
	problems and	l concerns, Ca	se studies			
С	Population ex	xplosion and it	s consequences	CO5		
Mode of	Theory					
examination		1				
Weightage	CA	MTE	ETE			
Distribution	25%	25%	50%			
Text book/s*	1. Joseph					
	Mcgra					
	2. Howa					
	Hill 1	985	tonnental engineering MC Grav			
Other		200				
References						
	A B C Unit 3 A B C C Unit 4 A B C C Unit 5 A B C Unit 5 A B C C Unit 5 A C Unit 5 A C Unit 5 A C Unit 5 A C Unit 3 C C Unit 3 C C Unit 3 C C Unit 3 C C Unit 4 A B C C Unit 3 C C Unit 3 C C Unit 3 C C Unit 3 C C Unit 5 A C C Unit 5 A C C Unit 5 A C C Unit 5 C C Unit 5 C C C Unit 5 C C Unit 5 C C Unit 5 C C Unit 5 C C Unit 5 C C Unit 5 C C Unit 5 C C C Unit 5 C C C C C C C C C C C C C C C C C C C	AStructure and Meteorologic Precipitation,CRadiation, WUnit 3Environment control measeAAir, water, NBCase studiesCSolid waste control measeCSolid waste control measeMathematical CClimate CharAConcept of GBOzone layerCClimate char protocol andUnit 5Social IssueseAConcept of conservationBResettlement problems andCPopulation exMode of examinationTheory examinationWeightage DistributionCADistribution25%Text book/s*1. Josepl Mcgra 2Howa Tchob Hill, 1Other ReferencesHill, 1	A       Structure and composition of Meteorological parameters Precipitation, Humidity,         C       Radiation, Wind speed and         Unit 3       Environmental Pollution control measures)         A       Air, water, Noise and Soil         B       Case studies on pollution         C       Solid waste management control measures of urban a         Unit 4       Climate Change and its in A         Concept of Global Warmin       B         Ozone layer Depletion and       C         C       Concept of sustainable conservation         B       Resettlement and rehabil problems and concerns, Ca         C       Population explosion and it         Mode of examination       CA         Weightage       CA         Distribution       25%         Text book/s*       1. Joseph, Benny, "Envi Mcgraw-Hill.         2. Howard S. Peavy, Detrichobanoglous. Envi Hill, 1985         Other       References	A       Structure and composition of atmosphere         B       Meteorological parameters: Pressure, Temperature, Precipitation, Humidity,         C       Radiation, Wind speed and direction, Wind Rose         Unit 3       Environmental Pollution (Cause, effects and control measures)         A       Air, water, Noise and Soil pollution         B       Case studies on pollution         C       Solid waste management: Causes, effects and control measures of urban and industrial wastes.         Unit 4       Climate Change and its impact         A       Concept of Global Warming and greenhouse effect         B       Ozone layer Depletion and its consequences         C       Climate change and its effect on ecosystem, Kyoto protocol and IPCC concerns on changing climate         Unit 5       Social Issues and the Environment         A       Concept of sustainable development, Water conservation         B       Resettlement and rehabilitation of people; its problems and concerns, Case studies         C       Population explosion and its consequences         Mode of examination       Ito Sová         Veightage       CA       MTE         Distribution       25%       25%       50%         Text book/s*       1. Joseph, Benny, "Environmental Studies", Tata Mcgraw-Hill.       Mcgraw-Hill.         2.		

$CO\downarrow PO \rightarrow$	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	3	3
CO2	2	2	2	2	2	3
CO3	2	2	3	2	3	3
CO4	2	2	3	2	3	3
CO5	2	2	2	2	3	3
CO6	2	2	3	2	2	3



Sch	ool: SET		
Pro	gram: B.Tech		
Bra	nch: All	Semester: I/II	
1	Course Code	HMM111 Course Name	
2	Course Title	Human Values and Ethics	
3	Credits	2	
4	Contact Hours	2-0-0	
	(L-T-P)	Commuterer	
5	Course Status	Compulsory	among students
5	Objective	towards life and profession as well as towards happiness and on a correct understanding of the Human reality and the res	l prosperity based t of Existence
6	Course Outcomes	<ol> <li>Understand that the technical education without study can generate more problems than solutions.</li> <li>Define the principles and ideals, which help in making what is more important.</li> <li>See that 'I' and 'Body' are two realities, and most of related to 'I' and not body, while their efforts are most fulfilment of the needs of the body assuming that it w of 'I' too.</li> <li>Appreciate the importance of harmony in the self, fami for mutual fulfilment.</li> <li>Understand the importance of harmony among hum living beings and entire nature for universal equilibriu existence.</li> <li>Know and practice the ethical approach in profession happiness and sustained prosperity.</li> </ol>	of human values the judgement of f their desires are ly centered on the ill meet the needs ly and the society han beings, other m and mutual co- on for continuous
7	Course Description	Human values and embedded in all human beings it is imp them towards these values that they can use in their life happiness and mutual prosperity. Professional ethics wil about the value addition that can be done within the fran behaviour.	ortant to sensitize to attain mutual l enlighten them nework of ethical
8	Outline syllabus		CO Mapping
	Unit 1	The Need and Process for Value Education	
	А	The need, basic guidelines, content, and process for Value Education	CO1
	В	Concept of 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration; Continuous Happiness and Prosperity- A look at basic Human Aspirations	CO1,CO2
	С	Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment aspirations of every human being with their correct priority	C01,C02
	Unit 2	Understanding Harmony in the Human Being - Harmony in Myself	
	Α	Human being as a co-existence of the sentient 'I' and the material 'Body'	CO3



В	The needs of Self ('I') and 'Body' ; Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)	CO3
С	The characteristics and activities of 'I' and harmony in 'I' ; Understanding the harmony of I with the Body: Correct appraisal of Physical needs, meaning of Prosperity in detail	CO3
Unit 3	Harmony in the Family and Society	
А	Values in human-human relationship; Trust and Respect as the foundational values of relationship	CO4
В	Understanding the meaning of Trust; Difference between intention and competence; The meaning of Respect; Difference between respect and differentiation; the other salient values in relationship	CO4
С	Harmony in the society (society being an extension of family; Visualizing a universal harmonious order in society - from family to world family	CO4
Unit 4	Harmony in the Nature and Existence	
A	The harmony in the Nature	CO5
В	Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature	CO5
C	Understanding Existence as Co-existence of mutually interacting units in all-pervasive space	CO5
Unit 5	Competence in professional ethics	
А	Ability to utilize the professional competence for augmenting universal human order	CO6
В	Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems,	CO6
С	Ability to identify and develop appropriate technologies and management patterns for above production systems.	CO6
Mode of examination	Theory	
Weightage	CA MTE ETE	
Distribution	25% 25% 50%	
Text book/s*	<ol> <li>R.R Gaur, R Sangal, G P Bagaria, "A foundation course in Human Values and professional Ethics", Excel books, New Delhi</li> </ol>	
Other References	<ol> <li>B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow.</li> <li>A.N. Tripathy, 2003, Human Values, New Age International Publishers.</li> <li>PL Dhar, RR Gaur, Science and Humanism, Commonwealth Publishers. Starting out with Python, Tony Gaddis, Pearson</li> </ol>	



## CO and PO Mapping

COs	PO1	PO2	PO3	PO4	PO 5	Р 06	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO2	PSO3	PSO 4	PSO 5
CO1						3	1	3	1			3					
CO2						2	1	3	2			3					
CO3						3	1	3	2			3					
CO4						3	1	3	2			3					
CO5						3	3	3	3		2	3					
CO6						3	3	3	2		3	3					



	School:	SET   SOL   SMFE   SBS-BBA   SBSR   SOF	E   SAP
	Department	Sharda Skills	
	Program:	Communicative English -2	
	Branch:	Aptitude Reasoning & Personality	
1	Course Code	ARP - 102	
2	Course Title	Communicative English -2	
3	Credits	2	
4	Contact Hours (L-T-P)	1-0-2	
	Course Status	Core	
5	Course Objective	To Develop LSRW skills through audio-visual langua creative writing, advanced speech et al and MTI Reduc of certain tools like texts, movies, long and sho	ge acquirement, ction with the aid rt essays.
6	Course Outcomes	After completion of this course, students will b CO1 Acquire Vision, Goals and Strategies through Language Texts CO2 Synthesize complex concepts and present the writing CO3 Develop MTI Reduction/Neutral Accent throu Sessions & Practice CO4 Determine their role in achieving team success t strategies for effective communication with diffe CO5 Realize their potentials as human beings and con properly in the ways of world. CO6 Acquire satisfactory competency in use of Quan and Logical Reasoning	e able to: Audio-visual em in creative ugh Classroom through defining rent people duct themselves
7	Course Description	The course takes the learnings from the previous se advanced level of language learning and self-compre- the introduction of audio-visual aids as language enabl learners to an advanced level of writing, reading, l speaking abilities, while also reducing the usage of L order to increase the employability chance	emester to an nension through lers. It also leads istening and 1 to minimal in ces.
8		Outline syllabus – ARP 102	CO Mapping
	Unit 1	Acquiring Vision, Goals, Strategies through Audio- visual Language Texts and Creative Writing	



А	Pursuit Proposi Principles,T life	of Happiness ition in life,12 The King's Sp strategies &	s / Goal Setting & Value 2 Angry Men / Ethics & beech / Mission statement in Action Plans in Life	C01				
В	Story Rec base	construction - d Story Writi	Positive Thinking, Theme ing - Positive attitude	CO2				
С	Learning I	Diary Learnii	ng Log – Self-introspection	CO2				
Unit 2	Writing Ski throu	ills 1 and MT gh Classroon	I Reduction/Neutral Accent n Sessions & Practice					
А	Precis, 1	Precis, Paraphrasing, Essays (Simple essays)						
В	Vowel, Cor Monotho Sound drills	ngs, Dipthon ngs, Dipthon s, Consonant Fricati	d correction, speech sounds, gs and Tripthongs, Vowel Sound drills, Affricates and ve Sounds	co3				
С	Speech S Dictior	Speech Sounds   Speech Music  Tone   Volume  Diction  Syntax  Intonation   Syllable Stress						
Unit 3	Gauging M	Gauging MTI Reduction Effectiveness through Free Speech						
А		Jam	sessions	CO3				
В		Exte	empore	CO3				
С		Situation-based Role Play						
Unit 4	Leadershij	Leadership and Management Skills and Universal						
А	Innovative	Leadership a and l	nd Design Thinking, Ethics	CO4				
В	Love &	Compassion, Righteou	Non-Violence & Truth, Isness, Peace	CO5				
С	Se	ervice, Renur	ciation (Sacrifice)	CO5				
Unit 5	Introduct	ion to Quanti Rea	itative aptitude & Logical					
А		Analytica	al Reasoning	CO6				
В	Number	Systems and Provident	its Application in Solving	CO6				
С		Puzzle	e Solving	CO6				
Mode of		CA / V	IVA / ESE					
examination								
Weightage	CA							
Distribution	25							
	25							
 Text book/s*	.Wren							
20110000140	and Cor	nposition, S.	Chand& Company Ltd, New					
		•	Delhi.					



	<ul> <li>Blum, M. Rosen. <i>How to Build Better</i> <i>Vocabulary</i>. London: Bloomsbury Publication</li> <li>Comfort, Jeremy(et.al). <i>Speaking Effectively</i>. Cambridge University Press.</li> </ul>	
Other References	The Luncheon by W.Somerset Maugham - http://mistera.co.nf/files/sm_luncheon.pdf	

## CO and PO Mapping

G		
<b>S</b> .	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(150)
1.	CO1 Acquire Vision, Goals and Strategies through Audio-visual	PO9, PO10, PO11,PO12
	Language Texts.	
2.	CO2 Synthesize complex concepts and present them in creative	PO9, PO10, PO11,PO12
	writing.	
2		DO0 DO10 DO11 DO12
э.	CO3 Develop M11 Reduction/Neutral Accent through Classroom	P09, P010, P011,P012
	Sessions & Practice.	
4.	CO4 Determine their role in achieving team success through	PO9, PO10, PO11,PO12
	defining strategies for effective communication with different neonle	
	demning strategies for effective communication with different people	
5.	CO5 Realize their potentials as human beings and conduct	PO9, PO10, PO11,PO12
	themselves properly in the ways of world.	
	enclusives property in the ways of workd.	
6.	CO6 Acquire satisfactory competency in use of Quantitative	PO9, PO10, PO11,PO12
	antitude and Logical Passoning	
	aputude and Logical Reasoning	

## PO and PSO mapping with level of strength for Course

Code_ Course Name	CO's	PO 1	PO2	P O 3	PO4	P O5	P O 6	PO 7	P O8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	CO1	-	-		-	-	-	-	-	1	3	1	2		-	-
CSC302_	CO2	-	-	-	-	-	-	-	-	1	3	1	2	-	-	
phy and	CO3	-	-	-	-	-	-	-	-	1	3	1	2	-	-	-
Network Security	CO4	-	-	-	-	-	-	_	-	1	3	1	2	-	-	-
	CO5	-	-	-		-	-	-		1	3	1	2	-	-	-
	CO6	-	-	-	-	-	-	-	-	1	3	1	2	-	-	

### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	РО 5	PO 6	Р 07	PO 8	PO9	PO 10	P 01 1	PO 12	PSO 1	PS O2	PS O3
ARP - 102	Communicative English - 2									1	3	1	2			



# Syllabus: CSP 113: Programming for problem solving Lab

Scł	nool: SET	Batch : 2023-27	
Pro	ogram: B.Tech.	Current Academic Year: 2023-24	
Bra	anch: CSE	Semester: I	
1	Course Code	CSP113	
2	Course Title	Programming for problem solving Lab	
3	Credits	3	
4	Contact Hours	3-0-0	
	(L-T-P)		
	Course Status	Compulsory	
5	Course	1. Learn basic programming constructs –data	types, decision
	Objective	structures, control structures in C	
		2. learning logic aptitude programming in C l	language
		3. Developing software in c programming	
6	Course	Students will be able to:	
	Outcomes	CO1: Implement core concept of c Programmi	ing
		CO2: develop programs using Array and String	g
		CO3: create Functions for any problem	
		CO4: Use Union and Structure to write any pro	ogram
		CO5: <b>implement</b> concept of Pointers	
		CO6: design a real world problem with the hel	p of c
		programming	
7	Course	Programming for problem solving gives the Understand	ling of C
	Description	programming and implement code from flowchart or al	gorithm
8	Outline syllabu	S	CO Mapping
	Unit 1	Logic Building	CO1, CO6
		Draw flowchart for finding leap year	
		Write a c Program to Add Two Integers	
		Write a program to create a calculator	
	Unit 2	Introduction to C Programming	CO2, CO6
		Write a c program to convert length meter to cm	
		Write a c program to convert temp	
		Write a c program to swap two numbers	
	Unit 3	Arrays and Functions	CO3, CO6
		Write a c program to calculate the average using	,
		arrays	
		Write a c program to find the largest element of the	
		array	
	Unit 4	Pre-processors and Pointers	CO4, CO6
		Write a c program to swap two values using pointers	
		Write a c program to find largest number from array	
		using pointers	
	Unit 5	User Defined Data Types and File Handling	<u>CO5, CO6</u>
		Write a c program to store information of a student	
	1	using structure	



	Write a c pr using union	Write a c program to store information of a student using union								
Mode of examination	Practical	Practical								
Weightage	CA	CE(Viva)	ETE							
Distribution	25%	25%	50%							
Text book/s*	Kernighan, B Language	rian, and Dennis	Ritchie. The C Programming							
Other References	4. B.S. Outl 2004 5. E. E Seco	<ul> <li>Language</li> <li>4. B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004.</li> <li>5. E. Balagurusamy - Programming in ANSI C - Second Edition - Tata McGraw Hill- 1999</li> </ul>								

#### **Course outline**

This course implements array and pointer and Recursive applications. The course talks primarily about Array, string, functions, structure & union and Pointers etc.

<b>Course Evaluation</b>	
Attendance	None
Any other	CA judged on the practicals conducted in the lab, weightage may be specified
References	
Text book	Kernighan, Brian, and Dennis Ritchie. The C Programming Language
Other References	<ol> <li>B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004.</li> <li>E. Balagurusamy - Programming in ANSI C - Second Edition - Tata McGraw Hill- 1999</li> </ol>
Softwares	Turbo C

# **PO and PSO mapping with level of strength for Course Name** Programming for problem solving Lab (**Course Code CSP113**)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	CO1	2	-	3	2	2	-	-	-	2	-	-	-	3	2	2
	CO2	3	-	3	2	2	-	-	-	3	-	-	-	3	3	1
	CO3	2	-	3	1	2	-	-	-	2	-	-	-	2	3	2
	CO4	1	-	2	1	1	-	-	-	2	-	-	-	2	2	-
CSP113_ Programming for	CO5	2	-	3	2	2	-	-	-	3	-	-	-	3	2	2
problem solving Lab	CO6	3	-	3	3	1	-	-	-	2	-	-	-	2	3	2

## Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSP113	Programming for problem															
	solving Lab	2.17		2.83	1.83	1.67	-	-	-	2.33	-	-	-	2.50	2.50	1.80

CSE, SSET, SU

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# Syllabus: CSP 101:Introduction to Computer Science and Engineering

Sch	ool: SET	Batch : 2023-27	
Pro	gram:B.Tech	Current Academic Year: 2023-24	
Bra	nch: CSE	Semester:I	
1	Course Code	CSP101 Course Name	
2	Course Title	Introduction to Computer Science and Engineering	
3	Credits	1	
4	Contact	0-0-2	
	Hours		
	(L-T-P)		
	Course	UG	
	Status		
5	Course	1. To familiarize the students about the importance of Under	rgraduate
	Objective	course on Computer Science & Engineering.	
		2. To discuss recent developments in hardware and software	\$
		environments.	1
		3. To focus future application areas of Computer Science an	d
		A To discuss various research and development options in C	Computor
		4. To discuss various research and development options in C Science and Engineering	lomputer
6	Course	The student should be able to:	
0	Outcomes	CO1. Understand the technical aspects of Computer Science &	& Engineering
	Outcomes	Course.	
		CO2. Perceive some knowledge about programming in various	applications.
		CO3. Acquire basic understanding about computer networking	ig and related
		CO4. Enhance some fundamental knowledge of DBMS includi	ng application
		areas.	discovering
		wisdom/knowledge and future prediction.	uiscovering
		CO6. Implement the course program on AWS cloud.	
7	Course	This course focuses application areas of Computer Science and E	ngineering for
	Description	students admitted in undergraduate program. The purpose of	B. Tech. in
		Computer Science & Engineering is to be given through this cour	se to students.
8	Outline syllab	us	CO Mapping
	Unit 1	Hardware aspect of Computer Science & Engineering	
	А	History of Computing Systems, Computer Basics and	
	D	Computer Organization.	001
	В	Computer Architecture, Introduction to various connecting	COI
	C	devices.	
	C	architectures	
	Unit 2	Programming Aspects	
	A	Basics of Programming Programming Paradigms System	
	**	Software versus Application Software.	
	В	Hard Computing versus Soft Computing, Data Structures and	CO2
		Algorithms.	
	С	Computer Graphics, Multimedia, Computer Vision.	



Unit 3	Computer	Networkin	g and DBMS						
А	Introduction	n to Netw	orking, Various terminologies, Client						
	Server Tech	hnology, W	eb Technology. Introduction to network						
	security			CO3					
В	Introduction to DBMS, DBMS versus File System, Relational								
	DBMS.								
С	Big Data A	nalytics & S	Scientific Computing						
Unit 4	Artificial I	ntelligence							
А	Information	n Processin	g and Retrieval, Basics of Artificial						
	Intelligence	e		CO4					
В	Basics of P	attern Reco	gnition	0.04					
С	Basics of M	Iachine Lea	rning						
Unit 5	Cloud Con	nputing: A	mazon Web Services						
А	Concept of	f Cloud Co	omputing and Virtualization, Real life						
	applications	•		CO5					
В	AWS servic	es:EC2, Lam	ibda,S3,IAM,VPC	005					
С	AWS securi	ty services, r	nanagement services						
Mode of	Practical								
 examination	I								
Weightage	CA	CE(Viva)	ETE						
Distribution	25%	25%	50%						
Text book/s*	1. Intr	oduction to	Computer, Peter Norton, 7/e, 2017, Tata	McGraw Hill					
	Pub	lishing.							
	2. Clo	ud Computi	ing: A Practical Approach, Anthony T. Vo	elte, Toby J.					
	Vel	te, Robert E	Elsenpeter						
 	3. AW	S Educate	Cloud Practitioners Essentials contents						
Other	L Equipartience of Computer Science D & Ecrowron & E								
References	4. Foundations of Computer Science, D A Fotouzana F								
	iviosnarrai, 2/e, 2008, Deimar Learning.								
	5. <u>https://aws.amazon.com/developer/language/java/</u>								
	6. <u>h</u> t	ttps://aws.ai	mazon.com/developer/						

## CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) &
		Program Specific Outcomes
		(PSO)
1.	CO1: Understand the technical aspects of Computer	PO1, PO2, PO12, PSO3
	Science & Engineering Course.	
2.	<b>CO2:</b> Perceive some knowledge about programming in	PO1, PO12, PSO1, PSO3
	various applications.	
3.	<b>CO3:</b> Acquire basic understanding about computer	PO1, PO2, PO12, PSO2,
	networking and related technology.	PSO3
4.	<b>CO4:</b> Enhance some fundamental knowledge of DBMS	PO1, PO12, PSO2, PSO3
	including application areas.	
5.	CO5: Understand the current trends in computing in	PO1, PO6, PO8, PO12, PSO2,
	discovering wisdom/knowledge and future prediction.	PSO3

CSE, SSET, SU

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	3	3	-	3
CO2	3	2	-	-	-	-	-	-	-	-	-	3	-	3	2
CO3	3	2	-	-	-	-	-	-	-	-	-	3	-	2	3
CO4	3	-	-	-	-	-	-	-	-	-	-	3	-	3	2
CO5	3	-	-	-	-	2	-	2	-	-	-	3	-	3	3



Scl	nool: SET	Batch : 2023-27								
Pre	ogram: B.Tech	Current Academic Year: 2023-24								
Br	anch: ALL	Semester: I								
1	Course Code	MEP 106								
2	Course Title	Computer Aided Design & Drafting Laboratory								
3	Credits	1.5	1.5							
4	Contact Hours	0-0-3	)-0-3							
	(L-T-P)									
	Course Status	Compulsory								
5	Course Objective	The objective of this introductory course is to make students familiar with computer-aided drafting/ design, introduce them about the basic commands, tools and dimension techniques for creation and presentation of various engineering drawing by using AutoCAD software which helps in visualization and problem solving in engineering disciplines.								
6	Course Outcomes	After successful completion of this course the student w	rill be able to							
		CO1: Understand the fundamental features of AutoCA	D workspace and							
		user interface. $CO2$ : Apply the fundamental tools such as draw, edit, and	d view for creating							
		two dimensional engineering drawings in AutoCAD	u view for creating							
		CO3: Choose advance features to present an engine	ering drawing in							
		AutoCAD.	8 8							
		CO4: Apply text and dimension features in the engineer	ing drawing.							
		CO5: Create different orthographic projections from a p	ictorial view.							
		CO6: Analyze an engineering drawing and use the soft	ware packages for							
_	9	drafting and modeling.	.1							
1	Course	This introductory course is offered to students to make	them proficient in							
	Description	technical drawing Using the current version of the A	utoCAD software							
		students will learn a variety of drawing techniques and h	and the software,							
		specific drawings in multiple perspectives. The pinnacl	e of the class is to							
		empower and enable students to create using the softwar	e provided. Career							
		opportunities in 3D modeling, manufacturing, and engin	eering will also be							
		explored. No drafting or computer experience is necessa	ary.							
8	Outline syllabus		CO Mapping							
	List of									
	Experiments									
	Experiment 1	Introduction to AutoCAD and its interface	CO1							
	Experiment 2	arc, polygon and creating sketches	CO2							
	Experiment 3	Editing of drawing by using editing Tools and Power CO2								
	Experiment 4	Creating of advanced feature like fillet, chamfer, hatch and using of block CO3								
	Experiment 5	Representing text and dimensioning in AutoCAD	CO4							
	Experiment 6	Creating the drawings of mechanical components by	CO2, CO3							
	Europin ant 7	Using AutoCAD features.								
	Experiment 7	Creating the electrical circuit drawings in AutoCAD.	02							
	Experiment 8	AutoCAD.	CO2, CO4							



Experiment 9	Creating the c as Taj Mahal i	lrawing of renow n AutoCAD	rned constructions such	CO3
Experiment 10	Creating of or views	CO5		
Mode of examination	Practical			
Weightage	CA	CE(Viva)	ETE	
Distribution	25%	25%	50%	
Text book/s*	1. Ibrahim Zai	Graw Hill,		
	Internat			
Software	AutoCAD			

## **1.3.5.1 COURSE ARTICULATION MATRIX**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO106.1	2	2	2	-	3	-	-	-	-	-	-	3	3	3
CO106.2	2	2	2	-	3	-	-	-	-	-	-	3	3	3
CO106.3	2	2	2	-	3	-	-	-	-	-	-	3	3	3
CO106.4	2	2	2	2	3	-	-	-	2	2	-	3	3	3
CO106.5	2	2	2	2	3	-	-	-	2	2	-	3	3	3
CO106.6	2	2	2	2	3	-	-	-	2	2	-	3	3	3

1-Slight (Low)2-Moderate (Medium)3-Substantial (High)



Scho	ol: SET	Batch : 2023-27							
Prog	ram: B.Tech	Current Academic Year: 2023-24							
Bran	ch: Mechanical	Semester: I							
Engi	neering								
1	Course Code	MEP 105							
2	Course Title	Mechanical Workshop							
3	Credits	1.5							
4	Contact Hours	0-0-3							
	(L-T-P)								
	Course Status	Compulsory							
5	Course	The objective of this course is to make the students, familiar with the							
	Objective	modern day manufacturing processes, introduce them to various hand tools							
	-	and equipment, acclimatize with the measuring devices, and perform basic							
		machine tool operations in various machine tools.							
6	Course	After successful completion of this course, students will be able to							
	Outcomes	CO1: Apply 5S (Seiri, Seiton, Seiso, Seiketsu and Shitsuke ) methodology							
		at workplace.							
		CO2: Select the various hand tools used in the basic mechanical							
		engineering workshop sections-smithy, carpentry, assembling, welding etc.							
		CO3: Choose different measuring devices according to the job							
		CO4: Differentiate between various machine tools and their operation							
		CO5: Classify and select suitable tools for machining processes including							
		turning, facing, thread cutting and tapping, milling, drilling and shaping.							
		CO6: Apply the knowledge for advance manufacturing experiments.							
7	Course	Black Smithy Shop: Simple exercises based on black smithy operations							
	Description	such as upsetting, practice of S -Hook from circular bar using hand forging							
		operations.							
		Carpentry Shop: Study of different types of wood, Carpentry Tools,							
		Equipment and different joints, Practice of T joint, cross lap joint, Mortise							
		and Tenon T joint, Bridle T joint							
		<b>Fitting Shop:</b> Preparation of Square joint, V joint, half round joint,							
		dovetail jointas per the given specifications, which contains: Sawing,							
		Filing, Grinding, and Practice marking operations.							
		<b>Sheet Metal Shop:</b> Study of galvanized from (G.I.) Sheet material							
		demonstration of different sheet metal ensurtions and projective geometry,							
		demonstration of different sheet metal operations and practice of							
		Welding Shop: Introduction Study of Tools and welding Equipment (Gas							
		and Arc welding) Selection of welding electrode and current Bead practice							
		and Practice of Butt Joint Lan Joint							
		<b>Machine Shop:</b> Study of machine tools in particular Lathe machine							
		(different parts different operations study of cutting tools) Demonstration							
		of different operations on Lathe machine. Practice of Facing. Plane							
		Turning, step turning, taper turning, knurling and parting and Study of							
		Ouick return mechanism of Shaper.							
		Foundry Shop: Introduction to foundry, Patterns, pattern allowances.							
		ingredients of moulding sand and melting furnaces. Foundry tools and their							
		purposes, Demo of mould preparation and Practice – Preparation of mould							
		by using split pattern.							
8	Outline syllabus	CO Mapping							
	List of								
	Experiments								



Experiment 1	t 1 To make a S sl circular rod using	haped hook from a given g hand forging technique.	CO4						
Experiment 2	t 2 To make a dove shop.	tail lap joint in Carpentry	CO2,CO3						
Experiment 3	t 3 To make a cross- shop.	-half lap joint in Carpentry	CO2,CO3						
Experiment 4	t 4 To make a square steel pieces in fit	e fit from the given mild ting shop.	CO3,CO5						
Experiment 5	t 5 To prepare a V-F pieces in fitting s	it from the given mild steel hop.	CO3, CO5						
Experiment 6	t 6 To make a rect dimensions in sho	tangular tray of specified eet metal shop.	CO2, CO5						
Experiment 7	t 7 To make a Lap j steel pieces using	joint, using the given mild g arc welding.	CO3, CO5						
Experiment 8	t 8 To perform step t operations on the	turning and taper turning given work piece	CO5						
Experiment 9	t 9 To prepare a sand single piece patte	d mold, using the given	CO2						
Experiment 10	t 10 To prepare a sand Split-piece patter	d mold, using the given n.	CO2						
Mode of examination	Practical								
Weight- age	CA MTE	ETE							
Distribution	25% 25%	50%							
Text book/s*	<ul> <li>* 1. Raghuwanshi Sons.</li> <li>2. Kannaiah P. a publishers.</li> <li>3. John K.C., Me</li> <li>4. JeyapoovanT.</li> <li>Edn. Vikas Public</li> </ul>	<ol> <li>Raghuwanshi B.S., Workshop Technology Vol. I Sons.</li> <li>Kannaiah P. and Narayana K.L., Workshop Manu publishers.</li> <li>John K.C., Mechanical Workshop Practice. 2nd Ec 4. JeyapoovanT.andPranitha S., Engineering Practic Edn. Vikas Pub 2008</li> </ol>							
examination         Weight- age         Distribution         Text book/s*	CA     MTE       25%     25%       *     1. Raghuwanshi       Sons.     2. Kannaiah P. a       publishers.     3. John K.C., Me       4. JeyapoovanT.     Edn. Vikas Pub.2	ETE 50% B.S., Workshop Technolog nd Narayana K.L., Worksho chanical Workshop Practice andPranitha S., Engineering 2008.	y Vol. I & II, Dhanpat op Manual, 2nd Edn, S 2. 2nd Edn. PHI 2010. g Practices Lab Manua						

## **Program Outcome Vs Courses Mapping Table:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO105.1	1	-	-	-	-	2	-	-	-	-	-	2	-	-	-
CO105.2	1	-	-	-	1	2	-	-	-	-	-	1	1	-	1
CO105.3	2	-	1	-	1	2	-	-	-	-	-	2	1	-	1
CO105.4	2	-	1	-	2	2	-	-	-	-	-	2	1	-	1
CO105.5	2	-	1	-	2	2	-	-	-	-	-	2	2	-	1
CO105.6	2	-	1	-	2	2	-	-	-	-	-	2	2	-	1
CO105	2	-	1	-	2	2	-	-	-	-	-	2	2	-	1

1-Slight (Low)

2-Moderate (Medium)

3-Substantial (High)



# TERM - II



Syllabus for	Δn	nlication	Rased	Programm	inσ	in	Python
Synabus Ior	лμ	plication	Dascu	1 Tugi anni	ung	111	i yuuun

Sch	ool:	School of Engineering & Technology							
Dep	artment	Department of Computer Science & Engineering							
Pro	gram:	B.Tech.							
Bra	nch:	CSE							
1	Course Code	CSE114							
2	Course Title	Application Based Programming in Python							
3	Credits	3							
4	Contact	3-0-0							
	Hours								
	(L-T-P)								
	Course Status	Core							
5	Course	hm design,							
	Objective	and language constructs common to most high-level lar	nguages						
		through Python Programming.							
6	Course	Upon successful completion of this course, the student	will be able to:						
	Outcomes CO1. Demonstrate program by using decision and repetition								
		structures							
		CO2. Construct programs by using Python lists, tuples	and						
		dictionaries	:4 <b>f</b>						
		CO3. Apply methods and functions to improve readabil	ity of						
		CO4 Develop logical problem using object oriented pr	ogramming						
		methodology	ogramming						
		CO5 Analyze and implement various tools modules at	nd nackages						
		for nython	la packages						
		CO6. Design efficient logical solution for any given rea	l life problem						
		by using concise and efficient algorithms	F						
7	Course	Python is a language with a simple syntax, and a power	ful set of						
	Description	libraries. It is widely used in many scientific areas for d	ata						
		exploration. This course is an introduction to the Python	n						
		programming language for students without prior progr	amming						
		experience. We cover data types, control flow, object-o	riented						
		programming.							
8	Outline syllabu	15	CO						
	<b>T</b> T <b>1</b> / <b>4</b>	<b>.</b>	Mapping						
		Introduction	COI						
	А	Python Environment, Variables, Data Types,							
	D	Operators.							
	Б	<b>Looping:</b> For While Nested loops							
	C	Control Statements: Break Continue And Deer							
		Comments							
	Unit ?	List Tunle and Dictionaries	CO1 CO2						
	A A	Lists and Nested List. Introduction Accessing list							
	2 <b>1</b>	Operations Working with lists Library Function and							
		Methods with Lists							
L	1		1						



В	Strings: Introduction, Accessing items of a string,	
	Operations, Working, Library Functions and Methods	
	with strings.	
	Tuple: Introduction, Accessing tuples, Operations,	
	Working, Library Functions and Methods with Tuples.	
С	Sets: Introduction, Operations, Working, functions	
	with sets. Difference between set and lists.	
	Dictionaries :Introduction, Accessing values in	
	dictionaries, Working with dictionaries, Library	
	Functions	
Unit 3	Functions and Exception Handling	CO3
А	Functions: Defining a function, Calling a function,	
	Types of functions, Function Arguments	
В	Anonymous functions, Global and local variables	
С	Exception Handling: Definition, Except clause, Try,	
	finally clause, User Defined Exceptions	
Unit 4	OOP and File Handling	CO4
А	<b>OOPs concept</b> : Class and object, Attributes,	
	Abstraction, Encapsulation, Polymorphism and	
	Inheritance	
В	Static and Final Keyword, Access Modifiers and	
	specifiers, scope of a class	
	1 1	
С	File Handling: Introduction, File Operations	
 C Unit 5	File Handling: Introduction, File Operations Application based programming	CO5,CO6
C Unit 5 A	File Handling: Introduction, File OperationsApplication based programmingModules& packages :Importing module, Math	CO5,CO6
C Unit 5 A	File Handling: Introduction, File OperationsApplication based programmingModules& packages :Importing module, Math module, Random module, creating Modules	CO5,CO6
C Unit 5 A B	File Handling: Introduction, File OperationsApplication based programmingModules& packages:Importing module, Mathmodule, Random module, creating ModulesIntroduction to Numpy, pandas, Matplotlib	CO5,CO6
C Unit 5 A B C	File Handling: Introduction, File OperationsApplication based programmingModules& packages:Importing module, Mathmodule, Random module, creating ModulesIntroduction to Numpy, pandas, MatplotlibApplications: Searching Linear Search, Binary Search.	CO5,CO6
C Unit 5 A B C	File Handling: Introduction, File OperationsApplication based programmingModules& packages :Importing module, Math module, Random module, creating ModulesIntroduction to Numpy, pandas, MatplotlibApplications: Searching Linear Search, Binary Search. Sorting: Bubble Sort	CO5,CO6
C Unit 5 A B C Mode of	File Handling: Introduction, File OperationsApplication based programmingModules& packages :Importing module, Mathmodule, Random module, creating ModulesIntroduction to Numpy, pandas, MatplotlibApplications: Searching Linear Search, Binary Search.Sorting: Bubble SortTheory	CO5,CO6
C Unit 5 A B C Mode of examination	File Handling: Introduction, File Operations         Application based programming         Modules& packages :Importing module, Math         module, Random module, creating Modules         Introduction to Numpy, pandas, Matplotlib         Applications: Searching Linear Search, Binary Search.         Sorting: Bubble Sort         Theory	CO5,CO6
C Unit 5 A B C Mode of examination Weightage	File Handling: Introduction, File Operations         Application based programming         Modules& packages :Importing module, Math         module, Random module, creating Modules         Introduction to Numpy, pandas, Matplotlib         Applications: Searching Linear Search, Binary Search.         Sorting: Bubble Sort         Theory         CA       MTE         ETE         25%	CO5,CO6
C Unit 5 A B C Mode of examination Weightage Distribution	File Handling: Introduction, File OperationsApplication based programmingModules& packages :Importing module, Math module, Random module, creating ModulesIntroduction to Numpy, pandas, MatplotlibApplications: Searching Linear Search, Binary Search. Sorting: Bubble SortTheoryCAMTE25%25%25%50%	CO5,CO6
C Unit 5 A B C Mode of examination Weightage Distribution Text book/s*	File Handling: Introduction, File OperationsApplication based programmingModules& packages :Importing module, Math module, Random module, creating ModulesIntroduction to Numpy, pandas, MatplotlibApplications: Searching Linear Search, Binary Search. Sorting: Bubble SortTheoryCAMTEETE25%25%50%The Complete Reference Python, Martin C. Brown,	CO5,CO6
C Unit 5 A B C Mode of examination Weightage Distribution Text book/s*	File Handling: Introduction, File Operations         Application based programming         Modules& packages :Importing module, Math         module, Random module, creating Modules         Introduction to Numpy, pandas, Matplotlib         Applications: Searching Linear Search, Binary Search.         Sorting: Bubble Sort         Theory         CA       MTE         25%       25%         50%         The Complete Reference Python, Martin C. Brown, McGraw Hill	CO5,CO6
C Unit 5 A B C Mode of examination Weightage Distribution Text book/s* Other	File Handling: Introduction, File Operations         Application based programming         Modules& packages :Importing module, Math         module, Random module, creating Modules         Introduction to Numpy, pandas, Matplotlib         Applications: Searching Linear Search, Binary Search.         Sorting: Bubble Sort         Theory         CA       MTE         25%       25%         50%         The Complete Reference Python, Martin C. Brown,         McGraw Hill         1.       Introduction to computing in problem solving	CO5,CO6
C Unit 5 A B C Mode of examination Weightage Distribution Text book/s* Other References	File Handling: Introduction, File Operations         Application based programming         Modules& packages :Importing module, Math module, Random module, creating Modules         Introduction to Numpy, pandas, Matplotlib         Applications: Searching Linear Search, Binary Search.         Sorting: Bubble Sort         Theory         CA       MTE       ETE         25%       25%       50%         The Complete Reference Python, Martin C. Brown, McGraw Hill       1. Introduction to computing in problem solving using Python, E Balahurusamy, McGraw Hill         2       Introduction to an any sequencies Pitchen V	CO5,CO6
C Unit 5 A B C Mode of examination Weightage Distribution Text book/s* Other References	File Handling: Introduction, File Operations         Application based programming         Modules& packages :Importing module, Math module, Random module, creating Modules         Introduction to Numpy, pandas, Matplotlib         Applications: Searching Linear Search, Binary Search.         Sorting: Bubble Sort         Theory         CA       MTE       ETE         25%       25%       50%         The Complete Reference Python, Martin C. Brown, McGraw Hill       1. Introduction to computing in problem solving using Python, E Balahurusamy, McGraw Hill         2. Introduction to programming using Python, Y. Danial Linga Boarson	CO5,CO6
C Unit 5 A B C Mode of examination Weightage Distribution Text book/s* Other References	File Handling: Introduction, File Operations         Application based programming         Modules& packages :Importing module, Math module, Random module, creating Modules         Introduction to Numpy, pandas, Matplotlib         Applications: Searching Linear Search, Binary Search.         Sorting: Bubble Sort         Theory         CA       MTE       ETE         25%       25%       50%         The Complete Reference Python, Martin C. Brown, McGraw Hill       1. Introduction to computing in problem solving using Python, E Balahurusamy, McGraw Hill         1.       Introduction to programming using Python, Y. Daniel Liang, Pearson       2.	CO5,CO6
C Unit 5 A B C Mode of examination Weightage Distribution Text book/s* Other References	File Handling: Introduction, File OperationsApplication based programmingModules& packages :Importing module, Math module, Random module, creating ModulesIntroduction to Numpy, pandas, MatplotlibApplications: Searching Linear Search, Binary Search. Sorting: Bubble SortTheoryCAMTE25%25%25%50%The Complete Reference Python, Martin C. Brown, McGraw Hill1.Introduction to computing in problem solving using Python, E Balahurusamy, McGraw Hill2.Introduction to programming using Python, Y. Daniel Liang, Pearson3.Mastering Python, Rick Van Hatten, Packet Publiching House	CO5,CO6
C Unit 5 A B C Mode of examination Weightage Distribution Text book/s* Other References	File Handling: Introduction, File Operations         Application based programming         Modules& packages :Importing module, Math         module, Random module, creating Modules         Introduction to Numpy, pandas, Matplotlib         Applications: Searching Linear Search, Binary Search.         Sorting: Bubble Sort         Theory         CA       MTE         25%       25%         25%       50%         The Complete Reference Python, Martin C. Brown,         McGraw Hill       1. Introduction to computing in problem solving using Python, E Balahurusamy, McGraw Hill         2. Introduction to programming using Python, Y. Daniel Liang, Pearson         3. Mastering Python, Rick Van Hatten, Packet Publishing House         4. Starting out with Python	CO5,CO6
C Unit 5 A B C Mode of examination Weightage Distribution Text book/s* Other References	File Handling: Introduction, File Operations         Application based programming         Modules& packages :Importing module, Math module, Random module, creating Modules         Introduction to Numpy, pandas, Matplotlib         Applications: Searching Linear Search, Binary Search.         Sorting: Bubble Sort         Theory         CA       MTE       ETE         25%       25%       50%         The Complete Reference Python, Martin C. Brown, McGraw Hill       1. Introduction to computing in problem solving using Python, E Balahurusamy, McGraw Hill         2.       Introduction to programming using Python, Y. Daniel Liang, Pearson       3. Mastering Python, Rick Van Hatten, Packet Publishing House         4.       Starting out with Python, Tony Gaddis, Pearson	CO5,CO6

## CO and PO Mapping

S.	Course Outcome	Program Outcomes (PO) & Program Specific
No.		Outcomes (PSO)



1.	CO1. Demonstrate program by using decision and repetition structures	PO1,PO2,PO3,PO8,PO12,PSO2
2.	CO2. Apply methods and functions to improve readability of programs.	PO1,PO2,PO3,PO4,PO8,PO12,PSO2,PSO3
3.	CO3. Construct programs by using Python lists, tuples and dictionaries	PO1,PO2,PO3,PO8,PO12,PSO1, PSO2,PSO3
4.	CO4. Develop logical problem using object-oriented programming methodology.	PO1,PO2,PO3, PO4,PO5,PO6,PO8, PO12,PSO1,PSO2,PSO3
5.	CO5. Analyze and implement various tools, modules and packages for python	PO1,PO2,PO3, PO4,PO5,PO6, PO8, PO12,PSO1,PSO2,PSO3
6.	CO6. Create efficient logical solution for any given real life problem by using concise and efficient algorithms.	PO1,PO2,PO3, PO4,PO5,PO6, PO8, PO12,PSO1,PSO2,PSO3

## PO and PSO mapping with level of strength for Course Name Application Based Programming in Python (Course Code CSE 114)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
		2	1	1					2				2		1	
	CO1															
		2	2	2	1				2				2		2	1
	CO2															
		2	2	1					2				2	1	2	1
	CO3															
		2	2	2	2	1	2		2				2	1	2	2
	CO4															
		2	2	2	2	3	2		2				2	2	2	1
CSE114_Applica	CO5															
programming in		3	3	2	2	2	2		2				2	2	3	2
Python	CO6															

Average of non-zeros entry in following table (should be auto calculated).

Course	Course Name	РО	PO	РО	РО	РО	РО	РО	PO	PO	PO	РО	PO	PSO	PSO	PSO
Code		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CSE114	Application Based programming in Python	2.1	2	1.7	1.2	1	1	-	2	-	-	-	2	1	2	1.1

### Strength of Correlation

1. Addressed to *Slight (Low=1) extent* 2. Addressed to *Moderate (Medium=2) extent* 

3. Addressed to Substantial (High=3) extent



Sch	ool: SET	Batch : 2023-27						
Pro	gram: B.Tech.	Current Academic Year: 2023-24						
Bra	nch: CSE	Semester: II						
1	Course Code	MTH 145						
2	Course Title	Probability and Statistics						
3	Credits	4						
4	Contact Hours (L-T-P)	3-1-0						
	Course Status	Compulsory						
5	Course Objective	e statistical techniques. It aims to equip the students with s concepts and tools at an intermediate to advanced level that w them well towards tackling various problems in the discipline						
6	Course Outcomes	<ul> <li>CO1: Explain the concept of probability and Rand (K2,K3, K4)</li> <li>CO2: Explain the concept of distribution function and probability distributions; illustrate discrete and probability distributions. (K1, K2, K3, K4)</li> <li>CO3: Describe the concept of moments, skewness evaluate correlation and regression – Rank correlation is distributions and their properties</li> <li>. (K1, K2, K5)</li> <li>CO4: Discuss the basic of Curve fitting by the met squares; evaluate straight lines, second degree parabolic general curves. (K1, K2, K5)</li> <li>CO5: Describe and use the concepts test of signification.</li> </ul>	lom Variable. ons, densities d continuous and Kurtosis; ation; discuss ethod of least blas and more icance: Large					
		<ul> <li>sample test for single proportion, difference of proportions single mean, difference of means, and difference deviations. (K1,K2,K3)</li> <li>CO6: Explain the basic concepts of tests of small samp T test, Chi-square test for goodness of fit, and evalue (K2, K4, K5)</li> </ul>	ions; calculate of standard bles- Student's ate the result.					
7	Course Description	This course is an introduction to the fundamental of Mat primary objective of the course is to develop the basic of statistics including measures of central tendency, c regression, statistical methods of data sampling, pr random variables and various discrete and continuou distributions and their properties.	hematics. The understanding orrelation and obability and us probability					
8	Outline syllabu	s :Probability and Statistics	CO Mapping					
	Unit 1	Basic Probability						
	А	Probability spaces, conditional probability, Bayes' rule.	CO1					



В	Discrete ra variables	ndom variab	les, Independe	nt random	CO1				
С	Expectation Chebyshev's	of Discre Inequality	ete Random	Variables,	CO1				
Unit 2	Discrete and	d Continuous	<b>Probability Di</b>	stributions					
А	Discrete Pro	bability distril	outions: Binomi	al, Poisson.	CO2				
В	Continuous distribution	random variab functions and	les and their pro densities.	operties,	CO2				
С	Normal, exp	onential and g	amma distributi	on.	CO2				
Unit 3	Statistics								
А	Moments, sl	kewness and K	urtosis.		CO3				
В	Correlation	and regression	-Rank correlat	tion.	CO3				
С	Bivariate dis	stributions and	their properties		CO3				
Unit 4	Applied Sta	tistics							
А	Curve fitting of straight li general curv	Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.							
В	Test of signi proportion,	ficance: Large	e sample test for	single	CO4, CO5				
С	Difference of means, and of	f proportions, difference of s	single mean, di tandard deviatio	fference of ons.	CO4, CO5				
Unit 5	<b>Testing Hy</b>	oothesis							
А	Test for sing	le mean, diffe	rence of means		CO6				
В	test for ratio	of variances			CO6				
С	Chi-square t of attributes	est for goodne	ss of fit and ind	ependence	CO6				
Mode of examination	Theory								
Weightage	CA	MTE	ETE						
Distribution	25%	25%	50%						
Text book/s*	<ol> <li>Erwin K Edition,</li> <li>P. G. H Probabi</li> <li>S. Ross Education</li> </ol>								
Other References	<ol> <li>W. Feller Application</li> <li>B.S. Grev Publishers Matheman Delhi, 20</li> </ol>								



## **COURSE OUTCOMES – PROGRAMME OUTCOMES MAPPING TABLE**

РО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
СО												
CO1	3	3	2	2	3	1	-	-	-	1	1	1
CO2	3	2	3	2	2	2	-	-	-	1	1	2
CO3	3	3	2	2	2	1	-	-	-	1	1	1
CO4	3	2	2	2	2	1	-	-	-	1	1	1
CO5	3	3	2	2	2	1	-	-	-	1	1	2
CO6	3	3	2	3	2	2	-	-	-	1	1	2



Sch	ool: SET	Batch : 2023-27								
Pro	gram: B.Tech	Current Academic Year: 2023-24								
Bra	nch:	Semester: I/II								
1	Course Code	EEE112								
2	Course Title	Principles of Electrical and Electronics Engineering								
3	Credits	3								
4	Contact Hrs (L-T-P)	2-1-0								
	Course Status	Compulsory								
5	Course	To provide the students with an introductory concept	in the field of							
	Objective	electrical and electronics engineering to facilitate better	understanding							
		of the devices, techniques and equipments used in	engineering							
		applications.								
6	Course	CO1: To analyze and solve basic electrical circuits								
	Outcomes	CO3: To understand the working principle of transform	er and							
		identify its applications.								
		CO3: To understand the working principle of dc and ac	motors and							
		identify the starting methods of single phase induction r	notor							
		CO4: To apply the basics of diode to describe the worki	ng of rectifier							
		circuits such as half and full wave rectifiers								
		COS: To apply the concepts of basic electronic devices	to design							
		various circuits CO6: Apply the basic concepts in Electrical and Electronics								
		COD: Apply the basic concepts in Electrical and Electronics Engineering for multi-disciplinary tasks								
7	Course	nis initial course introduces the concepts and fundamentals of								
/	Description	links initial course introduces the concepts and full electrical and electronic circuits and devices. Topics	include basic							
	Description	electrical and electronic circuits and devices. Topics include basic circuit analysis diode and transistor fundamentals and applications								
		This course also introduces working principle and applications of $dc/ac$								
		motors and transformers.								
8	Outline syllabi		CO							
Ŭ	o utilite sy liuo e	•	Mapping							
	Unit 1	DC & AC Circuits ( 6 lectures )	p							
	A	Electrical circuit elements (R. L and C), series and	CO1.CO6							
		parallel circuits, concept of equivalent resistance,	,							
		Kirchhoff current and voltage laws, star-delta								
		conversion								
	В	Analysis of simple circuits with dc excitation and	CO1,CO6							
		Superposition Theorem, Representation of sinusoidal								
		waveforms, peak and rms values, real power, reactive								
	power, apparent power, power factor									
	С	Introduction to three phase system, relationship	CO1,CO6							
		between phase voltages and line voltages,								
	Unit 2	Fransformer( 4 lectures )								
	A	Working principle and construction of transformer,	CO2,CO6							
		EMF equation								
	В	Efficiency of transformer, Power and distribution	CO2,CO6							
		transformer and difference between them								



С	Transformer distribution of	applications of electrical po	s in wer	transmission	and	CO2,CO6,
Unit 4	Electrical M					
А	Construction	CO3,CO6				
	characteristic					
В	Construction	, working prin	ciple a	nd applications	of a	CO3,CO6
	three-phase in	nduction moto	r, signi	ficance of torqu	ie-	
	slip character	ristic				
С	Working prin	ciple starting	method	ls and application	ons	CO3,CO6
	of single phase	se induction m	otor			
Unit 4	Semiconduc	tor Diode and	Recti	fier (5 lectures	)	
A	PN junction a	and its biasing				CO4,CO6
В	Semiconduct	or diode, ideal	versus	practical diode	, VI	CO4,CO6
	characteristic	s of diode				
C	Half wave an	d full wave re	ctifiers	with and witho	ut	CO4,CO6
	filters.					
Unit 5	Transistors					
А	Bipolar Junct	tion Transistor	(BJT)	– Construction,	,	CO5,CO6
	working prin	<u> </u>				
B	BJT as CE ar	nplifier and as	a swite	ch		C05,C06
C	Introduction	to JFET				C05,C06
Mode of	Theory					
examination	<u></u>		EEE			
Weightage	CA	MTE	ETE			
 Distribution	25%					
Text book/s*	I. D. P. Kot Engineering"					
	2 S K Bhat					
	Engineering",					
	3. Robert L Bo					
	Theory" Pears					
Other	1. V. D.					
References	Funda	mentals", Prent	ice Hal	l India, 1989.		
	1	1				

## **Course Articulation Matrix:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	1	-	-	-	-	-		-	-	-	-	-	-
CO4	2	1	2	-	-	-	-	-	-	-	1	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	1	-	-	-	-
CO6	2	2	3	1	-	-	-	-	-	-	1	-	-	-	-



School: SET												
Bat	Batch:2023-2027											
Pro	Program: B.Tech											
Cu	Current Academic Year: 2023-2024											
Bra	anch: ECE											
Ser	nester: I											
1	Course	EEP112										
	Code											
2	Course	Principles of Electrical and Electronics Engineering Lab										
2	Title	1										
3	Contact											
4	Hours	0-0-2										
	(L-T-P)											
	Course	Compulsory										
	Status	1 5										
5	Course	To provide the students with an introductory concept in the field of e	lectrical and									
	Objective	electronics engineering to facilitate better understanding of the devices, te	chniques and									
		equipment"s used in engineering applications.										
6	Course	After successful completion of this course the student will be able to:CO1	: To									
	Outcomes	configure and analyze any given circuit.										
		CO2: To inspect the working of transformer and calculate its efficiency										
		CO3: To understand the working of dc and ac motors and measure its vari	ous operating									
		parameters.										
		CO4: To design rectifier circuits such as half and full wave rectifiers and o	observe its									
		output waveforms.										
		CO5: To obtain the characteristics of BJT.										
		CO6: Apply the basic concepts in Electrical and Electronics Engineering for	or multi-									
		disciplinary tasks.										
7	Course	This initial course introduces the concepts and fundamentals of electrical a	and electronic									
	Description	circuits and devices. Topics include basic circuit analysis, diode a	nd transistor									
		fundamentals and applications. This course also introduces working	principle and									
		applications of dc/ac motors and transformers.										
8	Outline syll	abus	CO Mapping									
	Unit 1	Practical based on DC & AC Circuits	CO1									
		To configure a dc circuit on breadboard, and measure voltage/current	<u>CO1</u>									
		across/through each element	001									
		To verify Kirchhoff's Laws	CO1									
		To verify Superposition Theorem	CO1									
		To find the real power, reactive power, apparent power and power factor	CO1									
		of RL & RC load										
	Unit 2	Practical related to Transformers										
		To find the efficiency of transformer by obtaining its losses.	CO2,CO6									
	Unit 3	Practical related to Electrical Motors										
		To study cut-section of DC motor and induction motor.	CO3,CO6									
		To start the DC motor and reverse its direction of rotation	CO3 CO4									
		To start an induction motor and reverse its direction of rotation.	C03,C00									
			CO3,CO6									
	Unit 4	Practical related to Diode and Rectifier										
		To determine voltage-current characteristic of diode	CO4,CO6									
		-										
		To assemble and test half wave and full wave rectifier circuits for their	004,006									
		input and output waveform										



Unit 5	Practical	related to			
	To detern	nine input a	CO5, CO6		
	Validatio	n of BJT as	CO5, CO6		
Mode of examination	Practical				
Weightage	CA	CE	ETE		
Distribution	25%	25%	50%		
Text book/s*	1. D. P. Engineeri ISBN:978 2. S. K. Engineeri 97893325 3. Robert Theory" I ISBN: 97	Kothari an ing", Tata 8007014611 Bhattachar ing", Pearso 586505 L Boylesta PearsonEdu 7801311890			
Other References	4. V F S	7. D. Toro, ' undamenta BN:978013			

#### CO.PO & PSO MAPPING:

Cos	PO1	PO2	PO3	P04	PO5	PO6	PO7	PO8	P09	PO10	P011	P012	PSO1	PSO2	PSO3
EEP112.1	3	3	3	1	1	-	-	-	-	-	-	-	2	-	-
EEP112.2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	1
EEP112.3	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-
EEP112.4	2	1	3	-	-	-	-	-	-	-	-	-	2	-	-
EEP112.5	2	1	1	-	-	-	-	-	-	-	-	-	2	-	-
EEP112.6	2	2	2	2	2				2		2	-	1	1	-
EEP112	2.1	1.6	2	1	1	-	-	-	1	-	1	-	1.1	1	1



School: SET			
Program: B.Tech			
Bra	nch: All	Semester: I/II	
1	Course Code	HMM111 Course Name	
2	Course Title	Human Values and Ethics	
3	Credits	2	
4	Contact Hours (L-T-P)	2-0-0	
	Course Status	Compulsory	
5	Course Objective	To facilitate the development of a Holistic perspective towards life and profession as well as towards happiness and on a correct understanding of the Human reality and the res	among students l prosperity based t of Existence
6	Course Outcomes	<ol> <li>Understand that the technical education without study can generate more problems than solutions.</li> <li>Define the principles and ideals, which help in making what is more important.</li> <li>See that 'I' and 'Body' are two realities, and most o related to 'I' and not body, while their efforts are most fulfilment of the needs of the body assuming that it w of 'I' too.</li> <li>Appreciate the importance of harmony in the self, familifor mutual fulfilment.</li> <li>Understand the importance of harmony among hun living beings and entire nature for universal equilibriu existence.</li> <li>Know and practice the ethical approach in profession happiness and sustained prosperity.</li> </ol>	r of human values the judgement of f their desires are ly centered on the ill meet the needs ly and the society han beings, other m and mutual co- on for continuous
7	Course Description	Human values and embedded in all human beings it is imp them towards these values that they can use in their life happiness and mutual prosperity. Professional ethics will about the value addition that can be done within the fram behaviour.	ortant to sensitize to attain mutual l enlighten them nework of ethical
8	Outline syllabus		CO Mapping
	Unit 1	The Need and Process for Value Education	
	А	The need, basic guidelines, content, and process for Value Education	CO1
	В	Concept of 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration; Continuous Happiness and Prosperity- A look at basic Human Aspirations	CO1,CO2
	С	Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment aspirations of every human being with their correct priority	C01,C02
	Unit 2	Understanding Harmony in the Human Being - Harmony in Myself	
	A	Human being as a co-existence of the sentient 'I' and the material 'Body'	CO3


В	The needs of Self ('I') and 'Body' ; Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)	CO3
С	The characteristics and activities of 'I' and harmony in 'I' ; Understanding the harmony of I with the Body: Correct appraisal of Physical needs, meaning of Prosperity in detail	CO3
Unit 3	Harmony in the Family and Society	
А	Values in human-human relationship; Trust and Respect as the foundational values of relationship	CO4
В	Understanding the meaning of Trust; Difference between intention and competence; The meaning of Respect; Difference between respect and differentiation; the other salient values in relationship	CO4
C	Harmony in the society (society being an extension of family; Visualizing a universal harmonious order in society - from family to world family	CO4
Unit 4	Harmony in the Nature and Existence	
A	The harmony in the Nature	CO5
В	Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature	CO5
С	Understanding Existence as Co-existence of mutually interacting units in all-pervasive space	CO5
Unit 5	Competence in professional ethics	
А	Ability to utilize the professional competence for augmenting universal human order	CO6
В	Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems,	CO6
С	Ability to identify and develop appropriate technologies and management patterns for above production systems.	CO6
Mode of examination	Theory	
Weightage	CA MTE ETE	
Distribution	25% 25% 50%	
Text book/s*	<ol> <li>R.R Gaur, R Sangal, G P Bagaria, "A foundation course in Human Values and professional Ethics", Excel books, New Delhi</li> </ol>	
Other References	<ol> <li>B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow.</li> <li>A.N. Tripathy, 2003, Human Values, New Age International Publishers.</li> <li>PL Dhar, RR Gaur, Science and Humanism, Commonwealth Publishers. Starting out with Python, Tony Gaddis, Pearson</li> </ol>	



1. Course : Environmental Science

COs	PO1	Р	PO	PO	PO	PO	PO	PO8	PO9	PO	PO11	PO	PS	PS	PSO	PS	PS
		0	3	4	5	6	7			10		12	01	O2	3	O4	O5
		2															
CO1						3	1	3	1			3					
CO2						2	1	3	2			3					
CO3						3	1	3	2			3					
CO4						3	1	3	2			3					
CO5						3	3	3	3		2	3					
CO6						3	3	3	2		3	3					



Sch	ool: SET	Batch : 2023-27						
Pro	gram: B. Tech	Current Academic Year: 2023-24						
Bra	nch: All	Semester: II						
1	Course Code	CVL-103						
2	Course Title	Environmental Science						
3	Credits	02						
4	Contact	2-0-0						
	Hours							
	(L-T-P)							
	Course Status	Compulsory						
5	Course	1. Enable students to learn the concepts, princip	ples and					
	Objective	importance of environmental science	a 1					
		2. Provide students an insight of various causes	s of natural					
		Provide knowledge of layers of stragenberg	with an insight					
		of role of climatic elements in dispersion of	nollutants					
		4. Provide detailed knowledge of causes, effect	ts and control					
		of different types of environmental pollution	, solid waste					
		management and its effect on climate change	e, global					
		warming and ozone layer depletion						
		5. Provide and enrich the students about so	cial issues					
		such as R&R, water conservation and sus	stainability.					
6	Course	CO1.Understand the scope of environmental	science with					
	Outcomes	knowledge about various types of natural reso	ources and its					
		CO2 Study about the structure and composition of $f$	atmosphere and					
		factors affecting weather and climate	atmosphere and					
		CO3. Study about pollution causes, effects and co	ontrol and solid					
		waste management						
		CO4. Effect of global warming and ozone layer depl	etion					
		CO5.Understand sustainable development, res	ettlement and					
		rehabilitation, impact of population explosion or	n environment					
		CO6.Understand overall environmental iss	ues and its					
		management						
7	Course	Environmental Science emphasises on various factors a	8					
	Description	5. Importance and scope of environmental science						
		6. Natural resource conservation	1 1 1					
		7. Pollution causes, effects and control methods an	d solid waste					
		management						
		8. Social issues associated with environment						
8	Outline syllabi		CO					
0	Outline synabl	15	Mapping					
	Unit 1	General Introduction						
	А	Definition, principles and scope of environmental	CO1					
		science						
	В	Water Resources, Land Resources, Food Resources	CO1					
	C	Mineral Resources, Energy Resources, Forest	CO1					
	Unit 2	Atmosphere and meteorological narameters						
		A sumosphere and meteorological parameters						



Α	Structure and	composition	of atmosphere	CO2					
В	Meteorologic	al parameters:	: Pressure, Temperature,	CO2					
	Precipitation,	, Humidity,							
С	Radiation, W	ind speed and	direction, Wind Rose	CO2					
Unit 3	Environmen	Environmental Pollution (Cause, effects and							
	control meas	control measures)							
А	Air, water, N	loise and Soil	pollution	CO3					
В	Case studies	on pollution		CO3					
С	Solid waste	management	: Causes, effects and	CO3					
	control measure	ures of urban a	and industrial wastes.						
Unit 4	<b>Climate Cha</b>	inge and its in	npact						
А	Concept of G	lobal Warmin	g and greenhouse effect	CO4					
В	Ozone layer	Depletion and	its consequences	CO4					
С	Climate chan	ge and its effe	ct on ecosystem, Kyoto	CO4					
	protocol and	IPCC concern	s on changing climate						
Unit 5	Social Issues	and the Envi	ironment						
А	Concept of	sustainable	development, Water	CO5					
	conservation								
В	Resettlement	and rehabil	itation of people; its	CO5					
	problems and	l concerns, Cas	se studies						
 С	Population ex	xplosion and it	s consequences	CO5					
Mode of	Theory								
examination		1							
Weightage	CA	MTE	ETE						
 Distribution	25%	25%	50%						
Text book/s*	<b>3.</b> Joseph	n, Benny, "Envi	ronmental Studies", Tata						
	Mcgra	w-Hill.							
	4Howa								
	Hill 1								
 Other	1111, 1	205							
References									

$CO\downarrow PO \rightarrow$	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	3	3
CO2	2	2	2	2	2	3
CO3	2	2	3	2	3	3
CO4	2	2	3	2	3	3
CO5	2	2	2	2	3	3
CO6	2	2	3	2	2	3



### Syllabus: CSE242, Data Structures

Sch	ool: SET	Batch : 2023-27	
Prog	gram: B.Tech.	Current Academic Year: 2023-24	
Bra	nch:CSE/IT	Semester:II	
1	Course Code	CSE242	
2	Course Title	Data Structures	
3	Credits	3	
4	Contact	3-0-0	
	Hours		
	(L-T-P)		
	Course Status	Core	
5	Course Objective	<ol> <li>Learn the basic concepts of Data Structures and algor</li> <li>Design and Implementation of Various Basic and A Structures.</li> <li>Learn the concepts of various searching, Sorting Techniques.</li> <li>Choose the appropriate data structures and algorithm for a specified application.</li> </ol>	rithms. Advanced Data g and Hashing design method
6	Course Outcomes Course Description	CO1: <b>Select</b> appropriate data structures as applied to spec definition. CO2: <b>Choose</b> the suitable data structures like arrays, link and queues to solve real world problems efficiently. CO3 <b>Represent</b> and manipulate data using nonlinear of like trees and graphs to design algorithms for various ap CO4: <b>Compare</b> various techniques for searching and so CO5: <b>Design</b> and implement an appropriate hashing for application CO6: <b>Formulate</b> new solutions for programing problem existing code using learned algorithms and data structure This course starts with an introduction to data structure classification, efficiency of different algorithms, array based implementations and Recursive applications.	cified problem ked list, stacks data structures oplications. orting. unction for an as or improve es tures with its y and pointer
		progresses the study of Linear and Non-Linear data studied in details. The course talks primarily about Link queue, Tree structure, Graphs etc. This Course also c concept of searching, sorting and hashing methods.	structures are ed list, stacks, leals with the
8	Outline syllabu	IS	СО
			Mapping
	Unit 1	Introduction	
	A	Data Structure – Definition, Operations and Applications, Abstract Data Types, Algorithm – Definition, Introduction to Complexity, Big OH notation, Time and Space tradeoffs.	CO1
	В	Dynamic Memory Allocation( Malloc, calloc, realloc, free), Recursion – Definition, Examples- Tower of Hanoi problem, Tail Recursion	CO1
	С	Arrays: Implementation of One Dimensional Arrays, Multidimensional Arrays, Applications of Arrays, Address Calculation, Matrix Operations, Sparse martices	CO1



Unit 2	Linked List						
А	Concept of Lin	nked List, Garb	age Collection, Overflow and	CO2			
	Underflow,	Array Imple	ementation and Dynamic				
	Implementatio	n of Singly Lin	ked Lists				
В	Array Implem	entation and	Dynamic Implementation of	CO3			
	Doubly Linked	l List, Circularl	y Linked List				
С	Operations on	CO2					
 	Polynomial Re	Polynomial Representation and Addition					
Unit 3	Stack and Q	Stack and Queue					
A	Stacks: Definit	Stacks: Definitions, Primitive operations, Application of					
	stacks – Conve	ersion of Infix E	Expression to Postfix form,				
D	Evaluation of	Postfix Express	10ns	<u> </u>			
В	of Circular Qu	eues, Priority Q	Queues	03			
С	Deques, Appli	cation of Queu	es. Implementation - Linked	CO3			
	Stacks, Linked	Queues.					
Unit 4	Tree and Gr	aphs					
А	Trees: Termine	ologies, Binary	tree, Representation,	CO4, CO6			
	Applications, I	Binary search T	ree – Operations on Binary				
	Search Trees (	Fraversing, Inse	ertion, deletion etc.), Binary				
D	Search Algorit	nm, AVL Tree	ntation Transmals Douth				
В	First Search, B	004, 006					
С	Graph Applica	tions – Minimu	m Spanning Trees – Prim's	CO4, CO6			
	and Kruskal's	Algorithms					
Unit 5	Searching, S	orting and Ha	ashing				
A	Implementatio	n and Analysis	- Linear search, Binary Search	CO5, CO6			
В	Implementatio Selection Sort,	n and Analysis Tree sort	- Bubble Sort, Insertion Sort,	CO5, CO6			
С	Hashing: Conc	epts and Applic	cations, Hash Functions,	CO5, CO6			
	Collisions, Me	thods of Resolv	ving Collisions				
Mode of	Theory						
examination							
Weightage	CA	MTE	ETE				
Distribution	25%	25%	50%				
Text book/s*	1. Lipschutz, Series, TMH	"Data Structu	res" Schaum's Outline				
Other	1. Aaron M. <sup>7</sup>	Fenenbaum. Y	edidyah Langsam and				
References	Moshe J. Aug	enstein "Data	Structures Using C and				
	C++", PHI						
	2. Horowitz a						
	Structures" (						
	3. Jean Paul 7						
	Introduction f						
	McGraw Hill						
	4 R Kruse et	tal "Data Stru	ctures and Program Design				
	in C" Pearso	n Education	etares and i rogram Design				
	5. G A V Pai	Data Structure	s and Algorithms" TMH				
	5. G A V Pai, '	'Data Structure	s and Algorithms", TMH				



S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	<b>Select</b> appropriate data structures as applied to specified problem definition.	PO1, PO3, PO9, PSO1, PSO2
2.	<b>Choose</b> the suitable data structures like arrays, linked list,	PO1, PO2, PO3, PO9,
	stacks and queues to solve real world problems	PSO1, PSO2, PSO3
	enicientiy.	
3.	<b>Represent</b> and manipulate data using nonlinear data	PO1, PO2, PO3, PO4,
	structures like trees and graphs to design algorithms for	PO9, PSO1, PSO2
	various applications.	
4.	<b>Compare</b> various techniques for searching and sorting.	PO3, PO9, PO12, PSO1,
		PSO2
5.	<b>Design</b> and implement an appropriate hashing function	PO1, PO2, PO3, PO4,
	for an application	PO5, PO9, PSO1, PSO2,
		PSO3
6.	Formulate new solutions for programing problems or	PO1, PO3, PO4, PO5,
	improve existing code using learned algorithms and data	PO9, PSO1, PSO2, PSO3
	structures	

# PO and PSO mapping with level of strength for Course Name Data Structures (Course Code CSE 242)

Cos	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	2	-	2	-	-	-	-	-	2	-	-	-	2	2	-
CO 2	1	2	3	-	-	-	-	-	1	-	-	-	3	1	2
CO 3	2	3	3	2	-	-	-	-	2	-	-	-	2	3	-
CO 4	-	-	2	-	-	-	-	-	3	-	-	1	2	2	-
CO 5	3	2	3	2	1	-	-	-	2	-		-	3	2	2
CO 6	2	-	3	3	2	-	-	-	1	-	-	-	2	3	3



Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO	РО	PO	PO	PO	<b>PO</b>	PO	PO	PO	PO	PO	PSO	PSO	PSO3
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CSE242	Data structures	2	2.33	2.67	2.33	1.5	I	-	I	1.83	-	-	1	2.33	2.17	2.33

#### Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent

2. Addressed to *Moderate (Medium=2) extent* 



	School:	SET   SOL   SMFE   SBS-BBA   SBSR   SOF	E   SAP					
	Department	Sharda Skills						
	Program:	Communicative English -2						
	Branch:	Aptitude Reasoning & Personality						
1	Course Code	ARP – 102						
2	Course Title	Communicative English -2						
3	Credits	2						
4	Contact Hours (L-T-P)	1-0-2						
	Course Status	Core						
5	Course	To Develop LSRW skills through audio-visual langua	ge acquirement,					
	Objective	creative writing, advanced speech et al and MTI Reduc	ction with the aid					
		of certain tools like texts, movies, long and sho	rt essays.					
	Course	After completion of this course, students will b	e able to:					
	Outcomes							
		CO1 Acquire Vision, Goals and Strategies through	Audio-visual					
		Language Texts						
		CO2 Synthesize complex concepts and present the writing	em in creative					
6		CO3 Develop MTI Reduction/Neutral Accent through Classroom Sessions & Practice						
		CO4 Determine their role in achieving team success t	through defining					
		strategies for effective communication with diffe	rent people					
		CO5 Realize their potentials as human beings and con properly in the ways of world.	duct themselves					
		CO6 Acquire satisfactory competency in use of Quan	titativa antituda					
		and Logical Reasoning	intative aptitude					
	Course	The course takes the learnings from the previous se	emester to an					
	Description	advanced level of language learning and self-compret	nension through					
	2 comption	the introduction of audio-visual aids as language enabl	lers. It also leads					
7		learners to an advanced level of writing, reading, 1	istening and					
		speaking abilities, while also reducing the usage of L	1 to minimal in					
		order to increase the employability chance	ces.					
8	Outline syllabus – ARP 102 CO Mapping							
	Unit 1	Acquiring Vision Goals Strategies through Audio-						
		visual Language Texts and Creative Writing						



А	Pursuit Propos Principles, life	of Happiness ition in life,12 The King's Sp   strategies &	/ Goal Setting & Value 2 Angry Men / Ethics & beech / Mission statement in Action Plans in Life	CO1				
В	Story Rec base	construction - d Story Writi	Positive Thinking,Theme ng - Positive attitude	CO2				
С	Learning I	Diary Learnin	ng Log – Self-introspection	CO2				
Unit 2	Writing Sk throu	ills 1 and MT igh Classroom	I Reduction/Neutral Accent n Sessions & Practice					
А	Precis,	Paraphrasing,	Essays (Simple essays)	CO2				
В	Vowel, Cor Monotho Sound drills	Vowel, Consonant, sound correction, speech sounds, Monothongs, Dipthongs and Tripthongs, Vowel Sound drills, Consonant Sound drills, Affricates and Fricative Sounds						
С	Speech S Diction	ounds   Speed 1  Syntax  Into	ch Music  Tone   Volume  onation   Syllable Stress					
Unit 3	Gauging M	TI Reduction Sp	Effectiveness through Free beech					
А		Jam s	sessions	CO3				
В		Exte	empore	CO3				
С		Situation-based Role Play						
Unit 4	Leadershi	Leadership and Management Skills and Universal						
А	Innovative	Leadership and I	nd Design Thinking, Ethics	CO4				
В	Love &	Compassion, Righteou	Non-Violence & Truth, sness, Peace	CO5				
С	Se	ervice, Renun	ciation (Sacrifice)	CO5				
Unit 5	Introduct	ion to Quanti Rea	tative aptitude & Logical soning					
А		Analytica	al Reasoning	CO6				
В	Number	Systems and i Pro	its Application in Solving	CO6				
С		Puzzle	e Solving	CO6				
Mode of		CA / V	IVA / ESE					
examination		CAT VIVAT LSE						
Weightage	CA							
Distribution	25							
	25							
Text book/s*	.Wren,							
	and Cor	nposition, S.C	Chand& Company Ltd, New					
			Delhi.					



	<ul> <li>Blum, M. Rosen. <i>How to Build Better</i> <i>Vocabulary</i>. London: Bloomsbury Publication</li> <li>Comfort, Jeremy(et.al). <i>Speaking Effectively</i>. Cambridge University Press.</li> </ul>	
Other References	The Luncheon by W.Somerset Maugham - http://mistera.co.nf/files/sm_luncheon.pdf	

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1 Acquire Vision, Goals and Strategies through Audio-visual	PO9, PO10, PO11,PO12
	Language Texts.	
2.	CO2 Synthesize complex concepts and present them in creative	PO9, PO10, PO11,PO12
	writing.	
3.	CO3 Develop MTI Reduction/Neutral Accent through Classroom	PO9, PO10, PO11,PO12
	Sessions & Practice.	
4.	CO4 Determine their role in achieving team success through	PO9, PO10, PO11,PO12
	defining strategies for effective communication with different	
	people	
5.	CO5 Realize their potentials as human beings and conduct	PO9, PO10, PO11,PO12
	themselves properly in the ways of world	
6.	CO6 Acquire satisfactory competency in use of Quantitative	PO9, PO10, PO11,PO12
	aptitude and Logical Reasoning	

Code_	CO	Р	PO	Р	Р	Р	Р	Р	Р	PO	PO1	PO11	PO12	PS	PS	PSO3
Course	's	0	2	0	O4	0	0	0	0	9	0			01	O2	
Name		1		3		5	6	7	8							
	CO 1	I	-		-	-	-	-	I	1	3	1	2	-	-	-
	CO 2	I	I	-	l	-	-	-	I	1	3	1	2	-	-	
ARP10	CO 3	I	I	-	-	-	-	-	-	1	3	1	2	-	-	-
2	CO 4	-	-	I	-	-	_		-	1	3	1	2	-	-	-
	CO 5	-	-	-		-	-	-		1	3	1	2	-	-	-
	CO 6	-	-	-	-	-	-	-	-	1	3	1	2	-	-	



Course Code	Course Name	PO 1	PO2	PO 3	Р О 4	P O 5	P O 6	P O 7	P O 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	PS O 1	P S O 2	P S O 3
ARP - 102	Communic ative English - 2									1	3	1	2			

Average of non-zeros entry in following table (should be auto calculated).

Strength of Correlation

1. Addressed to *Slight* (Low=1) extent 2. Addressed to *Moderate* (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Sc	hool: SET	Batch : 2023-27								
Pr	ogram: B.Tec	h. Current Academic Year: 2023-24	Current Academic Year: 2023-24							
Br	anch: CSE / I	T Semester: 2 <sup>nd</sup>								
1	Course Code	CSP116 Course Name: Design & Creativit	y Lab							
2	Course Title	Design & Creativity Lab (DCL)								
3	Credits	2								
4	Contact Hour	s 1-0-2								
	(L-T-P)									
	Course Status	s Compulsory								
5	Course	1.To align student to think out of box and identify a re	ealistic							
	Objective	problem or project								
		2.To understand the significance of problem and its so	cope							
		3.To develop skills to frame small project for the defined	3.To develop skills to frame small project for the defined problem							
6	Course	Students will be able to:								
	Outcomes	CO1: Identify and formulate problem statements usi	ng systematic							
		approach for real world/proposed problems.								
		CO2: Develop teamwork and problem-solving skills, a	long with the							
		ability to communicate effectively with others.	ability to communicate effectively with others.							
		CO3: Design the problem solution as per the problem statement								
		framed.								
		CO4: Classify and understand project solution and de	esign solution							
		parameters.	/ .1 1							
		CO5: Fabricate the solution by using C programming	other known							
		programming.								
7	Course	Le DCL the students will learn the fundamentale of	In DCL the students will learn the fundamentals of defining the							
/	Description	not be problem formulating the problem statement identifying the required								
	Description	skills for developing the solution based on a given problem identified								
		based on the understanding of the programming language studied in								
		the previous semester or known								
8	Outline syllab		CO							
0	e danne synne		Mapping							
	Unit 1	Problem Definition, Formation of Teamwork and problem	CO1, CO2							
		solving, and Project Assignment.								
	Unit 2	Develop the ability to communicate effectively and	CO2, CO3							
		identify proposed problems.								
	Unit 3	Design proposed solution for identified problem statement.	CO3							
	Unit 4	Develop a solution set and obtain the appropriate results for	CO3, CO4							
		defined parameters.								
	Unit 5	Demonstrate and execute projects with the team.	CO4, CO5,							
		Determine future work based on the final outcome.	CO6							
		The report should include Abstract, Hardware / Software								
		Requirement, Problem Statement, Design/Algorithm,								
		Solution Detail. Reports.								
		References if any.								



	The presentation, repor supported by the docun assessment.	The presentation, report, work done during the term supported by the documentation, forms the basis of assessment.							
Mode of	Practical /Viva	Practical /Viva							
examination									
Weight age	CA	CE (VIVA)	ETE						
Distribution	25%	25%	50%						

S.	Course Outcome	Program Outcomes (PO)
No.		
1.	CO1: Identify and formulate problem	PO1, PO2, PO4, PO9, PO10, PO11,
	statements using systematic approach for	PO12,PSO1,PSO2,PSO3
	real world/proposed problems.	
2.	CO2: Develop teamwork and problem-	PO1, PO2, PO4, PO7, PO9, PO10,
	solving skills, along with the ability to	PO11, PO12 ,PSO3
	communicate effectively with others.	
3.	CO3: Design the problem solution as per the	PO1, PO2, PO5, PO9, PO10, PO11,
	problem statement framed.	PO12, PSO1,PSO2
4.	CO4: Classify and understand project	PO1, PO2, PO6, PO9, PO10, PO11,
	solution and design solution parameters.	PO12,PSO2
5.	CO5: Fabricate the solution by using C	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	programming/other known programming.	PO8, PO9, PO10, PO11, PO12
		PSO1,PSO2, PSO3
6.	CO6: Develop future work areas from the	PO1, PO2, PO4, PO9, PO10, PO11,
	project outcome.	PO12,PSO3

# PO and PSO mapping with level of strength for Course Name Design & Creativity Lab (Course Code CSP116)

	CO/PO Mapping														
	(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low														
Cos		Programme Outcomes(POs)													
	РО	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	3	3	-	3	-	-	-	-	3	3	2	3	2	2	1
CO2	3	2	-	3	-	-	2	-	3	3	2	3			1
CO3	3	2	-	-	2	-	-	-	3	3	2	3	2	2	
CO4	3	3	-	-	-	2	-	-	3	3	2	3		2	
CO5	3	3	2	2	2	2	3	3	3	3	2	3	2	2	
CO6	3	3	-	3	-	-	-	-	3	3	2	3			1
AvgP	3	2.7	0.3	1.8	0.6	0.6	0.8	0.5	3	3	2	3	1	1.4	0.5
0			4	4	1	7	4								
attain															
ed															



Sc	hool: SET	Batch : 2023-27								
Pr	ogram: B.Tec	h. Current Academic Year: 2023-24	Current Academic Year: 2023-24							
Br	anch: CSE / I	T Semester: 2 <sup>nd</sup>								
1	Course Code	CSP116 Course Name: Design & Creativit	y Lab							
2	Course Title	Design & Creativity Lab (DCL)								
3	Credits	2								
4	Contact Hour	s 1-0-2								
	(L-T-P)									
	Course Status	s Compulsory								
5	Course	1.To align student to think out of box and identify a re	ealistic							
	Objective	problem or project								
		2.To understand the significance of problem and its so	cope							
		3.To develop skills to frame small project for the defined	3.To develop skills to frame small project for the defined problem							
6	Course	Students will be able to:								
	Outcomes	CO1: Identify and formulate problem statements usi	ng systematic							
		approach for real world/proposed problems.								
		CO2: Develop teamwork and problem-solving skills, a	long with the							
		ability to communicate effectively with others.	ability to communicate effectively with others.							
		CO3: Design the problem solution as per the problem statement								
		framed.								
		CO4: Classify and understand project solution and de	esign solution							
		parameters.	/ .1 1							
		CO5: Fabricate the solution by using C programming	other known							
		programming.								
7	Course	Le DCL the students will learn the fundamentale of	In DCL the students will learn the fundamentals of defining the							
/	Description	not be problem formulating the problem statement identifying the required								
	Description	skills for developing the solution based on a given problem identified								
		based on the understanding of the programming language studied in								
		the previous semester or known								
8	Outline syllab		CO							
0	e danne synne		Mapping							
	Unit 1	Problem Definition, Formation of Teamwork and problem	CO1, CO2							
		solving, and Project Assignment.								
	Unit 2	Develop the ability to communicate effectively and	CO2, CO3							
		identify proposed problems.								
	Unit 3	Design proposed solution for identified problem statement.	CO3							
	Unit 4	Develop a solution set and obtain the appropriate results for	CO3, CO4							
		defined parameters.								
	Unit 5	Demonstrate and execute projects with the team.	CO4, CO5,							
		Determine future work based on the final outcome.	CO6							
		The report should include Abstract, Hardware / Software								
		Requirement, Problem Statement, Design/Algorithm,								
		Solution Detail. Reports.								
		References if any.								



	The presentation, repor supported by the docun assessment.							
Mode of	Practical /Viva	Practical /Viva						
examination								
Weight age	CA	CE (VIVA)	ETE					
Distribution	25%	25%	50%					

S.	Course Outcome	Program Outcomes (PO)			
No.					
1.	CO1: Identify and formulate problem	PO1, PO2, PO4, PO9, PO10, PO11,			
	world/proposed problems.	P012,PS01,PS02,PS03			
2.	CO2: Develop teamwork and problem-solving	PO1, PO2, PO4, PO7, PO9, PO10,			
	skills, along with the ability to communicate	PO11, PO12 ,PSO3			
	effectively with others.				
3.	CO3: Design the problem solution as per the	PO1, PO2, PO5, PO9, PO10, PO11,			
	problem statement framed.	PO12, PSO1,PSO2			
4.	CO4: Classify and understand project solution	PO1, PO2, PO6, PO9, PO10, PO11,			
	and design solution parameters.	PO12,PSO2			
5.	CO5: Fabricate the solution by using C	PO1, PO2, PO3, PO4, PO5, PO6, PO7,			
	programming/other known programming.	PO8, PO9, PO10, PO11, PO12			
		PSO1,PSO2, PSO3			
6.	CO6: Develop future work areas from the	PO1, PO2, PO4, PO9, PO10, PO11,			
	project outcome.	PO12,PSO3			

# PO and PSO mapping with level of strength for Course Name Design & Creativity Lab (Course Code CSP116)

	CO/PO Manning														
		(1/2)	/3 indi	icates	streno	th of a	correla	(ion)	ping 3-2	Strong	2-Med	ium 1.	Low		
Cos		(1/2	J ma	leates	sucie	D	corren	$\frac{1000}{1000}$	utcor	$\frac{1}{1000}$	$\frac{2}{2}$	14111, 1	LOW		
COS						Г1 П П П	logran				5)				
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	3	3	-	3	-	-	-	-	3	3	2	3	2	2	1
CO2	3	2	-	3	-	-	2	-	3	3	2	3			1
CO3	3	2	-	-	2	-	-	-	3	3	2	3	2	2	
CO4	3	3	-	-	-	2	-	-	3	3	2	3		2	
CO5	3	3	2	2	2	2	3	3	3	3	2	3	2	2	
CO6	3	3	-	3	-	-	-	-	3	3	2	3			1
AvgP	3	2.7	0.3	1.8	0.6	0.6	0.8	0.5	3	3	2	3	1	1.4	0.5
0			4	4	7	7	4								
attain															
ed															



### Syllabus: CSP 114: Application based programming in Python Lab

Sc	hool:	School of Engineering & Technology											
De	epartment	Department of Computer Science & Engine	ering										
Pr	ogram:	B.Tech.											
Bı	anch:	CSE											
1	Course Code	CSP114											
2	Course Title	Application Based Programming in Python Lab											
3	Credits	1											
4	Contact	0-0-2											
	Hours												
	(L-T-P)												
	Course Status	Compulsory											
5	Course	Emphasis is placed on procedural programming, al	gorithm design, and										
	Objective	language constructs common to most high level lan	nguages through Python										
6	Course	Trogramming.	dent will be able to:										
0	Outcomes	CO1: Develop program based on procedural state	ments like assignments.										
	Outcomes	conditional statements and loops.											
		CO2: Compare and implement different data types	of python.										
		CO3: Create programs by using function and funct	ion call.										
		04: Formulate clear and accurate logical solution by using OOPS											
		05: Apply different modules, packages available in python.											
		CO6: Design real life situational problems and thi	O6: Design real life situational problems and think creatively about										
7	Course	Solutions of mem.	Solutions of them.										
/	Description	is widely used in many scientific areas for data ext	ploration This course is an										
	Description	introduction to the Python programming language	for students without prior										
		programming experience. We cover data types, con	ntrol flow, object-oriented										
		programming.	-										
8	Outline syllabu	S	CO Mapping										
	TI:4 1	Drastical based on conditional statements											
	Unit I	Practical based on conditional statements											
		1 Dragram to implement all conditional	CO1 C06										
		1. Program to implement all conditional statements	01,000										
		2 Program to implement different control											
		structures											
	Unit 2	Practical related to List, Tuples and											
		dictionaries											
		1. Program to implement operations on lists	CO2,CO6										
		2. Program to implement operations on											
		Dictionary											
		<b>3.</b> Program to implement operations on											
	<b>I</b> I <b>' ' '</b>	Tuple											
	Unit 3	Practical related to Functions and											
		Exception Handling											



	1. Prog Han	gram to dling	implement	Exception	CO3,CO6
 Unit 4	Practical r Programm	elated to ( ing	Object Orier	nted	
	1. Program inheritance, 2.Program fo	to use objeoverloading	ect oriented co g polymorphis ling	oncepts like m etc.	CO4,CO6
Unit 5	Practical r Application	elated to ] ns	l		
	1.Program to 2.Program to	o use modu o implemen	ge d sorting	CO5,CO6	
Mode of examination	Practical/V	iva			
Weightage	CA	CE(Viva	.)	ETE	
Distribution	25%	25%		50%	
Text book/s*	2. The Brown, McGr	Complete R aw Hill	Reference Pytho	on, Martin C.	
Other References	<ol> <li>Intro using Python,</li> <li>Intro Y. Daniel Lia</li> <li>Mast Publishing Ho</li> <li>Start Pearson</li> </ol>	duction to c E Balaguru duction to ng, Pearson tering Pytho buse ing out w	blem solving Hill sing Python, atten, Packet ony Gaddis,		

S.	Course Outcome	Program Outcomes (PO) & Program Specific
No.		Outcomes (PSO)
1.	CO1: Develop program based	PO1,PO2,PO3,PO4,PO8,PO12,PSO2
	on procedural statements like	
	assignments, conditional	
	statements and loops.	
2.	CO2: Compare and implement	PO1,PO2,PO3,PO4,PO5,PO8,PO12,PSO2,PSO3
	different data types of python.	
3.	CO3: Create programs by using	PO1,PO2,PO3,PO4,PO5,PO6,PO8,PO12,
	function and function call.	PSO1,PSO2,PSO3
4.	CO4: Formulate clear and	PO1,PO2,PO3,PO4,PO5,PO6,PO8,PO12,
	accurate logical solution by	PSO1,PSO2,PSO3
	using OOPS	
5.	CO5: Apply different modules,	PO1,PO2,PO3,PO4,PO5,PO6,PO8,PO12,
	packages available in python.	PSO1,PSO2,PSO3
6.	CO6: Design real life situational	PO1,PO2,PO3,PO4,PO5,PO6,PO8,PO12,
	problems and think creatively	PSO1.PSO2.PSO3
	about solutions of them.	



## **PO and PSO mapping with level of strength for Course Name-**Application Based Programming in Python Lab (**Course Code CSP 114**)

Course Code_ Course Name	CO' s	РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	CO1	1	1	1	1				2				2		1	
	CO2	2	2	1	1	2			2				2		1	1
	СО3	2	2	1	1	1	1		2				2	1	2	1
	CO4	2	2	2	2	1	1		2				2	2	2	1
CSP114_Appli cation Based	CO5	2	2	2	2	2	2		2				2	2	2	2
programming in Python Lab	CO6	3	3	2	2	2	3		2				2	2	2	2

#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO3
CSP11 4	Application Based programming in Python Lab	2	2	1.5	1.5	1.3	1.2	-	2	-	-	-	2	1.2	1.7	1.2

#### Strength of Correlation

- 1. Addressed to *Slight* (*Low=1*) *extent* 
  - *t* 2. Addressed to *Moderate* (*Medium=2*) *extent*
- 3. Addressed to Substantial (High=3) extent



Scho	ol: SET	Batch : 2023-27							
Prog	ram: B.Tech	Current Academic Year: 2023-24							
Brar	ch: Mechanical	Semester: II							
Engi	neering								
1	Course Code	MEP 105							
2	Course Title	Mechanical Workshop							
3	Credits	1.5							
4	Contact Hours	0-0-3							
	(L-T-P)								
	Course Status	Compulsory							
5	Course	The objective of this course is to make the students, familiar with the							
	Objective	modern day manufacturing processes, introduce them to various hand tools							
	-	and equipment, acclimatize with the measuring devices, and perform basic							
		machine tool operations in various machine tools.							
6	Course	After successful completion of this course, students will be able to							
	Outcomes	CO1: Apply 5S (Seiri, Seiton, Seiso, Seiketsu and Shitsuke ) methodology							
		at workplace.							
		CO2: Select the various hand tools used in the basic mechanical							
		engineering workshop sections-smithy, carpentry, assembling, welding etc.							
		CO3: Choose different measuring devices according to the job							
		CO4: Differentiate between various machine tools and their operation							
		CO5: Classify and select suitable tools for machining processes including							
		turning, facing, thread cutting and tapping, milling, drilling and shaping.							
		CO6: Apply the knowledge for advance manufacturing experiments.							
7	Course	Black Smithy Shop: Simple exercises based on black smithy operations							
	Description	such as upsetting, practice of S -Hook from circular bar using hand forging							
		operations.							
		<b>Carpentry Shop</b> : Study of different types of wood, Carpentry Tools,							
		Equipment and different joints, Practice of T joint, cross lap joint, Mortise							
		and Tenon T joint, Bridle T joint							
		<b>Fitting Shop:</b> Preparation of Square joint, V joint, half round joint,							
		dovetail jointas per the given specifications, which contains: Sawing,							
		Filing, Grinding, and Practice marking operations.							
		<b>Sheet Metal Shop:</b> Sludy of galvanized from (G.I.) Sheet material							
		demonstration of different sheet metal operations and practice of							
		development of Tray, cylinder, hopper, funnel etc.							
		Welding Shop: Introduction Study of Tools and welding Equipment (Gas							
		and Arc welding) Selection of welding electrode and current Bead practice							
		and Practice of Butt Joint Lan Joint							
		Machine Shop: Study of machine tools in particular Lathe machine							
		(different parts, different operations, study of cutting tools). Demonstration							
		of different operations on Lathe machine. Practice of Facing. Plane							
		Turning, step turning, taper turning, knurling and parting and Study of							
		Quick return mechanism of Shaper.							
		Foundry Shop: Introduction to foundry, Patterns, pattern allowances.							
		ingredients of moulding sand and melting furnaces. Foundry tools and their							
		purposes, Demo of mould preparation and Practice – Preparation of mould							
		by using split pattern.							
8	Outline syllabus	CO Mapping							
	List of								
	Experiments								



Experiment 1	To mal	ke a S shap rod using ha	bed hook from a given and forging technique.	CO4					
Experiment 2	To mal shop.	ke a dovetai	l lap joint in Carpentry	CO2,CO3					
Experiment 3	To mak shop.	te a cross-ha	lf lap joint in Carpentry	CO2,CO3					
Experiment 4	To mak steel pi	te a square fi eces in fitting	t from the given mild g shop.	CO3,CO5					
Experiment 5	To prep pieces i	oare a V-Fit f n fitting sho	from the given mild steel p.	CO3, CO5					
Experiment 6	To ma dimens	ke a rectang	gular tray of specified metal shop.	CO2, CO5					
Experiment 7	To mal steel pi	ke a Lap join eces using ar	nt, using the given mild rc welding.	CO3, CO5					
Experiment 8	To perf	orm step turi	ning and taper turning ven work piece	CO5					
Experiment 9	To prep single p	oare a sand m	old, using the given	CO2					
Experiment 10	To prep Split-pi	bare a sand m ece pattern.	nold, using the given	CO2					
Mode of examination	Practica	al							
Weight- age	CA	MTE	ETE						
Distribution	25%	25%	50%						
Text book/s*	<ol> <li>Raghuwanshi B.S., Workshop Technology Vol. 1 &amp; II, DhanpathRa Sons.</li> <li>Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scite publishers.</li> <li>John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.</li> <li>JeyapoovanT.andPranitha S., Engineering Practices Lab Manual,</li> </ol>								
	Euii. V	ikas Pub.200	0.						

#### **Program Outcome Vs Courses Mapping Table:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO105.1	1	-	-	-	-	2	-	-	-	-	-	2	-	-	-
CO105.2	1	-	-	-	1	2	-	-	-	-	-	1	1	-	1
CO105.3	2	-	1	-	1	2	-	-	-	-	-	2	1	-	1
CO105.4	2	-	1	-	2	2	-	-	-	-	-	2	1	-	1
CO105.5	2	-	1	-	2	2	-	-	-	-	-	2	2	-	1
CO105.6	2	-	1	-	2	2	-	-	-	-	-	2	2	-	1
CO105	2	-	1	-	2	2	-	-	-	-	-	2	2	-	1

1-Slight (Low)

2-Moderate (Medium)

3-Substantial (High)



Scl	hool: SET	Batch : 2023-27									
Pr	ogram: B.Tech	Current Academic Year: 2023-24									
Br	anch: ALL	Semester: II									
1	Course Code	MEP 106									
2	Course Title	Computer Aided Design & Drafting Laboratory									
3	Credits	1.5									
4	Contact Hours	0-0-3									
	(L-T-P)										
	Course Status	Compulsory									
5	Course Objective	The objective of this introductory course is to make stud	lents familiar with								
	5	computer-aided drafting/ design, introduce them commands, tools and dimension techniques for creation of various anginaging drawing by using AutoCAD soft	about the basic and presentation								
		in visualization and problem solving in engineering disciplines.									
6	Course Outcomes	After successful completion of this course the student w	ill be able to								
		CO1: Understand the fundamental features of AutoCA	D workspace and								
		user interface.	1 . 6 .								
		CO2: Apply the fundamental tools such as draw, edit, and	a view for creating								
		CO3: Choose advance features to present an engine	ering drawing in								
		cring drawing in									
		AutoCAD. CO4: Apply text and dimension features in the engineering drawing									
		CO5: Create different orthographic projections from a pictorial view.									
		CO6: Analyze an engineering drawing and use the software packages for									
		drafting and modeling.									
7	Course	This introductory course is offered to students to make	them proficient in								
	Description	design, layout, product development, and other car	eers that require								
		technical drawing. Using the current version of the Au	itoCAD software,								
		students will learn a variety of drawing techniques and t	e able to replicate								
		empower and enable students to create using the software	e provided Career								
		opportunities in 3D modeling, manufacturing, and engine	eering will also be								
		explored. No drafting or computer experience is necessa	iry.								
8	Outline syllabus		CO Mapping								
	List of										
	Experiments										
	Experiment 1	Introduction to AutoCAD and its interface	CO1								
	Experiment 2	Working with coordinates, Drawing offline, circle,	CO2								
	<b>D</b> • 42	arc, polygon and creating sketches									
	Experiment 3	tools	CO2								
	Experiment 4	Creating of advanced feature like fillet, chamfer, hatch and using of block	CO3								
	Experiment 5	Representing text and dimensioning in AutoCAD	CO4								
	Experiment 6	Creating the drawings of mechanical components by using AutoCAD features.	CO2, CO3								
	<b>Experiment 7</b>	Creating the electrical circuit drawings in AutoCAD.	CO2								
	Experiment 8	Drawing plan and elevation of various buildings in AutoCAD.	CO2, CO4								
	Experiment 9	Creating the drawing of renowned constructions such as Taj Mahal in AutoCAD	CO3								



Experiment 10	Creating of o views	rthographic proje	ections from a pictorial	CO5						
Mode of examination	Practical									
Weightage	CA	CE(Viva)	ETE							
Distribution	25%	25%	50%							
Text book/s*	1. Ibrahim Zai	Graw Hill,								
	Internat									
Software	AutoCAD									

#### **1.3.5.1 COURSE ARTICULATION MATRIX**

COs	PO	РО	PO	PO	PS	PS								
	1	2	3	4	5	6	7	8	9	10	11	12	O1	O2
CO10	2	2	2	-	3	-	-	-	-	-	-	3	3	3
6.1														
CO10	2	2	2	-	3	-	-	-	-	-	-	3	3	3
6.2														
CO10	2	2	2	-	3	-	-	-	-	-	-	3	3	3
6.3														
CO10	2	2	2	2	3	-	-	-	2	2	-	3	3	3
6.4														
CO10	2	2	2	2	3	-	-	-	2	2	-	3	3	3
6.5														
CO10	2	2	2	2	3	-	-	-	2	2	-	3	3	3
6.6														

1-Slight (Low) 2-Moderate (Medium)

3-Substantial (High)



### Syllabus: CSP 242, Data Structure Lab

Sch	ool: SET	Batch : 2023-27						
Prog	gram: B.Tech.	Current Academic Year: 2023-24						
Bra	nch: CSE/IT	Semester: II						
1	Course Code	CSP242						
2	Course Title	Data Structure Lab						
3	Credits	1						
4	Contact Hours	0-0-2						
	(L-T-P)							
	Course Status	Compulsory						
5	Course Objective	<ol> <li>Learn the basic concepts of Data Structures and algorithms.</li> <li>Design and Implementation of Various Basic and Advanced Structures.</li> <li>Learn the concepts of various searching, Sorting and Ha Techniques.</li> <li>Choose the appropriate data structures and algorithm design m for a specified application.</li> </ol>						
6	Course Outcomes	<ul> <li>CO1: Implement operation like traversing, insertion, deletion, searchi etc. on various data structures.</li> <li>CO2 apply linear data structure(s) to solve various problems</li> <li>CO3: develop the solution of any problem using non linear da structure(s)</li> <li>CO4: create a solution of any problem using searching and sortitechniques</li> <li>CO5: Design a hash function using any programming language</li> <li>CO6: Choose the most appropriate data structure(s) for a giv problem</li> </ul>						
7	Course Description	This course starts with an introduction to data structure classification, efficiency of different algorithms, array based implementations and Recursive applications. As progresses the study of Linear and Non-Linear data stru- studied in details. The course talks primarily about Lin stacks, queue, Tree structure, Graphs etc. This Course a with the concept of searching, sorting and hashing met	es with its and pointer the course uctures are ked list, also deals hods.					
8	Outline syllabus	S	CO Mapping					
	Unit 1	Introduction	CO1					
		Program to implement Operation on Array such as	CO1					
		Traversing, Insertion & Deletion operation						
		Program based on Recursion such as Towers of Hanoi, Fibonacci series etc.	COI					
	Unit 2	Linkod List	CO2					
		Dragram to implement different exerction on the						
		following linked list: Singly, Doubly and circular linked list.	02					



Unit 3	Stack & Que	Stack & Queue									
	Program to I	mplement Stack	c operation using Array and	CO3							
	Linked list										
	Program to co	onvert infix expr	ession to post fix expression	CO3							
	Program on E	Program on Evaluation of Post fix expression									
	Program to i linked list	CO3									
	Program to in	nplement circula	r queue and deque.	CO3							
Unit 4	Tree & Grap	h		CO4, CO6							
	Program to in	plement binary	tree and BST.	CO4, CO6							
	Program to in	nplement MST a	and shortest path algorithm.	CO4, CO6							
Unit 5	Searching, S	Sorting & Has	hing	CO5							
	Program on S	earching and Ha	ashing	CO5							
	Program on S	orting.		CO5							
Mode of	Practical										
examination											
Weightage	CA	CE(Viva)	ETE								
Distribution	25%	25%	50%								
Text book/s*	1. Lipschutz Series, TMH	, "Data Structu [	res" Schaum's Outline								
Other	1. Aaron M.	Tenenbaum, Y	edidyah Langsam and								
References	Moshe J. Au	genstein "Data	Structures Using C and								
	C++", PHI										
	2. Horowitz	and Sahani, "F	undamentals of Data								
	Structures",	Galgotia Publi	cation								
	3. Jean Paul	3. Jean Paul Trembley and Paul G. Sorenson, "An									
	Introduction										
	McGraw Hil										
	4. R. Kruse										
	Design in C'	', Pearson Edu	cation								
	5. G A V Pai,	"Data Structure	es and Algorithms", TMH								

# PO and PSO mapping with level of strength for Course Name Data Structures (Course Code CSE 242)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	3	_	_	-	_	_	3	_	_	2	3	2	2
CO2	3	2	2	2	2	-	_	_	2	_	-	_	2	3	3
CO3	3	1	3	3	_	_	_	_	3	_	_	1	3	2	2
CO4	3	2	3	2	_	_	_	_	2	_	_	2	2	3	2



CO5	2	2	2	_	_	_	_	_	_	_	_	_	1	2	2
CO6	3	3	2	3	-	-	-	-	3	I	-	-	2	3	2

Average of non-zeros entry in following table (should be auto calculated).

Cou rse Cod e	Cours e Name	Р О1	P O2	Р О3	Р О4	Р О5	Р Об	Р О7	Р 08	Р О9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSP 242	Data struct ures Lab	2. 67	2	2. 5	2. 5	2	-	-	-	2. 6	-	-	1.7	2.1 7	2.5	2.2

#### Strength of Correlation

1. Addressed to *Slight (Low=1) extent*2. Addressed to *Moderate (Medium=2) extent*3. Addressed to *Substantial (High=3) extent*



### TERM - III



Scho	ol:SET	Batch : 2023-27								
Prog	ram: B.Tech	Current Academic Year: 2023-24								
Bran	ch:CSE	Semester:III								
1	Course Code	CSE245 Course Name: Discrete	Structures							
2	Course Title	Discrete Structures								
3	Credits	4								
4	Contact Hours(L-T-P)	3-1-0								
	Course Status									
5	Course Objective	This course provides a mathematical foundation for subsection in Computer Science, as well as developing the skills necessolve practical problems.	uent study ssary to							
6	Course Outcomes (CO)	<ul> <li>After the completion of this course, students will be able to CO-1. <i>Apply the</i> basic principles of sets and operations in CO-2. <i>Classify</i> logical notation and determine if the argun not valid.</li> <li>CO-3. <i>Construct</i> and prove models by using algebraic str CO-4. <i>Analyze</i> basic principles of Boolean algebra with mathematical description.</li> <li>CO-5. <i>Construct</i> Permutations and combinations in count techniques and applications of Graph Theory.</li> <li>CO-6. <i>Compose</i> computer programs in a formal mathematima manner.</li> </ul>	o: sets. ment is or is uctures. ing tical							
-	D									
7	Prerequisite	Concepts of algebra	CO							
8	Course Conten	its	Mapping							
	Unit 1	Introduction to Set Theory, Relations and Functions.								
	А	Set Theory: Introduction, Combination of sets, Multi sets, ordered pairs, Set Identities.	CO1							
	В	Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.	CO1							
	С	Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.	CO1							
	Unit 2	Logics and Mathematical Induction								
	А	Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference, Natural Deduction.	CO1,CO2							
	В	Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.	CO1,CO2							
	С	Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.	CO1,CO2							
	Unit 3	Algebraic Structures								
	A	Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups,	CO3							



В	Hon of R	nomorphism's, De ings and Fields, Ir	finition and elementary ntegers Modulo n.	properties	CO3			
С	Part Con	ial order sets: Def	inition, Partial order set l order sets, Hasse diag	rs, ram.	CO3			
Unit 4	Latt	tices and Applica	tions					
A	Defi Con Mor	nition, Properties plemented, Modu phisms of lattices.	of lattices – Bounded, lar and Complete Lattic	ce,	CO4			
В	Boo Boo expr Karr Boo	lean Algebra: Intro lean algebra, Alge ressions. Simplific naugh maps, Logic lean algebra. Com	CO4					
С	Rect define of so	urrence Relation & nition of functions olving recurrences	& Generating function: l s, Recursive algorithms,	erating function: Recursive ursive algorithms, Method				
Unit 5	Gra	ph Theory and A	pplications.					
А	Tree Bina	es: Definition, Bin ary search tree.	versal,	CO4,CO5				
В	Grap grap Ison Ham	Graphs: Definition and terminology, Representation of graphs, Multi graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph colouring.						
С	Con Pige	binatory: Introduc conhole Principle	ction, Counting Technic	ques,	CO4,CO5			
Mode of examination	Theo	ory						
Weightage	CA		MTE	ETE				
Distribution	25%		25%	50%				
Text book*		<ol> <li>1. C. L. Liu, Elements of Discrete Mathematics, second edition 1985, McGraw-Hill Book Company. Reprinted 2000.</li> <li>2) Jean Paul Trembley, R Manohar, "Discrete Mathematical Structures with Application to Computer Science", McGraw-Hill.</li> <li>3) K. H. Rosen, Discrete Mathematics and applications, fifth edition 2003, Tata McGraw Hill Publishing Company.</li> </ol>						
other reference	es	<ol> <li>J.L. Mott, A. Kandel, T.P. Baker, Discrete Mathematics for Computer Scientists and Mathematicians, second edition 1986, Prentice Hall of India.</li> <li>W.K. Grassmann and J.P.Trembnlay, Logic and Discrete Mathematics, A Computer Science</li> </ol>						

<b>S.</b>	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)



1.	<b>CO1:</b> <i>Apply the</i> basic principles of sets and operations in sets.	PO1,PO2,PO3,PO4,PO6,PO12, PSO1,PSO2
2.	<b>CO2:</b> <i>Classify</i> logical notation and determine if the argument is or is not valid.	PO1,PO2,PO3,PO6,PO9,PO12 PSO1,PSO2
3.	<b>CO3:</b> <i>Construct</i> and prove models by using algebraic structures.	PO1,PO2,PO3,PO4,PO5,PO9,PSO2 PSO3
4.	<b>CO4:</b> <i>Analyze</i> basic principles of Boolean algebra with mathematical description.	PO1,PO2,PO3,PO4,PO5,PO11,PO12 PSO1, PSO3
5.	<b>CO5:</b> <i>Construct</i> Permutations and combinations in counting techniques and applications of Graph Theory.	PO1,PO2,PO3,PO4,PO6,PO9,PO11,PO12, PSO2,PSO3
6	<b>CO6:</b> <i>Compose</i> computer programs in a formal mathematical manner.	PO1,PO2,PO3, PO4, PO5,PO9,PO11, PSO1,PSO2,PSO3

### PO and PSO mapping with level of strength for Course Name Discrete Structures (Course Code CSE245)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	3	3	1	_	3	_	_	3	_	_	3	3	3	_
CO2	2	2	3	-	-	2	-	-	_	-	_	3	3	2	_
CO3	3	2	3	3	3	_	-	-	2	-	_	_	-	3	2
CO4	2	2	3	3	3	_	_	_	_	_	3	3	3	_	3
CO5	2	2	2	3	_	3	_	_	3	_	3	3	_	2	3
CO6	1	2	1	2	3	_	_	_	3	_	3	_	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	РО		РО	РО	РО	PO	РО	РО	РО	РО	РО	РО	PSO	PSO	PSO
Code	Name	1	PO2	3	4	5	6	7	8	9	10	11	12	1	2	3
CSE245	DS	2	2.1	2.5	2	1.5	1.3	0	0	1.8	0	1.8	2	2	2.1	1.6

Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



### Syllabus: CSE 247, Computer organization and architecture

Scho	ool: SET	Batch : 2023-27										
Prog	gram: B.Tech	Current Academic Year: 2023-24										
Bra	nch: CSE/IT	Semester: III										
1	Course Code	CSE247 Course Name										
2	Course Title	Computer Organization and Architecture										
2	course mile											
3	Credits	3										
4	Contact Hours	3-0-0										
	(L-T-P)											
	Course Status	Compulsory										
5	Course	To impart an understanding of the internal organization ar	nd operations of a									
	Objective	computer and to introduce the concepts of processor logic of	lesign and control									
		logic design.										
6	Course	Upon successful completion of this course, the student will	be able to:									
	Outcomes	<b>CO1:</b> Identify the basic structure and functional units of a c	digital computer									
		CO2:Study the architecture of Bus and registers										
		. <b>CO3:</b> Study the design of arithmetic and logic unit and in	mplementation of									
		fixed point and floating-point arithmetic operations										
		<b>CO4:</b> Understand basic processing unit and organization of	simple processor									
		including instruction sets, instruction formats and various a	ddressing modes									
		<b>CO6:</b> Describe hierarchical memory systems including cache memories and										
		<b>COO:</b> Describe interfacing standards for I/O devices	the merarchical memory systems including cache memories and $prior a prior a $									
7	Course	This course discusses the basic structure of a digital comp	uter and used for									
/	Description	understanding the organization of various units such	as control unit									
	Description	Arithmetic and Logical unit and Memory unit and I/O unit in a digital										
		computer	unit in a uigitai									
8	Outline syllabus		CO Mapping									
0	Unit 1	Computer Organization and Design	e e mupping									
	A	Functional units of digital system and their	CO1									
		interconnections, buses, bus architecture, types of buses										
		and bus arbitration. Register bus and memory transfer										
	В	Register transfer Language, Registertransfer, Bus &	CO1									
		memory transfer, Logic micro operations, Shift micro										
		operation.										
	С	Adder-Subtractor- Incrementor, Arithmetic unit, Logic	CO1									
		unit.										
	Unit 2	Computer Arithmetic										
	Α	Representation of numbers in 1's and 2's complement,	CO1, CO2									
		Addition and subtraction of signed numbers.										
	В	Binary Multiplier, Multiplication: Signed operand	CO1, CO2									
		multiplication, Booth algorithm										
	C	Floating point arithmetic representation: addition and	CO1, CO2									
	TL-14 0	subtraction.										
		Processor Urganization	<u> </u>									
	A	General register organization, stack organization	CO3									
	Б	Instruction set architecture of a CPU - registers, Instruction	03									
	C	Addressing modes DISC/CISC	CO2									
	U Unit 4	Addressing modes, KISU/UISU	0.05									
	Unit 4	Control Unit										



	А	Introduction	to CPU desig	gn, Instruction interpretation and	CO3, CO4								
		execution,	Micro-operati	on and their register transfer									
		language (R	TL) specificat	tion									
	В	Hardwired c	ontrol CPU d	esign	CO3, CO4								
	С	Microprogra	immed contro	l CPU design	CO3, CO4								
	Unit 5	Memory an	d I/O										
	А	RAM/ROM	/Flash memor	ry, Designing Memory System	CO1, CO5								
		using RAM	using RAM and ROM chips										
	В	Cache mem	Cache memory: Memory hierarchy, performance Considerations, mapping techniques										
		Consideration											
	С	Input Outpu	CO1, CO5										
		Programme	ł I/O, Interrup	ot driven I/O, Direct Memory									
		Access	Access										
	Mode of	Theory	Theory										
	examination	-											
	Weightage	CA	MTE	ETE									
	Distribution	25%	25%	50%									
	Text book/s*	1. M. I	Morris Mano,	Computer System Architecture,									
		Pear	son										
	Other	1 C	Homeshan	7 Vranasia and S. Zalay									
	References	1. U.	Hamacher,	Z. Vranesic and S. Zaky,									
		2 W	Stallinga	"Computer Organization and									
		2. W.	Stannigs,	Designing for Derformence"									
		Alc	intecture -	dia 2002									
				and L. L. Hannager, "Computer									
		5. D. A	A. Patterson a	and Design The									
		Ulg	duero/Softwo	and Design - The									
		Hai Kau	fmore 1008	ie interface, Morgan									
			Uovos "	Computer Architecture and									
		4. J.P.	nayes,	Computer Architecture and									
		Org	anization , M	Ulaw-IIII, 1770.									
1													

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1. Identify the basic structure and	PO1, PO2, PO3, PO6, PO12, PSO3
	functional units of a digital computer.	
2.	CO2:Study the architecture of Bus and	PO1, PO2, PO3, PO6, PO12, PSO3
	registers	
3.	CO3. Study the design of arithmetic and	PO1, PO2, PO3, PO6, PO12, PSO3
	logic unit and implementation of fixedpoint	
	and floating-point arithmetic operations	
4.	CO4. Understand basic processing unit and	PO1, PO2, PO3, PO6, PO12, PSO3
	organization of simple processor including	
	instruction sets, instruction formats and	
	various addressing modes	
5.	CO5. Study the two types of control unit	PO1, PO2, PO3, PO4, PO6, PO12, PSO2,
	techniques	PSO3



6.	CO6. Describe hierarchical memory
	systems including cache memories and
	select appropriate interfacing standards for
	I/O devices

PO1, PO2, PO3, PO6, PO12, PSO2, PSO3

## PO and PSO mapping with level of strength for Course Name Computer Organization and Architecture (Course Code CSE 247)

С	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO1	PO1	PSO 1	PSO 2	PSO
S											0	1	2	1	2	5
Ē	CO1	3	1	1	-	-	2	-	-	-	-	-	2	-	1	3
4	CO2	3	3	3	-	-	3	-	-	-	-	-	3	-	2	3
7	CO3	3	2	3	-	-	2	-	-	-	-	-	3	-	2	3
	CO4	3	2	2	-	-	1	-	-	-	-	-	3	-	3	2
	CO5	3	3	3	-	-	2	-	-	-	-	-	3	-	2	2
	CO6	3	3	3	-	-	2	-	-	-	-	-	3	-	1	2

1-Slight (Low)

2-Moderate (Medium)

3-Substantial (High)



2.1 7	<b>Cemplate</b>	A1:	Syllabus	for '	Theory	Courses
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Sch	ool:	School of Engineering & Technology										
Dep	artment	Department of Computer Science & Engineering										
Pro	gram:	B.Tech										
Bra	nch:											
1	Course Code	CSE253										
2	Course Title	Object Oriented Programming Using Java										
3	Credits	2										
4	Contact	2-0-0										
-	Hours											
	(L-T-P)											
	Course	Core /Elective/Open Elective										
	Status	I										
5	Course	To learn Java language syntax and semantics and concep	ts such as									
	Objective	classes, objects, inheritance, polymorphism and multit	hreading.									
6	Course	CO1. Define Object oriented programming concepts by id	lentifying classes,									
	Outcomes	objects, members of a class and relationships among the	m needed for a									
		specific problem.										
		CO2: Illustrate different features of java.										
		CO3: Develop Java programs to solve problems of an	plications using									
		OOP principles such as abstraction, polymorphism and	d inheritance.									
		CO4: Categorize runtime errors thrown in the applica	tion software or									
		generated runtime by applying the methods of exception handling.										
		CO5. Explain the concept of multithreading.										
		CO6. Design real life application using Java										
7	Course	Basic Object Oriented Programming (OOP) concepts	including									
	Description	objects, classes, methods, parameter passing, informat	ion hiding,									
		inheritance and polymorphism are discussed.										
8	Outline syllabu	15	CO Mapping									
	Unit 1	Introduction to Object Oriented Paradigm										
	А	Introduction to OOP, Characteristics of OOP,	CO1, CO2									
	-	Difference between OOP and procedural languages										
	B	Byte Code, Architecture of JVM	CO1, CO2									
	С	Features of Java, Class Loader Execution Engine, Garbage collection	CO1, CO2									
	Unit 2	Introduction to Java										
	A A	Classes, Objects Constructors, Methods	CO1 CO2									
	R	Constants Variables Data Types Operators	C01, C02									
	D	Expressions, Decision Making Branching, Loops	001, 002									
	С	Arrays	CO1, CO2									
	Unit 3	Polymorphism & String handling										
	А	Polymorphism, method overloading	CO3									
	В	Constructors overloading, Wrapper class, Type	CO3									
		conversion & casting,										
	С	Strings and String handling,	CO3									
	Unit 4	Inheritance										



А	Inheritance, T methods, use c	ypes of inheri of this and sup	tance, Overriding er	CO3,CO6						
В	Constructor ca Concept of mu	ll in inheritand lliple inheritat	ce, Abstract class , nce in Java	CO3,CO6						
С	Final class, me Modifiers	thod and varia	able, Interface, Access	CO3,CO6						
Unit 5	Exception and	Exception and Multithreading Introduction to Exception Handling, Introduction to try, catch, Finally, throw and throws								
А	Introduction to catch, Finally,									
В	Checked and U exception	CO4,CO6								
С	Introduction to Runnable interf	CO5,CO6								
Mode of examination	Theory/Jury/P	ractical/Viva								
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	1.Schildt H, "T	he Complete R	eference JAVA2", TMH							
Other References	<ol> <li>Balagurusa</li> <li>Professiona Publication</li> </ol>									

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	Define Object oriented programming	PO5,PO12
	concepts by identifying classes,	
	relationshing among them needed	
	for a spacific problem	
2	The specific problem.	
2.	inustrate different features of java.	
3.	Develop Java programs to solve	PO1,PO2,PO3,PO5,
	problems of applications using	PO9,PO12,PSO1,PSO2
	OOP principles such as	
	abstraction, polymorphism and	
	inheritance.	
4.	Categorize runtime errors thrown	PO5
	in the application software or	
	generated runtime by applying	
	the methods of exception	
	handling and File I/O	
5.	Explain the concept of	PO5
	multithreading.	
6.	Design real life application using	PO1,PO2,PO3,PO5,PO6,PO7,PO9,PO11,PO12,PSO1,PSO2,PSO3
	Java.	

# **PO and PSO mapping with level of strength for Course Name** Object Oriented Programming Using Java (**Course Code CSE243**)



Course Code Course	С	р	р	р	р	р	р	р	р	р	P	P	P O	P s		
Course Code_ Course	0'	r	r	r	r	r	r	r	r	r				3	DC	DC
Name	s	0	0	0	0	0 2	0 ć	0	0	0	1	1	1	0	PS 02	PS O2
		I	2	3	4	5	6	7	8	9	0	I	2	I	02	03
	С					2							2			
	0															
	1															
	С					2										
	0															
	2															
	С	2	3	3		2				3			2	2	3	
	0															
	3															
	С					2										
	0															
	4															
	С					2										
	0															
	5															
	С	3	3	3		2	3	2		3		2	3	3	3	2
CSE253_ Object Oriented	0															
Programming Using Java	6															

Average of non-zeros entry in following table (should be auto calculated).

Course	Course Name	PO		PO	PSO	PSO	PSO									
Code	Course Name	1	PO2	3	4	5	6	7	8	9	10	11	12	1	2	3
	Object Oriented															
CSE 253	Programming															
	Using Java	2.5	3	3	0	2	3	2	0	3	0	2	2.3	2.5	3	2

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent
2. Addressed to Moderate (Medium=2) extent
3. Addressed to Substantial (High=3) extent


## Syllabus: CSE 244, Principles of Operating System

Sch	ool: SET	Batch : 2023-27							
Pro	gram:	Current Academic Year: 2023-24							
B.T	ech								
Bra	nch: CSE	Semester: III							
1	Course Code	<b>CSE</b> Course Name: Principles of Oper	rating System						
1	Course code	<b>244</b>	turing by stern						
2	Course Title	Principles of Operating System							
3	Credits	4							
4	Contact	3-0-2							
	Hours								
	(L-T-P)								
	Course	Core							
	Status								
5	Course	1. This course introduces the challenges for	or designing the operating						
-	Objective	systems.							
	o ojeen (e	2. Includes different design principles and	algorithms.						
		3. Evaluation of algorithms proposed.	-						
		4. Implementation of algorithms and utility	ies.						
6	Course	Students will be able :							
	Outcomes	<b>CO1:</b> To Understand the basic concept of Operation	ating system.						
		<b>CO2:</b> Explore process management concepts inc	cluding scheduling,						
		synchronization, deadlocks							
		<b>CO3:</b> To understand and implement algorithms	in resource allocation and						
		utilization.	CC : C 1 :4 1						
		<b>CO4:</b> To integrate and interpret effectiveness, e	fficiency of algorithms used						
		CO5: A palvza various memory management on	d virtual momory tachniques						
		<b>CO6:</b> To Understand file and disk management	and analyzing them						
7	Course	This course introduces the design principles of c	operating systems, resource						
,	Description	management, identifying challenges and applying respective algorithms							
8	Outline syllab		CO Mapping						
0	Unit 1	Introduction							
		Operating System Concepts and functions.	CO1						
	2 1	Comparison of different Operating system	201						
	В	Types of Operating Systems (Batch,	CO1						
		Multiprogramming ,Multi-Tasking ,							
		Multiprocessing, Distributed and Real Time							
	C	Operating System Structure(Monolithic Layered	COL						
	C	and Microkernel ), Operating System Services	COI						
	Unit 2	Process Synchronization							
	A	Process Concepts (PCB, Process States, Process	CO1, CO2						
		Operations, Inter process communication)	<u> </u>						
	В	Critical Section problem & their solutions, Introduction to Semanhores	CO1, CO2						
	С	Classical Problems of Synchronization(Producer	<u>CO1 CO2</u>						
		Consumer Problem, Readers Writer Problem,	001,002						
		Dining philosophers problem)							
	Unit 3	CPU Scheduling							



	А	Concept, T term, Middl Criteria	ypes of sched e term), Disp	lulers( Short term, Long atcher, Performance	CO1,CO2
	В	CPU Schedu Round Robi feedback Qu	uling Algoritl n, Multilevel 1eue)	nms( FCFS, SJF, Priority, Queue, Multilevel	CO1,CO2,CO3,CO4
	С	Deadlock c Techniques( & Recovery	oncepts & Ha (Avoidance, I	andling Prevention and Detection	CO1,CO2,CO3,CO4
	Unit 4	Memory M	anagement		
	А	Memory Hi	erarchy, Men	CO1,CO2,CO3,CO5	
	В	Paging, Seg	mentation		CO1,CO2,CO3,CO5
	С	Virtual men replacement	nory concept, t algorithms(H	demand paging, Page FCFS, Optimal, LRU)	C01,C02,C03,C05
	Unit 5	INPUT-OU	TPUT Mana	agement	
	А	Input –Outp transfer(Pro	out interface, I grammed, int	C01,C02,C03,C06	
	В	Disk structu SCAN, LOO	re , Disk sche DK,C-SCAN,	eduling(FCFS,SSTF, C-LOOK)	C01,C02,C03,C04,C06
	С	File Concep Case study of	t,File operat	ions, File Directories, Operating System	CO1,CO2,CO3,CO6
	Mode of examination	Theory			
	Weightage	CA	MTE	ETE	
	Distribution	25%	25%	50%	
	Text book/s*	2. Sill Co	berschatz ncepts, Wiley		
	Other References	1. W. Mar 2. Tan Des Ind 3. Mil <i>Con</i>	Stalling, "Op cmillan inenbaum A s sign and Impl ia enkovic M, C <u>acepts, McGr</u>	erating System", Maxwell S, <i>Operating System</i> <i>lementation</i> , Prentice Hall <i>Operating System</i> aw Hill	
1		1			1

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	<b>CO1:</b> To identify the challenges and apply suitable	PO1,PO2,PO3,PO4,PSO1
	algorithms for them.	
2.	CO2: To assess the strengths and weaknesses of	PO1, PO3, PO4, PSO2
	the algorithms.	
3.	CO3: To understand and implement algorithms in	PO1,PO2,PO3,PO4
	resource allocation and utilization.	
4.	<b>CO4:</b> To integrate and interpret effectiveness,	PO9, PO10,PO11, PSO3
	efficiency of algorithms used for resource	
	management of operating systems.	
5.	<b>CO5:</b> Analyze various memory management and	PO1,PO2,PO8,PO9,PO10,PSO1
	virtual memory techniques	
6.	CO6: To Understand file and disk management	PO1,PO2,PO10,PO11,PSO1,PSO2
	and analyzing them.	

CSE, SSET, SU

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### PO and PSO mapping with level of strength for Course Name Principles of Operating System (Course Code CSE 244)

CSE24	Cos	PO 1	PO	PO 2	PO	PO	PO	PO 7	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
4		1	2	3	4	3	0	/	0	9	0	1	2	1	2	3
		3	3	3	3				2	2	1	2	1	3	2	2
	CO															
	1															
		3	2	3	3				2	2	2	1	1	2	3	2
	CO															
	2															
		3	3	3	3				1	1	1	3	2	3	2	1
	CO															
	3															
	CO	2	2	2	2	1			2	3	3	3	1	2	2	2
	4															
	Co5	2	2	3	-	-	-	-	3	3	1	2	-	3	-	-
										-						
	CO	3	2	-	-	-	-	-	-	-	2	3	-	2	2	-
	6															



## Syllabus: CSE 252, Computer Networks

Sch	ool: SET	Batch : 2023-27	
Pro	gram: B.Tech	Current Academic Year: 2023-24	
Bra	nch:CSE	Semester: III	
1	Course Code	CSE252 Course Name: B. Tech	
2	Course Title	Computer Networks	
3	Credits	3	
<u>J</u>	Contact	3-0-0	
-	Hours		
	$(I_T_P)$		
	(L-1-1) Course	Compulsory	
	Status	Compulsory	
5	Course	Provide students with an overview of networking insig	ht into the issues
5	Objective	challenges and working at all level of reference models	Also practice on
	Objective	applying protocols in network design.	. This practice on
6	Course	Students will be able to:	
-	Outcomes	CO1:Demonstrate and differentiate working of all layers of	of the OSI
		Reference Model and TCP/IP model.	
		CO2:Investigate and explore fundamental issues driving n	etwork design
		including error control.	
		<b>CO3:</b> Understand and building the skills of IP addressing,	subnetting and
		routing protocols.	· · · 1
		<b>CO5:</b> Describe the connection monocompute and application	transport layer
		<b>CO6:</b> Outline the basic knowledge of the use of cryptogra	in layer protocols.
		security	ipity and network
7	Course	To familiarize with the basic taxonomy and terminol	ogy of computer
'	Description	networking area.	ogy of computer
8	Outline syllabi	18	CO Manning
0	Unit 1	Introduction	Compping
	A	Introduction to computer networks, applications and uses,	CO1 CO2
	1	classification of Networks based on topologies, geographical	001, 002
		distribution and communication techniques	
	В	Reference models: OSI model, TCP/IP model, Overview of	CO1. CO2
	2	Connecting devices (Hub, Repeaters, Switches, Bridges,	001,002
		Routers, Gateways)	
	C	Transmission Media: wired, wireless, Multiplexing	CO1, CO2
	Unit 2	Data Link Lavar	
	Unit 2	Data Dink Dayer	
	Δ	Functions, Framing, Error Control-Error correction	CO1 CO2
	11	codes(Hamming code),Error Detection codes(Parity Bit, CRC)	0.01, 0.02
	В	Flow Control- Stop and Wait Protocol, Sliding window –Go	CO1, CO2
		back N and Selective repeat(ARQ)	
	C	MAC- Sub-layer Protocols: ALOHA, CSMA, CSMA/CD	CO1, CO2
	Unit 2	protocols, IEEE Standards 802.3, 802.4,802.5	
		Design issues IDV/addressing basics and Handar formet	CO1 CO2
	A	CIDR. sub-netting and sub-masking	01,005
	В	Routing, optimality Principle Routing protocols-, Shortest	CO1.CO3
	-	path, flooding, distance vector routing, link state routing	,



С	Congestion co	ontrol-Leaky bu	icket, Token Bucket, jitter control	CO1,CO3,CO4						
Unit 4	Transport La	iyer								
А	Need of trans connection or	port layer with	h its services, Quality of service, nection less	CO1,CO4						
В	Transmission format, TCP (	Transmission Control Protocol: Segment structure and header format, TCP Connection Management, Flow Control								
С	TCP congestion Algorithm, Ov	CO1,CO4,CO5								
Unit 5	Application I	Application Layer								
А	Domain Name	e System (DNS	S), HTTP, FTP, SMTP	CO1,CO5						
В	Network Secu Asymmetric c	Network Security services, cryptography, Symmetric versus Asymmetric cryptographic algorithms- DES, and RSA								
С	Application of	f Security in No	etworks: Digital signature	CO1,CO5,CO6						
Mode of	Theory									
examination										
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	1. Tane Editi	1. Tanenbaum, A.S." Computer Networks", 4 <sup>th</sup> Edition, PHI								
Other	1. Foro	1. Forouzan, B., "Communication Networks",								
References	TMI	H, Latest Editio	on							
	2. W.	Stallings,	"Data and Computer							
	Com	munication"	Macmillan Press							

S.	Course Outcome	Program Outcomes (PO) & Program Specific
No.		Outcomes (PSO)
1.	<b>CO1:</b> Demonstrate and differentiate	PO2,PO11,PO12,PSO2
	working of all layers of the OSI	
	Reference Model and TCP/IP model.	
2.	CO2:Investigate and explore	PO1,PO3,PO4,PO5,PO11PO12,PSO2
	fundamental issues driving network	
	design including error control.	
3.	<b>CO3:</b> Understand and building the	PO1,PO2,PO4,PO6,PSO1,PSO3
	skills of IP addressing, subnetting and	
	routing protocols.	
4.	<b>CO4:</b> Discuss the flow control,	PO2,PO3,PSO2,PSO3
	elements and protocols of transport	
	layer	
5.	<b>CO5:</b> Describe the connection	PO1, PO2, PO3, PO4, PSO2
	management and application layer	
	protocols.	
6.	<b>CO6:</b> Outline the basic knowledge of	PO1, PO2, PO4, PO8 PO11, PSO2
	the use of cryptography and network	
	security.	



PO and PSO mapping with level of strength for Course Name Computer Netw	vorks
(Course Code CSE 252)	

COs	P01	P02	PO3	P04	P05	904	P07	P08	60d	PO10	P011	P012	PSO1	PSO2	PSO3
CO1		2	-	-	-	-	-	-	-	-	2	3	-	3	-
CO2	2	-	2	2	3	-	-	-	-	-	2	3		3	-
CO3	3	2	-	2	-	2	-	-	-	-	-	-	2	-	2
CO4	-	2	2	-	-	-	-	-	-	-	-	-	-	2	2
CO5	2	2	2	2	I	-	-	-	-	-	-	-	-	2	-
CO6	2	-	-	2	-	-	_	2	-	-	2	-	-	2	-

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code/ Name	Р О 1	P O 2	P O 3	P O 4	P O 5	PO 6	P O 7	P O 8	Р О 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PS O 3
Comp uter Netwo rks	1.5	1.3 3	1	1.3 3	0. 5	0.3 3	-	0.3 3	-	-	1	1	0.3 3	2	0.6 7

Strength of Correlation:1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent 3. Addressed to Substantial (High=3) extent



Scho	ool:	School of Engineering & Technology							
Dep	artment	Department of Computer Science & Engineering							
Prog	gram:	B.Tech							
Bran	nch:								
1	Course Code	CSP-252							
2	Course Title	Computer Networks Lab							
3	Credits	1							
4	Contact Hours	0-0-2							
	(L-T-P)								
	Course Status	Compulsory/Elective							
5	Course	The students will be introduced to the basic	concepts and						
	Objective	fundamentals of computer networks along with the stu	udy of individual						
		layers of reference model.							
6	Course	Students will be able to:							
	Outcomes	CO1: Explain the basic concepts of computer networ	k.						
		CO2: Illustrate and differentiate working of all layers	s of the OSI						
		Reference Model and TCP/IP model							
		CO3: Analyse fundamental issues driving network de	esign including						
		error control, IP addressing, access control, flow and	congestion						
		control							
		CO4: Compare working of various routing algorithms							
		CO6: Examina various arguntagraphia Algorithms							
7	9	CO6: Examine various cryptographic Algorithms	C						
7	Course	To familiarize with the basic taxonomy and terminol	ogy of computer						
	Description	networking area.							
8	Outline syllabu	o	CO Mapping						
0	Unit 1	Introduction							
		Study of Data Communication and Networking	CO1 CO2						
	71	Identify five components of Data communication	001, 002						
		system							
	В	Study of computer network topology and OSI model	CO1. CO2						
	-	lavered architecture.	,						
	С	Study of basic networking commands: IPCONFIG,	CO1, CO2						
		PING / Tracer and Net stat utilities to debug the	,						
		network issues.							
	Unit 2	Data Link Laver							
	Oliti 2								
	А	To connect the computers in Local Area Network	CO1. CO2						
	В	Write a C program to implement Character	CO1. CO2						
		Stuffing and Destuffing	,  -						
	С	C Write a C program to Error Detection using Cyclic CO1. C							
		Redundancy Check Algorithms.	ck Algorithms.						
	Unit 3	Network Layer							
	А	Write a program to generate Hamming code.	CO1,CO3						
			-						



	В	Write a C pr	rogram to dete	ermine if the IP address is	CO1,CO3				
		in Class A, l	B, C, D, or E.						
	С	Write a C p	program to tra	anslate dotted decimal IP	CO1,CO3,CO4				
		address into	32 bit address	5.					
	Unit 4	Transport La	ayer						
	А	Write a prog	Write a program for congestion control using Leaky bucket algorithm.						
		Leaky bucke							
	В	Write a Prog	Write a Program to simulate Distance vector						
		routing.							
	С	Creating a N	letwork topolo	ogy using CISCO packet	CO1,CO4,CO5				
		tracer softwa	are						
	Unit 5	Application							
	А	Write a prog	gram to impler	ment DES for encryption.	CO1,CO5				
	В	Using RSA	algorithm enc	rypts a text data and	CO1,CO5,CO6				
		decrypts the	same.						
	С	Open Ended	Project		CO1,CO5,CO6				
	Mode of	Jury/Practic	al/Viva						
	examination	-							
	Weightage	СА	CE(Viva)	ETE					
	Distribution	25%	25%	50%					
	Text book/s*	Tanenbaum,	, A.S." Compu	iter Networks", 4 <sup>th</sup>					
		Edition, PH	[]						
	Other	1. Foro	uza <mark>n, B, "Co</mark>	ommunication Networks",					
	References	TMF	I, Latest Editi	on					
		2. W.	Stallings,	"Data and Computer					
		Com	munication"	Macmillan Press					
1									

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Explain the basic concepts of	PO2,PO11,PO12,PSO2
	computer network.	
2.	CO2: Illustrate and differentiate working of	PO1,PO3,PO4,PO5,PO11PO12,PSO2
	all layers of the OSI Reference Model and	
	TCP/IP model	
3.	CO3: Analyze fundamental issues driving	PO1,PO2,PO4,PO6,PSO1,PSO3
	network design including error control, IP	
	addressing, access control, flow and	
	congestion control	
4.	CO4: Compare working of various routing	PO2,PO3,PSO2,PSO3
	algorithms	
5.	CO5: Test various network security	PO1, PO2,PO3, PO4, PSO2
	algorithms	
6.	CO6: Examine various cryptographic	PO1, PO2, PO4, PO8 PO11, PSO2
	Algorithms	



Comp uter		P 0	P O 2	P O 3	P O	P O 5	P O	P O 7	P O	P O o	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
orks	С	1		3	4	5	0	/	0	9	_					_
Lab	0		2	-	-	-	-	-	-	-		2	3	-	3	
(Cour	1															
se	С										-	2				-
Code	0	2	-	2	2	3	-	-	-	-			3		3	
CSP2	2															
52)	С										-	-				2
	0	3	2	-	2	-	2	-	-	-			-	2	-	
	3															
	С										-	-		-		
	0	-	2	2	-	-	-	-	-	-			-		2	2
	4															
	С							-			-	-		-		
	0	2	2	2	2	-	-		-	-			-		2	-
	5															
	С							-						-		
	0	2	-	-	2	-	-		2	-	-	2	-		2	-
	6															

PO and PSO mapping with level of strength for Course Name Computer Networks Lab (Course Code CSP252)

Average of non-zeros entry in following table (should be auto calculated).

										Р	Р	Р			
Course Code/Nome	Р	Р	Р	Р	Р	Р	Р	Р	Р	0	Ο	Ο	PS	PS	PS
Course Code/Ivallie	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
Computer Networks (CSP252)	1. 5	1. 33	1	1. 33	0. 5	0. 33	-	0. 33	-	-	1	1	0. 33	2	0. 67

Strength of Correlation

- *1*. Addressed to *Slight* (*Low*=1) *extent*
- 2. Addressed to *Moderate* (*Medium=2*) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology											
Dep	artment	<b>Department of Computer Science &amp; Engine</b>	eering										
Pro	gram:	B.Tech											
Bra	nch:	CSE											
1	Course Code	CSP243											
2	Course Title	Object Oriented Programming Using Java Lab											
3	Credits	1											
4	Contact Hours (L-T-P)	0-0-2											
	Course Status	Compulsory/Elective											
5	Course Objective	To learn Java language syntax and semantics and concepts such as classes, objects, inheritance, polymorphism, packages and multithreading.											
6	Outcomes	<ul> <li>CO1. Define Object oriented programming concepobjects, members of a class and relationships arr specific problem.</li> <li>CO2: Illustrate different features of java.</li> <li>CO3: Develop Java programs to solve problem OOP principles such as abstraction, polymorp CO4:Categorize runtime errors thrown in the generated runtime by applying the methods of File I/O</li> <li>CO5. Explain the concept of multithreading.</li> <li>CO6. Design real life application using Java</li> </ul>	objects, members of a class and relationships among them needed for a specific problem. CO2: Illustrate different features of java. CO3: Develop Java programs to solve problems of applications using OOP principles such as abstraction, polymorphism and inheritance. CO4:Categorize runtime errors thrown in the application software or generated runtime by applying the methods of exception handling and File I/O CO5. Explain the concept of multithreading.										
7	Course	Basic Object Oriented Programming (OOP) c	oncents including										
,	Description	objects, classes, methods, parameter passing, inheritance and polymorphism are discussed.	information hiding,										
8	Outline syllabu	S	CO Mapping										
	Unit 1	Introduction to Object Oriented Paradigm											
		Program related to garbage collection and OC	PS CO1,CO2										
	Unit 2	Introduction to Java	,										
		Program to take input from user, decision mal and branching	ting CO1,CO2										
	Unit 3	Polymorphism											
		Program related to string handling and polymorphism	CO1,CO2										
	Unit 4	Inheritance, package and Interface Inherit Implementation	ance										
		Program related to inheritance and interfaces	CO2,CO3,CO6										
	Unit 5	Exception and Multithreading											
		Program related to exception handling	CO4,CO6										
	Mode of examination	Jury/Practical/Viva											
	Weightage	CA CE(Viva) ETE											
	Distribution	25% 25% 50%											
	Text book/s*	1.Schildt H, "The Complete Reference JAVA2", 7	ſMH										



Other	3. Balagurusamy E, "Programming in JAVA", TMH
References	Professional Java Programming: Brett Spell, WROX
	Publication

## **PO and PSO mapping with level of strength for Course Name** Object Oriented Programming Using Java (**Course Code CSP243**)

	C										Р	Р	Р			
Course Code Course Name	o,	Р	Р	Р	Р	Р	Р	Р	Р	Р	0	0	0	PS		
Course Coue_ Course Ivame	U	0	0	0	0	0	0	0	0	0	1	1	1	0	PS	PS
	5	1	2	3	4	5	6	7	8	9	0	1	2	1	02	03
	С					2							2			
	01															
	С					2										
	02															
	С	2	3	3		2				3			2	2	3	
	03															
	С					2										
	04															
	С					2										
	05															
CSP243_ Object Oriented	С	3	3	3		2	3	2		3		2	3	3	3	2
Programming Using Java Lab	06															

#### Strength of Correlation

- 1. Addressed to Slight (Low=1) extent
- 3. Addressed to Substantial (High=3) extent
- 2. Addressed to *Moderate (Medium=2) extent* t



## Syllabus: CSP 244, Principles of Operating System Lab

Sch	pol: SET	Batch : 2023-27								
Pros	gram: B.Tech	Current Academic Year: 2023-24								
Bra	nch: CSE	Semester: III								
1	Course Code	CSP 244								
2	Course Title	Principles of operating System Lab								
3	Credits	1								
4	Contact Hours	0-0-2								
	(L-T-P)									
	Course Status									
5	Course	Introduces different type operating systems, function	s of operating							
	Objective	systems, working in a Unix/Linux and Windows sy	stem, writing							
		programs on Process management and file managem	ent.							
6	Course									
	Outcomes	CO1: Working with single user multi task and mu	lti-user multi-							
		tasking environment.								
		CO2: Identify and use utilities of Windows & U	nix operating							
	systems									
		management and file management	i.e. process							
		CO4. Writing programs on Process creation mu	ltiple process							
		creation, process synchronization.	iupie process							
		CO5: Writing program on basic file operations								
		CO6: Writing program on file buffering.								
7	Course	The course is designed to make the students rese	earch/industry							
	Description	ready as operating systems are indispensable for the	systems used							
		in industries/research organizations. New operating	g systems for							
		different gadgets are launched in last few years. So th	e students will							
0		get the design principles operating system in this cou	irse.							
8	Outline syllabus	5	CO							
	Unit 1	Introduction	Mapping							
		Illustration of Different types of operating system:	CO1							
		Single user Multi task Multi user Multi task	COI							
		Basic Windows features & Unix commands.	CO2							
	Unit 2	Processes								
		Process basics: Creating processes using fork(),	CO2, CO3,							
		the parent-child processes PID, PPID, process	CO4							
		states: creating orphan, zombie processes.								
	Unit 3	Process Synchronization								
		Creating multiple processes, Process table, use the	CO3, CO4							
		command ps with –el, Synchronization of processes								
	TT . • 4 4	by using sleep() & wait(), background process,								
	Unit 4	Files	<u> </u>							
		basic file operations, Programs for File operations,	CO3,							
	Unit 5	sharing data between processes using mes.	04,005							
	UIIIt 5	r ne duniering								



	File descript buffer acces	ile descriptor table, system file table, file pointer ouffer accessing block wise, use the functions											
	fopen(), fre	open(), fread(), ftell(), lseek(), fflush() etc.											
Mode of	Practical	ractical											
examination													
Weightage	CA	CA CE(Viva) ETE											
Distribution	25%	25% 25% 50%											
Text book/s*	1. Sumitabh	a Das, "Unix (	Concepts and										
	Applications	s", Tata McGr	aw Hill.										
Other	1. Unix: The	e complete Re	ference, Kenneth Rosen										
References	et.al., TMH	et.al., TMH											
	2. Unix 'C'	Odessey, Mee	ta Gandhi et.al. BPB										
		•											

<b>Course outline</b>												
This course introd	uces the features of GUI i.e. Windows operating system as well as the CUI											
i.e. the commands	s used in Unix, so that the students will be familiar with both GUI & CUI											
environment of operating systems. As the course progresses the students will learn to write												
programs for proc	programs for process management and file operations. Further the students can implement											
the algorithms stu	the algorithms studied in theory by writing programs using the above principles and skills.											
<b>Course Evaluation</b>	on a second s											
Attendance	None											
Any other	CA judged on the practical conducted in the lab, weightage may be											
	specified											
References												
Text book	1. Sumitabha Das, "Unix Concepts and Applications", Tata McGraw											
	Hill.											
Other	1. Unix: The complete Reference, Kenneth Rosen et.al., TMH											
References	2. Unix 'C' Odessey, Meeta Gandhi et.al. BPB											
Software	Windows, Unix / Any Unix family OS i.e. Linux											

-		
S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	CO1: Working with single user multi task and	PO1,PO2,PO3,PO4,PSO1
	multi-user multi-tasking environment.	
2.	CO2: Identify and use utilities of Windows &	PO1, PO3, PO4, PSO2
	Unix operating systems	
3.	CO3: Use the resources of operating system i.e.	PO1,PO2,PO3,PO4
	process management and file management	
4.	CO4: Writing programs on Process creation,	PO9, PO10, PO11, PSO3
	multiple process creation, process	
	synchronization,	

CSE, SSET, SU

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5.	CO5: Writing program on basic file operations	PO1,PO2,PO8,PO9,PO10,PSO1
6.	CO6: Writing program on file buffering.	PO1,PO2,PO10,PO11,PSO1,PSO2

### PO and PSO mapping with level of strength for Course Name Principles of Operating System (Course Code CSP 244)

		r		r											1	1
CSE24	Cos	PO	PO1	PO1	PO1	PSO	PSO	PSO								
4		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
		3	3	3	3				2	2	1	2	1	3	2	2
	CO															
	1															
		3	2	3	3				2	2	2	1	1	2	3	2
	CO	-		-	_										_	
	2															
	_	3	3	3	3				1	1	1	3	2	3	2	1
	CO	5	5	5	5				1	1	1	5	2	5	2	1
	0															
	3															
	CO	2	2	2	2	1			2	3	3	3	1	2	2	2
	4															
	Co5	2	2	3	-	-	-	-	3	3	1	2	-	3	-	-
	60	2	2								2	2		2	2	
	00	3	2	-	-	-	-	-	-	-	2	3	-	2	2	-
	6															



Sc	hool: SET	Batch : 2023-27	Batch : 2023-27					
Pr	ogram: B.tecl	h Current Academic Year: 2023-24	Current Academic Year: 2023-24					
Br	anch: CSE / I	IT Semester: 3 <sup>rd</sup>	Semester: 3 <sup>rd</sup>					
1	Course Code	CSP254 Course Name: Project Based Learn	ning -1					
2	Course Title	Project Based Learning -1	Project Based Learning -1					
3	Credits	2						
4	Contact Hour	rs 0-0-4						
	(L-T-P)							
	Course Status	s Compulsory						
5	Course Object	tive 1. To align student's skill and interests with	th a realistic					
		problem or project						
		2.To understand the significance of problem	and its scope					
		3.Students will make decisions within a fram	ework					
6	Course Outco	bmes Students will be able to:						
		CO1: Identify and formulate problem st	atement with					
		systematic approach.						
		CO2: Develop teamwork and problem-solving	g skills, along					
		with the ability to communicate effectively wit	h others.					
		CO3: Design the problem solution as per	the problem					
		statement framed.	statement framed.					
		CO4: Classify and understand techniques	CO4: Classify and understand techniques for software					
		verification and validation of project successful $CO5$ . Echarizate and implement the solution has	verification and validation of project successfully.					
		cos: Fabricate and implement the solution by	aspects of programming language					
		CO6: Develop a glory of the need to engage	aspects of programming language.					
		learning	Learning					
7	Course Descr	ription In PBL -1 the students will learn how to defin	In PBL -1, the students will learn how to define the problem					
,	Course Deser	for developing projects, identifying the skill	for developing projects identifying the skills required for					
		developing the projects, rechtliging une sind developing the project based on given a set of	specifications					
		and all subjects of that Semester.	specifications					
8	Outline syllal	bus	CO					
	2		Mapping					
	Unit 1	Problem Definition, Team/Group formation and Project	CO1, CO2					
		Assignment. Finalizing the problem statement, resource						
		requirement, if any.						
	Unit 2	Develop a work flow or block diagram for the proposed	CO2,CO3					
	system / software.							
<u> </u>	Unit 3	Unit 3Design algorithms for the proposed problem.C						
	Unit 4	Implementation of work under the guidance of a faculty	CO3, CO4					
	<b>T</b> T <b>1</b> / <b>7</b>	member and obtain the appropriate results.						
	Unit 5	Demonstrate and execute Project with the team. Validate	CO4, CO5,					
		and verify the project modules.	CU6					
		Report should include Abstract, Hardware / Software						
		Requirement, Problem Statement, Design/Algorithm,						
		Implementation Detail. Validation Reports.						
		keierences II any.						



	The presentation, report, w supported by the documen assessment.							
Mode of	Practical /Viva	Practical /Viva						
examination								
Weight age	СА							
Distribution	25%							

S.	Course Outcome	Program Outcomes (PO)
No.		
1.	CO1: Identify and formulate problem statement	PO1, PO2, PO4, PO9, PO10,
	with systematic approach.	PO11,
		PO12,PSO1,PSO2,PSO3
2.	CO2: Develop teamwork and problem-solving	PO1, PO2, PO4, PO7, PO9,
	skills, along with the ability to communicate	PO10, PO11, PO12, PSO3
	effectively with others.	
3.	CO3: Design the problem solution as per the	PO1, PO2, PO5, PO9, PO10,
	problem statement framed.	PO11, PO12, PSO1,PSO2
4.	CO4: Classify and understand techniques for	PO1, PO2, PO6, PO9, PO10,
	software verification and validation of project	PO11, PO12,PSO2
	successfully.	
5.	CO5: Fabricate and implement the solution by	PO1, PO2, PO3, PO4, PO5,
	using different aspects of programming language.	PO6, PO7, PO8, PO9, PO10,
		PO11, PO12 PSO1,PSO2,
		PSO3
6.	CO6: Develop a glory of the need to engage in life-	PO1, PO2, PO4, PO9, PO10,
	long learning.	PO11, PO12, PSO3

#### PO and PSO mapping with level of strength for Course Name Project Based Learning -1 (Course Code CSP254)

CO/PO Mapping															
	(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low														
Cos						Pr	ogran	nme O	utcom	nes(PO	s)				
	PO	PO	РО	РО	РО	РО	РО	РО	PO	РО	РО	PO	PS	PS	PS
	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	03
CO1	3	3	-	3	-	-	-	-	3	3	2	3	2	2	1
CO2	3	2	-	3	-	-	2	-	3	3	2	3			1
CO3	3	2	-	-	2	-	-	-	3	3	2	3	2	2	
CO4	3	3	-	-	-	2	-	-	3	3	2	3		2	
CO5	3	3	2	2	2	2	3	3	3	3	2	3	2	2	
CO6	3	3	-	3	-	-	-	-	3	3	2	3			1
AvgP	3	2.7	0.3	1.8	0.6	0.6	0.8	0.5	3	3	2	3	1	1.4	0.5
0			4	4	/	/	4								
attain															
ed															



Program: B.techCurrent Academic Year: 2023-24Branch: CSE / ITSemester: 3 <sup>rd</sup> 1Course CodeCSP2922Course TitleSummer Internship-I2Course TitleSummer Internship-I						
Branch: CSE / IT     Semester: 3 <sup>rd</sup> 1     Course Code     CSP292       2     Course Title     Summer Internship-I						
1     Course Code     CSP292     Course Name: Summer Internship-I       2     Course Title     Summer Internship-I						
2 Course Title Summer Internship-I						
3 Credits 2						
4 Contact Hours						
(L-T-P)						
Course Status Compulsory						
5 Course Objective This course will expose students to apply theories le	s learned in					
the classroom and provides current techr	chnological					
developments relevant to the subject area of	f training.					
Students will be able to identify the career preferen	prences and					
professional goals.						
Course Outcomes Students will be able to.	practices					
$CO^2$ : Identify and analyze an appropriate problem	practices.					
$CO_3$ : Develop teamwork and apply prior acquired kn	r. knowledge					
in problem solving.	kilowiedge					
CO4: Demonstrate effective verbal and	l written					
communication skills.						
CO5: Practice engineer's responsibilities, self-unders	erstanding,					
self-discipline and ethical standards.	-					
CO6: Identify the career preferences and professiona	CO6: Identify the career preferences and professional goals.					
7 Course Description The Internship aims to offer students the opportunity	The Internship aims to offer students the opportunity to apply					
their prior acquired knowledge in problem solving.	their prior acquired knowledge in problem solving. Students					
will acquire skills important for time management, di	will acquire skills important for time management, discipline,					
self learning, and effective communication and so or	on.					
8 Outline syllabus CO	0					
Mar	lapping					
<b>Unit I</b> Define objectives and conditions for the internship, ensuring COI students that it is related to the study path carried out at the	01,006					
University						
<b>Unit 2</b> Problem Definition and identification. Team/Group CO	02.CO6.					
formation and Project Assignment. Finalizing the problem	,,					
statement, resource requirement, if any.						
<b>Unit 3</b> The internship work plan is drawn up by developing team work CO.	O3,CO6,					
and applies prior acquired knowledge in problem solving.						
Unit 4 Demonstrate and execute Project with the team. Submission CO <sub>4</sub>	04,CO6					
of evaluation form and final report completed by the intern.	05.001					
Unit 5 Final evaluation form completed by the supervisor at the Host COS	05,CO6					
committee.						
Mode of Theory						
examination						
Weight age CA CE	E(Viva)					
Distribution						
25% 25%	5%					



Text		ETE	
book/s*		50%	
Other			
References			

S.	Course Outcome	Program Outcomes (PO)
No.		
1.	CO1: Get familiarize with industry principles and	PO1
	practices.	
2.	CO2: Identify and analyze an appropriate problem.	PO2,PO3,PO5,PSO1,PSO2
3.	CO3: Develop teamwork and apply prior acquired	PO1,PO2, PO3,PO9,PSO1
	knowledge in problem solving.	
4.	CO4: Demonstrate effective verbal and written	PO10
	communication skills.	
5.	CO5: Practice engineer's responsibilities, self-	PO6,PO8
	understanding, self-discipline and ethical	
	standards.	
6.	CO6: Identify the career preferences and	PO12,PSO1
	professional goals.	

## PO and PSO mapping with level of strength for Course Name Summer Internship-I

CO/PO Mapping															
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low															
Cos						Pr	ogran	nme O	utcon	nes(PO	s)				
	РО	PO	PO	PO	PO	PO	PO	PO	PO	PO	РО	РО	PS	PS	PS
	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	03
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	2	-	-	-	-	-	-	-	2	2	-
CO3	2	2	3	-	-	-	-	-	3	-	-	-	1	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO5	-	-	-	-	-	2	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-
Avg PO attain ed	1	0.8 4	0.8 4	0	0.3 4	0.3 4	0	0.5	0.5	0.5	0	0.34	0.64	0.34	0



## TERM - IV



## 2.1 Template A1: Syllabus for Theory Subjects

Sc	hool: SET	Batch : 2023-27					
Pr	ogram: B.Tech	Current Academic Year: 2023-24					
Br	anch:	Semester: IV					
M	echanical						
En	gineering						
1	Course Code	HMM305					
2	Course Title	Management for Engineers					
3	Credits	3					
4	Contact Hours	3-0-0					
-	(L-T-P)						
	Course Status	Compulsory					
5	Course	The objective of this course is to expose the students	s to understand				
-	Objective	the basics of Management Foundations. The students	will be given a				
	J	detailed grounding for the theories and cases related	to the general				
		management. The aim of the course is to orient t	he students in				
		theories and practices of Management so as to appl	y the acquired				
		knowledge in actual business practices. This is a gate	way to the real				
		world of management and decision-making.	2				
6	Course	CO1: Define basic principles and concepts related to	management				
	Outcomes	in an organization including the functions, different t	heories of				
		management and roles they play in an organization.					
		CO2: Explain the primary function Planning with its	process. Also,				
		how forecasting is done in organizations with various	techniques are				
		used.	-				
		CO3: Use of organizing by studying different types of	of organization				
		and also using decentralization and span of control in	organizations.				
		CO4: Analyse jobs, recruitment process, manpower planning, job					
		rotation, trainings and rewards in various organization	ıs.				
		CO5: Measure motivation and management control c	oncepts to				
		obtain effective controlling in management system in	organizations.				
		CO6: Develop proper system in an organization by us	sing all the				
		functions of management.					
7	Course	This course gives an overview of engineering manage	ement and help				
	Description	to understand the various functions of manageme	nt used in an				
		organization. The focus of the course is the de	evelopment of				
		individual skills and team work.					
8	Outline syllabus		CO Mapping				
	Unit 1	Introduction of Management & Organisation	CO1,CO6				
	А	Management-Definition of Management &	CO1,CO6				
		Organisation	,				
	В	Concept, Nature, Scope and Functions of	CO1,CO6				
		Management, Levels of Management, Management	·				
		Theories - Taylors principle, Fayol's Principles,					
		Hawthorne Studies, Systems Approach and					
		Contingency Approach to Management.					



С	Mintzberg's N	Managerial Ro	les, Skills of Manager,	CO1,CO6
	Functions of	management		
Unit 2	Management	Planning Proc	ess	CO2,CO6
А	Planning obje	ectives and cha	aracteristics.	CO2,CO6
В	Hierarchies of	CO2, CO6		
С	The concept a	and techniques	of forecasting.	CO2,CO6
Unit 3	Organizing			C03,C06
А	Meaning, Imp	portance and P	rinciples	C03,C06
В	Departmental	ization, Span	of Control	CO3,CO6
С	Types of Org	anization, Aut	hority, Delegation of	CO3,CO6
	Authority			
Unit 4	Staffing			CO4,C06
Α	Meaning, Job	analysis		CO4,C06
В	Manpower pl	anning, Recru	itment, Transfers and	CO4, CO6
	Promotions			
C	Appraisals, M	Ianagement D	evelopment, Job	CO4, CO6
	Rotation, Tra	ining, Reward	s and Recognition,	
Unit 5	Directing & C	Controlling		CO5,CO6
А	Motivation, C	Co-ordination,	Communication,	CO5,CO6
В	Directing and	Management	Control, Decision	CO5,CO6
	Making,			
C	Management	by objectives	(MBO) the concept and	CO5,CO6
	relevance. Ob	jectives and P	rocess of Management	
	Control			
Mode of	Theory			
 examination		ſ	I	
Weightage	CA	MTE	ETE	
 Distribution	25%	25%	50%	
Text book/s*	1. Princip			
Other	1. Manage			
References	2. Princip			
	3. Unders	tanding Mana	gement, Richard L.Daft	
	4. Manage	ement, Stoner,	Freemand & Gilbert	
	5. Essenti	al of Manager	nent, Koontz O' Donnel	
1		-		



## **BTY223** (Introduction to Biology for Engineers)

Sc	hool: SET	Batch : 2023-27							
Pr	ogram: B	Current Academic Year: 2023-24							
Te	ch								
Br	anch:	Semester:							
1	Course Code	BTY223							
2	Course Title	Introduction to Biology for Engineers							
3	Credits	2							
4	Contact Hrs	2-0-0							
	(L-T-P)								
	<u> </u>								
	Course	Compulsory							
_	Gamma		1 interestions (111 1 1						
2	Course	Students will be introduced to the functions an	d interactions of biological						
	Objective	with engineering of living systems and to apply	various tools of traditional						
		engineering fields. To harness potential of living	systems for the benefit of						
		human mankind.	5 systems for the benefit of						
6	Course	After the successful completion of this course stud	ents will be able to:						
	Outcomes	CO1 Analyze the fundamentals of living things, th	eir classification, cell						
		structure and biochemical constituents.							
		CO2: Examine the concept of plant, animal and m	icrobial systems and growth						
		in real life situations.							
		CO3: Discuss bout genetics and the immune system	m.						
		CO4: Inspect the cause, symptoms, diagnosis and	treatment of common						
		CO5: Elaborate the basic knowledge of biological systems in relevant							
		industries							
		CO6: Appraise the potential of living system for the benefit of environment							
		and human kind and ecosystem.							
7	Course	Introduction to Biology designed foundation for	or careers in for basics of						
	Description	biotechnology, or research in all branches of the E	ngineering sciences.						
8	Outline syllabi	18	CO Mapping						
	Unit 1	INTRODUCTION TO LIFE PROCESSES &							
		BIOTECHNOLOGY							
	A	Characteristics of living organisms; Cell theory;	CO1, CO6						
		structure of Prokaryotic and Eukaryotic Cell							
	В	Introduction to Biotechnology and its							
	C	Interdisciplinary applications							
	C	databases: and their applications in various fields							
		of science							
	Unit 2	Biomolecules							
	A	General classification and important functions of	CO2. CO6						
		carbohydrates and lipids	,						



	1			
В	General class proteins	sification and	important functions of	
С	General class DNA and RN	sification and	important functions of	
Unit 3	Genetics and	d Immune sys		
А	Theories of I	Evolution		CO3, CO6
В	Mendel's la project	ws of inherit	ance; human genome	
С	Immune syst in viral disea	em and Immu ses: case studi	nity; role of immunity es of COVID-19	
Unit 4	Human Dise	eases; Prevent	tion and Cure	
А	Genetic dise of biotechno	ases and Infec logy in cure of	tious diseases and role these diseases	CO4, CO6
В	AIDS and D cure of AIDS	iabetes and ro and diabetes	le of biotechnology in	
C	Cancer its c cure of cance	auses and role	e of biotechnology in	
Unit 5	UNIT V: 1 applications	Biotechnology	and its Industrial	
А	Genetic Recombinan fields: medic therapeutics	Engineering: t DNA Techi cine, food, ag	Applications of nology across various priculture, diagnostics,	CO5, CO6
В	Application waste Biopesticides	of biotechnolo management: s, Biofertilizer	bgy in agriculture and Bioremediation, s	
С	Production o Bioreactors	f recombinant	proteins and vaccines;	
Mode of examination	<b>Theory</b> /Jury	/Practical/Viva		
Weightage	CA	MTE	ETE	
Distribution	25%	25%	50%	
Text book/s*	Berger, S. e <i>Bioengineer</i> University I	t al. <i>Introduc</i> ring, 2020 ed Press (ISBN:		
Other References	1. Alberts, 2018 G 0815334	B. et al. <i>Ess</i> arland Publi 480X) 4.	sential Cell Biology, ishing, Inc. (ISBN:	



COURSE	ARTICUL	ATION	MATRIX
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		1	1	1				1	1	1	1	T
COs	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12
C01	3	-	-	1	-	-	-	1	3	-	-	3
CO2	3	-	-	1	-	-	-	-	3	-	-	3
CO3	3	3	3	2	3	-	-	-	2	-	-	2
CO4	3	3	3	2	3	-	-	1	-	-	-	2
CO5	3	-	3	1	-	2	2	2	3	-	-	3
CO6	3	3	3	3	3	3	1	2	3	-	-	2
Avg. Wt.	3	1.50	2.00	1.66	1.50	0.83	0.5	1	2.33	0	0	2.50



## Syllabus: CSP 249, Database management System

Sch	ool: SET	Batch : 2023-27					
Pro	gram: B.Tech	Current Academic Year: 2023-24					
Bra	nch: CSE	Semester: IV					
1	Course Code	CSE249	Course Name				
2	Course Title	Database	Management System				
3	Credits	3					
4	Contact Hours (L-T-P)	3-0-0	3-0-0				
	Course Status						
5	Course Objective	<ol> <li>Develop the ability to design,</li> <li>Implement and manipulate databases.</li> <li>Introduce students to build data base management systems.</li> <li>Apply DBMS concepts to various examples and real life application</li> </ol>					
6	Course Outcomes	Students w CO1: Expl CO2: Dem CO3: Abil diagrams in CO4: App database. CO5: To a Serializabil CO6: Desi	vill be able to: ain the basics concepts of data base. constrate the knowledge of databases to E-R modelling. ity to design entity relationship and convert entity relationship nto RDBMS and formulate SQL queries on the respective data. ly normalization techniques to reduce redundancy from the ppraise the basic issues of Transaction processing, lity& concurrency control gn & develop database for real life problems				
7	Course Description	This course Emphasis i simple tabl	e introduces database design and creation using a DBMS product. s on, normalization, data integrity, data modeling, and creation of es, queries, reports, and forms. Upon completion, students should				



		be able to design and implement normalized database structure simple database tables, queries, reports, and forms.							
8	Outline syllabus	5	CO Mapping						
	Unit 1	Introduction to Databases:							
	A	Introduction of DBMS, Characteristic of DBMS, Data Models, Database languages, Database Administrator, Database Users.							
	В	Three Schema architecture of DBMS, Data Models, Hierarchical, Network ,Data independence and database language, DDL, DML, Data Modeling using Entity Relationship Model	CO1,CO2,CO6						
	С								
	Unit 2								
	А	Relational data model concepts ,Concept of keys, Mapping Constraints							
	В	Null Values, Domain Constraints, Referential Integrity Constraints	CO3						
	С	Unary Relational Operations: SELECT and PROJECT Relational Algebra Operations from Set Theory ,Binary Relational Operations: JOIN and DIVISION ,SQL.							
	Unit 3	Normalization in Design of Databases:							
	A	Functional Dependency, Different anomalies in designing a Database, loss less join decompositions							
	В	Normalization : first second and third normal forms, BoyceCodd normal form, dependency preservation,	CO1, CO4, CO6						
	С								
	Unit 4	Transaction Management:							
	А								



В	Serializability schedule	Serializability of schedules, conflict & view serializable schedule						
С	Recovery fro	Recovery from transaction failures, deadlock handling.						
Unit 5	Concurrenc	Concurrency Control						
A	Two-Phase L , Concurrenc	ocking Techn y Control Base	iques for Concurrency Control ed on Timestamp Ordering					
В	Multiversion ,Validation (	Multiversion Concurrency Control Techniques ,Validation (Optimistic) Concurrency Control Techniques						
С	Granularity o Locking	Granularity of Data Items and Multiple Granularity Locking						
Mode of examination	Theory	Theory						
Weightage	CA	MTE	ETE					
Distribution	25%	25%	50%					
Text book/s*	1. Kortl Conc	h , Silberschat cepts, Tata Mc	z&Sudarshan, Data base Graw-Hill, Latest Edition					
Other References	1.Elmasr Systems, 2.Thoma Systems: Impleme Educatio	Concepts, Tata McGraw-Hill, Latest Edition 1.Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education Inc. 2.Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to design, Implementation and Management, Pearson Education, Third Edition.						

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	Understand the basics concepts of data base.	PO1, PO6, PO12, PSO1,PSO2
2.	Acquire the knowledge of databases to E-R	PO1, PO5, PO6, PO9, PO12,
	modelling.	PSO1 PSO2
3.	Ability to design entity relationship and	PO1, PO2, PO3, PO5, PO6, PO12
	convert entity relationship diagrams into	PSO1, PSO2

CSE, SSET, SU

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	RDBMS and formulate SQL queries on the			
	respective data.			
4	Learn the basic concept of normalization &	PO1, PO2, PO3, PO4, PO6, PO8		
	apply them to reduce redundancy from the	PO9 ,PO12 , PSO3		
	database .			
5	To appraise the basic issues of Transaction	PO1, PO2, PO3, PO5, PO6, PO8		
	processing ,Serializability& concurrency	PO12 ,PSO2		
	control			
6	Design & develop database for real life	PO1, PO2, PO3, PO4, PO5, PO6		
	problems	PO8 ,PO9 ,PO10 ,PO11, PO12		
		PSO3		

# PO and PSO mapping with level of strength for Course Name Database Management System (Course Code CSE 249)

COs	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	2	-	-	-	-	-	3	3	3	-
CO2	2	-	-	-	3	2	-	-	2	-	-	3	3	3	-
CO3	3	3	3	-	3	2	-	-	-	-	-	2	2	3	-
CO4	3	3	3	3	-	2	-	2	3	-	-	2	-	-	3
CO5	2	3	2	-	2	2	-	2	-	-	-	1	-	3	-
CO6	3	3	3	3	3	3	-	3	3	3	2	3	-	-	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code/ Name	PO 1	PO 2	PO 3	P 0 4	PO 5	P O 6	P 0 7	P 0 8	P O 9	P O 10	P 0 11	P 0 12	PS O 1	PS O 2	PS O 3
CSE 249/ DBMS	2.6 7	3	2.7 5	3	2.7 5	2. 2	-	2. 3	2. 7	3	2	2. 3	2.6	3	3

Strength of Correlation:1. Addressed to Slight (Low=1) extent 2. Addressed to
Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



## Syllabus for Introduction of Entrepreneurship Development (IED001)

Scho	ool: SET	Batch : 2023-27						
Prog	gram: B. Tech	Current Academic Year: 2023-24						
Bra	nch: CSE	Semester: IV						
1	Course Code	IED001						
2	Course Title	Introduction of Entrepreneurship Development						
3	Credits	2						
4	Contact Hours	0-1-2						
	(L-T-P)							
	Course Status	CORE						
5	Course Objective	Entrepreneurship plays an influential role in the economic growth and development of the country. As the world economy is changing so is the dynamism of the business world. The aim of this course is to instil and kindle the spirit of Entrepreneurship amongst students. The idea of this course is to create "job providers rather than job seekers".						
6	<ul> <li>6 Course Outcomes</li> <li>6 Course Outcomes</li> <li>7 After successfully completion of this course students will be able to CO1. To understand how start up entrepreneurship is supportive enhancing business.</li> <li>7 CO2. Outline different ways of idea generation as innovator.</li> <li>7 CO3. Identify &amp; utilize various Government policy for Small S Enterprises and its impact on Business.</li> <li>7 CO4. Analyze various financial schemes available to start up enterprise.</li> <li>7 CO5. Assess the importance &amp; significance of institutional suppo various levels for determining the entrepreneurial climate.</li> <li>7 CO6. Develop the art of creativity and innovations in managing entrepreneurial activities effectively.</li> </ul>							
7	Outline syllabus	· · · · · · · · · · · · · · · · · · ·	CO					
			Mapping					
	Unit A	Introduction to Entrepreneurship	CO1					
	Unit A Topic 1	Meaning, Definition and concept of Enterprise, Entrepreneurship and Entrepreneurship Development, Evolution of Entrepreneurship	CO1					
	Unit A Topic 2	Theories of Entrepreneurship. Characteristics of Entrepreneurship, Concepts of Intrapreneurship, Entrepreneur v/s Intrapreneur, Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager	CO1					
	Unit A Topic 3	Role of Entrepreneurship in Economic Development, Factors affecting Entrepreneurship, Problems of Entrepreneurship	CO1					
	Unit B	Entrepreneurship Journey as Innovator	CO2					
	Unit B Topic 1	Idea generation, Feasibility Study and opportunity assessment	CO2					
	Unit B Topic 2	Business Plan: meaning, purpose and elements, Execution of Business Plan	CO2					
	Unit B Topic 3	Entrepreneurs as problem solvers, Innovations and Entrepreneurial Ventures – Global and Indian,	CO2, CO6					
	Unit C	Setting Up Small Business Enterprises	CO3					
	Unit C Topic 1	Identifying the business Opportunity – Business opportunity in various Sectors – Formalities for setting up a small Business Enterprise	CO3					



Unit C Topic 2	Benefits to Small S Allowance, Investr	cale Enterprises: Tax H nent Allowance,	oliday, Rehabitation	CO3				
	Government polic	y for Small Scale Ente	erprises: New Small	СОЗ,				
Unit C Topic 3	Enterprise Policy	1991, Micro Small &	Medium Enterprises	CO6				
	Development (MS							
Unit D	Role of Governme	Role of Government in promoting Entrepreneurship						
	MSME policy in I	ndia, Agencies for Pol	icy Formulation and	CO4,				
Unit D Topic 1	Implementation: District Industries Centres (DIC),							
	Entrepreneurship I	Development Institute o	f India (EDII),					
	National Institute	of Entrepreneurship	& Small Business	CO4,				
Unit D Topic 2	Development (NIESBUD), National Entrepreneurship							
	Development Boar	d (NEDB),	1	<u></u>				
Unit D Topic 3	Financial Support	System: long term and	short-term financial	CO4,				
	support, investmen		C06					
Unit E	IPM & Institution	hal support for small b	businesses in India	<u>C05</u>				
Unit E Topic 1	Intellectual Proper	ty Management, Impor	tance of innovation,	COS				
	Introduction to law	tie Support in groop	CO5					
Unit E Topic 2	of entrepreneurshi	o development	ina, support in areas	COS				
	Case Studies based	on Role of Industry 4.0	in innovations Case	CO5				
Unit E Topic 3	Studies based on IPR & Patents							
Mode of	Theory/Jury/Practi							
examination								
Weightage	CA	CE (VIVA)	ESE					
 Distribution	25%	25	50%					
Text book/s*	1. Udyamita	by Dr. MMP. Akhouri	and S.P Mishra, By					
	National	Institute for Entrepren	eurship and Small					
	Business	Development (NIESE	SUD), NSIC-PATC					
	Campus, C	Jkhla						
	2. Entreprene	Someony Ltd	Dr S S Khanka, S					
	Chand & Company Ltd							
	5. Enucpient	s by Poorning M Chara	ntimath Pearson					
	4 I all & Sah	ai. Entreprenurshin (Ex	cel Books 2 edition)					
	Couger C	- Creativity and Innovat	tion (IPP, 1999)					
	5. Kakkar D	N - Enterpreneurship I	Development (Wilev					
	Dreamtech	l)	······································					

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1. To understand how start up entrepreneurship is	PO5, PO9, PO11, PO12
	supportive for enhancing business.	
2.	CO2. Outline different ways of idea generation as innovator.	PO1, PO2, PO3, PO4, PO5,
		PO6
3.	CO3. Identify & utilize various Government policy for	PO10, PO11, PO12
	Small Scale Enterprises and its impact on Business.	
4.	CO4. Analyze various financial schemes available to start up	PO10, PO11, PO12
	their enterprise.	
5.	CO5. Assess the importance & significance of institutional	PO4, PO7, PO12
	support at various levels for determining the	
	entrepreneurial climate.	



6.	CO6. Develop	the art of creativity and innovations in	PO2, PO3, PO4, PO5, PO11,
	managing	the entrepreneurial activities effectively.	PO12

## PO and PSO mapping with level of strength for Course Name Introduction of Entrepreneurship Development (Course Code IED001)

Course Code_ Course Name	C O 's	P O 1	P 0 2	P 0 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P 0 1 0	P 0 1	P 0 1 2	P S O 1	PS 0 2	PS 0 3
	C 0 1	-	-	-	-	1	-	-	-	2	-	2	3	-	-	-
	C 0 2	1	1	2	3	3	3	-	-	-	-	-	-	-	-	-
IED001_ Introduction of	C 0 3	-	-	-	-	-	-	-	-	-	3	2	3	-	-	-
Entrepreneurship Development	C 0 4	-	-	-	-	-	-	-	-	-	1	3	1	-	-	-
	C 0 5	-	-	-	1	-	-	3	-	-	-	-	2	-	-	-
	C O 6	-	1	3	2	1	-	-	-	-	-	1	2	-	-	-

Average of non-zeros entry in following table (should be auto calculated).

Co urs e Co de	Course Name	P 0 1	P 0 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	P 0 1 1	P O 1 2	P S O 11	P S O 2	P S O 3
IE	Introduction of			2		1.							2			
<b>D00</b>	Entrepreneurship	1	1	.	2	6	3	3	0	2	2	2	•	0	0	0
1	Development			5		7							2			

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



## Syllabus: CSE 251, Theory of Computation

Scho	ool: SET	Batch : 2023-27								
Prog	gram: B.Tech	Current Academic Year: 2023-24								
Brai	nch:CSE	Semester:IV								
1	Course Code	CSE-251 Course Name: Theory of Computation								
2	Course Title	Theory of Computation								
3	Credits	4								
4	Contact Hours	3-1-0								
	(L-T-P)									
	Course Status									
5	Course	The goal of this course is to provide students with an unde	erstanding of basic							
	Objective	concepts in the theory of computation.	C							
6	Course	Students will be able to:								
	Outcomes	CO1: Formulate the concept of Automata and related terr	ninology.							
		CO2: Design DFA and NDFA and conversion from NDFA	A to DFA.							
		CO3: Construct finite automata without output and with o	output.							
		CO4:Implement regular expression and grammar correspondence	onding to DFA							
		and vice-versa								
		<b>CO5: Design</b> Push down Automata from Context Free Lar	nguage or							
		Grammar and vice-versa.								
		<b>CO6: Design</b> Turing Machine for computational problems	s, Develop a clear							
-	9	understanding of un-decidability.								
1	Course	The course introduces some fundamental concepts in autor	nata theory and							
	Description	formal languages including grammar, finite automaton, reg	gular expression,							
		formal language, pushdown automaton, and Turing machin	ne. Not only do							
		they form basic models of computation, they are also the fo	oundation of							
		many branches of computer science, e.g. compilers, softwa	tre engineering,							
		concurrent systems, etc. The properties of these models wi	hom will be							
		discussed by using both formalism and examples	nem will be							
8	Outline syllabus	discussed, by using both formalism and examples.	CO Mapping							
0	Unit 1	Finite Automata	CO Mapping							
		Introduction to languages Kleene closures Finite	CO1 CO2							
	Л	Automata (FA) Transition graph Nondeterministic	001, 002							
		finite Automata (NFA) Deterministic finite Automata								
		(DFA).								
	В	Equivalence of NDFA and DFA. Construction of DFA	CO1. CO2							
	_	from NFA and optimization of Finite Automata.								
	С	Applications and Limitation of FA. (FAT tool).	CO1, CO2							
	Unit 2	Regular Expression and Finite Automata	,							
	А	Regular Expression, Finite Automata with null move,	CO1, CO2,CO4							
		Regular Expression to Finite Automata.								
	В	Arden Theorem, Pumping Lemma for regular	CO1, CO2,CO4							
		expressions.								
	С	FA with output: Moore machine, Mealy machine and	CO1, CO2,CO3							
		Equivalence.								
	Unit 3	REGULAR & CONTEXT FREE LANGUAGE								
	А	Defining grammar, Chomsky hierarchy of Languages and	CO4							
		Grammar. Ambiguous to Unambiguous CFG.								
	В	Simplification of CFGs.	CO4							
	С	Normal forms for CFGs, Pumping lemma for CFLs.	CO4							



Unit 4	PUSH DOW	<b>N AUTOMA</b>	ATA	
А	Description a PDA, Workin	nd definition on the second seco	of PDA and Non-Deterministic	CO5
В	Acceptance of Null store. The store of the s	of a string by wo stack PDA	PDA with final state and with	CO5
С	Conversion of PDA.	of PDA into (	CFG, Conversion of CFG into	CO5
Unit 5	TURING M			
А	Turing mach representation	CO6		
В	Turing mach problem of T	CO6		
C	Modification corresponder Numbering	CO6		
Mode of examination	Theory			
Weightage	CA	MTE	ETE	
Distribution	25%	25%	50%	
Text book/s*	1. K.L.	P. Mishra and	N.Chandrasekaran, "Theory of	
	Com Com			
Other	1.Peter Linz,			
References	Publishing H			
	2.Hopcroft, U	Ullman, "Intro	oduction to Automata Theory,	
	Language and	d Computation	n", Narosa Publishing House	

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	<b>CO1:</b> Formulate the concept of Automata and related	PO1,PO2,PO3,PO4,PO5,
	terminology.	PO9,PO12,PSO1,PSO2
2.	<b>CO2:</b> Design DFA and NDFA and conversion from NDFA	PO1, PO3, PO4, PO5, PO9,
	to DFA.	PO12 PSO2, PSO3
3.	<b>CO3:</b> Construct finite automata without output and with	PO1,PO2,PO3,PO4,
	output.	PO9,PSO1,PSO2
4.	<b>CO4:</b> Implement regular expression and grammar	PO1,PO2,PO3, PO5,PO9,
	corresponding to DFA and vice-versa	PO12 PSO3
5	CO5: Design Push down Automata from Context Free	PO1,PO2,PO3,PO4, PO5,
	Language or Grammar and vice-versa.	РО9,
		PO12,PSO1,PSO2,PSO3
6	CO6: Design Turing Machine for computational	PO1,PO2,PO3,PO4,PO5PO9,
	problems, Develop a clear understanding of un-decidability.	PO12, PSO1, PSO2,PSO3



## PO and PSO mapping with level of strength for Course Name Theory of Computation (Course Code CSE251)

0040	00														
Cos	РО	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO						
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO	3	3	3	3	2				3			3	3	2	
1															
CO	3		3	3	2				2			2		3	2
2															
CO	3	3	3	3					2				3	2	
3															
CO	2	2	2		2				3			2			3
4															
CO	3	3	3	3	3							3	3	2	2
5															
CO	3	2	3	3	3				2			3	3	3	2
6															

**1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)** *Average of non-zeros entry in following table (should be auto calculated).* 

Course Code	Course Name	РО 1	PO 2	PO 3	РО 4	P 0 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE251	тос	2.8	2.1	2.8	2.5	2	0	0	0	2	0	0	2.1	2	2	1.5

#### Strength of Correlation

- 1. Addressed to *Slight (Low=1) extent*
- 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



Scho	ool: SET	Batch: 2023-27										
Dep	artment	Department of Computer Science & Engineering										
Prog	gram: B.Tech	Current Academic Year: 2023-24										
Bra	nch:CSE	Semester:IV										
1	Course Code	CSE 011										
2	Course Title	Mathematical Techniques										
3	Credits	3										
4	Contact Hours	3-0-0										
	(L-T-P)											
	Course Status	Program Elective-I										
5	Course	The objective of the course is to teach students the mathematic	al & statistical									
	Objective	techniques that provide sound basis for research and application	development in									
	-	Computer Science.										
6	Course	By the end of the course, students will be able to:	tation and sorias									
	Outcomes	approximation.	auon and series									
		CO2: Make use of various Numerical techniques for interpolation.										
		CO3: Recall probability concepts and statistical terms to apply in various r	andom situations									
		CO4: Identify various distributions for suitable scenario										
		COS: Make use of various techniques for hypothesis testing CO6: Apply mathematical and statistical methods in their research and application										
		development										
7	Course	In this subject, the fundamental concepts and principles of Mathemati	cal & Statistical									
	Description	Techniques together with the challenging issues in Computer S	cience software									
		Computer Science will also be conducted.	mathematics and									
8	Outline syllabus	3	СО									
			Mapping									
	Unit 1	Introduction, Computational Errors and their Analysis										
	Α	Accuracy of numbers, Errors and a general error formula, Errors in	CO1, CO6									
	B	From a Series Approximation	CO1 CO6									
	C	Provisions	C01, C06									
	Unit 2	Numerical Techniques	01,000									
		I U decomposition for systems of linear equations:	CO2 CO6									
	R	numerical solutions of non-linear algebraic equations by Secant.	CO2, CO6									
	В	Bisection and Newton-Raphson Methods;	02,000									
	С	Numerical integration by trapezoidal and Simpson's rules.	CO2, CO6									
	Unit 3	Probability										
	A	Probability: Conditional Probability;	CO3,CO6									
	В	Mean, Median, Mode and Standard Deviation;.	CO3,CO6									
	C	Random Variables; Distributions;	CO3,CO6									
	Unit 4	Permutation										
	A	uniform, normal, exponential	CO4,CO6									
	B	Poisson, Binomial distribution CO4,CO6										
	C	Permutations; Combinations; Counting; Summation; CO4,CO6										
	Unit 5	Hypothesis testing										
	A	Generating functions; recurrence relations;	CO5,CO6									
	B	Techniques for statistical quality control,	CO5,CO6									
	C	Testing of hypotheses. CO5,CO6										



Mode of	Theory											
examination												
Weightage	CA	MTE	ETE									
Distribution	25%											
Text book/s*	M. Goyal, "C											
	Infinity Scienc	Infinity Science Press, LLC, MA, USA.										
Other	1. Mathe	eus Grasselli an	d Dimitry Pelinovsky, "Numerical Math	nematics", Jones								
References	and E	Bartlet Publisher	s, USA.									
	2. Lars I	2. Lars Elden, "Mattrix Methods in Data Mining and Pattern Recognition", SIAM										
	(Society for Industrial and Applied Mathematics), USA.											
	Internet as a re	esource for refer	ences.									

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	CO1: Identify and analyze computational errors in numerical computation and series approximation.	PO1, PO2, PSO1
2.	CO2: Make use of various Numerical techniques for	PO1, PO2, PO3, PO7, PO10,
	interpolation.	PO11, PO12, PSO1, PSO2
3.	CO3: Recall probability concepts and statistical	PO1, PO2, PO3, PO4, PO7, PO10,
	terms to apply in various random situations	PO11, PO12, PSO1, PSO2
4.	CO4: Identify various distributions for suitable	PO1, PO2, PO3, PO4, PO5, PO7,
	scenario	PO10, PO11, PO12, PSO1, PSO2
5.	CO5: Make use of various techniques for hypothesis	PO1, PO2, PO3, PO4, PO5, PO7,
	testing	PO10, PO11, PO12, PSO1, PSO2
6.	CO6: Apply mathematical and statistical methods in	PO1, PO2, PO3, PO4, PO5, PO7,
	their research and application development	PO10, PO11, PO12, PSO1, PSO2

# PO and PSO mapping with level of strength for Course Name Mathematical techniques (Course Code CSE011)

Course	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO	PO12	PSO	PSO2	PSO3
												11		1		
		3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
les	CO1															
iġi		2	3	1	1	1	-	1	-	-	1	2	1	1	1	-
hn	CO2															
<b>1</b> )		3	1	1	1	-	-	1	-	-	2	1	1	3	1	-
al 1 101	CO3															
SE		2	3	2	1	1	-	1	-	-	1	1	1	2	1	-
	CO4															
len	CO5	1	1	1	2	2	-	1	-	-	1	2	1	2	1	-
ath																
Ϊ	CO6	3	1	3	1	2	-	2	-	-	2	2	3	3	1	-


#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO2	РО 3	PO 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE011	Mathematical techniques	2.3	1.8	1.3	1	1	0	1	0	0	1.1	1.3	1.1	2.1	.8	0

#### Strength of Correlation

1. Addressed to *Slight (Low=1) extent*2. Addressed to *Moderate (Medium=2) extent*3. Addressed to *Substantial (High=3) extent*



Sc	hool: SET	Batch : 2023-27									
Pr	ogram: B.Tech	<b>Current Academic Year: 20</b>	23-24								
Br	anch:CS/IT	Semester:IV									
1	Course Code	CSE012 Course Name	: Introduction to G	braph Theory and its							
		Application									
2	Course Title	Introduction to Graph Theory	and its Application	on							
3	Credits	3									
4	Contact Hours	3-0-0									
	(L-T-P)										
	Course Status	Program Elective-I									
5	Course	The objective of the course is to te	ach students the basic	c graph theory concepts and							
	Objective	their applications in computer scien	ice.								
6	Course	After successful completion of the	course students will be	e able to							
	Outcomes	develop their skill in solving basic	applications and under	rstanding societal needs.							
		CO2: interpret the fundamentals of	f graphs and trees and	to apply these as computer							
		science applications such as to fir	nd a minimal spanning	g tree for a given weighted							
		graph etc.	. 1								
		costs and circuits in graphs p	operties and concep	ots of graphs such as cut-							
		application in the real-world	ianality of graphs								
		CO4: Examine a graph using ma	trices to communica	ate their application in the							
		real world.									
		CO5: Develop efficient graph-theoretic algorithms (mathematically) to explore the									
		applications of coloring problems of graph theory.									
		CO6: Relating the concepts	to prepare ground	s for project work and							
_		research interests.	1 • 1 4	. 1.1							
1	Course	This course is to teach students the applications in computer science	basic graph theory co	ncepts and their							
0	Description	applications in computer science.		CO 14							
8	Outline syllabus	T / 1 /		CO Mapping							
	Unit I	Introduction	f Creat Theorem	001							
	А	European Eur	ications in various	COI							
		areas	leations in various								
	В	Properties of graphs, theorems base	ed on different types	CO1,CO2							
	~	of graph and various operations on	graphs								
	С	Special types of graphs (Hamiltonia	in, Euler), Travelling	CO1, CO6							
	Unit 2	TREES									
	Δ	Fundamentals of trees and their typ	es. Binary trees and	CO2							
	1	their properties, importance of bina	ry trees in data	002							
		structure (searching algorithms)	-								
	В	fundamental circuits, spanning tree	s, algorithms to find	CO2							
	C	Applications: Representation of the	(NIUSKAI& Prim)	CO2 CO6							
	C	expressions as ordered binary trees.	, Huffman procedure	(02, 000)							
		for construction of an optimal tree	for a given set of								
<u> </u>		weights.									
	Unit 3	CUT SETS									
	A	a cut-set of a connected graph, the f	tundamental circuit	CO1, CO3							
		, rroperties of circuits & cut–sets, C	concept of								
L		connectivity and separability									



В	Concept of Plana Kuratowski's nor formula	r graphs with introdu n-planar graphs, Proc	ction to of of Euler's	CO3	
С	Detection of plan thickness & Cros	arity , geometric dua sings, network flow	ls of graph,	CO3, CO6	
Unit 4	Coloring and Cov	vering			
А	Concept of prope chromatic numbe	r coloring of vertices r , Chromatic partitio	of a graph, ning	CO5, CO6	
В	Chromatic polyno of a given graph	omial, finding chrom	atic polynomial	CO5, CO6	
С	Matching, Coveri	ing, Five color proble	em and its proof	CO5, CO6	
Unit 5	Matrix Represent	ation of Graphs& Ap	plications		
А	Incidence matrix fundamental circu	a, sub matrices of A(C uit matrix and Rank of	CO3, CO4		
В	Cut set matrix, fu matrix, Adjacenc	undamental cut set m y matrix	CO4		
С	Finding Rank of among A <sub>t</sub> , B <sub>t</sub> , and	different matrices, Re dC <sub>r</sub>	elationship	CO3, CO4	
Mode of	Theory				
examination	-				
Weightage	СА	MTE	ETE		
Distribution	25%	25%	50%		
Text book/s*	1. Deo, N, <i>Enginee</i> Hall Ind	Graphtheory with ap ring and Computer S ia			
Other References	<ol> <li>Wilson I Pearson</li> <li>Harary,</li> <li>Bondy&amp; <i>applicat</i></li> </ol>	R J, Introduction to C Education F, Graph Theory, Na Murthy, Graph theo ion. Addison Wesley			

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: : demonstrate some of the most important notions and	PO1, PO2, PO6, PO7, PO10,
	types of graph theory and develop their skill in solving basic applications understanding societal needs.	PO11, PO12, PSO1
2.	CO2: interpret the fundamentals of graphs and trees and to	PO1, PO2, PO3, PO4, PO6,
	apply these as computer science applications such as to find a minimal spanning tree for a given weighted graph etc.	PO7, PO10, PO12, PSO1
3.	CO3: Discover the advanced properties and concepts of	PO2, PO4, PO5,PO6, PO10,
	graphs such as cut-sets and circuits in graph, planarity of	PO12, PSO2
	graphs etc in addition to their application in real-world.	
4.	CO4: Examine a graph using matrices to communicate	PO2, PO4, PO10, PSO1,
	their application in real world.	PSO2,
5.	CO5: Develop efficient graph-theoretic algorithms	PO1, PO2, PO4, PO5, PO6,
	(mathematically) to explore the applications of coloring problem of graph theory	PO10, PO12, PSO2
6	CO6: Relating the concepts to prepare grounds for	PO4, PO6, PO12, PO10.
	project work and research interests.	PSO2, PSO3.



PO and PSO mapping with level of strength for Course Name: Introduction to Graph Theory and its Application (CSE 012)

C	DO	DO1	DO1	DO 1	DCO	DCO	DCO								
Cos	PO	POI	POI	POI	PSO	PSO	PSO								
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	3	3	2	2	1	2	2	-	-	2	1	2	3	1	-
CO2	3	3	3	2	-	1	1	-	-	1	-	2	3	1	-
CO3	1	3	1	3	2	2	-	-	-	1	-	2	2	2	-
CO4	1	3	1	3	1	1	-	-	-	2	-	1	3	2	-
CO5	2	2	2	3	2	1	-	-	-	1	-	2	1	2	-
Co6	1	1	2	3	1	2	-	-	-	2	-	2	1	2	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	P O 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE012	Introduction to Graph Theory and its Application	1.8 3	2.8 3	1.8 3	2.6 7	1.1 7	1.5	0.5	-	-	1.5	0.1 7	1.8 3	2.17	1.67	0.33

Strength of Correlation

- 1. Addressed to *Slight* (Low=1) extent
- 2. Addressed to *Moderate* (*Medium=2*) *extent*
- 3. Addressed to Substantial (High=3) extent

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Sch	ool: SET	Batch : 2023-27								
Prog	gram: B.Tech	Current Academic Year: 2023-24								
Bra	nch:CSE	Semester: IV								
1	Course Code	CSP249								
2	Course Title	Database Management System Lab								
3	Credits	1								
4	Contact	0-0-2								
	Hours									
	(L-T-P)									
	Course	Compulsory								
	Status									
5	Course	To Develop efficient SQL programs to access Orac	cle							
	Objective	databases								
		Build database using Data Definition Language Statements								
		Perform operations using Data Manipulation Lang	guage							
-	C	statements like Insert, Update and Delete								
6	Course	By the end of this course you will be able to:								
	Outcomes	CO1: Understand the concept of SQL commands in DBM	S							
		CO2: Create SQL SELECT statements that retrieve any re	quired data							
		CO3: Perform operations using Data Manipulation Langua	age							
		statements like Insert, Update and Delete								
		CO4: Manipulate your data to modify and summaries your	r results for							
		reporting								
		CO5: Apply Grouping Clauses on various tuples & relatio	ns of							
		database								
		CO6: Develop project based on various SQL commands.								
7	Course	An introduction to the design and creation of relational da	itabases.							
	Description	Create database-level applications and tuning robust busin	ess							
		applications. Lab sessions reinforce the learning objectives	sand							
		provide participants the opportunity to gain practical hand	s-on							
0	Outling gullab	experience.	C0							
0	Outline synab	us	CO							
	Unit 1	Practical based Data types	wapping							
	Omt I	Classification SOL Data types of SOL /Oracle	CO1 CO2							
	Unit 2	Practical based on DDL commands	01,002							
	Cint 2	Create table Alter table and drop table	CO2CO3							
	Unit 3	DML commands and Aggregate functions	02,005							
		Introduction about the INSERT, SELECT, UPDATE &	CO3.CO4							
		DELETE commands.	005,001							
	Unit 4	Practical based on Grouping Clauses GROUP BY	1							
		ORDER BY & GROUP BY HAVING								
		Briefly explain Group by, order by , having clauses with	CO5							
		examples. Aggregate function: sum, avg, count, max,								
		min								
	Unit 5	Practical based on Sub- queries, JOINS								

## Syllabus: CSP 249, Database management System Lab



	Related examples, Vi	nple of Sub- qu ews,Trigger	eries, Joins and related	CO5,CO6									
Mode of examination	Jury/Practica	ul/Viva											
Weightage	CA	CA CE(Viva) ETE											
Distribution	25%	25% 25% 50%											
Text book/s*	1. Korth ,Si McGraw-	1. Korth ,Silberschatz& Sudarshan, Data base Concepts, Tata McGraw-Hill											
Other References	1. Elmas Pearso 2. Thom	<ol> <li>Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education Inc.</li> <li>Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to design, Implementation and Management, Pearson Education, Latest Edition.</li> </ol>											
	2. Thoma Practi Mana												
3. Jeffrey D. Ullman, Jennifer Windon, A first course in Database Systems, Pearson Education.													

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Understand the concept of SQL commands in	PO1,PO5, PSO1 ,PSO2
	DBMS.	
2.	CO2: Create SQL SELECT statements that retrieve	PO2, PO3, PO4, PO5, PO9, PSO1, , PSO3
	any required data.	
3.	CO3: Perform operations using Data Manipulation	PO2, PO3, PO4, PO5, PO9, PSO1, , PSO3
	Language statements like Insert, Update and Delete.	
4.	CO4: Manipulate your data to modify and	PO2, PO3, PO4, PO5, PO9, PSO1, , PSO3
	summaries your results for reporting.	
5	CO5: Apply Grouping Clauses on various tuples &	PO2, PO3, PO4, PO5, PO9, PSO1, , PSO3
	relations of database	
6	CO6: Develop project based on various SQL	PO2, PO3, PO4, PO5, PO9, PO12, PSO1,
	commands.	PSO2,PSO3

PO and PSO mapping with level of strength for Course Name Principles of Database Management System lab (Course Code CSP 249)

COs	P01	P02	PO3	P04	P05	P06	P07	PO8	P09	PO10	P011	P012	PS01	PSO2	PSO3
CO1	3	-	-	-	2	-	-	-	-	-	-	-	2	3	2
CO2	-	3	3	3	2	-	-	-	3	-	-	-	2	3	3
CO3	-	2	2	2	2	-	-	-	3	-	-	-	2	2	3
CO4	-	2	2	2	2	-	-	-	3	-	-	-	2	2	3
CO5	-	2	2	2	2	-	-	-	3	-	-	-	2	2	3
CO6	-	2	3	2	3	-	-	-	3	-	-	2	3	3	3



Average of non-zeros entry in following table	e (should be auto calculated).
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Course Code/	РО	РО	РО	РО	РО	P O	РО	РО	РО	РО	РО	PO	PS	PS	PSO
Name	1	2	3	4	5	6	7	8	9	10	11	12	O 1	O2	3
CSP249															
/ DBMS	3	2.2	2.4	2.2	2.2	-	-	-	3	-	-	2	2.2	2.5	2.8
lab															

### Strength of Correlation

1. Addressed to Slight (Low=1) extent
2. Addressed to Moderate (Medium=2) extent
3. Addressed to Substantial (High=3) extent



.S	chool: SET		Batch : 2023-27								
Pr	ogram: B.tec	h	Current Academic Year: 2023-24								
B	ranch: CSE / ]	(T	Semester: 4th								
1	Course Code		CSP297 Course Name: Project Based Learn	ning -2							
2	Course Title		Project Based Learning -2								
3	Credits		2								
4	Contact Hour	ſS	0-0-4								
	(L-T-P)										
	Course Status	S	Compulsory								
5	Course Object	ctive	1. To align student's skill and interests wit	h a realistic							
	_		problem or project								
			2. To understand the significance of problem a	and its scope							
			3.Students will make decisions within a frame	ework							
6	Course Outco	omes	Students will be able to:								
			CO1: Identify and formulate problem sta	atement with							
			systematic approach.								
			CO2: Develop teamwork and problem-solving	g skills, along							
			with the ability to communicate effectively with	n others.							
			CO3: Design the problem solution as per	the problem							
			statement framed.								
			CO4: Explain the characteristics, architecture	e of database							
			approach, describe the components of the project	ct.							
			CO5: Fabricate and implement the solution by u	using different							
			object oriented concepts like encapsulation, polymorphism								
			etc.								
			CO6: Develop a glory of the need to engage in life-long								
			learning.								
7	Course Desci	ription	In PBL-1, the students will learn how to define the problem								
			for developing projects, identifying the skills required for								
			developing the project based on given a set of specifications								
			and all subjects of that Semester.								
8	Outline sylla	bus		CO							
				Mapping							
	Unit 1	Problem D	Definition, Team/Group formation and Project	CO1, CO2							
		Assignmen	it. Finalizing the problem statement, resource								
		requiremen	nt, if any.								
	Unit 2	Develop a	work flow or block diagram for the proposed	CO2,CO3							
		system / so	ftware.								
	Unit 3	Design alg	orithms for the proposed problem.	CO3							
	Unit 4	Implement	ation of work under the guidance of a faculty	CO3, CO4							
		member an	d obtain the appropriate results.								
	Unit 5	Demonstra	te and execute Project with the team. Validate	CO4, CO5,							
		and verify	the project modules.	CO6							
		Report sho	uld include Abstract, Hardware / Software								
		Requireme	nt, Problem Statement, Design/Algorithm,								
		Implement	ation Detail. Validation Reports.								
1		References	if any.								



	The presentation, report, w supported by the documen assessment.			
Mode of	Practical /Viva			
examination				
Weight age	СА	CE(Viva)	ETE	
Distribution	25%	25%	50%	

S.	Course Outcome	Program Outcomes (PO)
No.		
1.	CO1: Identify and formulate problem statement	PO1, PO2, PO4, PO9, PO10,
	with systematic approach.	PO11,
		PO12,PSO1,PSO2,PSO3
2.	CO2: Develop teamwork and problem-solving	PO1, PO2, PO4, PO7, PO9,
	skills, along with the ability to communicate	PO10, PO11, PO12 ,PSO3
	effectively with others.	
3.	CO3: Design the problem solution as per the	PO1, PO2, PO5, PO9, PO10,
	problem statement framed.	PO11, PO12, PSO1,PSO2
4.	CO4: Explain the characteristics, architecture of	PO1, PO2, PO6, PO9, PO10,
	database approach, describe the components of the	PO11, PO12, PSO2
	project.	
5.	CO5: Fabricate and implement the solution by	PO1, PO2, PO3, PO4,PO5,
	using different object oriented concepts like	PO6, PO7, PO8, PO9, PO10,
	encapsulation, polymorphism etc.	PO11, PO12 PSO1,PSO2,
		PSO3
6.	CO6: Develop a glory of the need to engage in life-	PO1, PO2, PO4, PO9, PO10,
	long learning.	PO11, PO12, PSO3

#### PO and PSO mapping with level of strength for Course Name Project Based Learning -1 (Course Code CSP297)

CO/PO Mapping															
	(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low														
Cos						Pr	ogran	nme O	utcon	nes(PO	s)				
	PO	PO	PO	PO	PO	PO	PO	PO	РО	РО	РО	PO	PS	PS	PS
	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	03
CO1	3	3	-	3	-	-	-	-	3	3	2	3	2	2	1
CO2	3	2	-	3	-	-	2	-	3	3	2	3			1
CO3	3	2	-	-	2	-	-	-	3	3	2	3	2	2	
CO4	3	3	-	-	-	2	-	-	3	3	2	3		2	
CO5	3	3	2	2	2	2	3	3	3	3	2	3	2	2	
CO6	3	3	-	3	-	-	-	-	3	3	2	3			1
Avg															
РО															
attaint															
ed	3	2.7	0.3	1.8	0.7	0.7	0.8	0.5	3	3	2	3	1	1.3	0.5

CSE, SSET, SU

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# TERM - V



School:		School of Engineering & Technology								
Depa	rtment	Department of Computer Science & Engineering								
Prog	ram:	B. Tech.								
Bran	ch:	Computer Science and Engineering								
1	Course Code	CSE021	CSE021							
2	Course Title	Introduction	Introduction to Cloud Computing							
3	Credits	3								
4	Contact Hours (L-T-P)	3		0	0					
	Course Status	Core								
5	Course Objective	This introduc fundamental Cloud techno	tory course on concepts of ho logies that ma	Cloud computing ow and why Cloud s nifest these concep	will teach both the systems works, as well as ts.					
6       Course Outcomes       At the end of the course, students will have achieved the following lead objectives.         CO1.       Define the basics of cloud and recall the computer Sc concepts which are helpful in understanding on demand set architecture.         CO2.       Classify and describe the architecture and taxonomy of pa and distributed computing, including shared and distri memory, and data and task parallel computing.         CO3.       Apply the PAAS and SAAS to manage the workflow and u cloud in scientific application.         CO4.       Categorize and Characterize between Infrastructure ser deployment models, and governance in cloud compu Examine the design of task and data parallel distri algorithms for Clouds and use them to construct ( applications.         CO5.       Evaluate the importance of cloud using monitoring management of services for performance improvement of and to follow the Governance and Compliances.										

		A++ NAAGE SHA UNIV Beyond B	RDA ERSITY Ioundaries									
		CO6. Elaborate the design concept and formulate to build using cloud service providers as AWS, MS Azu Cloud.Demonstrate the use of Map-Reduce, Vertex- Continuous Dataflow programming models.	the solution are, Google Centric and									
7	Course Description	This course is an introductory course for cloud computing concept helps in understanding the core functionalities, algorithms, models workflows in cloud environment. In this course Students wil demonstrations of real-time cloud services for better exposure and res understanding.										
8	Outline sylla	bus	CO Mapping									
	Unit 1	FOUNDATIONS										
	А	<b>Introduction to compute</b> Types of Computing, Grid computing, distributed computing, Client-server computing, Three Tier Architecture, use of Sockets and Remote Procedure Call, working of RMI and CORBA, Web services, Web Sockets, Message Queues and Message Brokers.	CO1									
	В	<b>Introduction to Cloud Computing</b> Cloud Computing definition, Roots of Cloud Computing, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks	CO1									
	С	<b>Migrating and Integrating into Cloud</b> Broad Approaches to Migrating into the Cloud, The Seven- Step Model of Migration into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era, Evolution and Challenges of SaaS Paradigm, Integration Scenarios, The Integration Methodologies	CO1									
	Unit 2	ENTERPRISE CLOUD COMPUTING AND IAAS										
	А	<b>The Enterprise Cloud Computing Paradigm</b> Issues for Enterprise Applications on the Cloud, Transition Challenges, Enterprise Cloud Technology and Market Evolution, Business Drivers Toward a Marketplace for Enterprise Cloud Computing, The Cloud Supply Chain	CO1,CO2									
	В	<b>Virtual Machines Provisioning and Migration Services</b> Introduction to Virtual Machines, The Anatomy of Cloud Infrastructures, VM Provisioning and Manageability, Virtual	CO1,CO2									



	Machine Migration Services, Management of Virtual Machines for Cloud Infrastructures,, Distributed Management of Virtual Infrastructures, Scheduling Techniques							
C	<b>Enhancing Cloud Computing Environments Using a</b> <b>Cluster as a Service</b> Introduction and Related Work, RVWS Design, Cluster as a Service: The Logical Design, Secure Distributed Data Storage in Cloud Computing, Cloud Storage, Technologies for Data Security in Cloud Computing	CO1,CO2						
Unit 3         PLATFORM AND SOFTWARE AS A SERVICE								
A	Aneka and Comet Cloud Aneka—Integration of Private and Public Clouds, Technologies and Tools for Cloud Computing, Aneka Cloud Platform, Comet Cloud: An Autonomic Cloud Engine, Introduction of Comet Cloud (Architecture, Autonomic Behavior, Applications overview)	CO1,CO3						
B Business Solutions and Workflow Cloud-Based Solutions for Business Applications (Introduction of Enterprises Demand and Cloud Computing Dynamic ICT Services), Workflow Engine for Clouds, Workflow Management Systems, Architecture of Workflow Management Systems								
С	Scientific Applications and Map Reduce Model Scientific Application for Cloud Environments, Classification of Scientific Applications and Services in the Cloud, SAGA-based Scientific Applications, Map Reduce Programming Model, Map Reduce Impacts and Research Directions	CO1,CO3, CO6						
Unit 4	MONITORING, MANAGEMENT & GOVERNANCE							
A	<b>SLA Management in Cloud Computing</b> Introduction of typical Use Cases, Model for Federated Cloud Computing, Security Considerations, SLA Management in Cloud Computing: A Service Provider's Perspective, Types of SLA, Life Cycle of SLA, Automated Policy-based Management	C01,C04						
B         Performance Predictions for HPC on Clouds           Introduction and Background of Grid and Cloud, HPC in the Cloud: Performance-related Issues, Game Hosting on Cloud								



	Resources, Build Clouds, Resource	ing Content Cloud Mashup	Delivery Networks Using s						
С	Security and Gov Basic Concept o Changes: Commo and Risk in the Content Level Se Cloud Computing Issues	CO1,CO4							
Unit 5	AWS, MS AZUR	AWS, MS AZURE AND GOOGLE CLOUD							
A	AWS Services:EC Watch,	CO1,CO5, CO6							
В	MS Azure Service Machines, Azure S Azure Backup	es: Azure VM SQL Database,	SQL Server on Virtual Azure Active Directory,	CO1,CO5, Co6					
С	Google Cloud: Co Engine, Cloud Fur Balancing ,Cloud	ompute Engine actions, Gsuite Storage	, Migrate for Compute Admin,Cloud Lab	CO1,CO5, CO6					
Mode of examinatio n	Theory/Jury/Pract	ical/Viva							
Weightage Distributio	CA	MTE	ETE						
n	25%	25%	50%						
Text book/s*	CLOUD COMPU by Raj Kumar Buy Cloud Computing Toby J. Velte, Rob								
Other References									



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Define the basics of cloud and recall the computer Science concepts which are helpful in understanding on demand service architecture. Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory, and data and task parallel computing.	PO1,PO2,PO3,PO4
2.	Define the basics of cloud and recall the computer	PO1,PO2,PO3,PO4
3.	Apply the PAAS and SAAS to manage the workflow and use of cloud in scientific application.	PO1,PO2,PO3,PO4,PSO2 ,PSO3
4.	Categorize and Characterize between Infrastructure services, deployment models, and governance in cloud computing. Examine the design of task and data parallel distributed algorithms for Clouds and use them to construct Cloud applications.	PO1,PO2,PO3,PO4,PSO2 ,PSO3
5.	Evaluate the importance of cloud using monitoring and management of services for performance improvement of HPC and to follow the Governance and Compliances	PO1,PO2,PO3,PO4,PSO2 ,PSO3
6.	Elaborate the design concept and formulate to build the solution using cloud service providers as AWS, MS Azure, Google Cloud.Demonstrate the use of Map-Reduce, Vertex-Centric and Continuous Dataflow programming models.	PO1,PO2,PO3,PO4,PSO1 ,PSO2,PSO3



Course Code_ Course Name	CO's	P 0 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	P O 1 1	P O 1 2	PS O 1	PS O2	PS O3
	CO1	2	3	1	2											
	CO2	2	2	2	3											
	CO3	1	3	1	2										2	3
Introductio	CO4	3	1	2	2										3	2
n to Cloud Computing (Course	CO5	2	2	3	1										2	2
Code CSE021)	CO6	1	3	1	2									2	3	3

**PO and PSO mapping with level of strength for Course Name** Introduction to Cloud Computing (**Course Code CSE021**)

Average of non-zeros entry in following table (should be auto calculated).

Co urs e Co de	Cour se Nam e	Р О 1	P O 2	Р О З	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	P O 1 1	P O 1 2	P S O 1	P S O 2	P S O 3
		1. 8 3	2. 3 3	1 6 6	2									.3 3	1. 66	1. 6 7

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent
2. Addressed to Moderate (Medium=2) extent
3. Addressed to Substantial (High=3) extent



## 2.1 Template A1: Syllabus for Theory Courses (SAMPLE)

Sch	ool:	School of Engineering & Technology										
Dep	artment	Department of Computer Science & Engineering										
Pro	gram:	B.Tech										
Bra	nch:	Computer Science and Engineering										
1	Course Code	CSE023										
2	Course Title	Android Application Development										
3	Credits	2										
4	Contact	2-0-0										
	Hours											
	(L-T-P)											
	Course Status	Core /Elective/Open Elective										
5	Course	1. Basics of Android OS										
	Objective	2. Develop Basic and advance Android Apps										
6	Course	CO1: Define anatomy of an android application.										
	Outcomes	CO2: Compare different components of Android Applic	ation									
		CO3: Develop various android applications related to la	youts and rich									
		uses interactive interfaces.										
		CO4:Analyze essential android programming concept										
		CO5: Access and work with databases under an android	operating									
		system.										
		android devices	ient for									
		android devices.										
7	Course	This android development course will help students to L	Inderstand the									
,	Description	basis of Android Platform and its lifecycle. This will he	elp them to									
	2 comption	implement simple GUI applications, use built-in compo	nents and									
		work with database to store the data.										
8	Outline syllabu	15	СО									
	-		Mapping									
	Unit 1	Introduction and Architecture of Android										
	А	History of Android, Features of Android, Open Handset	CO1									
		Alliance (OHA), Advantages of Android										
	В	Android Directory Structure, Architecture of Android.	CO1									
	С	Structure of Manifest files, CO1										
	Unit 2 Components of Android											
	А	Activity, Activity life cycle CO1,CO2										
	BServices, service life cycleCO1,CO2											
	C Content Provider, Broadcast receivers CO1,CO2											
	Unit 3	User Interfaces										
	A	Layouts-Linear layout, Relative layout, Constraint	CO3									
		layout, Table layout										



В	Input Control	s – Text input	, Checkboxes, Radio	CO3						
	buttons, Butto									
С	Dialog, date j	Dialog, date picker, Time picker								
Unit 4	Intent & Not	tification								
А	Intents, Inten	t Filter		CO4, CO6						
В	Implicit inten	t, Explicit Inte	ent	CO4, CO6						
С	Notification			CO4, CO6						
Unit 5	Working wit	h SQL Lite								
А	Introduction	to SQLite data	base, Steps for connecting	CO5,CO6						
	application w	ith database.								
В	Fetch and upo	late data in da	tabase from application,	CO5,CO6						
С	Cursor and co	ontent value, c	ppening and closing	CO5,CO6						
	database									
Mode of	Theory/Jury/	Practical/Viva								
examination										
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	1. Anubhav Prac									
	Apps: Learn, Ex									
 Others	India.									
Other	Development	1. wei-Meng Lee, Beginning Android 4 Application								
Keierences	2. Neil Smyth ,A	Android Studio D	Development essentials-Android 6							

S.	Course	Program Outcomes (PO) & Program Specific Outcomes (PSO)
No.	Outcome	
1.	CO1:	PO5,PO9,PO12,PSO3
	Demonstrate	
	and	
	understanding	
	anatomy of an	
	android	
	application.	
2.	CO2: Develop	PO5,PO9,PO12,PSO3
	various android	
	applications	
	related to	
	layouts and rich	
	uses interactive	
	interfaces.	
3.	CO3:Apply	PO3,PO5,PO9,PO12,PSO1,PSO3
	essential	
	android	
	programming	
	concept	
4.	CO4:	PO5,PO9,PO11,PO12,PSO3
	Distinguish and	

CSE, SSET, SU

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	compare different components of Android	
5.	CO5: Access and work with databases under an android operating system.	PO3,PO4,PO5,PO7,PO9,PO11,PO12,PSO3
6.	CO6: Develop Basic and advance android app development for android devices	PO1,PO2,PO3,PO4,PO5,PO7,PO9,PO11,PO12,PSO1,PSO2,PSO3

# **PO and PSO mapping with level of strength for Course Name** Android Application Development (**Course Code** CSE023)

Course Code_ Course Name	C O' s	P 0 1	PO 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P 0 1 0	P 0 1	P 0 1 2	PS O 1	PS O2	PS O3
	C 01					3				2			1			2
	C 02					3				2			1			2
	C 03			2		3				2			1	2		2
	C 04					3				2		2	1			2
	C 05			2	3	3		2		2		2	1			2
CSE023_ Android Application Development	C 06	1	2	3	3	3	3	3		3		3	1	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Cour		Р		Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
se	Course Name	0	Р	0	0	0	0	0	0	0	0	0	0	0	0	0
Code		1	02	3	4	5	6	7	8	9	10	11	12	1	2	3
CSE0	Android Application			2.				2.		2.		2.				
23	Development	1	2	3	3	3	3	5	0	2	0	3	1	2.5	3	2.2

#### Strength of Correlation

1. Addressed to *Slight (Low=1) extent*2. Addressed to *Moderate (Medium=2) extent*3. Addressed to *Substantial (High=3) extent*



## **2.1 Template A1: Syllabus for Theory Courses**

Sch	ool:	School of Engineering & Technology	
Der	partment	Department of Computer Science & Engineeri	ng
Pro	gram:	B-Tech	0
Bra	nch:	Computer Science and Engineering	
1	Course Code		
2	Course Title	Web Technologies	
3	Credits	2	
4	Contact	2-0-0	
	Hours		
	(L-T-P)		
	Course	Core /Elective/Open Elective	
~	Status		
5	Course	The objective of this course is to provide a foundation of the second state of the sec	ation of technologies
	Objective	of a web, this course provides an insight of comp	utor and networking
		technologies and hands on experience in web pro-	oramming
6	Course	CO1: Define the basic concept of HTML	grammig.
Ũ	Outcomes	CO2: Illustrate the basics of PHP	
		CO3:Develop interactive web pages using HTML	.5 and CSS3
		CO4: Design web pages/site having validation on	user data access.
		CO5:Compare relationship of HTML, Javascript a	and PHP
		CO6:Develop web site for business and organizat	ion or for individual
7	Course	The purpose of this course is to give students the	basic understanding
	Description	of Web pages and technologies to be used for des	igning web sites.
8	Outline syllab	ne	CO Mapping
0			
	Unit I	HTML & HTML 5	<u></u>
	А	HTML basic tags, various links implementation,	COI
		image ,image map, table formatting, Lists, form	
	B	Page layout design using frame div and span	CO1
		tag. iframe	
	С	HTML5: New elements, canvas, offline	C01.C03
	•	webpage, HTML Media: video, audio	001,000
	Unit 2	CSS &CSS3	
	А	Introduction, syntax, selector: class and id, text	CO3
		formatting, margin, align, pseudo-class, pseudo-	
		element	
	В	Positioning, background formatting, Navigation	CO3
		bar, and image gallery.	
	С	CSS3: Introduction, colors, text formatting,	CO3
		tonts formatting, Background formatting, 2D	
	11.4.2	transform, animation	
	Unit 3	Java script	



	А	Introduction	, syntax, com	iment, statement,	CO4,CO5
	D			•	G04 G05
	В	Conditional	CO4,CO5		
		Functions			
	С	Object, ever	nts, Accessing	g form elements,	CO4,CO5
		validating for	orm elements,	popup windows.	
	Unit 4	<b>PHP Basics</b>	1		
	А	Introduction	to PHP, synt	ax, variables,	CO2,CO5
		operators			
	В	Conditional	statement, ite	erative	CO2,CO5
		statements,F	Functions		,
	С	Array: single	, multi dimens	ional, numeric array,	CO2,CO5
		associative an	ray		,
	Unit 5	File Handli	ng in PHP		
	А	File Operatio	n: Reading &	writing data on web page	CO5,CO6
		from file, del	eting file, rena	ming file	,
	В	Session M	anagement:	introduction, creation,	CO5,CO6
		destroying an	d login session	n management	
	С	PHP Databas	e Connectivity	, Retrieving records,	CO5,CO6
	-	retrieving fie	elds from recor	d	
	Mode of	Theory/Jury	/Practical/Viv	va	
	examination				
-	Weightage	CΔ	MTE	FTF	
	Distribution	2504	2504	50%	
-	Trast has 1/2*	2370	2370	3070	
	Text DOOK/S*	1 Ivon	Daumaga "UTMI	DUTMI JourSprint Dorl	
			H" BPR Publics	ation	
		2. Schile	dt H. "The Com	plete Reference JAVA2".	
		ТМН		, , , , , , , , , , , , , , , , , , ,	
		3. Schile	dt H, "The Com	plete Reference J2EE",	
		TMH		-	
	Other	1. Rick	Delorme," Prog	ramming in HTML5 with	
	References	JavaS	cript and CSS3'	', Microsoft	
1					

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	Define the basic concept of HTML	PO5,PSO2
2.	Illustrate the basics of Extensible markup language.	PO5,PSO2,PO12
3.	Develop interactive web pages using HTML 5 and CSS3	PO2,PO3,PO5,PO6,PO9,
	Develop interactive web pages using ITTWILS and CSSS	PSO1,PSO2,PSO3
4.	Design web pages/site baying validation on user data	PO2,PO3,PO5,PO6,PO9,
	access.	PSO1,PSO2,PSO3
5.	Compare relationship of HTML, Javascript and PHP	PO5,PSO2



6. Develop web site for business and organization or for individual	PO1, PO2,PO3,PO4,PO5,PO6, PO7,PO9,PO11,PO12,PS O1,PSO2,PSO3
---	--

# **PO and PSO mapping with level of strength for Course Name** Web Technologies (**Course Code CSE352**)

Course Code_ Course Name	CO 's	P 0 1	PO 2	P 0 3	PO 4	P 0 5	P 0 6	P O 7	P 0 8	P O 9	P 0 10	P 0 11	P 0 12	PS O 1	PS O2	PS O3
	CO 1					1									1	
	CO 2					3							1		1	
	CO 3		1	3		2	1			2				1	2	2
	CO 4		1	3		1	1			2				1	2	2
	CO 5					2									1	
CSE352_Web Technologies	CO 6	2	3	3	1	3	3	1		3		2	2	1	2	3

#### Average of non-zeros entry in following table (should be auto calculated).

Cour se Code	Course Name	P 0 1	PO 2	P 0 3	Р О 4	P 0 5	P 0 6	P 0 7	P 0 8	P 0 9	P 0 10	P 0 11	P 0 12	PS O 1	PS O 2	PS O 3
Cse	Web	2	1.0	2.	1	2	1.	1	0	2.	0	2.	1.	1	1.5	2.2

#### Strength of Correlation

- 1. Addressed to *Slight (Low=1) extent*
- 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



#### Syllabus: Design and Analysis of Algorithm lab

Sch	ool:	Batch : 2023-27									
Pro	gram:	Current Academic Year: 2023-24									
Bra	nch:	Semester:V									
1	Course Code	CSP 350									
2	Course Title	Design and Analysis of Algorithm lab									
3	Credits	1									
4	Contact	0-0-2									
	Hours										
	(L-T-P)										
	Course Status	Compulsory/Elective									
5	Course	Objective of this course is to									
	Objective	1. Reinforce basic design concepts (e.g., pseudocod	le, specifications,								
		top-down design)									
		2. Knowledge of algorithm design strategies	withma								
		4 Fnable students to analyze time and space compl	exity								
6	Course	Students will be able to:	omty								
Ŭ	Outcomes	<b>CO1: calculate</b> time complexity of searching algorithm									
	outcomes	<b>CO2</b> : Write program based on dynamic programming.									
	(same as	<b>CO3: apply</b> greedy algorithm to any problem									
	theory course)	<b>CO3:</b> develop program based on different string matching algorithm									
		CO5: design a program based on different string matchin	ig algorithm								
		CO6: implement real world problem based on greedy an	d dynamic								
7	Course	algorithm This course introduces concents related to the design and	analysis of								
/	Description	algorithms. Specifically, it discusses recurrence relations	and illustrates								
	Description	their role in asymptotic and probabilistic analysis of algo	rithms. It covers in								
		detail greedy strategies divide and conquer techniques, d	ynamic								
		programming and max flow - min cut theory for designin	g algorithms, and								
		illustrates them using a number of well-known problems	and applications.								
8	Outline syllabu	S	CO Mapping								
	Unit 1	Practical based on Searching and sorting									
		1. WAP to demonstrate the concept of Linear	CO1								
		and Binary Search									
		2. WAP to implement Merge sort									
		3. WAP to implement Quick Sort									
	Unit 2	Practical based on Dynamic Programming									
		1. WAP to implement Matrix Chain	CO2, CO6								
		Multiplication problem									
		2. WAP to demonstrate the concept of									
		Longest Common Subsequence(LCS)									
		3 WAP to demonstrate concept of 0 1									
		Vnancosk Droklan:									
	Unit 3	Practical based on Greedy Programming									



	1.	WAF	P to demonstra	ate concept of Minimum	CO3, CO6
		Span	ning Tree(Pri	m's Algorithm)	
	2.	WAF	P to demonstra	ate concept of Fractional	
		Knap	sack Problem	1	
	3.	WAF	o to implement	nt single source shortest	
		probl	lem using Dij	kstra's Algorithm	
Unit 4	Practio	cal ba	sed on Adva	nce concepts	
	WAP t	o den	nonstrate conc	cept of Red Black Tree	CO4
	insertio	on and			
Unit 5	Practic				
	1.	WAF	CO5		
		Strin			
	2.	WAF			
		Karp			
		I			
Mode of	Jury/Pr	ractica			
examination					
Weightage	CA				
Distribution	25%				
Text book/s*	-				
Other					
References					

# PO and PSO mapping with level of strength for Course Name Design and Analysis of Algorithms Lab. Course Code CSP 350)

Cos	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	3	1			-	2	-	-	-	2	3	3
CO 2	2	3	3	2	2	-	-	-	2	-	-	-	3	2	2
CO 3	3	2	2	-	3			-	1	-	-	-	2	1	-
CO 4	2	3	3	3	1			-	3	-	-	-	3	3	1
CO 5	3	2	2	3	2	-	-	-	2	-	-	-	2	3	2
CO 6	2	3	3	1	3	-	-		1	-	-	-	3	2	3



Cou rse Cod e	Cours e Name	Р О 1	P O 2	Р О 3	Р О 4	Р О 5	P O 6	Р О 7	P O 8	Р О 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CSP 350	Design and Analysi s of Algorit hms Lab	2.5	2.7	2.5	2.4	2	-	-	-	1.8	-	-	-	2.5	2.3	2.2

Average of non-zeros entry in following table (should be auto calculated).

#### Strength of Correlation

- 1. Addressed to *Slight (Low=1) extent* 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



Bı	ranch: CSE / ]	[ <b>T</b>	Semester: 5th							
1	Course Code		<b>CSP354</b>	Course Name: Project Based Lean	rning -3					
2	Course Title		Project Bas	sed Learning -3						
3	Credits		2							
4	Contact Hour	S	0-0-4							
	(L-T-P)									
	Course Status	8	Compulsor	ry						
5	Course Object	ctive	1. To	align student's skill and interests w	ith a realistic					
			pro	blem or project.						
			2.To und	lerstand the significance of problem	and its scope.					
			3.Studen	ts will make decisions within a fram	nework.					
6	Course Outco	omes	Students w	vill be able to:						
			COI: Ident	tify and formulate problem statemer	nt.					
			CO2: Desi	gn relational database schema.						
			CO3: Dev	elop the solution by using diffe	rent aspects of					
			CO4. Classify and understand various test techniques for							
			verification and validation of project							
			CO5: Analyze and make use of modern for solving real word							
			cos: Analyze and make use of modern for solving real word							
			CO6: Develop teamwork and need to engage in life-long							
			learning, along with the ability to communicate effectively							
			with others	S.						
7	Course Descr	ription	In PBL-3,	the students will learn how to define	the problem for					
		1	developing	projects, and Design applicable sol	lutions in one or					
			more app	lication domains using softwa	re engineering					
			approaches	s that integrate ethical, social, lega	l and economic					
			concerns.							
8	Outline sylla	ous		CO Mapping						
	Unit 1	Problem	Definition	and identification, Team/Group	CO1,CO4					
		formation	and Proje	ect Assignment. Finalizing the						
		problem s	tatement, res	source requirement, if any.						
	Unit 2	Use of the	relational a	lgebra operations from	CO2,CO6					
		mathemat	ical set theor	ry (union, intersection, difference,						
		and Cartes	sian product	) and the relational algebra						
		detabases	(soloot (rost	rict) project join and division)						
	Unit 3	Design: in	nplement n	roject work in any programming	CO3					
	Onit 5	language	npiement p	roject work in any programming	005					
	Unit 4	Use of v	rious test t	ools and techniques for software	CO4 CO5					
	Omt 4	verificati		ation of project	04,005					
	Unit 5	Demonstr	ate and exec	sute Project with the team.	CO6					
		Report she	ould include							
		Requirem	ent. Problem							
		ER diagra	ms, Use Cas	e Diagrams, State Diagrams.						
		Sequence	Diagrams, C	ommunication Diagrams, and						
		Activity D	iagrams, Im	plementation Detail. Validation						
		Reports.		-						



	References, Test cases if The presentation, report, supported by the docume assessment.	any. work done ontation, form	luring the term ns the basis of	
Mode of examination	Practical /Viva			
Weight age Distribution				
	CA	CE(Viva)	ETE	
	25%	25%	50%	

S. No.	Course Outcome	Program Outcomes (PO)
1.	CO1: Identify and formulate problem statement.	PO1, PO2, PO4,PO6, PO8,PO9, PO10, PO11,
2.	CO2: Design relational database schema.	PO12,PS01,PS02,PS03 PO1, PO2, PO3,PO4,PO5, PO7, PO8, PO9, PO11, PO12, PS01,PS02,PS03
3.	CO3: Develop the solution by using different aspects of programming language.	PO1, PO2, PO3,PO4,PO5, PO6, PO8, PO9, PO11, PO12, PSO1,PSO2
4.	CO4: Classify and understand various test techniques for verification and validation of project.	PO1, PO2, PO3,PO4,PO5, PO8,PO9, PO10, PO11, PO12 ,PSO1,PSO2,PSO3
5.	CO5: Analyze and make use of modern for solving real word problems.	PO1, PO2, PO5, PO6, PO7, PO8, PO9, PO12 PSO1,PSO2
6.	CO6: Develop teamwork and need to engage in life-long learning, along with the ability to communicate effectively with others.	PO2, PO4, PO8,PO9, PO10, PO11, PO12,PSO1,PSO3



#### PO and PSO mapping with level of strength for Course Name Project Based Learning -3 (Course Code CSP354)

						C	CO/PC	) Map	ping						
		(1/2/	3 indi	cates s	streng	th of c	correla	tion)	3-	Strong,	, 2-Mec	lium, 1	-Low		
Cos						Pr	ogran	nme O	utcom	nes(PO	s)				
	РО	PO	PO	PO	PO	PO	PO	PO	PO	РО	РО	РО	PS	PS	PS
	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	O3
CO1	3	3	-	2	-	1	-	1	2	-	2	1	2	2	3
CO2	3	2	2	2	2	-	-	1	2	-	2	1	2	1	1
CO3	3	2	2	2	2	3	-	1	2	-	2	1	2	2	-
CO4	3	3	2	2	3	-	-	1	2	-	-	1	2	2	2
CO5	3	2	-	-	3	-	-	1	2	-	-	1	2	2	-
CO6		1	-	1	-	-	-	2	2	3	3	3	1	-	1
Avg															
PO															
attain															
ed	3	2.2	1	1.5	1.7	0.7	0	1.2	2	1	2	1	2	1.5	1.2



Sch	abust CS1 C2	Batch: 2023	-27					
Pro	oram·R Tech	Current Ac	-27 ademic Vear	• 2023-24				
Bra	nch: CSF	Somester-v	iucinic I cai	. 2023-24				
1	Course Code	CSP391	Course Name	· Summer Internshin-II				
$\frac{1}{2}$	Course Title	Summer Int	ernshin-II	. Summer mernismp-m				
3	Credits	2	ernsmp-m					
4	Contact	0-0-2						
•	Hours	002						
	(L-T-P)							
	Course Status	UG						
5	Course	1. Experience	e the activitie	s and functions of business r	professionals.			
	Objective	2. Develop a	and refine ora	l and written communication	skills.			
	5	3. Identify a	reas for futur	e knowledge and skill develo	opment.			
6	Course	Students will	be able to:		-			
	Outcomes	CO1. Integra	te the concep	ots and strategies of academ	ic study in a real time			
		environment	t.					
		CO2. Identif	y, formulate	and model problems and fin	d engineering solution			
		based on a sy	stems approa	ach.				
		CO3. Develo	op teamwork	and apply prior acquired 1	knowledge in problem			
		solving.						
		CO4. Develo	op communica	ation, interpersonal and other	r critical skills required			
		for career gro	owth.					
		CO5. Practic	e engineer s	responsibilities, self-unders	tanding, self-discipline			
		CO6 Explor	106 Explore career alternatives prior to graduation					
7	Course	An internshi	An internship experience provides the student with an opportunity					
'	Description	career interes	An internship experience provides the student with an opportunity pareer interests while applying knowledge and skills learned in the					
	Description	in a work set	a work setting. The experience also helps students gain a c					
		what they sti	ll need to lear	rn and provides an opportuni	ty to build professional			
		networks.			J I I I I I I I I I I I I I I I I I I I			
8	Outline syllabus	5			CO Mapping			
	Unit 1	Define obje	ctives and co	CO1,CO2				
		ensuring stu	idents that it	is related to the study path				
		carried out	at the Univer	sity				
	Unit 2	Problem	Definition	and identification,	CO2			
		Team/Gro	up form	ation and Project				
		Assignmen	nt. Finalizin	g the problem statement,				
		resource re	equirement,	if any.				
	Unit 3	The interns	hip work plar	n is drawn up by	CO3			
		developing	team work an	nd applies prior acquired				
		knowledge	in problem so	olving.				
	Unit 4	Demonstra	ate and executive	ute Project with the team.	CO4			
		Submission	of evaluati	on form and final report				
		completed l	by the intern.					
	Unit 5	Final evalua	ation form co	mpleted by the supervisor at	CO5,CO6			
		the Host Or	rganization a	nd final presentation before				
		department	al committee.					
	Mode of	Practical						
	examination			PPP				
	weightage		CE(Viva)	EIE				
	Distribution	25%	25%	50%				

#### Syllabus: CSP 391, Summer Internship-II



Text book/s*	NA
Other References	NA

S.	Course Outcome	Program Outcomes (PO)
No.		
1.	CO1. Integrate the concepts and strategies of academic study in a real time environment.	PO1,PO2,PO4,PO5,PO7, PO8,PO9,PSO1,PSO2,PSO3
2.	CO2. Identify, formulate and model problems and find engineering solution based on a systems approach.	PO1,PO2,PO3, PO4,PO5,PO7, PO8,PO9, PSO1,PSO2
3.	CO3. Develop teamwork and apply prior acquired knowledge in problem solving.	PO1,PO3,PO4,PO5, PO8,PO9,PO11, PO12, PSO1,PSO2,PSO3
4.	CO4. Develop communication, interpersonal and other critical skills required for career growth.	PO8,PO10
5.	CO5. Practice engineer's responsibilities, self- understanding, self-discipline and ethical standards.	PO6,PO8
6.	CO6. Explore career alternatives prior to graduation.	PO12,PSO1,PSO2

# PO and PSO mapping with level of strength for Course Name Summer Internship-II (CSP391)

						C	CO/PC	) Map	ping						
		(1/2/	3 indi	cates s	streng	th of c	orrela	tion)	3-3	Strong,	2-Mec	lium, 1	-Low		
Cos						Pr	ogran	nme O	utcom	nes(PO	s)				
	РО	PO	РО	PO	PO	РО	РО	РО	РО	РО	РО	РО	PS	PS	PS
	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	03
CO1	2	2	-	3	2	-	1	1	1	-	-	-	1	2	2
CO2	1	2	1	2	2	-	1	1	1	-	-	-	1	2	-
CO3	2	-	2	2	2	-	-	1	3	-	1	1	1	2	2
CO4	-	-	-	-	-	-	-	1	-	3	-	-	-	-	-
CO5	-	-	-	-	-	2	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	2	2	2	-
Avg															
PO															
attain															
ed	1	0.7	0.5	1.2	1	0.3	0.3	1.2	1	1	0	1	1	1.3	0.7



## **Technical Skill Enhancement Course-1 (Simulation Lab)**

Sch	ool: SET	Batch : 2023-27	
Pro	gram:	Current Academic Year: 2023-24	
B.T	ECH		
Bra	nch:CSE	Semester: V	
1	Course Code	CSP 395 Technical Skill Enhancement Course-1	( Simulation
		Lab)	
2	Course Title	Simulation Lab	
3	Credits	1	
4	Contact	0-0-2	
	Hours		
	(L-T-P)		
	Course	Lab	
	Status		
5	Course	The objective of this course is to provide the bas	sic programming
	Objective	concepts of MATLAB such as – functions, arrays, lo	pops, conditional
		statements, procedures.lt alsoexpose students	s with visual
	0	representations of a model and its results.	
6	Course	Students will be able to:	1
	Outcomes	<b>CO1:</b> Use basic fundamentals to write simple Matia	ab programs.
		<b>CO2:</b> Plot graphs in Matlab and use procedural fun	ictions.
		<b>CO3</b> : Writing Matlab programs with logic and flow	v control.
		<b>CO5</b> : Make use of graphical user interfaces in MAT	
		CO6: Apply MATLAR Programming to solve real	lLAD.
7	Course	This course introduces the concents of MATLAN	B programming
· /	Description	Modelling and simulation to identify the problems	and choose the
	Description	relevant models and algorithms to apply Matlab is u	sed for scientific
		applications involving images sound and other sig	mals
8	Outline syllabi	Tuppireutions involving integes, sound, and other sig	CO Mapping
0	UNIT-1	Introduction to MATLAB	CO1.CO6
	Δ	Programming Environment: MATLAB Windows A	
	1	First Program	
	В	Expressions, Constants, Variables and assignment	
		statement	
	С	Arrays	
	UNIT-2	Graph Plots&Procedures and Functions	CO2,CO6
		Pagio plotting Duilt in functions Connection	
	А	Basic plotting, Built in functions, Generating	
	B	Procedures and Functions: Arguments and return	
	D	values. M-files	
	С	Formatted console input-output, String handling	
	C UNIT-3	Formatted console input-output, String handling Control Statements	CO3,CO6
	C UNIT-3 A	Formatted console input-output, String handling Control Statements Conditional statements: If, Else, Else-if	CO3,CO6
	C UNIT-3 A B	Formatted console input-output, String handling Control Statements Conditional statements: If, Else, Else-if Repetition statements: While	CO3,CO6
	A B C UNIT-2 A B	Introduction to MATLAB         Programming Environment: MATLAB Windows, A         First Program         Expressions, Constants, Variables and assignment         statement         Arrays         Graph Plots&Procedures and Functions         Basic plotting, Built in functions, Generating         waveforms, Sound replay, load and save         Procedures and Functions: Arguments and return         values, M-files	C01,C06 C02,C06



UNIT-4	Manipulati	CO4,CO6		
А	Writing to a to			
В	Randomising			
С	Searching a li			
UNIT-5	<b>GUI Interfa</b>	ice	CO5,CO6	
А	Attaching but	tons to actior	18	
В	Getting Input			
С	Develop MA			
Mode of examination				
Weightage Distribution	Project on Simulation based	CE(Viva)	ETE	
	25%	25%	50%	
Text book/s*				
Other	1.			
References				

Mapping between Cos and Pos, PSO's						
Sl. No.	Course Outcomes (COs)	Mapped Program Outcomes and PSO's				
1	<b>CO1:</b> Use basic fundamentals to write simple Matlab programs.	PO1,PO3,PO5,PO12,PSO1,PS O2,PSO3				
2	<b>CO2:</b> Plot graphs in Matlab and use procedural functions.	PO1,PO3,PO5,PO10,PO12,PS O1,PSO2,PSO3				
3	<b>CO3</b> : Writing Matlab programs with logic and flow control.	PO1,PO2,PO3,PO5,PO12,PSO 1,PSO2,PSO3				
4	CO4:Manipulate and work with text files.	PO1,PO3,PO5,PO12,PSO1,PS 02,PSO3				
5	<b>CO5</b> :Make use of graphical user interfaces in MATLAB.	PO1,PO3,PO5,PO12,PSO1,PS O2,PSO3				
6	<b>CO6</b> : Apply MATLAB Programming to solve real life problem	PO1,PO2,PO3,PO4,PO5,PO6,P O7,PO8,PO9,PO10,PO11,PO12 ,PSO1,PSO2,PSO3				



# PO and PSO mapping with level of strength for Course Name: Technical Skill Enhancement Course-1 CSP 395)

1-Slight (Low)

2-Moderate (Medium)

**3-Substantial (High)** 

COs	PO1	PO	РО	PO	PO	PO	PO	PO	PO9	РО	PO1	РО	PSO	PSO2	PSO3
		2	3	4	5	6	7	8		10	1	12	1		
CO1	1	-	1	-	2	-	-	-	-	-	-	1	1	2	1
CO2	1	-	1	-	2	-	-	-	-	2	-	1	1	2	1
CO3	1	2	1	-	2	-	-	-	-	-	-	1	1	2	1
CO4	1	-	1	-	2	-	-	-	-	-	-	1	1	2	1
CO5	1	-	1	-	2	-	-	-	-	-	-	1	1	2	1
CO6	2	2	3	3	2	2	1	-	2	3	2	2	2	3	1
Avg PO attain															
ed	1	0.7	1.3	0.5	2	0.3	0.2	0	0	1	0	1	1	2.2	1



# TERM - VI



# Syllabus: CSE 353, Compiler Design

School: SET		Batch : 2023-27					
Program: B.Tech		Current Academic Year: 2023-24					
Branch:CSE		Semester: VI					
1	Course Code	CSE353 Course Name: Compiler Design					
2	Course Title	Compiler Design					
3	Credits	3					
4	Contact	3-0-0					
	Hours						
	(L-T-P)						
	Course	Core					
	Status						
5	Course	1. To provide students with an overview of the iss	ues that arise in				
	Objective	Compiler construction as well as to throw light upo	n the significant				
		theoretical developments and tools that are deep roote	ed into computer				
		science.					
		2. To introduce the major phases of Compiler constru	ction and also its				
		theoretical aspects including regular expression	ns, context-free				
		grammars, Finite Automata etc.					
6	Course	After the successful completion of this course, studen	ts will be able to				
	Outcomes	:					
		<b>CO 1:Explain</b> the concepts and different phases of compilation with					
		compile time error handling					
		<b>CO 2:Represent</b> language tokens using regular expressions, context					
		free grammar and finite automata and design lexical analyzer for a					
		language					
		<b>CO 3:Compare</b> top down with bottom up parsers, and develop appropriate					
		parser to produce parse tree representation of the input					
		<b>CO 4: Design</b> syntax directed translation schemes for a	given context free				
		grammar.					
		<b>CO 5:Generate</b> intermediate code for statements in high level language,					
		<b>CO 6:Apply</b> optimization techniques to intermediate code and generate					
		machine code for high level language program	Joue and generate				
7	Course	To provide students with an overview of the issues the	at arise in				
	Description	Compiler construction as well as to throw light upon the significant					
	-	theoretical developments and tools that are deep rooted into computer					
		science.	-				
8	Outline syllabu	15	CO Mapping				
	Unit 1	Introduction					
	А	Introduction to Compiler, Phases and passes, CO1, CO2					
		Bootstrapping, Cross-Compiler					



-								
	В	Finite state n	CO1, CO2					
		applications						
	С	lexical-analy	CO1, CO2					
	Unit 2	Parsing Techniques						
	А	The syntactic	e specification	of programming languages:	CO2, CO3			
		Context free	grammars, de	privation and parse trees.				
	В	Basic Parsing	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers.					
		operator prec						
		predictive pa						
		Automatic C	onstruction of	f efficient Parsers: LR parsers,				
		the canonica	l Collection of	f LR(0) items, constructing				
		SLR parsing	tables					
	C	Constructing	Canonical LI	R parsing tables, Constructing	CO2, CO3			
		LALR parsir	ng tables, usin	g ambiguous grammars.				
		Syntactic pha	ase errors and	semantic errors.				
	Unit 3	Syntax Dire	cted Translat	tions And Intermediate Code				
		Generation		<u> </u>	<u> </u>			
	А	Syntax direc	ted definition,	Construction of syntax trees,	CO4,CO5			
	<b>D</b>	syntax direct	ed translation	scheme				
	В	B Variants of Syntax Trees, Three Address Codes						
	C	Translation of Expression, Type Checking and control						
	<b>T</b> T <b>1</b> / <b>4</b>	flow.						
	Unit 4	it 4 Symbol table						
	А	Data structure for symbols tables, representing scope						
		information.						
	В	Run-Time A	CO5					
	9	stack allocat						
	С	Run Time St	Run Time Storage Management					
	Unit 5	Code Gener	ation And O	ptimization				
	А	Sources of Optimization of basic blocks and flow graphs						
	В	Basic Blocks	CO4,CO6					
	С	C Global Data Flow Analysis						
	Mode of	Theory						
	examination							
	Weightage	CA						
	Distribution	25%						
	Text book/s*	1. 1.Aho, S						
		Technic						
	Other	1. Lauden,						
	References	2. D. M. L						
		Principles and Practice, Macmillan India,						


S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO 1:Explain the concepts and different	PO1,PO5,PO6,PO9,PO12,PSO1,PSO2
	phases of compilation with compile time	
	error handling	
2.	CO 2:Represent language tokens using	PO1,PO2,PO3, PO4,PO5, PO12, PSO1,
	regular expressions, context free grammar	PSO2
	and finite automata and design lexical	
	analyzer for a language	
3.	CO 3:Compare top down with bottom up	PO1,PO2,PO3,PSO1,PSO2
	parsers, and develop appropriate parser to	
	produce parse tree representation of the input	
4.	CO 4: Design syntax directed translation	PO1,PO2,PO3, PO4,PO5,PO9,
	schemes for a given context free grammar.	PSO2,PSO3
5.	CO 5:Generate intermediate code for	PO1,PO2,PO3,
	statements in high level language, Benefits and	PO4,PO5,PO9,PO12,PSO1,PSO2,PSO3
	limitations of automatic memory management.	
6.	CO6:Apply optimization techniques to	PO1, PO3,PO4, PO4,PO5,PO9,PO12
	intermediate code and generate machine code	PSO1,PSO2,PSO3
	for high level language program	

# PO and PSO mapping with level of strength for Course Name Compiler Design (Course Code CSE 353)

Cos	PO1	PO	PO3	PO4	PO5	PO	PO7	PO8	PO9	PO1	PO	PO1	PS	PSO2	PSO3
		2				6				0	11	2	01		
CO1	3				3				2			3	2	1	
CO2	2	2	3	3	2							2	3	2	
CO3	3	3	3										3	2	
CO4	1	2	3	3	3				3					3	2
CO5	1	1	2	3	2				3			3	1	2	2
CO6	2		3	3	2				3			3	3	2	3

1-Slight (Low)

2-Moderate (Medium)

**3-Substantial (High)** 



Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	Р О 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE353	Compiler Design	2	1.3	2.3	2	2	0	0-	0	1.8	0	0	2	2	2	1.2

Strength of Correlation

1. Addressed to *Slight (Low=1) extent*2. Addressed to *Moderate (Medium=2) extent*3. Addressed to *Substantial (High=3) extent*



## 2.1 Template A1: Syllabus for Theory Courses (SAMPLE)

Sch		School of Engineering & Technology							
Den	artment	Department of Computer Science & Engineering							
Proc	artificiti	B Tech							
Brai	ach:	CSE							
1	Course Code	CSE062							
1	Course Title	Ouentum Computing							
2	Course Thie	Quantum Computing							
3	Credits	3							
4	Contact	3 0 2							
	Hours								
	(L-T-P)								
	Course	Core /Elective/Open Elective							
	Status	-							
5	Course	Fundamentals of quantum information processing, in	cluding quantum						
	Objective	computation, quantum cryptography, and quantum in	formation						
		theory. Topics include: the quantum circuit model, qu	ibits, unitary						
		operators, measurement, entanglement, quantum algo	orithms for						
		factoring and search, quantum cryptographic key dist	ribution, error-						
		correction and fault-tolerance, information capacity of	of quantum						
		channels, complexity of quantum computation.							
6	Course	CO1: Analyze the behavior of basic quantum algorith	CO1: Analyze the behavior of basic quantum algorithms						
	Outcomes								
	(must be 6	CO2: Demonstrate simple quantum algorithms							
	COs,								
	following verbs given	CO3: Simulate a simple quantum error-correcting coo	de						
	in Bloom's Taxonomy)	CO4: Prove basic facts about quantum information cl	nannels						
	Tuxonomy)	CO5: Explain quantum computing and quantum proto	ocols						
		CO6: Illustrate information channels in the quantum	circuit model.						
7	Course	This course teaches the fundamentals of quantum infe	ormation						
	Description	processing, including quantum computation, quantum	n cryptography,						
		and quantum information theory.	1						
8	Outline syllabu	us	CO Mapping						
	Unit 1	Introduction							
	А	Computers and the Strong Church–Turing Thesis,							
		Circuit Model of Computation							
	В	A Linear Algebra Formulation of the Circuit Model,	CO1						
		Reversible Computation							
	С	Quantum Physics and Computation	CO1, CO2						
	Unit 2	LINEAR ALGEBRA AND THE DIRAC	CO1,						
		NOTATION	CO2,CO4						
	А	The Dirac Notation and Hilbert Spaces, Dual							
		Vectors, Operators							



В	The Spectral	Theorem, Fu	nctions of Operators						
С	Tensor Produ	icts, The Schr	nidt Decomposition	CO1, CO2					
	Theorem		_						
Unit 3	A QUANTU	M MODEL C	OF COMPUTATION	CO1, CO2					
А	The Quantum	The Quantum Circuit Model, Quantum Gates							
				CO2,CO5,CO6					
В	Universal Set	ts of Quantum	n Gates, Efficiency of						
	Approximation	ng Unitary Tr	ansformations						
С	Implementing	g Measuremer	nts with Quantum Circuits						
Unit 4	INTRODUC'	TORY QUAN	NTUM ALGORITHMS	CO1,CO2,CO3					
А	Probabilistic	Versus Quant	tum Algorithms, Phase	CO1,CO2,CO3					
	Kick-Back								
В	The Deutsch	Algorithm, T	he Deutsch–Jozsa	CO1,CO2,CO3					
	Algorithm								
С	Simon's Algo	Simon's Algorithm							
Unit 5									
А	Tools for Ana	alysing Proba	bilistic Algorithms	CO2,CO3,CO4					
В	Solving the D	Discrete Logar	rithm Problem When the	CO3,CO4					
	Order of a Is	Composite							
С	Computing S	chmidt Decor	npositions	CO2,					
				CO4,CO5					
Mode of	Theory/Jury/								
examination									
Weightage	CA	MTE	ETE						
Distribution	25%	25%	50%						
Text book/s*	"An Introduc	tion to Quant	um Computing", Phillip						
	Kaye Raymo								
Other		·							
References									

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: Analyze the behavior of basic quantum algorithms	
2.	CO2: Demonstrate simple quantum algorithms	PO1, PO2, PO5, PO8,
		PO12, PSO3
3.	CO3: Simulate a simple quantum error-correcting code	PO1, PO2, PO3, PSO3
4.	CO4: Prove basic facts about quantum information	PO1, PO2, PO3, PO5,
	channels	PO9, PO12, PSO1
5.	CO5: Explain quantum computing and quantum	PO1, PO2, PO4, PO5,
	protocols	PO6, PO8, PSO2
6.	CO6: Illustrate information channels in the quantum	PO1, PO2, PO3, PO8,
	circuit model	PO9, PSO2,



# PO and PSO mapping with level of strength for Course Name Quantum Computing (Course Code CSE063)

a			1			1	1			1						
Course																
Code_	CO'	Р		Р		Р	Р	Р	Р	Р	Р	Р	Р	PS		
Course	s	0	PO	0	РО	0	0	0	0	0	0	0	0	0	PSO	PSO
Name		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
	CO	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	1															
	CO	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	2															
	CO	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	3															
	CO	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	4															
	CO	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
Quantum	5															
Computi	CO	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
ng	6															

Average of non-zeros entry in following table (should be auto calculated).

Cour	Course			Р	Р	Р	Р	Р	Р	Р	Р	Р	Р			
se	Name	PO	PO	0	0	0	0	0	0	0	0	0	0	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	01	2	O 3
	Quantu															
	m	3	27	1.	1	1.	1	5	1.	Q	5	5	Q	1	1	1
	Computi	5	2.1	1	1	5	1	.5	3	.0	.5	.5	.0	1	1	1
	ng															

#### Strength of Correlation

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



School: School of Engineering & Technology									
Dep	artment	Department of Computer Science & Engineering							
Prog	gram:	B. Tech							
Bra	nch:								
1	Course Code	CSE032							
2	Course Title	Cryptography and Network Security							
3	Credits	3							
4	Contact	3-0-0							
	Hours								
	(L-T-P)								
	Course Status	Core							
5	Course	The objective of this course is to provide an intention to	explain basic						
	Objective	concepts and algorithms of symmetric &asymmetric key	cryptography,						
		including encryption/decryption and key exchange with	the application						
		of cryptography and technique.							
6	Course	On successful completion of this module students will be	able to:						
	Outcomes	CO1: Identify the basic concepts of computer security,	algorithms of						
		symmetric Key cryptography, including encryption/decry	ption.						
		CO2: Apply the tools and methodologies used to perform	mathematic						
		concepts bening the cryptographic algorithms							
		cos: Explain the tools and methodologies used to perfor	In Security						
		analysis. $COA$ : Interpret use of cryptographic data integrity algor	ithms and user						
		authentication protocols	U4: Interpret use of cryptographic data integrity algorithms and user						
		CO5: Examine security at application layer transport laye	er and network						
		laver	and network						
		CO6: Compare various algorithm of cryptography used	l for Network						
		Security.							
7	Course	This course will provide a deterministic approach of both	the principles						
	Description	and practice of cryptography & network security. It cover	s the basic						
	Ĩ	issues to be addressed by a network security capability, ar	nd explored by						
		providing a tutorial and survey of cryptography and netwo	ork security						
		technology.	_						
8	Outline syllabu	IS	CO						
			Mapping						
	Unit 1	Introduction& symmetric Key Cryptography							
	А	Computer Security Concepts- OSI security Architecture,	CO1						
		Security attacks, Services, mechanism, model of							
		network security							
	В	Classical encryption techniques- Substitution	CO1						
		Cipher(Mono-alphabetic, Poly-alphabetic),							
	~	Transposition cipher, Stegnography	<b>G G G G G G G G G G</b>						
	C	Block Cipher- Encryption Principles, DES and its CO1							
	TT 0	variants, strength of DES							
	Unit 2	Mathematics of Cryptography							
	А	Eucledian, Extended Eucledian Algorithm,	002						
		Euliers I otient Function, Ferment little Theorem, Eulers							
		theorem							



В	Primality Tes Theorem	ting-Miller Ra	bin test, Chinese Remainder	CO2, CO6					
С	Exponential- Logarithm	Exponential- square and multiply method, Discrete Logarithm							
Unit 3	Asymmetric	Asymmetric Cryptography & Key Exchange							
А	Public Key cr	yptography-R	SA, Cryptanalysis of RSA	CO3					
В	Elgamal cryp	tography, Ellip	otic Curve cryptography	CO3, CO6					
С	Key Manager Hellman Key	nent and distri Exchange	bution : KDC, Diffie	CO3, CO6					
Unit 4	Digital signa	tures							
А	User Authent	ication protoco	ol- Kerberos	CO4					
В	Digital Signat	ture – RSA, Elg	gamal, DSS	CO4					
С	Data integrity 512	algorithms-H	ash Functions, MD5, SHA-	CO4					
Unit 5	Security								
А	Security at A S/MIME, PG	CO5							
В	Security at Tr	ansport layer-	SSL( Services, Protocols)	CO5					
С	Security at Ne Protocols-AH	etwork layer-II I, ESP, Service	PSec(Modes, Security s provided by IPSEC)	CO6					
Mode of examination	Theory/Jury/I	Practical/Viva							
Weightage	СА	MTE	ETE						
Distribution	25%	25%	50%						
Text book/s*	<ol> <li>Atul Kahate</li> <li>Michael T. Security &amp;</li> <li>Rajat Khare Security ", I</li> </ol>								
Other References	<ol> <li>Bruce Schn Inc, 2001.</li> <li>Behrouz A. McGraw Hi</li> <li>Internet as a</li> </ol>	<ol> <li>Bruce Schneier, "Applied Cryptography", John Wiley &amp; Sons Inc, 2001.</li> <li>Behrouz A. Forouzan, "Cryptography And Network Security"- McGraw Hill</li> <li>Internet as a resource for reference.</li> </ol>							

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Identifybasic concepts of computer security, algorithms	PO1, PO2, PSO1. PSO2
	of symmetric Key cryptography, including	
	encryption/decryption.	
2.	CO2: Apply the tools and methodologies used to perform mathematic concepts behind the cryptographic algorithms	PO1,PO2,PO3, PO4, PSO1,PSO2
3.	CO3: Explain the tools and methodologies used to perform Security analysis.	PO1, PO3, PO5, PSO1, PSO2
4.	CO4: Analyze and use cryptographic data integrity algorithms and user authentication protocols	PO1, PO4, PO6, PO7, PSO1, PSO2

CSE, SSET, SU

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5.	CO5. Examine security at application layer, transport layer and network layer.	PO5,PO7, PO8, PO9, PSO1,PSO2
6.	CO6: Compare various algorithm of cryptography used for Network Security.	PO10,PO11,PO12,PSO1,PSO3

# **PO and PSO mapping with level of strength for Course Name** Cryptography and Network Security (**Course Code CSE032**)

Code_ Course	СО	Р	PO2	PO	РО	РО	РО	РО	РО	РО	PO10	PO11	PO12	PSO1	PSO2	PSO3
Name	's	0 1		3	4	5	6	7	8	9						
	CO 1	3	2		-	-	-	-	-	-	-	-	-	3	1	-
CSE022 Counto	CO 2	2	3	2	1	-	-	-	-	-	-	-	-	2	3	-
graphy and	CO 3	2	-	2	-	3	-	-	-	-	-	-	-	2	2	1
Network Security	CO 4	2	-	-	2	-	2	2	-	-	-	-	-	2	2	
	CO 5	-	-	-	-	2	-	2	2	2		-	-	1	-	-
	CO 6	-	-	-	-	-	-	-	-	-	2	2	2	2	-	2

#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	РО 2	P O 3	P 0 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CSE03 2	Cryptograph y and Network Security y and Network Security	2.5	2.5	2	1.5	2.5	2	2	2	2	2	2	2	2	2	1.5

#### Strength of Correlation

- 1. Addressed toSlight (Low=1) extent
- 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



# Syllabus: CSE041 SOFTWARE PROJECT MANAGEMENT

School:		School of Engineering & Technology	
Departm	ent	Department of Computer Science & Engineering	
Program	•	B.Tech	
Branch	•	Computer Science and Engineering	
	Course Code	CSE041	
1	Course Code	CSEU41	
2	Course Title	SOFTWARE PROJECT MANAGEMENT	
3	Credits	3	0
4	Contact	3 0	0
	Hours		
	(L-T-P)		
	Course	Core /Elective/Open Elective	
	Status		
5	Course	To provide fundamental skills of software Project m	anagement
	Objective	emphasizing on issues & hurdles associated with delivering	successful
		projects. Apply project management concepts through wo	orking in a
6	G	group as team leader or active team member on an 11 project.	11
6	Course	After successful completion of this course students should be	able to:
	Outcomes	COI: Define the Project Management principles while	developing
	(0)	software.	
		CO2: Explain different project scheduling techniques.	to also i ave a a
		CO3: Apply vano-+us project monitoring, control and review	nuclear in
		vorious project activities	iivoived iii
		CO5: A scale project autitus and issues related to contract ma	nagamant
		COS. Assess project quality and issues related to contract ma	liagement.
		CO6: Discuss the impact of project planning on the perform	ance of the
		organizations	
7	Course	This course is aimed at introducing the primary important of	concepts of
	Description	project management related to managing software developme	nt projects.
		Students will also get familiar with the different activities i	nvolved in
		Software Project Management. Further, they will also come to	know how
		to successfully plan and implement a software project m	anagement
		activity, and to complete a specific project in time with th	e available
0		budget.	60
8	Outline syllab	DUS	
	TT •4 1		Mapping
		Introduction to Software Project Planning	001
	A	Fundamentals of Software Project Management (SPM),	COI
		Need Identification, Vision and Scope Document, Project	
	D	Management Cycle, SPM Objectives	001
	В	SPM Framework, Software Project Planning, Planning	COI
		Objectives, Project Plan, Types of Project Plan, Structure of	
	C	a Software Project Management Plan	CO1
		Estimation Models Decision Process	COI
	Unit 2	Estimation Models, Decision Process	
		Work Drockdown Structure (WDS) Turger of WDS	<u> </u>
	A	work breakdown Structure (WBS), Types of WBS, Eurotions Activities and Teslas Project Life Crude and	02
		Product Life Cycle and Tasks, Project Life Cycle and	
1	1	FIOUUCI LIIE CYCIE	



	BWays to Organize Personnel, Project Schedule, Scheduling Objectives, Building the Project Schedule, Scheduling													
		Objectives, Building	the Project	Schedule, S	cheduling									
		Terminology and Tec	hniques											
	C	Network Diagrams:	PERT, CPM,	Bar Charts:	Milestone	CO2								
	TT 1/ 2	Charts, Gantt Charts												
	Unit 3	Project Monitoring	and Control	1 87 1	<b>G</b> 02									
А	Analysis	of Project Monitoring	& Control, E	arned Value	CO3, CO6									
В	Earned Value	Indicators: Budgeted	Cost for Wor	k Scheduled	CO3									
	(BCWS), Cos	t Variance (CV), Scho	edule Variance	e (SV), Cost										
	Performance I	ndex (CPI), Schedule F	Performance In	dex (SPI)										
С	Software Rev	iews, Types of Review	: Inspections, I	Desk checks,	CO3									
	Walkthroughs	, Code Reviews												
	Unit 4	Project Managemen	t Tools											
	А	Software Configuration	on Items and Ta	asks, Baseline	s, Plan for	CO4								
		Change, Change Con	ntrol, Change	Requests Ma	nagement,									
		Version Control												
	В	Risk Management: R	isks and Risk	Гуреs, Risk B	Breakdown	CO4,								
		Structure (RBS),	Risk Manage	ement Proce	ess: Risk	CO6								
		Identification, Risk	Analysis,	Risk Planni	ng, Risk									
		Monitoring	nitoring											
	C	Cost Benefit Analysis	st Benefit Analysis, Software Project Management Tools:											
		CASE Tools, MS-Pro	ASE Tools, MS-Project											
	Unit 5	Software Quality an	oftware Quality and Staffing in Project Management											
	A	Concept of Software	Quality, Softv	vare Quality	Attributes,	CO5,								
		Software Quality Met	rics and Indica	tors, The SEI	Capability	CO6								
		Maturity Model (CM	M)											
	В	SQA Activities, Fo	ormal SQA	Approaches:	Proof of	CO5								
		Correctness, Statistic	al Quality Ass	surance, Prod	uct versus									
		process												
	C	quanty management,	a a statute at a statute	a in a antro at a	1	COF								
	C	Introduction, types of	contract, stage	s in contract, p	blacement,	CO5,								
	Madaaf	The serv/Jurne /Dreatical	Aline	nanagement, a	acceptance	000								
	wide of	Theory/Jury/Practical	/ viva											
	Weightage	CA	MTE	FTF										
	Distribution	25%	25%	50%										
	Text	1 Cottrell M at	d Hughes B	Software Pro	iect									
	book/s*	Management	" 5th Edition 7	The McGraw-	Hill									
	0000/3	Companies												
		2 Walker Rovo	e: —Software ]	Project Manas	pement-									
		Addison-Wes	slev. 1998											
	Other	1. Pankai Jalote	"Software Pro	piect Manager	ment in									
	References	practice". 1st	Edition. Pearso	on Education.	2005.									
		2. Kathy Schwa	lbe, "Informati	on Technolog	y Project									
		Management	"International	Student Ed.	J J									
		THOMSON	Course Techno	logy										



S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	CO1: Define the Project Management principles while	PO1,PO3,PO5,PO9,PO10,
	developing software.	PO11,PO12,PSO3
2.	CO2: Explain different project scheduling techniques.	PO1,PO3,PO5,PO9,PO10,
		PO11,PO12,PSO3
3.	CO3: Apply various project monitoring, control and	PO1,PO3,PO5,PO8,PO9,
	review techniques	PO10,PO11,PO12,PSO3
4.	CO4: Categorize various activities and estimate the	PO1,PO3,PO5,PO8,PO9,
	risks involved in various project activities.	PO10,PO11,PO12,PSO3
5.	CO5: Assess project quality and issues related to	PO1,PO3,PO5,PO6,PO8,PO9,
	contract management.	PO10,PO11,PO12,PSO3
6.	CO6: Discuss the impact of project planning on the	PO1,PO3,PO4,PO5,PO6,PO8,PO9,
	performance of the organizations	PO10,PO11,PO12,PSO3

# PO and PSO mapping with level of strength for Software Project management (Course code CSE 041)

Course Code_ Course Name	CO's	РО 1	PO 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
	CO1	3	-	1	-	1	-	-	-	3	2	3	2	-	-	2
CSE041_	CO2	2	-	2	-	2	-	-	-	3	3	3	3	-	-	2
Software Brainat	CO3	2	-	3	-	2	-	-	1	3	2	3	3	-	-	3
Manageme	CO4	2	-	2	-	2	-	-	1	3	2	3	3	-	-	3
nt	CO5	1	-	3	-	2	3	-	1	3	3	3	3	-	-	3
	CO6	2	-	3	3	2	2	-	1	3	3	3	2	-	-	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE041	Software Project Managem ent	2	-	2.3	3	1.8	2.5	-	1	3	2.5	3	2.6	-	-	2.5

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent
2. Addressed to Moderate (Medium=2) extent
3. Addressed to Substantial (High=3) extent



# CSE042 SOFTWARE TESTING

Sch	ool:	SET											
Pro	gram:	B.Tech											
Bra	nch:	CSE											
1	Course Code	CSE042											
2	Course Title	SOFTWARE TESTING											
3	Credits	3											
4	Contact	3 0	0										
	Hours												
	(L-T-P)												
	Course	Core /Elective/Open Elective (Drop Down)											
	Status												
5	Course	The primary objective of this course is to introduce	e and instruct										
	Objective	tware testing and Quality assurance concepts, strategies, and											
	-	techniques in order to develop a total understanding	of the testing										
		process and how it impacts the software project.	-										
6	Course	On successful completion of this module students will b	be able to										
	Outcomes	CO1: Define Basic concepts of Testing and Debugging											
	(5-6)	CO2: Make use of Control flow graph to perform white	box testing										
		CO3: Apply Data flow and integration testing to develo	p feasible										
		software											
		CO4: Classify techniques of Functional testing and desi	gn test cases										
		CO5: Evaluate the software quality using Reviews, mat	5: Evaluate the software quality using Reviews, maturity models										
		and ISO standards.	ISO standards.										
		CO6: Adapt software testing methods and modern softw	vare testing										
		tools for their testing projects.											
7	Course	This course will examine fundamental software testing	and related										
	Description	program analysis techniques. In particular, the important	t phases of										
		testing will be reviewed, emphasizing the significance of	of each phase										
		when testing different types of software. The course will	l also include										
		concepts such as test generation, test oracles, test cover	age,										
		regression testing, mutation testing, program analysis (e	e.g., program-										
		flow and data-flow analysis), and test prioritization.											
8	Outline syllabi	18	CO										
	<b>T</b> T <b>1</b> / 4		Mapping										
	Unit I												
	А	Human and errors, Testing Objectives, Principles of	COI										
		validation Debugging and its techniques											
	B	Software metrics Software Testing Life Cycle Testing	CO1										
	U	activities . Test Levels.											
	С	Testing exit criteria, Bug defect life cycle. White Box and	CO1										
		Black Box Testing, test planning and design	0.01										
	Unit 2	Unit and Control Flow Testing											
	А	Concept of Unit Testing, Static Unit Testing, Defect	CO2,CO6										
		Prevention, Dynamic Unit Testing, Mutation Testing	, 										
	В	Control Flow Testing: Overview of Control Flow Testing,	CO2,CO6										
		Control Flow Graph, Paths in a Control Flow Graph											



		Cyclomatic complexity, Path Selection Criteria, Generating C											
С	Cyclomatic co	mplexity, Path	Selection Criteria, Generating	CO2,CO6									
Unit 3	Dete Flow & I												
	Data Flow & F	enominance les	un of Dynamia Data Flow	CO2 CO6									
A	Testing Data	Flow Graph D	ata Flow Terms	005,000									
D	Data Flow Te	sting Criteria	Comparison of Data Flow Test	CO3 CO6									
D	Selection Crite	oria Feasible P	aths and Test Selection	003,000									
	Criteria		and rest selection										
C	Integration Te	sting. Introduct	ion Integration Techniques	CO3 CO6									
C	Regression tes	ting Performation	nce testing: Stress Load	003,000									
	Volume Soak	and Spike Ov	erview of performance tools.										
	Jmeter, Loadri	inner. WebLoa	d										
Unit 4	Functional Tes	sting											
A	Equivalence C	lass Partitionin	g, Boundary Value Analysis,	CO4.CO6									
**	Decision Table	es, Random Te	sting: Monkeys & Gorillas,	001,000									
	Error Guessing	2	<u> </u>										
В	Test case desig	gning – Test ca	ses, Test case format, Test	CO4.CO6									
	case designing	, Acceptance te	esting and criteria	,									
С	Automation te	utomation testing: Need for automation, categorization of esting tools, Selection of testing tools, Guidelines for											
	Testing tools,												
	automated test	atomated testing, Overview of commercial testing tools											
Unit 5	<b>Reviews and</b>	Reviews and Quality Control											
А	Testing maturi	Festing maturity model, Test metrics and measurements –											
	project, progre	ess and production	ivity metrics – Status										
	Meetings - Re	ports and Cont	rol Issues – Criteria for Test										
	Completion												
В	Types of revie	ws – Developii	ng a review program –	CO5,CO6									
	Components o	f Review Plans	- Reporting Review Results										
С	Five Views of	Software Qual	ity, McCall's Quality Factors	CO5,CO6									
	and Criteria, IS	SO 9000:2000 S	Software Quality Standard,										
	evaluating soft	ware quality											
Mode of	Theory/Jury/	Practical/Viva	L										
examination													
Weightage	CA	MTE	ETE										
Distribution	25%	25%	50%										
Text book/s*	1. Sagar	1. Sagar Naik & Piyu Tripathy, "Software Testing and											
	Qualit	Quality Assurance: Theory and Practice", Wiley.											
		-											
Other	1. Naresl	n Chauhan, "So	ftware Testing : Principles and										
References	practic	es", Oxford un	iversity press										
	2. Boris	Beizer, "Sof	tware Testing Techniques",										
	Dream	ntech Press											
	3. K.K.	Aggrawal and	Yogesh Singh, "Software										
	Engine	eering" New A	ge International Publication										



S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Define Basic concepts of Testing	PO1,PO2,PO10,PO12,PSO3
	and Debugging	
2.	CO2: Make use of Control flow graph to	PO1,PO2,PO3,PO4,PO5,PO6,
	perform white box testing	PO8,PO9,PO10,PO12,PSO1,PSO3
3.	CO3: Apply Data flow and integration	PO1,PO2,PO3,PO4,PO5,PO6,
	testing to develop feasible software	PO8,PO9,PO10,PO12,PSO1,PSO3
4.	CO4: Classify techniques of Functional	PO1,PO2,PO3,PO4,PO5,PO6,
	testing and design test cases	PO8,PO9,PO10,PO12,PSO1,PSO3
5.	CO5: Evaluate the software quality using	PO1,PO2,PO3,PO4,PO5,PO6,
	Reviews, maturity models and ISO	PO8,PO9,PO10,PO12,PSO1,PSO3
	standards.	
	CO6: Adapt software testing methods and	PO1,PO2,PO3,PO4,PO5,PO6,PO7,
	modern software testing tools for their	PO8,PO9,PO10,PO11,PO12,PSO1,PSO3
	testing projects.	

### PO and PSO mapping with level of strength for Software Testing (CSE 042)

Course Code_ Course Name	CO's	РО 1	PO 2	РО 3	PO4	РО 5	PO 6	РО 7	PO 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	2	1	-	-	-	-	-	-	-	3	-	2	-	-	3
	CO2	3	3	3	2	3	1	-	1	2	3	-	2	2	-	3
CSE042_ Software Testing	CO3	3	3	3	2	2	2	-	1	2	3	-	2	2	-	3
Soloware resting	CO4	3	3	3	2	3	1	-	1	2	3	-	2	2	-	3
	CO5	3	3	2	2	2	2	-	1	2	3	-	2	2	-	3
	CO6	3	3	3	2	3	2	3	2	3	3	3	3	2	-	3

#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO2	PO 3	РО 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE042	Software Testing	2.8	2.6	2.8	2	2.6	1.6	3	1.2	2.2	3	3	2.1	2	-	3

#### Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



1	Course Code	CSE051	
2	Course Title	Wireless Networks	
3	Credits	3	
4	Contact	3-0-0	
	Hours		
5	Course	The objective of this course is to provide fundamental knowledge a	bout Wireless
	Objective	networks, protocol stack and standards, understand and analyze the	network
		layer solutions for Wireless networks, and make student aware of 4	G Services.
6		After successful completion of this course students should be able	to:
		CO1. Enumerate, identify the foundation, and describe properties a	nd
		capabilities of commonly used wireless technologies	
		CO2. Identify and describe the infrastructure and requirements of N	Mobile IP and
	Course	Mobile IPv6	
	Outcomes	CO3.Illustrate the issues and solutions of various layers of mobile	networks,
		namely MAC layer, Network Layer & Transport Layer	
		CO4. Demonstrate the typical mobile networking infrastructure thr	ough a
		popular GSM protocol	
		CO5. Identify and describe the structure of current 4G cellular netv	vorks.
		CO6.Compare applications of 4G technologies.	
7	Course	The course will describe concepts, technology and application	ns of wireless
	Description	networking as used in current and next-generation wireless network	ks. In addition,
		the course addresses the fundamentals of wireless communication	s and provides
_		an overview of existing and emerging wireless communication network	works.
8	<b>**</b> •. •	Course Contents	
	Unit A	WIRELESS LAN	
			CO Manala a
	Unit A Tonio	Introduction WI AN technologies, Infrared IIIIE normovies	Mapping
	Unit A Topic	Introduction-WLAN technologies: Infrared, UHF narrowband,	Mapping CO1
	Unit A Topic 1	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol	Mapping CO1
	Unit A Topic 1 Unit A Topic	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer MAC layer 802 11b 802 11a – Hiper LAN:	Mapping CO1
	Unit A Topic 1 Unit A Topic 2	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM BRAN HiperLAN2	Mapping CO1 CO1
	Unit A Topic 1 Unit A Topic 2 Unit A Topic	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link	Mapping CO1 CO1 CO1
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical	CO1 CO1 CO1 CO1
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX	Mapping       CO1       CO1       CO1
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b>	Mapping CO1 CO1 CO1
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Unit B Unit B Topic	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery,	Mapping           CO1           CO1           CO1           CO1           CO1           CO1
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Unit B Topic 1	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation,	Mapping           CO1           CO1           CO1           CO1           CO1           CO1
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Topic 1 Unit B Topic	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation	Mapping           CO1           CO1, CO2           CO1, CO2
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Unit B Unit B Topic 1 Unit B Topic 2	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol	Mapping           CO1
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Topic 1 Unit B Topic 2 Unit B Topic	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol Mobile ad-hoc network: Routing Destination Sequence distance	Mapping           CO1           CO1, CO2           CO1, CO2           CO1, CO2
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Topic 1 Unit B Topic 2 Unit B Topic 2 Unit B Topic 3	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol Mobile ad-hoc network: Routing Destination Sequence distance vector, Dynamic source routing.	Mapping           CO1           CO1, CO2           CO1, CO2           CO1, CO2
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Topic 1 Unit B Topic 2 Unit B Topic 2 Unit B Topic 3 Unit B Topic 2 Unit B Topic 2 Unit B Topic 3 Unit B Topic 3 Unit B Topic	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol Mobile ad-hoc network: Routing Destination Sequence distance vector, Dynamic source routing. <b>MOBILE TRANSPORT LAYER</b>	Mapping           CO1           CO1, CO2           CO1, CO2           CO1, CO2
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Topic 1 Unit B Topic 2 Unit B Topic 2 Unit B Topic 3 Unit C Topic	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol Mobile ad-hoc network: Routing Destination Sequence distance vector, Dynamic source routing. <b>MOBILE TRANSPORT LAYER</b> TCP enhancements for wireless protocols - Traditional TCP:	Mapping           CO1           CO1, CO2           CO1, CO2           CO1, CO2           CO3
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit A Topic 3 Unit B Topic 1 Unit B Topic 2 Unit B Topic 3 Unit C Unit C Unit C Topic 1	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol Mobile ad-hoc network: Routing Destination Sequence distance vector, Dynamic source routing. <b>MOBILE TRANSPORT LAYER</b> TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of	Mapping           CO1           CO1, CO2           CO1, CO2           CO1, CO2           CO1, CO2           CO3
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Unit B Unit B Topic 1 Unit B Topic 2 Unit B Topic 3 Unit C Unit C Unit C Topic 1	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol Mobile ad-hoc network: Routing Destination Sequence distance vector, Dynamic source routing. <b>MOBILE TRANSPORT LAYER</b> TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility	Mapping           CO1           CO1, CO2           CO1, CO2           CO1, CO2           CO3
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Topic 1 Unit B Topic 2 Unit B Topic 2 Unit B Topic 3 Unit C Topic 1 Unit C Topic 2	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol Mobile ad-hoc network: Routing Destination Sequence distance vector, Dynamic source routing. <b>MOBILE TRANSPORT LAYER</b> TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility Classical TCP improvements: Indirect TCP, Snooping TCP, Mabila TCP. Time out fragging	Mapping           CO1           CO1, CO2           CO1, CO2           CO1, CO2           CO3
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Topic 1 Unit B Topic 2 Unit B Topic 2 Unit B Topic 3 Unit C Topic 1 Unit C Topic 2 Unit C Topic 2 Unit C Topic	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol Mobile ad-hoc network: Routing Destination Sequence distance vector, Dynamic source routing. <b>MOBILE TRANSPORT LAYER</b> TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing	Mapping           CO1           CO1, CO2           CO1, CO2           CO1, CO2           CO3           CO3
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit A Topic 3 Unit B Topic 1 Unit B Topic 2 Unit B Topic 3 Unit C Topic 1 Unit C Topic 2 Unit C Topic 2 Unit C Topic 3	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol Mobile ad-hoc network: Routing Destination Sequence distance vector, Dynamic source routing. <b>MOBILE TRANSPORT LAYER</b> TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks	Mapping         CO1         CO1, CO2         CO1, CO2         CO3         CO3         CO3
	Unit A Topic 1 Unit A Topic 2 Unit A Topic 3 Unit B Topic 1 Unit B Topic 2 Unit B Topic 2 Unit B Topic 3 Unit C Topic 1 Unit C Topic 2 Unit C Topic 3 Unit C Topic	Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, Physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX <b>MOBILE NETWORK LAYER</b> Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet Mobile IP session initiation protocol Mobile ad-hoc network: Routing Destination Sequence distance vector, Dynamic source routing. <b>MOBILE TRANSPORT LAYER</b> TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks.	Mapping         CO1         CO1         CO1         CO1         CO1         CO1         CO1         CO1         CO1, CO2         CO1, CO2         CO1, CO2         CO3         CO3         CO3



Unit D Topic 1	Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture	CO3, CO4				
Unit D Topic 2	3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall,	CO3, CO4				
Unit D Topic 3	DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.	CO3, CO4				
Unit E	4G NETWORKS					
Unit E Topic 1	Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies	CO5, CO6				
Unit E Topic 2	Multicarrier Modulation, Smart antenna techniques, OFDM- MIMO systems,	CO5, CO6				
Unit E Topic 3	nit E Topic Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.					
	<b>Reading Content</b>					
Text book*	1. Jochen Schiller, Mobile Communications, Second Edition, Pearso 2012.(Unit I,II,III)	on Education				
other references	<ol> <li>Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "36 HSPA and LTE for Mobile Broadband", Second Edition, Academic 2.Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", I Elsevier 2011.</li> <li>Simon Haykin, Michael Moher, David Koilpillai, "Modern Wire Communications", First Edition, Pearson Education 2013</li> </ol>	G Evolution 2 Press, 2008. First Edition, less				

C	Courses Outcomes	$\mathbf{D}_{\mathbf{H}\mathbf{Q}} = \mathbf{D}_{\mathbf{H}\mathbf{Q}} + \mathbf{D}_{\mathbf{Q}\mathbf{Q}} + \mathbf{D}_{\mathbf{Q}\mathbf{Q}\mathbf{Q}} + \mathbf{D}_{\mathbf{Q}\mathbf{Q}\mathbf{Q}\mathbf{Q}\mathbf{Q}\mathbf{Q}\mathbf{Q}\mathbf{Q}\mathbf{Q}Q$
S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: Enumerate, identify the foundation, and describe properties	PO1,PO3,PO8 PSO3
	and capabilities of commonly used wireless technologies	
2.	CO2. Identify and describe the infrastructure and requirements of	PO1,PO2,PO3,PO8 PSO3
	Mobile IP and Mobile IPv6	
3.	CO3.Illustrate the issues and solutions of various layers of mobile	PO1,PO2,PO3,PO8 PSO3
	networks, namely MAC layer, Network Layer & Transport Layer	
4.	CO4. Demonstrate the typical mobile networking infrastructure	PO1,PO2,PO3,PO8 PSO3
	through a popular GSM protocol	
5	CO5. Identify and describe the structure of current 4G cellular	PO1,PO2,PO3,PO4,PO5,PO8
	networks.	PSO3
6.	CO6.Compare applications of 4G technologies.	PO1,PO2,PO3,PO4,PO5,PO8
		PSO3



# PO and PSO mapping with level of strength for Course Name Wireless Networks (CSE051)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	-	3	-	-	-	-	1	-	-	-	-	-	-	2
CO2	3	2	3	-	-	-	-	1	-	-	-	-	-	-	2
CO3	3	2	3	-	-	-	-	1	-	-	-	-	-	-	2
CO4	3	2	3	-	-	-	-	1	-	-	-	-	-	-	2
CO5	3	2	3	2	2	-	-	1	-	-	-	-	-	-	3
CO6	3	2	3	2	2	-	-	1	-	-	-	-	-	-	3
Avg.	3	1.6	3	0.6	0.6	-	-	1	-	-	-	-	-	-	2.3



Sch	ool:	School of Engineering & Technology								
Dep	artment	Department of Computer Science & Engineering								
Pro	gram:	B. tech								
Bra	nch: CSE	Semester: 6								
1	Course Code	CSE052								
2	Course Title	Risk Management								
3	Credits	3								
4	Contact	3-0-0								
	Hours									
	(L-T-P)									
	Course Status	Core /Elective/Open Elective								
5	Course	The objective of this course is to provide an insight to fu	ndamentals of							
	Objective	risk management in which business and society make an	assessment of,							
		control, regulation of risk management and transfer risk.								
6	CourseOn successful completion of this module students will be able to:									
	Outcomes									
		CO1: define the basic concept of risk, types, uncertainty, i	managing,							
		evaluation and prediction of risk.								
		CO2: illustrate the key stages, component, framework, sta	ndards,							
		architecture, strategy policies, and protocols process of the	e risk							
		management.								
		CO3: identify various risk, score them, control and opport	unity risk							
		CO4: apply approach/technique of risk assessment for stra	ategy, projects							
		and operations, and make use of risk matrix								
		CO5: analyze uncertainty and risk in projects and apply me	easurement							
		CO6: Explain compare and apply risk management conce	ent and							
		techniques in projects to the success of the organization	pr und							
		techniques in projects to the success of the organization.								
7	Course	This course is to provide students with the concepts and fu	indamentals of							
/	Description	risk management a study of risk assessment and	management							
	Description	techniques, methods, and models used in industry to min	imize. control							
		and communicate risks.								
8	Outline syllabu	15	CO							
			Mapping							
	Unit 1	Introduction								
	А	The Concept of Risk, Risk and Uncertainty: Distinction,	CO1, CO6							
		Classification of Risks								
	В	Managing Risk, Sources and Measurement of Risk CO1, CO								
	C	Risk Evaluation and Prediction, Types of RiskCO1, C								
	Unit 2	Principles and aims of risk management								
	А	Principles of risk management, Importance of risk	CO2, CO6							
		management, Risk management activities, Perspectives								
		of risk management								



В	Scope of ris	k managemer	t standards:- Risk management	CO2, CO6					
	process, Ris	k managemer	nt framework						
С	Risk archited	cture, strategy	y Policies and protocols	CO2, CO6					
Unit 3	<b>Risk classif</b>	ication Syste	ms						
А	Shor, Mediu	m and long to	erm Risk	CO3, CO6					
В	FIRM risk s	corecard, PES	STLE risk classification system	CO3, CO6					
С	Hazard, cont	trol and oppo	rtunity risk	CO3, CO6					
Unit 4	<b>Risk Assess</b>	ment							
А	Importance	of risk assess	ment, Approaches to risk	CO4, CO6					
	assessment,	assessment, risk assessment techniques							
В	Risk Matrix,	CO4, CO6							
С	Application	Application of risk matrix, inherent and current level of							
	risk, 4T's of	risk response	2						
Unit 5	Risk Manag	Risk Management							
А	Importance	of risk appeti	te – Risk tolerance, treatment,	CO5, CO6					
	termination								
В	Introduction	to Project Ri	sk Management, uncertainty in	CO5, CO6					
	projects, pro	oject lifecycle	e, Project risk analysis and						
	managemen	t							
С	Operational	risk manager	nent- definition, measurement,	CO5, CO6					
	difficulties of	of measureme	nt						
Mode of	Theory								
examination		1							
Weightage	CA	MTE	ETE						
Distribution	25%	25%	50%						
Text book/s*	1. Paul Hop	okin,"Fundan	nental of Risk Management-						
	Understa	anding evalua	ting and implementing						
	effective	risk manage	ment", KoganPage London						
	Philadel	phia New Del	lhi.						
Other	1. Internet								
References									

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: define the basic concept of risk, types, uncertainty, managing, evaluation and prediction of risk.	PO1, PO2, PO7, P12, PSO1
2.	CO2: illustrate the key stages, component, framework, standards, architecture, strategy policies, and protocols process of the risk management.	PO1, PO4, PO5, PO8, PO9, PO10, PO11, PO12 PSO3
3.	CO3: identify various risk, score them, control and opportunity risk	PO1, PO2, PO4, PO9, P12, PSO1



4.	CO4: apply approach/technique of risk assessment for strategy, projects and operations, and make use of risk matrix	PO1, PO3, PO5, PO6, PO9, P11, PSO3
5.	CO5: analyze uncertainty and risk in projects and apply measurement	PO1, PO2, PO4, PO5, PO7, PO9, PSO3
6.	CO6: explain, compare and apply risk management concept and techniques in projects to the success of the organization.	PO1, PO3, PO5, PO7, PO9, P11, P12, PSO2

# PO and PSO mapping with level of strength for Course Name Risk Management (Course Code CSE052)

	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	CO1	3	-	-	-	-	-	1	-	-	-	-	1	2	-	-
CSE052	CO2	2	2	-	3	2	-	-	1	2	1	1	1	-	-	2
Risk	CO3	2	-	-	-	-	-	-	-	2	-	-	1	1	-	-
Management	CO4	1	-	2	-	3	-	-	-	2	2	2	-	-	-	1
	CO5	2	2	-	2	1	-	1	-	2	1	1	-	-	-	1
	CO6	2	2	2	-	-	-	1	-	2	1	1	1	-	1	-

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	PO	PO	PSO 1	PSO	PSO 3
Code	Name										10	11	12		2	
CSE052	Risk	2	2	2	2.5	2	-	1	1	2	1.25	1.25	1	1.5	1	1.33
	Manage															
	ment															

#### Strength of Correlation

- 1. Addressed to *Slight (Low=1) extent* 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



# Syllabus: CSE 053, Advanced Operating System

Sch	ool: SET	Batch : 2023-27								
Pro	gram:	Current Academic Year: 2023-24								
B.T	<b>Tech</b>									
Bra	anch: CSE	Semester: VI								
1	Course Code	CSE053 Course Name: Advanced Operating	System							
2	Course Title	Principles of Operating System								
3	Credits	3								
4	Contact	3-0-0								
	Hours									
	(L-T-P)									
	Course Status	Core								
5	Course	1. This course introduces the challenges for	r designing the operating							
	Objective	systems.	systems.							
		2. Includes different design principles and	algorithms.							
		3. Evaluation of algorithms proposed.	00							
6	Course	Students will be able :	4. Implementation of algorithms and utilities.							
0	Outcomes	<b>CO1</b> Discuss the various synchronization, sched	<b>O1</b> Discuss the various synchronization scheduling and memory							
	0 000 0 0 0 0 0	management issues								
		CO2 Demonstrate the Mutual exclusion, Deadlo	ock detection and agreement							
		protocols of	C C							
		Distributed operating system								
		CO3 Discuss the various resource management	techniques for distributed							
		systems								
		<b>CO4</b> Identify the different features of real time a	and mobile operating systems							
		<b>CO5</b> Install and use available open source kerne								
		<b>CO6</b> Modify existing open source kernels in ter	ms of functionality or							
7	Course	This course covers general issues of design and	implementation of advanced							
/	Description	modern operating systems. The focus is on issue	es that are critical to the							
	Description	applications of distributed systems and compute	r networks, which include							
		inter process communication, distributed proces	sing, sharing and replication							
		of data and files.								
8	Outline syllabu	s	CO Mapping							
	Unit 1	FUNDAMENTALS OF OPERATING								
		SYSTEMS								
	А	Overview – Synchronization Mechanisms –	CO1							
		Processes and Threads - Process Scheduling								
	В	Deadlocks: Detection, Prevention and	COI							
		Recovery								
	C	Models of Resources – Memory	COI							
	Unit 2	Nanagement Techniques.								
		Issues in Distributed Operating System	CO1 CO2							
	1	Architecture – Communication Primitives –	001,002							
	В	Lamport's Logical clocks – Causal Ordering	CO1 CO2							
		of Messages								
L	1	0								



С	Distributed	Mutual Exc	clusion	CO1, CO2
	Algorithms	– Centraliz	ed and Distributed	
	Deadlock I	Detection Al	gorithms – Agreement	
	Protocols.			
Unit 3	DISTRIBU	UTED RES	OURCE	
	MANAGE	MENT		
А	Distributed	File System	ns – Design Issues -	CO1,CO2
	Distributed	Shared Mer	mory – Algorithms	
	for – Imple	menting Dis	stributed Shared	
	memory	-		
В	Issues in L	oad Distribu	ting – Scheduling	CO1,CO2,CO3,CO4
	Algorithms	-Synchron	nous and Asynchronous	
	Check Poir	ting and Re	covery	
С	Fault Toler	ance – Two-	-Phase Commit	C01,C02,C03,C04
	Protocol –	Non-blockir	ng Commit Protocol –	
	Security an	d Protection	l.	
 Unit 4	REAL TIN	AE AND M	<b>OBILE OPERATING</b>	
	SYSTEMS	5		
А	Basic Mode	el of Real Ti	ime Systems -	C01,C02,C03,C05
	Characteris	tics- Applic		
	Systems			
В	Real Time	Task Schedu	C01,C02,C03,C05	
	Resource S	haring		
С	Mobile Op	erating Syste	ems –Micro Kernel	C01,C02,C03,C05
	Design - C	lient Server	Resource Access –	
	Processes a	and Threads	- Memory	
	Manageme	nt - File syst	tem.	
Unit 5	CASE ST	UDIES		
А	linux Syste	m: Design F	Principles - Kernel	CO1,CO2,CO3,CO6
	Modules -	Process Ma	nagement Scheduling -	
В	Memory M	anagement	- Input-Output	C01,C02,C03,C04,C06
	Manageme	nt - File Sy	stem	
С	Inter-proce	ss Commun	ication. iOS and	C01,C02,C03,C06
	Android: A	Architecture	and SDK Framework -	
	Media Lay	er -		
	Services La	ayer - Core (	OS Layer - File System.	
Mode of	Theory			
examination				
Weightage	CA	MTE	ETE	
Distribution	25%	25%	50%	
Text book/s*	Abraham	Silberschatz	z; Peter Baer Galvin;	
	Greg Gagr	ne, "Operati	ng System Concepts",	
	Seventh Ed	lition, John V		
Other	1. Mukes	h Singhal a	nd Niranjan G.	
References	Shivara	atri, "Advan	ced Concepts in	
	Operati	ing Systems	*	
	– Distri	ibuted, Data	base, and	
	Multip	rocessor Ope	erating Systems", Tata	



McGraw-Hill, 2001. 2. Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
3. Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	<b>CO1</b> Discuss the various synchronization, scheduling	PO1,PO2,PO3,PO4,PSO1
	and memory management issues	
2.	CO2 Demonstrate the Mutual exclusion, Deadlock	PO1, PO3, PO4, PSO2
	detection and agreement protocols of	
	Distributed operating system	
3.	CO3 Discuss the various resource management	PO1,PO2,PO3,PO4
	techniques for distributed systems	
4.	CO4 Identify the different features of real time and	PO9, PO10,PO11, PSO3
	mobile operating systems	
5.	CO5 Install and use available open source kernel	PO1,PO2,PO8,PO9,PO10,PSO1
6.	CO6 Modify existing open source kernels in terms of	PO1,PO2,PO10,PO11,PSO1,PSO2
	functionality or features used	

# PO and PSO mapping with level of strength for Course Name Principles of Operating System (Course Code CSE 053)

CSE05	Cos	PO	PO	PO	PO	PO	РО	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
3		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
		3	3	3	3				2	2	1	2	1	3	2	2
	CO															
	1															
		3	2	3	3				2	2	2	1	1	2	3	2
	CO															
	2															
		3	3	3	3				1	1	1	3	2	3	2	1
	CO															
	3															
	CO	2	2	2	2	1			2	3	3	3	1	2	2	2
	4															
	Co5	2	2	3	-	-	-	-	3	3	1	2	-	3	-	-
	CO	3	2	-	-	-	-	-	-	-	2	3	-	2	2	-
	6															



|--|

Sch	ool:	School of Engineering & Technology							
Dep	artment	Department of Computer Science & Engineering							
Pro	gram:	B-TECH							
Bra	nch:	Computer Science and Engineering							
1	Course Code	CSP472							
2	Course Title	Artificial Intelligence Lab							
3	Credits	1							
4	Contact Hours	0-0-2							
	(L-T-P)								
	Course Status	Compulsory							
5	Course	The objective of the course is to introduce basic fundament	ntal concepts in						
	Objective	Artificial Intelligence (AI), with a practical approach in unde	erstanding them.						
	5	To visualize the scope of AI and its role in futuristic develo	pment.						
		• To develop a sense of appreciation for t	traditional AI						
		Programming							
		To use classical AI problems to understand cog	nitive process.						
		• To have an overview of the various processe	es involved in						
		Machine Learning	Machine Learning						
		• To develop a working model of real life pro	blem base on						
		Artificial Agent.							
6	Course	After the completion of this course, students will be ab	le to:						
	Outcomes	CO-1. <i>Relate</i> the goals of Artificial Intelligence and Al	and non-AI						
		solution.							
		CO-2. Analyze and various AI uninformed and informed	ed search						
		algorithms.							
		CO-3. <i>Extend</i> knowledge representation, reasoning, an	d theorem						
		proving techniques to real-world problems							
		CO-4. <i>Make use of:</i> Machine learning algorithms in vario	us application						
		domains of AI.	omains of Al.						
		CO-5. Select Artificial Intelligent based applications.							
		communicate it effectively							
7	Course	In this course students will learn basic introduction of Artifi	cial						
/	Description	Intelligence, problem solving agents, reasoning, learning an	d applications						
	Description	of artificial intelligence.	- approximiting						
8	Outline syllabus	5	СО						
			Mapping						
	Unit 1	Practical based on goal based problems	CO1						
		Sub unit - a, b and c detailed in Instructional Plan							
	Unit 2	Practical related to uninformed search algorithm.	CO1,CO2						
		Sub unit - a, b and c detailed in Instructional Plan							
	Unit 3	Practical related to informed search algorithm.	CO3						
		Sub unit - a, b and c detailed in Instructional Plan							
	Unit 4	Practical related to knowledge representations	CO4						
		and logical reasoning							
		Sub unit - a, b and c detailed in Instructional Plan							



Unit 5	CO5,CO6									
	Sub unit - a,	Sub unit - a, b and c detailed in Instructional Plan								
Mode of examination	Practical/Viv	Practical/Viva								
Weightage	CA	CE(Viva)	ETE							
Distribution	25%	25%	50%							
Text book/s*	1. Rich E&	z Knight K, A	Artificial Intelligence, Tata							
	McGraw	Hill, Edition 3.								
Other References	<ol> <li>Russell S <i>Approach</i> </li> <li>Dan W. Systems, Indian Ec</li> </ol>	&Norvig P, Art a, Prentice Hall. Patterson, Arti- Pearson Educat lition.	<i>ificial Intelligence: A Modern</i> ficial Intelligence & Expert ion with Prentice Hall India.							

#### **Course Outcomes:**

Sl. No.	Course Outcome (CO)	
CO-1:	<i>Relate</i> the goals of Artificial Intelligence and AI	PO3, PO4, PO5, PO10, PSO1,
	and non-AI solution.	PSO2, PSO3
CO-2:	Analyze and various AI uninformed and	PO1, PO2, PO3, PO4, PO5,
	informed search algorithms.	PO10, PSO1, PSO2, PSO3
CO-3:	<i>Extend</i> knowledge representation, reasoning,	PO1, PO2, PO3, PO4, PO5,
	and theorem proving techniques to real-world	PO12, PSO1, PSO2, PSO3
	problems	
CO-4:	Make use of: Machine learning algorithms in	PO1, PO2, PO3, PO4, PO5,
	various application domains of AI.	PO12, PSO1, PSO2, PSO3
CO-5:	Select Artificial Intelligent based applications.	PO1, PO2, PO3, PO4, PO5,
		PO9, PO10 PO12, PSO1,
		PSO2, PSO3
CO-6:	<i>Develop</i> independent (or in a small group)	PO1, PO2, PO3, PO4, PO5,
	research and communicate it effectively.	PO9, PO10 PO12, PSO1,
		PSO2, PSO3

# PO and PSO mapping with level of strength for Course Name Artificial Intelligence Lab (Course Code CSP472)

Course Code_ Course Name	CO 's	P 0 1	PO 2	Р О 3	РО 4	P 0 5	P 0 6	P 0 7	P 0 8	P 0 9	P 0 10	P 0 11	P 0 12	PS 0 1	PS O2	PS O3
	CO 1	1	2	3	2	2					2		2	3	2	2
	CO 2	2	3	3	2	3					2		2	3	3	2
	CO 3	3	3	3	3	2	1	1			1	2	3	3	2	3
	CO 4	3	3	3	3	2	2	1			2	1	3	3	2	3
CSP472: Artificial	CO 5	2	3	3	3	3	2	2	2	3	2	2	2	3	3	2
Intelligence Lab	CO 6	2	3	3	3	3	2	2	2	3	2	2	2	3	3	2

#### Strength of Correlation

1. Addressed to *Slight (Low=1) extent*2. Addressed to *Moderate (Medium=2) extent*3. Addressed to *Substantial (High=3) extent*



## List of Practical's:

	Unit 1	Practic	l based on goal based problems					
Week 1	A	Lab expt.1	Implementation of Water Jug Problem.					
Week 2, 3	В	Lab expt.2	<ul> <li>Introduction to Lisp, and basic programming in Lisp like following: <ol> <li>Write a LISP function to compute sum of squares.</li> <li>Write a LISP function to compute difference of squares. (if x &gt; y return x<sup>2</sup> - y<sup>2</sup>, Otherwise y<sup>2</sup> - x<sup>2</sup>).</li> </ol> </li> <li>Write a Recursive LISP function which takes one argument as a list and return last element of the list. (Do not use last predicate.)</li> <li>Write a Recursive LISP function which takes one argument as a list and return list except last element of the list. (Do not use butlast.)</li> <li>Write a Recursive LISP function which takes one argument as a list and return reverse of the list. (Do not use reverse predicate).</li> <li>Write a Recursive LISP function which takes two arguments first an atom second a list returns a list after removing first occurrence of that atom within the list.</li> <li>Write a Recursive LISP function which takes 2 lists as arguments and returns a list containing alternate elements from each list.</li> </ul>					
Week 4	C	Lab expt.3	<ul> <li>Advance programming in Lisp like following: <ol> <li>Write a function that compute the factorial of a number.(factorial of 0 is 1, and factorial of n is n*(n-1)*1.Factorial is defined only for integers greater than or equal to 0.)</li> <li>Write a function that evaluate a fully parenthesized infix arithmetic expression. For examples, (infix (1+ (2*3))) should return 7.</li> <li>Write a function that performs a depth first traversal of binary tree. The function should return a list containing the tree nodes in the order they were visited.</li> <li>Write a LISP program for water jug problem.</li> <li>Write a LISP program that determines whether an integer is prime.</li> </ol> </li> </ul>					
West 5	2	r racuca	Defen fellenning figure og men midt distanse deteile. Weite					
week 5	a, o,	expt.4	in your preferred language to generate path from ARAD to BUCHREST, analyze result obtained by a) Depth First Search					



			b) Breadth First Search
			c) Uniform Cost Search
			Arad 118 118 110 110 140 151 151 151 151 151 151 151 15
			75 Drobeta 120 Craiova Giurgiu
Week 6	С	Lab expt.5	Write a program in your preferred language to generate steps to solve Tower of Hanoi problem.
	Linit	<b>D</b> (*	
1	Omt	Practica	al related to informed search algorithm.
	3	Practica	al related to informed search algorithm.
Week 7	3 Mid ter	m	al related to informed search algorithm.
Week 7 Week 8	3 Mid ter a,b,c	m Lab expt.6	Write a program in your preferred language to solve the 8 puzzle Problem-using A* algorithm.
Week 7 Week 8	3 Mid ter a,b,c Unit 4	m Lab expt.6 Practica	Write a program in your preferred language to solve the 8 puzzle Problem-using A* algorithm. al related to knowledge representations and logical reasoning
Week 7 Week 8 Week 9	3Mid tera,b,cUnit4A	m Lab expt.6 <b>Practica</b> Lab	Write a program in your preferred language to solve the 8 puzzle Problem-using A* algorithm. al related to knowledge representations and logical reasoning Write PROLOG program to Program to categorize animal
Week 7 Week 8 Week 9	Mid ter     a,b,c       Unit     4     A	m Lab expt.6 Practica Lab expt.7	Write a program in your preferred language to solve the 8 puzzle Problem-using A* algorithm. al related to knowledge representations and logical reasoning Write PROLOG program to Program to categorize animal characteristics.
Week 7 Week 8 Week 9	Mid ter a,b,c Unit 4 A B	m Lab expt.6 Practica Lab expt.7 Lab	al related to informed search algorithm.         Write a program in your preferred language to solve the 8 puzzle         Problem-using A* algorithm.         al related to knowledge representations and logical reasoning         Write PROLOG program to Program to categorize animal characteristics.         Write PROLOG program to solver for the linear equation A*X + B =
Week 7 Week 8 Week 9 Week 10	Mid ter a,b,c Unit 4 A B	m Lab expt.6 Practica Lab expt.7 Lab expt.8	Write a program in your preferred language to solve the 8 puzzle Problem-using A* algorithm. al related to knowledge representations and logical reasoning Write PROLOG program to Program to categorize animal characteristics. Write PROLOG program to solver for the linear equation A*X + B = 0. Let the predicate linear (A, B, X) return the root X of the equation.
Week 7 Week 8 Week 9 Week 10 Week 11	Mid ter a,b,c Unit 4 A B C	m Lab expt.6 Practica Lab expt.7 Lab expt.8 Lab expt.9	<ul> <li>al related to informed search algorithm.</li> <li>Write a program in your preferred language to solve the 8 puzzle Problem-using A* algorithm.</li> <li>al related to knowledge representations and logical reasoning</li> <li>Write PROLOG program to Program to categorize animal characteristics.</li> <li>Write PROLOG program to solver for the linear equation A*X + B = 0. Let the predicate linear (A, B, X) return the root X of the equation.</li> <li>Write a PROLOG program that answers questions about family members and relationships includes predicates and rules which define sister, brother, father, mother, grandchild, grandfather and uncle. The program should be able to answer queries such as the following: father(x, Amit) grandson(x, y) uncle (sumit, puneet) mother (anita, x)</li> </ul>
Week 7 Week 8 Week 9 Week 10 Week 11	Mid ter a,b,c Unit 4 A B C Unit 5	m Lab expt.6 Practica Lab expt.7 Lab expt.8 Lab expt.9	<ul> <li>al related to informed search algorithm.</li> <li>Write a program in your preferred language to solve the 8 puzzle Problem-using A* algorithm.</li> <li>al related to knowledge representations and logical reasoning</li> <li>Write PROLOG program to Program to categorize animal characteristics.</li> <li>Write PROLOG program to solver for the linear equation A*X + B = 0. Let the predicate linear (A, B, X) return the root X of the equation.</li> <li>Write a PROLOG program that answers questions about family members and relationships includes predicates and rules which define sister, brother, father, mother, grandchild, grandfather and uncle. The program should be able to answer queries such as the following: father(x, Amit) grandson(x, y) uncle (sumit, puneet) mother (anita, x)</li> <li>al related to machine learning algorithms</li> </ul>
Week 7 Week 8 Week 9 Week 10 Week 11	Mid ter a,b,c Unit 4 A B C Unit 5 a,	Practica         m         Lab         expt.6         Practica         Lab         expt.7         Lab         expt.8         Lab         expt.9	al related to informed search algorithm.         Write a program in your preferred language to solve the 8 puzzle         Problem-using A* algorithm.         al related to knowledge representations and logical reasoning         Write PROLOG program to Program to categorize animal characteristics.         Write PROLOG program to solver for the linear equation A*X + B = 0. Let the predicate linear (A, B, X) return the root X of the equation.         Write a PROLOG program that answers questions about family members and relationships includes predicates and rules which define sister, brother, father, mother, grandchild, grandfather and uncle. The program should be able to answer queries such as the following: father(x, Amit) grandson(x, y) uncle (sumit, puneet) mother (anita, x)         al related to machine learning algorithms         Project Work Evaluation-0: Problem Statement



Week 14	С	Project	Project Work Evaluation-2: Development



## Syllabus: Compiler Design lab

Sch	ool:	School of Engineering & Technology							
Dep	artment	Department of Computer Science & Engineering							
Pro	gram:	B.Tech							
Bra	nch:CSE	Semester:6							
1	Course Code	CSP353							
2	Course Title	Compiler Design Lab							
3	Credits	1							
4	Contact Hours	0-0-2							
	(L-T-P)								
	Course Status	Compulsory							
5	Course	This laboratory course is intended to make the students exp	periment on the						
	Objective	basic techniques of compiler construction and tools that can	used to perform						
		syntax-directed translation of a high-level programming la	inguage into an						
		executable code. Students will design and implement langu	lage processors						
		in C by using tools to automate parts of the implementation	on process. This						
		will provide deeper insignts into the more advanced sema	independent						
		optimizations dynamic memory allocation and object orier	ntation						
6	Course	CO1 Apply different compiler writing tools to implement f	he different						
-	Outcomes	Phases							
		CO2: Understand and define the role of lexical analyzer, u	use of regular						
		expression and transition diagrams.	U						
		CO3: Implement a parser for different context free gramm	ars.						
		CO4: <b>Construct</b> the intermediate representation							
		CO5: <b>Implement</b> Symbol table							
		CO6: Compare various code optimization techniques							
7	Course	This self-paced course will discuss the major ideas used tod	ay in the						
	Description	implementation of programming language compilers, include	ling lexical						
	-	analysis, parsing, syntax-directed translation, abstract synta	x trees, types						
		and type checking, intermediate languages, dataflow analys	is, program						
		optimization, code generation, and runtime systems. As a result, you will							
		learn how a program written in a high-level language design	hed for humans						
		nore suited to machines	ver assembly						
8	Outline syllabu	s	CO						
	5		Mapping						
	Unit 1	Practical based on Designing of Finite Automata							
		and Compiler construction tools							
		1. Design a DFA which will accept all the	CO1						
		strings containing even number of 0's and							
		even number of 1's over an alphabet {0, 1}							
		and write a program to implement the DFA.							
		2. Design a DFA which will accept all the							
		strings containing mod 3 of 0's over an							



		alpha	abet {0, 1} and	write a program to			
		impl	ement the DFA	L.			
	3.	Desig	gn a lexical anal	yzer for given language and	L		
		the le	exical analyzer s	hould ignore redundant			
		space	es, tabs and new	lines			
Unit 2	Practic	cal re	lated to Par	sing Techniques			
	1.	Write	e an algorithm	and program on Recursiv	/e CO2,CO3		
		Desc	ent parser.				
	2.	Write	e an algorithm	and program to compute			
		FIRS	T and FOLLO				
	3.	Deve					
		giver	n language.				
	4.	Impl	ementation of	shift reduce parsing			
		algor	rithm and LR p	arser			
Unit 3	Practic	:					
		Write	ediate Code Gel	ieration			
	1.	W IIU	e coue to gener		04		
	2.	Inter	mediate Code	Jeneration			
Unit 4	Practic	cal re	lated toSyn	ibol table			
	Implem	ent Sy	ymbol table		CO5		
Unit 5	Practic	cal re	lated toCod	e optimization			
	technic	ques					
	1.	Impl	ementation of I	Directed Acyclic Graph	CO4,CO5		
	2.	Impl	ementation of (	Code Generation			
Mode of	Jury/Pr	actica	al/Viva				
examination							
Weightage	CA		CE(Viva)	ETE			
Distribution	25%		25%	50%			
Text book/s*	Aho, S	Aho, Sethi, Ulman, compilers Principles,					
 Others	Techni	echniques, and Tools, Pearson Education, 2003					
Other							
References	ס. D	. IVI.	1				
	P1						

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1 Apply different compiler writing tools	PO1,PO5,PO6,PO9,PO12,PSO1,PSO2
	to implement the different Phases	



2.	CO2: <b>Understand</b> and define the role of lexical analyzer, use of regular expression and transition diagrams.	PO1,PO2,PO3, PO4,PO5, PO12, PSO1, PSO2
3.	CO3: <b>Understand</b> and use Context free grammar, and parse tree construction.	PO1,PO2,PO3,PSO1,PSO2
4.	CO4: Construct the intermediate	PO1,PO2,PO3, PO4,PO5,PO9,
	representation	PSO2,PSO3
5.	CO5: Implement Symbol table	PO1,PO2,PO3,
		PO4,PO5,PO9,PO12,PSO1,PSO2,PSO3
6.	CO6: Compare various code optimization	PO1, PO3,PO4, PO4,PO5,PO9,PO12
	techniques	PSO1,PSO2,PSO3

#### PO and PSO mapping with level of strength for Course Name Compiler Design Lab (Course Code CSP353)

Cos	PO1	РО	PO3	PO4	PO5	РО	PO7	PO8	PO9	PO1	РО	PO1	PS	PSO2	PSO3
		2				6				0	11	2	01		
CO1	3				3				2			3	2	1	
CO2	2	2	3	3	2							2	3	2	
CO3	3	3	3									-	3	2	
CO4	1	2	3	3	3				3					3	2
CO5	1	1	2	3	2				3			3	1	2	2
CO6	2		3	3	2				3			3	3	2	3

**1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)** *Average of non-zeros entry in following table (should be auto calculated).* 

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	Р О 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSE353	Compiler Design	2	1.3	2.3	2	2	0	0-	0	1.8	0	0	2	2	2	1.2

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent
2. Addressed to Moderate (Medium=2) extent
3. Addressed to Substantial (High=3) extent



# Syllabus: CSP 396, Technical Skill Enhancement Course-2(Application Development Lab)

Sch	ool: SET	Batch : 2023-27	
Pro	gram: BTech	Current Academic Year: 2023-24	
Bra	nch:	Semester:6	
1	Course Code	CSP396	
2	Course Title	Technical Skill Enhancement Course-2(Application I	Development
		Lab)	_
3	Credits	1	
4	Contact Hours	0-0-2	
	(L-T-P)		
	Course Status	Compulsory/Elective	
5	Course	Describe the components and structure of a mobile develop	ment
	Objective	frameworks (Android SDK and Eclipse Android Developm	ent Tools
	5	(ADT)) and learn how and when to apply the different com	ponents to
		develop a working system.	
6	Course	On successful completion of the course, the student will be	able to:
	Outcomes	CO1:Explainthe fundamentals of Android App Developme	nt.
		<b>CO2:</b> Make use of UI components to create Android applications in android to p	ations.
		driven programming	eriorin event
		<b>CO4:</b> Develop database SQLite based Android applications	
		CO5: Analyze the usage of commonly available device sense	sors while
		building Android App.	
	~	CO6:Develop application using Android software develop	ment tools.
7	Course	The course will introduce concepts of the Android platform	, Android
	Description	application components, Activities and their lifecycle, UI de	esign. It will
		also help students to build applications according to their pr	oblem
8	Outline syllabus	statements.	CO
0	Outline synabul	3	Manning
	Unit 1	Introduction to Android	Mapping
		Configuration of android SDK and test run of application on	CO1 CO6
		device, Create "Hello World" application, develop an Android	01,000
		Application to implement Activity life cycle.	
	Unit 2	Android UI Components	
		Create a layout of Calculator using Grid layout, develop an	CO1,CO2,
		layout, develop an Android Application to implement implicit	,CO6
		intent.	
	Unit 3	Services and Notification	
		Develop an Android Application to implement Service life	CO3, ,CO6
		notification, Create a menu with 5 options and selected option	
		should appear in text box	
	Unit 4	Working with SQL Lite	



	Create and Log Create an appli operation on th Delete and retr	Create and Login application for above mentioned problems, Create an application to implement Create, Insert and update operation on the database, Create an application to perform Delete and retrieve operation on the database. Sensor Device							
Unit 5	Sensor Device	Sensor Device							
	Develop an An sensors, Develo sensors, Develo compass applic	CO5, ,CO6							
Mode of examination	Jury/Practica	Jury/Practical/Viva							
Weightage	CA	CE(Viva)	ETE						
Distribution	25%	25%	50%						
Text book/s*	1. AnubhavPra Apps: Learn, E Wiley India.								
Other References	<ol> <li>Wei-MengL</li> <li>Development.</li> <li>Neil Smyth ,</li> </ol>	ee , Beginning Ar Android Studio D	ndroid 4 Application Development essentials-Android						

	Mapping between Cos and Pos, PSO's									
Sl. No	Course Outcomes (COs)	Mapped Program Outcomes and PSO's								
1	<b>CO1:</b> Explain the fundamentals of Android App Development.	PO1,PO3,PO5,PO12,PSO1,PS O2,PSO3								
2	<b>CO2:</b> Make use of UI components to create Android applications.	PO1,PO3,PO5,PO10,PO12,PS O1,PSO2,PSO3								
3	<b>CO3:</b> Examine the services and notifications in android to perform event driven programming.	PO1,PO2,PO3,PO5,PO12,PSO 1,PSO2,PSO3								
4	<b>CO4:</b> Develop database SQLite based Android applications.	PO1,PO3,PO5,PO12,PSO1,PS 02,PSO3								
5	<b>CO5:</b> Analyze the usage of commonly available device sensors while building Android App.	PO1,PO3,PO5,PO12,PSO1,PS 02,PSO3								
6	<b>CO6:</b> Develop application using Android software development tools.	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO9,PO10,PO11,PO12,P SO1,PSO2,PSO3								



# PO and PSO mapping with level of strength for Course Name Technical SkillEnhancement Course-2 (Course Code CSP 396)1-Slight (Low)2-Moderate (Medium)3-Substantial (High)

COs	PO1	PO	PO	PO	PO	PO	PO	PO	PO9	PO	PO1	PO	PSO	PSO2	PSO3
		2	3	4	5	6	7	8		10	1	12	1		
CO1	1	-	1	-	2	-	-	-	-	-	-	1	1	2	1
CO2	1	-	1	-	2	-	-	-	-	2	-	1	1	2	1
CO3	1	2	1	-	2	-	-	-	-	-	-	1	1	2	1
CO4	1	-	2	-	2	-	-	-	-	-	-	1	1	2	1
CO5	2	-	1	-	2	-	-	-	-	-	-	1	1	2	1
CO6	2	2	3	2	2	2	1	-	2	3	2	2	2	3	1
Avg PO attain	1	07	15	03	2	03	0.2	0	0	1	0	1	1	2.2	1



Sc	hool: SET		Batch : 2023-27							
Pr	ogram: BTecl	h	Current Academic Year: 2023-24							
Br	anch: CSE / I	T	Semester: 6th							
1	Course Code		CSP398 Course Name: Project Based Lear	ming -4						
2	Course Title		Project Based Learning -4							
3	Credits		2							
4	Contact Hour	S	0-0-4							
	(L-T-P)									
	Course Status	5	Compulsory							
5	Course Objec	tive	1. To align student's skill and interests w	ith a realistic						
			problem or project.							
			2. To understand the significance of problem	and its scope.						
6	Course Outer		3. Students will make decisions within a fram	nework.						
0	Course Oulco	omes	Students will be able to:	at						
			CO2: Design relational database schema	11.						
			CO3 Develop the solution by using diffe	rent aspects of						
			programming language.							
			CO4: Classify and understand various test	techniques for						
			verification and validation of project.	•						
			CO5: Analyze and make use of modern for so	olving real word						
			problems.							
			CO6: Develop teamwork and need to engage in life-long							
			learning, along with the ability to communi	cate effectively						
7		• ,•	with others.	.1 11 0						
/	Course Descr	iption	In PBL-4, the students will learn how to define	the problem for						
			more application domains using software engineering							
			approaches that integrate ethical, social legal and economic							
			concerns.							
8	Outline syllab	ous		CO Mapping						
	Unit 1	Problem	Definition and identification, Team/Group	C01,C04						
		formation	and Project Assignment. Finalizing the							
		problem s	tatement, resource requirement, if any.							
	Unit 2	Use of the	relational algebra operations from	CO2,CO6						
		mathemat	ical set theory (union, intersection, difference,							
		and Cartes	sian product) and the relational algebra							
		operations	developed specifically for relational							
	Unit 2	Design:	(select (lestifict), project, join, and division)	CO3						
	Unit J	language	inprement project work in any programming	005						
	Unit 4	Use of ve	prious test tools and techniques for software	CO4 CO5						
		verificatio	n and validation of project	201,205						
	Unit 5	Demonstr	ate and execute Project with the team. CO6							
		Report sho	ould include Abstract, Hardware / Software							
		Requirem	ent, Problem Statement, Design/Algorithm,							
		ER diagra	ms, Use Case Diagrams, State Diagrams,							
		Sequence	Diagrams, Communication Diagrams, and							



	Activity Diagrams, Impler Reports. References, Test cases if The presentation, report, supported by the docume assessment.			
Mode of examination	Practical /Viva			
Weight age Distribution	СА	MTE		
		CE(Viva)	ETE	
	25%	25%	50%	

S. No.	Course Outcome	Program Outcomes (PO)
1.	CO1: Identify and formulate problem	PO1, PO2, PO4, PO6, PO8, PO9,
	statement.	PO10, PO11,
		PO12,PSO1,PSO2,PSO3
2.	CO2: Design relational database schema.	PO1, PO2, PO3, PO4, PO5, PO7,
		PO8, PO9, PO11, PO12,
		PSO1,PSO2,PSO3
3.	CO3: Develop the solution by using	PO1, PO2, PO3, PO4, PO5, PO6,
	different aspects of programming language.	PO8, PO9, PO11, PO12,
		PSO1,PSO2
4.	CO4: Classify and understand various test	PO1, PO2, PO3, PO4, PO5,
	techniques for verification and validation of	PO8,PO9, PO10, PO11, PO12
	project.	,PSO1,PSO2,PSO3
5.	CO5: Analyze and make use of modern for	PO1, PO2, PO5, PO6, PO7, PO8,
	solving real word problems.	PO9, PO12 PSO1,PSO2
6.	CO6: Develop teamwork and need to	PO2, PO4, PO8, PO9, PO10,
	engage in life-long learning, along with the	PO11, PO12, PSO1, PSO3
	ability to communicate effectively with	
	others.	


### PO and PSO mapping with level of strength for Course Name Project Based Learning – 4 (Course Code CSP398)

	CO/PO Mapping														
		(1/2/	3 indi	cates s	streng	th of c	orrela	tion)	3-	Strong,	, 2-Mec	lium, 1	-Low		
Cos		Programme Outcomes(POs)													
	РО	PO	PO	PO	PO	PO	PO	PO	PO	РО	РО	РО	PS	PS	PS
	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	03
CO1	3	3	-	2	-	1	-	1	2	-	2	1	2	2	3
CO2	3	2	2	2	2	-	-	1	2	-	2	1	2	1	1
CO3	3	2	2	2	2	3	-	1	2	-	2	1	2	2	-
CO4	3	3	2	2	3	-	-	1	2	-	-	1	2	2	2
CO5	3	2	-	-	3	-	-	1	2	-	-	1	2	2	-
CO6	-	1	-	1	-	-	-	2	2	3	3	3	1	-	1
Avg															
PO															
attain															
ed	3	2.2	1	1.5	1.7	0.7	0	1.2	2	1	2	1	2	1.5	1.2



## TERM - VII



### CSE451: Artificial Intelligence

Sc	hool: SET	Batch : 2023-27								
Pr	ogram: B.Tech	Current Academic Year: 2023-24								
Br	anch: ALL	Semester: VII								
1	<b>Course Code</b>	CSE451 Course Name: Artifici	al Intelligence							
2	<b>Course Title</b>	Artificial Intelligence								
3	Credits	3								
4	Contact	3-0-0								
	Hours									
	(L-T-P)									
	<b>Course Status</b>	CORE								
5	Course	The objective of the course is to introduce b	asic fundamental concepts in							
	Objective	Artificial Intelligence (AI), with a practical application	proach in understanding them.							
		To visualize the scope of AI and its role in futu	To visualize the scope of AI and its role in futuristic development.							
6	Course	After the completion of this course, student	fter the completion of this course, students will be able to:							
	Outcomes	1. <i>Relate</i> the goals of Artificial Intelligence	1. <i>Relate</i> the goals of Artificial Intelligence and AI and non-AI							
		solution.								
		2. Analyze and various AI uninformed and	d informed search							
		algorithms								
		3 Extend knowledge representation reason	oning and theorem proving							
		techniques to real-world problems	shing, and theorem proving							
		4 Make use of: Mashina lasming algorithm	a in various application							
		4. Make use of M	is in various application							
		5 Salast Artificial Intelligent based applie	ations							
		5. Select Artificial Interligent based applic								
		6. <i>Develop</i> independent (or in a small group	up) research and							
_	~	communicate it effectively.								
1	Course	In this course students will learn basic introduc	ction of Artificial Intelligence,							
	Description	problem solving agents, reasoning, learning	and applications of artificial							
0	Outline cullaburg	Intemgence.	CO Manaina							
8	Unit 1	INTRODUCTION TO AL	CO Mapping							
	А	Foundation of AI, Goals of AI, History and	COI							
	-	Al course line								
	В	Introduction to Intelligent Agents;	CO1							
		Environment; Structure of Agent								
	С	AI Solutions Vs Conventional Solutions; a	CO1, CO2							
		philosophical approach; a practical approach								
	Unit 2	PROBLEM SOLVING AGENTS								
	А	Problem solving using Search Techniques;	CO1, CO2							
		Problems; Solutions; Optimality								
	В	Informed Search Strategies; Greedy Best-	CO1, CO2							
		First; A* Search; Heuristic Functions								
	С	Uninformed Search Strategies; BFS; DFS;	CO1, CO2							
		DLS; UCS; IDFS; BDS								
<u> </u>	Unit 3	<b>KNOWLEDGE &amp; REASONING</b>								
	А	Knowledge-Based Agents: Logic: First-Order	CO3							
		Logic; Syntax-Semantics in FOL: Simple	-							
		usage;								



В	Inference Procedure;	Inference in F	OL;	CO3			
a							
C	Forward Chaining; Ba	ickward Chair	nıng;	CO3			
	Resolution						
Unit 4	LEARNING						
А	Common Sense Vs Le	earning; Com	CO1, CO2, CO3,CO4				
	Representations; Feed	back					
В	Learning Types: Supe	rvised; Unsur	pervised;	CO1, CO2, CO3,CO4			
	Reinforcement Learni	Reinforcement Learnings					
С	Artificial Neural Netw	vorks: Introdu	ction.	CO1, CO2, CO3,CO4			
	types of networks: Sir	ngle Laver and	d Multi-				
	Layer n/w.	8					
Unit 5	APPLICATIONS						
А	AI Present & Future;	CO3, CO4, CO5, CO6					
	on NLP, Image Proce	on NLP. Image Processing:					
В	Robotics – Hardware:	CO3, CO4, CO5, CO6					
	based case studies;	,,	0				
С	Ambient Intelligence	case studies;		CO3, CO4, CO5, CO6			
Mode of	Theory						
examination							
Weightage	CA	MTE	ETE				
Distribution	25%	25%	50%				
Text book/s*	1. <b>Rich E</b> & K	night K.	Artificial				
	Intelligence, Tata	a McGraw H	ill. Edition				
	3.		,				
Reference	1. Russell S &	Norvig P.	Artificial				
Books	Intelligence: A Mo	dern Approac	<i>ch</i> , Prentice				
	Hall.	,					
	2. Dan W. Patterson.	elligence &					
	Expert Systems	Pearson Educ	ation with				
	Prentice Hall India	a. Indian Editi	on.				

### **Course Outcomes:**

Sl.	Course Outcome (CO)	
No.		
1.	Relate the goals of Artificial Intelligence and AI	PO3, PO4, PO5, PO10, PSO1,
	and non-AI solution.	PSO2, PSO3
2.	Analyze and various AI uninformed and informed	PO1, PO2, PO3, PO4, PO5,
	search algorithms.	PO10, PSO1, PSO2, PSO3
3.	<i>Extend</i> knowledge representation, reasoning, and	PO1, PO2, PO3, PO4, PO5,
	theorem proving techniques to real-world	PO12, PSO1, PSO2, PSO3
	problems	
4.	Make use of: Machine learning algorithms in various	PO1, PO2, PO3, PO4, PO5,
	application domains of AI.	PO12, PSO1, PSO2, PSO3
5.	Select Artificial Intelligent based applications.	PO1, PO2, PO3, PO4, PO5,
		PO9, PO10 PO12, PSO1,
		PSO2, PSO3
6.	<b>Develop</b> independent (or in a small group)	PO1, PO2, PO3, PO4, PO5,
	research and communicate it effectively.	PO9, PO10 PO12, PSO1,
	· · · · · · · · · · · · · · · · · · ·	PSO2, PSO3

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Course Objecti ves	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	2	3	2	2					2		2	3	2	2
CO2	2	3	3	2	3					2		2	3	3	2
CO3	3	3	3	3	2	1	1			1	2	3	3	2	3
CO4	3	3	3	3	2	2	1			2	1	3	3	2	3
CO5	2	3	3	3	3	2	2	2	3	2	2	2	3	3	2
CO6	2	3	3	3	3	2	2	2	3	2	2	2	3	3	2

## Mapping of POs & COs: CO-PO and CO-PSO Mapping with level of strength



Sc	hool: SET		Batch: 2023-27						
Pr	ogram: B.Tech	1	Current Academic Year: 2023-24						
B	ranch: CSE / 1	[T	Semester: 6 <sup>th</sup>						
1	Course Code		CSP398 Course Name: Project Based Lear	ming -4					
2	Course Title		Project Based Learning -4						
3	Credits		2						
4	Contact Hour	S	0-0-4						
	(L-T-P)								
	Course Status	S	Compulsory						
5	Course Object	ctive	1. To align student's skill and interests w	ith a realistic					
	5		problem or project.						
			2.To understand the significance of problem	and its scope.					
			3.Students will make decisions within a fram	nework.					
6	Course Outco	omes	Students will be able to:						
			CO1: Identify and formulate problem statement	nt.					
			CO2: Design relational database schema.						
			CO3: Develop the solution by using diffe	rent aspects of					
			programming language.						
			CO4: Classify and understand various test	techniques for					
			verification and validation of project.						
			CO5: Analyze and make use of modern for so	olving real word					
			problems.						
			CO6: Develop teamwork and need to engage in life-long						
			learning, along with the ability to communi	cate effectively					
			with others.						
7	Course Descr	ription	In PBL-4, the students will learn how to define	the problem for					
			developing projects, and Design applicable so	lutions in one or					
			more application domains using software engineering						
			approaches that integrate ethical, social, legal and economic						
			concerns.						
8	Outline sylla	bus		CO Mapping					
	Unit 1	Problem	Definition and identification, Team/Group	CO1,CO4					
		formation	and Project Assignment. Finalizing the						
	<b>T</b> T <b>1</b> / <b>0</b>	problem s	tatement, resource requirement, if any.						
	Unit 2	Use of the	relational algebra operations from	CO2,CO6					
		mathemat	ical set theory (union, intersection, difference,						
		and Carte	sian product) and the relational algebra						
		operations	developed specifically for relational						
	TI	Databases	(select (restrict), project, join, and division)	<u> </u>					
	Unit S	Design; 1	inplement project work in any programming	CUS					
	Tin:4 4	language.	mions tool tools and tooksimer for of	CO4 CO5					
		Use of Va	anous test tools and techniques for software	04,005					
	Ilnit E	Domonstr	and avaluation of project	COG					
	Unit 5	Demonstr	ale and execute Project with the team.	00					
		Report she	build include Abstract, Hardware / Software						
		ED diama	ent, Flooleni Statement, Design/Algorithm,						
		EK diagra	IIIs, Use Case Diagrams, State Diagrams,						
		Sequence	Diagrams, Communication Diagrams, and						



	Activity Diagrams, Impler Reports. References, Test cases if The presentation, report, supported by the docume assessment.			
Mode of examination	Practical /Viva			
Weight age Distribution	СА	MTE		
		CE(Viva)	ETE	
	25%	25%	50%	

S. No.	Course Outcome	Program Outcomes (PO)			
1.	CO1: Identify and formulate problem	PO1, PO2, PO4, PO6, PO8, PO9,			
	statement.	PO10, PO11,			
		PO12,PSO1,PSO2,PSO3			
2.	CO2: Design relational database schema.	PO1, PO2, PO3, PO4, PO5, PO7,			
		PO8, PO9, PO11, PO12,			
		PSO1,PSO2,PSO3			
3.	CO3: Develop the solution by using	PO1, PO2, PO3, PO4, PO5, PO6,			
	different aspects of programming language.	PO8, PO9, PO11, PO12,			
		PSO1,PSO2			
4.	CO4: Classify and understand various test	PO1, PO2, PO3, PO4, PO5,			
	techniques for verification and validation of	PO8,PO9, PO10, PO11, PO12			
	project.	,PSO1,PSO2,PSO3			
5.	CO5: Analyze and make use of modern for	PO1, PO2, PO5, PO6, PO7, PO8,			
	solving real word problems.	PO9, PO12 PSO1,PSO2			
6.	CO6: Develop teamwork and need to	PO2, PO4, PO8, PO9, PO10,			
	engage in life-long learning, along with the	PO11, PO12, PSO1, PSO3			
	ability to communicate effectively with				
	others.				



### PO and PSO mapping with level of strength for Course Name Project Based Learning – 4 (Course Code CSP398)

	CO/PO Mapping														
	(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low														
Cos		Programme Outcomes(POs)													
	РО	PO	PO	PO	PO	PO	PO	PO	PO	РО	РО	РО	PS	PS	PS
	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	03
CO1	3	3	-	2	-	1	-	1	2	-	2	1	2	2	3
CO2	3	2	2	2	2	-	-	1	2	-	2	1	2	1	1
CO3	3	2	2	2	2	3	-	1	2	-	2	1	2	2	-
CO4	3	3	2	2	3	-	-	1	2	-	-	1	2	2	2
CO5	3	2	-	-	3	-	-	1	2	-	-	1	2	2	-
CO6	-	1	-	1	-	-	-	2	2	3	3	3	1	-	1
Avg															
PO															
attain															
ed	3	2.2	1	1.5	1.7	0.7	0	1.2	2	1	2	1	2	1.5	1.2



## Syllabus: CSE062 MOBILE COMPUTING

Sch	ool: SET	Batch: 2023-27							
Pro	gram: B.Tech	Current Academic Year: 2023-24							
Bra	nch:	CSE							
1	Course Code	CSE062							
2	Course Title	MOBILE COMPUTING							
3	Credits	3							
4	Contact	3 0	0						
'	Hours	5	0						
	(L-T-P)								
	Course	Core /Elective							
	Status								
5	Course	The objective of the course is to impart knowledge	of mobile and						
5	Objective	wireless computing systems and techniques	or moone and						
6	Course	On successful completion of this module students will h	e able to						
0	Outcomes	CO1: synthesize the basic concepts and principle	es in mobile						
	(5-6)	computing.							
		CO2: analyze the concept of wireless telecommunicat	ion networks.						
		CO3: synthesize the concepts of IEEE802.11. E	Bluetooth and						
		HYPERLAN.							
		CO4: Understand the concept of mobile IP & va	rious Routing						
		Protocols	e						
		CO5: synthesize the concepts of Mobile Transport Laye	er & WAP						
		CO6: Comparison of all the protocols							
7	Course	This course will cover various topics of mobile comput	This course will cover various topics of mobile computing.						
	Description	networking, and systems, including but not limited to: a	pplications of						
	1	smart phones, cellular networks, embedded sensor syste	ems,						
		localization systems, energy efficiency of mobile device	es, wearable						
		and vehicular mobile systems, mobile security etc.							
8	Outline syllabu	18	CO						
			Mapping						
	Unit 1	INTRODUCTION							
	А	Wireless transmission, Frequencies for radio transmission	CO1						
	В	Signals, Antennas, Signal Propagation, Multiplexing, Modulations	CO1						
	С	Spread spectrum, MAC, SDMA, FDMA, TDMA, CDMA	CO1						
		, Cellular Wireless Networks							
	Unit 2	TELECOMMUNICATION NETWORKS							
	А	GSM: Mobile services, System architecture, Radio	CO2						
		interface, Protocols							
	B	Localization and calling, Handover, Security CO2							
	C	GPRS network nodes	CO2						
	Unit 2	WIDELESS LANS							
		Introduction to IEEE 202 11b/a/a	<u> </u>						
	A D	Relation to IEEE 602.110/g/ll	$CO_2$						
	D	HIDEDI AN WML programming							
		MODILE NETWORK LAVED	03						
	Unit 4	WUDILE NEI WUKK LAYEK							

CSE, SSET, SU



Α	Mobile IP C	oals, Entities, I	P packet Delivery Agent	CO4				
	Advertiseme	ent and Discove	ry, Registration.					
В	Hidden and	exposed termination	al problems ,Routing protocols	CO4				
	classificatio	n,						
С	DSDV, DSH	R, AODV ,Secur	rity	CO4				
Unit 5	Mobile Tra	nsport Layer &	& Wireless Application					
	Protocol							
А	Traditional '	TCP, Indirect T	CP,	CO5				
В	Snooping T	Snooping TCP, Mobile TCP						
С	WAP: Proto	cols, Architectu	ire	CO5,CO6				
Mode of	Theory/Jur	Theory/Jury/Practical/Viva						
examination								
Weightage	CA	MTE	ETE					
Distribution	25%	25%	50%					
Text book/s*	2. Joch	nenSchiller : M	obile Communication, Pearson					
	Edu	cation.						
	3. U.H	Hansman and L.	Merck : Principles of Mobile					
	Cor	nouting" 2nd F	d Springer					
	Con	inputing, 2nd D						
Other	4. A. S	S. Tanenbaum.	: Computer Networks, 4th Ed.,					
References	Pear	rson Education.						
iterene en	5. D.	Miloiicic, F.	Douglis. : Mobility Processes.					
	Cor	nputers and Age	ents".Addison Wesley					
	6. D.B	Lange and M	I. Oshima : Programming and					
	Der	loving Java	Mobile Agents with Aglets					
	Add	lison Wesley						
	1100	moon mooney.		1				

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: synthesize the basic concepts and principles in	PO1, PO2, PO4, PO5,
	mobile computing.	PO10, PSO1, PSO2
2.	CO2: analyze the concept of wireless&	PO1, PO2, PO4, PO5,
	telecommunication networks.	PO10, PSO1, PSO2
3.	CO3: synthesize the concepts of IEEE802.11, Bluetooth	PO1, PO2, PO4, PO5,
	and HYPERLAN.	PO10, PSO1, PSO2
4.	CO4: Understand the concept of mobile IP & various	PO1, PO2, PO4, PO5,
	Routing Protocols	PO10, PSO1, PSO2
5.	CO5: synthesize the concepts of Mobile Transport Layer &	PO1, PO2, PO4, PO5,
	WAP	PO10, PSO1, PSO2
6.	CO6: Comparison of all the protocols	PO1, PO2, PO4, PO5,
		PO10, PSO1, PSO2

## PO and PSO mapping with level of strength for Mobile Computing (CSE 062)

Course Code_ Course Name	CO's	РО 1	PO 2	РО 3	РО 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
CSEOCO	CO1	3	3	-	2	3	-	-	-	-	2	-	-	3	2	-
CSE002_	CO2	3	3	-	2	3	-	-	-	-	2	-	-	3	2	-

CSE, SSET, SU



MOBILE	CO3	3	3	-	2	3	-	-	-	-	2	-	-	2	3	-
NG	CO4	3	3	-	2	3	-	-	-	-	2	-	-	3	2	-
	CO5	3	3	-	2	3	-	-	-	-	2	-	-	2	2	-
	CO6	3	3	-	2	3	-	-	-	-	2	-	-	2	2	-
Avg.		3	3	-	2	3	-	-	-	-	2	-	-	2	2	-



2.1 Template A1: Syllabus for Theory Courses (SAMPLE)

0.1	1		
Scho		School of Engineering & Technology	
Depa	artment	Department of Computer Science & Engineering	
Prog	gram:	B.lech	
Bran	ich:	CSE	
1	Course Code	CSE063	
2	Course Title	Quantum Computing	
2	Cardita	2	
3	Credits		
4	Contact Hours	3 0 2	
<u> </u>	(L-I-P)	Core /Elective/Open Elective	
5	Course Status	Eurodementale of quantum information processing includio	na avantum
3	Objective	Fundamentals of quantum information processing, including	ng quantum
	Objective	Tonics include: the quantum circuit model, gubits, uniterry	auon meory.
		ropics include, the quantum circuit model, qubits, unitary	ring and sourch
		quantum cryptographic key distribution error correction a	nd fault tolerance
		information capacity of quantum channels, complexity of	nu raun-torerance,
		computation	quantum
6	Course	CO1: Analyze the behavior of basic quantum algorithms	
	Outcomes	cor. Thatyze the benavior of busic quantum argorithms	
	(must be 6	CO2: Demonstrate simple quantum algorithms	
	COs.	CO2. Demonstrate simple quantum argonamis	
	following	CO3: Simulate a simple quantum error-correcting code	
	verbs given in	cos. Simulate a simple quantum error correcting code	
	Bloom's	COA: Prove basic facts about quantum information channel	10
	Taxonomy)	CO4. 110ve basic facts about quantum mormation channe	15
		CO5: Explain quantum computing and quantum protocols	
		CO6: Illustrate information channels in the quantum circuit	t model.
7	Course	This course teaches the fundamentals of quantum informat	tion processing,
	Description	including quantum computation, quantum cryptography, a	nd quantum
		information theory.	
8	Outline syllabus	5	CO Mapping
	Unit 1	Introduction	
	А	Computers and the Strong Church–Turing Thesis, Circuit	
		Model of Computation	
	В	A Linear Algebra Formulation of the Circuit Model,	CO1
		Reversible Computation	
	C	Quantum Physics and Computation	CO1, CO2
	Unit 2	LINEAR ALGEBRA AND THE DIRAC NOTATION	CO1,
			CO2,CO4
	A	The Dirac Notation and Hilbert Spaces, Dual Vectors,	
		Uperators	
	В	The Spectral Theorem, Functions of Operators	
	C	Tensor Products, The Schmidt Decomposition Theorem	CO1, CO2
	Unit 3	A QUANTUM MODEL OF COMPUTATION	CO1, CO2
	A	The Quantum Circuit Model, Quantum Gates	CO1,
1			CO2,CO5,CO6



В	Universal Sets	of Quantum G	ates. Efficiency of	
	Approximating	g Unitary Trans	sformations	
С	Implementing	Measurements	with Quantum Circuits	
Unit 4	INTRODUCT	ORY QUANT	UM ALGORITHMS	CO1,CO2,CO3
А	Probabilistic V	versus Quantun	n Algorithms, Phase Kick-	CO1,CO2,CO3
	Back			
В	The Deutsch A	Algorithm, The	Deutsch–Jozsa Algorithm	CO1,CO2,CO3
С	Simon's Algor			
Unit 5				
А	Tools for Anal	CO2,CO3,CO4		
В	Solving the Di	CO3,CO4		
	of a Is Compo	site		
С	Computing Sc	hmidt Decomp	ositions	CO2,
				CO4,CO5
Mode of	Theory/Jury/P	ractical/Viva		
examination				
Weightage	CA	MTE	ETE	
Distribution	25%			
Text book/s*	"An Introducti			
	Raymond Lafl	amme, Michel	e Mosca	
Other				
References				

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific
		Outcomes (PSO)
1.	CO1: Analyze the behavior of basic quantum algorithms	
2.	CO2: Demonstrate simple quantum algorithms	PO1, PO2, PO5, PO8,
		PO12, PSO3
3.	CO3: Simulate a simple quantum error-correcting code	PO1, PO2, PO3, PSO3
4.	CO4: Prove basic facts about quantum information channels	PO1, PO2, PO3, PO5, PO9,
		PO12, PSO1
5.	CO5: Explain quantum computing and quantum protocols	PO1, PO2, PO4, PO5, PO6,
		PO8, PSO2
6.	CO6: Illustrate information channels in the quantum circuit	PO1, PO2, PO3, PO8, PO9,
	model	PSO2,



## PO and PSO mapping with level of strength for Course Name Quantum Computing (Course Code CSE063)

		-	-			-			r			r	r			
Course																
Code_	CO'	Р		Р		Р	Р	Р	Р	Р	Р	Р	Р	PS		
Course	s	0	PO	0	PO	0	0	0	0	0	0	0	0	0	PSO	PSO
Name		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
	CO	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	1															
	CO	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	2															
	CO	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	3															
	CO	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	4															
	CO	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
Quantum	5															
Computi	CO	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
ng	6															

Average of non-zeros entry in following table (should be auto calculated).

Cour	Commo			Р	Р	Р	Р	Р	Р	Р	Р	Р	Р			
se	Nome	PO	PO	0	0	0	0	0	0	0	0	0	0	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	01	2	O 3
	Quantu															
	m	3	27	1.	1	1.	1	5	1.	Q	5	5	Q	1	1	1
	Computi	5	2.1	1	1	5	1	.5	3	.0	.5	.5	.0	1	1	1
	ng															

Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Scho	ool:	School of Engineering & Technology									
Dep	artment	Department of Computer Science & Engineering									
Prog	gram:	B.Tech									
Bra	nch:	CSE with Specialization in Internet of Things & Appli	cations								
1	Course Code	CSE071									
2	Course Title	Introduction to Internet of Things									
3	Credits	2									
4	Contact	2-0-0									
	Hours										
	(L-T-P)										
	Course Status	Elective									
5	Course	In this course, student will explore various concepts of Ir	nternet of things								
	Objective	such as things, enabling technologies, M2M to IoT and I	oT architecture.								
	5	This course also discusses the security challenges and	then provides								
		answers on how to successfully manage IoT security a	nd build a safe								
		infrastructure for smart devices. In the end they will also be	e able to identify								
		the challenges in IoT and its various areas of application.	-								
6	Course	CO1: Define the general concepts of Internet of Things.									
	Outcomes	CO2: Recognize the basic M2M Ecosystem and change fr	rom M2M to								
		IoT.									
		CO3: Outline the concepts of IoT platform.									
		CO4: Explain IoT security and vulnerability threats.									
		CO5: Examine the challenges in IoT specific application.									
		CO6: Discuss the various domains where IOT can be appl	lied								
		successfully.									
7	Course	This course introduces the concepts for internet of things	and how we								
	Description	can embed it into our daily lives for the development of li	fe style. It will								
		also help students to understand the applications according	g to their								
		problem statements.	1								
8	Outline syllabu	IS	CO Mapping								
	Unit 1	Introduction to IoT									
	А	Defining IoT, History of IoT, Importance of IoT, IoT	CO1								
		Basic Characteristics, Enabling Technologies of IoT									
	В	About the Internet in IoT, IoT Advantages and	CO1								
		Disadvantages, M2M Overview, M2M Features									
	С	M2M Ecosystem, Comparison of the Main	CO1								
		Characteristics of M2M and IoT, M2M Applications									
	Unit 2	IoT Architecture									
	А	Basic Building blocks of IoT system: Sensors,	CO1, CO2								
		Processors, gateways, Applications									
	В	Physical design of IoT: Things in IOT, IoT Protocols,	CO1, CO2								
		Logical design of IoT: IoT Functional Blocks, IoT									
		Communication Models. IoT Communication API's									
	С	IoT Service Oriented Architecture (SOA), API Oriented	CO1, CO2								
		Architecture.									
	Unit 3	Introduction to IoT Platform									
	А	IoT Working, Introduction to Arduino and Raspberry Pi	CO1, CO3								

CSE, SSET, SU

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В	The SENSEn Calls: DIO Fu	ut Platform, Pe inctions, I <sup>2</sup> C F	eripheral Hardware Specific unctions	CO1, CO3								
С	MAC function Functions, get	ns: General Fu nMac Functior	nctions, Coordinator	CO1, CO3								
Unit 4	Vulnerabiliti	ies. Attacks, a	nd Countermeasures									
A	Cyber securit	y versus IoT se d to secure IoT	ecurity and cyber-physical	CO1, CO4, CO5								
В	Primer on thr	eats, vulnerabi	lity, and risks (TVR)	CO1, CO4, CO5								
С	Common IoT modeling for	attacks, Today an IoT system	y's IoT attacks , Threat	CO1, CO4, CO5								
Unit 5	Domain spec	ns of IoT										
А	Home automa	nd case study	CO1, CO3, CO6									
В	Industry appli	CO1, CO3, CO6										
С	Surveillance a IoT application	CO1, CO3, CO6										
Mode of examination	Theory/Jury/H											
Weightage	CA	ETE										
Distribution	25%	25%	50%									
Text book/s*	<ol> <li>The Interr Web edite Unit-1.</li> <li>Introduction NPTEL L Science &amp; Technolog 4.</li> <li>Internet of Unit 3 (c)</li> <li>Arshdeep Things – A 2015, Reff</li> <li>API REFF sensation</li> <li>Practical I Drew Van</li> </ol>	CAMTEETE25%25%50%1. The Internet of Things: Connecting Objects to the Web edited by Hakima Chaouchi, Reference for Unit-1.2. Introduction to Internet of Things, Prof. Sudip Misra NPTEL Lectures Notes, Department of Computer Science & Engineering, Indian Institute of Technology Kharagpur, Reference for Unit 2, 3 (c), 4.3. Internet of Things, Rajkumar Buyya, Reference for Unit 3 (c)4. Arshdeep Bahga and Vijay Madisetti, "Internet of Things – A Hand-on Approach", Universities press, 2015, Reference for Unit 3 (B)5. API REFERENCE GUIDE: SENSEnuts WSN sensation6. Practical Internet of Things Security, Brian Russell,										
Other References	<ol> <li>Charalamy with the A</li> <li>Dr. Ovidin of Things: deployme</li> <li>Contiki : 7 <u>os.org</u></li> </ol>	pos Doukas, " Arduino", Creat u Vermesan an : From researcl nt", River Publ The open sourc	Building Internet of Things te space, April 2002 d Dr. Peter Friess, "Internet h and innovation to market lishers 2014. te for IOT, <u>www.contiki-</u>									



C	Course Outcome	Program Outcomes (PO) & Program
ъ.	Course Outcome	Flogram Outcomes (FO) & Flogram
No.		Specific Outcomes (PSO)
1.	CO1: Define the general concepts of	PO1, PO2, PO3, PO6, PO7, PO12,
	Internet of Things.	PSO1
2.	CO2: Recognize the basic M2M	PO1, PO2, PO3, PO6, PO7, PO12,
	Ecosystem and change from M2M to IoT.	PSO1
3.	CO3: Outline the concepts of IoT	PO1, PO2, PO3, PO4, PO6, PO7,
	platform.	PO12, PSO1
4.	CO4: Explain IoT security and	PO1, PO2, PO3, PO4, PO5, PO6, PO8,
	vulnerability threats.	PO9, PO10, P011, PO12, PSO1, PSO2,
		PSO3
5.	CO5: Examine the challenges in IoT	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	specific application.	PO12, PSO1
6.	CO6: Discuss the various domains where	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	IOT can be applied successfully.	PO12, PSO1

# **PO and PSO mapping with level of strength for Course Name Introduction to Internet of Things (Course Code** CSE071)

Course Code_ Course Name	CO's	P O 1	PO 2	P O 3	Р О 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	PO 11	PO 12	PS O1	PS O 2	PS 0 3
	CO1	3	1	1	-	-	2	1	-	-	-	-	3	3	-	-
_	CO2	2	2	1	-	-	1	3	-	-	-	-	3	3	-	-
Introduct	CO3	3	1	1	2	-	2	1	-	-	-	-	3	3	-	-
ion to	CO4	3	3	3	3	2	2	-	3	3	3	3	3	2	2	3
Internet of Things	CO5	3	3	3	3	3	2	3	-	-	-	-	3	3	-	-
or rnings	CO6	2	2	2	2	3	2	3	-	-	-	-	3	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Cour se Code	Course Name	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P 0 1 0	Р О 11	P O 12	PS O 1	PS O 2	PS O 2
	Introduc tion to Internet of Things	2. 7	2. 0	1. 8	2. 5	2. 7	1. 8	2. 2	3. 0	3. 0	3. 0	3.0	3.0	2.8	2.0	3.0

### Strength of Correlation

1. Addressed to *Slight (Low=1) extent* 2. Addressed to *Moderate (Medium=2) extent* 

3. Addressed to Substantial (High=3) extent

CSE, SSET, SU



2.1 Template A1: Syllabus for Theory Courses (SAMPLE)

Scho	ol:	School of Engineering & Technology										
Depa	artment	Department of Computer Science & Engineering										
Prog	ram:	B.Tech										
Bran	ch:	CSE										
1	Course Code	CSE072										
2	Course Title	Parallel Computing Algorithms										
3	Credits	2										
4	Contact Hours	2 0 2										
	(L-T-P)											
~	Course Status	Core /Elective/Open Elective	. 1 1 . 1									
3	Course	Design and analysis of parallel algorithms on various parallel netw	ork model, with									
	Objective	emphasis on time complexities after implementation, a comparativ	e study of									
		fundamental of parallel algorithms	g the									
6	Course	CO1: Acquire the skill to design and develop parallel algorithms y	with efficient time									
	Outcomes	complexity.	vitil efficient time									
	(must be 6 COs,	CO2: Explain various terminology of parallel processing which is	required to design									
	following verbs	and understand the future processor architectures.	1 0									
	given in	and understand the future processor architectures. CO3: Demonstrate the skill to choose the technology to use, based on the requirements and functionality of multi-processor architecture based on the design										
	Bloom's	CO3: Demonstrate the skill to choose the technology to use, based on the requirements and functionality of multi-processor architecture based on the design										
	Taxonomy)	requirements and functionality of multi-processor architecture based on the design parameters of the parallel architectures. CO4: Explain how large-scale parallel systems are architecture and how massive										
		CO4: Explain how large-scale parallel systems are architecture and	d how massive									
		parallelism are implemented in accelerator architectures										
		CO5: Design efficient parallel algorithms and applications										
	~	CO6: Analyse performance and modeling of parallel programs										
7	Course	This course introduces critical methods and techniques related to p	arallel									
	Description	computing. Particularly, the course focuses on hardware, algorithm	n, and									
		programming of parallel systems, providing students a complete pr	cture to									
8	Outline syllabus	understand pervasive paraner computing.	CO Manning									
0	Unit 1	Introduction	CO Wapping									
	A	Introduction to Parallel Processing Approach										
	B	Difference between Parallel Processing and Serial Processing.	CO1									
	2	Background, Flynn's Taxonomy for serial and parallel computer	001									
		architecture										
	С	Parallel Algorithms, Performance of Parallel Algorithm.	CO1, CO2									
	Unit 2	Basic Techniques and Different Network Architecture	CO1,									
			CO2,CO4									
	А	Criteria to evaluate processor organization										
	В	Mesh Networks, Binary Tree Networks, Hypertree Networks,										
		Pyramid Networks, Butterfly Networks, Hypercube (Cube-										
		Connected) Networks,										
	C	Cube-Connected Cycle Networks, Shuffle-Exchange Networks,	CO1, CO2									
	11.4.2	Case Studies Based on the Parallel Network Architecture.	001.002									
		Parallel Architectures	CO1, CO2									
	A	Multiprocessors and Non Uniform Memory Access (UMA)	CO1,									
		Trees Architecture	02,005,000									
	B	Applications based on MoT Advantages/Disadvantages of MoT	+									
	U U	based on parallel parameters. Multi-Mesh Architecture										
	C	Applications based on MM Advantages/Disadvantages of MM	+									
		hased on parallel parameters Multi-Mesh of Trees Architecture										
		Advantages of MMT over MM and MoT										
	1	1										

CSE, SSET, SU



Unit 4	Parallel Algorith	nms on Different	Architectures	CO1,CO2,CO3						
А	One to One Con	nmunication Alg	orithm on Multi-Mesh	CO1,CO2,CO3						
	Architecture and	d Multi-Mesh of	Trees Architecture,							
В	All-to-All Algor	rithm Communic	ation Algorithm on Multi-Mesh	CO1,CO2,CO3						
	Architecture and									
С	Sorting Algorith	nms on MMT, Ca	se Studies based on MMT							
	Architecture									
Unit 5	Parallel comput	ing Application								
А	Performance me	easurement and a	nalysis of parallel programs	CO2,CO3,CO4						
В	Problem solving	g on clusters using	g MapReduce	CO3,CO4						
С	Warehouse-scal	e computing		CO2,						
				CO4,CO5						
Mode of	Theory/Jury/Pra	ctical/Viva								
examination										
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	"Introduction to	Parallel Comput	ing", 2nd Ed, Ananth Grama,							
	Anshul Gupta, G	George Karypis, V	Vipin Kumar							
Other	<ul> <li>"Using</li> </ul>	MPI: Portable P	arallel Programming with the							
References	Messag	ge-Passing Interfa	ace", 3rd Ed - William Gropp,							
	Ewing	Lusk, Anthony S	kjellum							
	<ul> <li>"Progra</li> </ul>	• "Programming Massively Parallel Processors: A Hands-								
	on App									
	Hwu									

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: Acquire the skill to design and develop parallel algorithms	
	with efficient time complexity.	
2.	CO2: Explain various terminology of parallel processing which is	PO1, PO2, PO5, PO8, PO12,
	required to design and understand the future processor architectures.	PSO3
3.	CO3: Demonstrate the skill to choose the technology to use, based	PO1, PO2, PO3, PSO3
	on the requirements and functionality of multi-processor architecture	
	based on the design parameters of the parallel architectures.	
4.	CO4: Explain how large-scale parallel systems are architecture and	PO1, PO2, PO3, PO5, PO9,
	how massive parallelism are implemented in accelerator	PO12, PSO1
	architectures	
5.	CO5: Design efficient parallel algorithms and applications	PO1, PO2, PO4, PO5, PO6,
		PO8, PSO2
6.	CO6: Analyse performance and modeling of parallel programs	PO1, PO2, PO3, PO8, PO9,
		PSO2,



Course																
Code_	CO'	Р		Р		Р	Р	Р	Р	Р	Р	Р	Р	PS		
Course	s	0	PO	0	РО	0	0	0	0	0	0	0	0	0	PSO	PSO
Name		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
	CO	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	1															
	CO	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	2															
	CO	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	3															
	CO	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	4															
	CO	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
Parallel	5															
Computi	CO	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
ng	6															

PO and PSO mapping with level of strength for Course Name Parallel Computing (Course Code CSE072)

Average of non-zeros entry in following table (should be auto calculated).

Cour	Course			Р	Р	Р	Р	Р	Р	Р	Р	Р	Р			
se	Nome	PO	PO	0	0	0	0	0	0	0	0	0	0	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	01	2	03
	Parallel Computi ng	3	2.7	1. 1	1	1. 5	1	.5	1. 3	.8	.5	.5	.8	1	1	1

Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



2.1 template a1: syllabus for theory courses (sample)

Cab	<b>1</b> .	School of Engineering	Pr Tashnalagy										
Der	001:	School of Engineering	ton Science & Encineer										
Dep	artment	Department of Compu	tter Science & Engineer	ring									
Prog	gram:	B.tech											
Brai	nch:	CSE											
1	Course code	CSE073											
2	Course title	3d printing and softwa	3d printing and software tools										
3	Credits	)											
4	Contact	2	0	0									
-	bours		0	0									
	$(l_{t-n})$												
	Course status	Core /elective/open ele	ective										
5	Course	This course will help u	inderstand the technica	l principl	es and								
5	objective	workflows of polyme	rs metals and composition	ites									
6	Course	Col: apply the unique	advantages of 3d print	ing to the	vir designs								
0	outcomes	Co2: compare additive	manufacturing to trad	itional te	chnologies and								
	(must be 6	choose the best techno	logy for a given applic	ation	chilologies and								
	COS	$C_{03}$ : distinguish betwee	en various 3d printing	technolo	gies and								
	following	materials and select ar	propriately for a given	annlicati	on								
	verbs given	$C_04$ discuss the econo	propriately for a given	l printing	including its								
	in bloom's	impact on startup husinesses and supply chains											
	taxonomy)	Co5: evaluate real-life scenarios and recommend the appropriate use											
	<i>unonony)</i>	of 3d printing technolo	ov		ppropriate ase								
		Co6: explain current a	nd emerging 3d printin	g applica	tions in a								
		variety of industries	na emerging sa prinan	5 uppricu	diolis in u								
7	Course	In this course students	will gain broad unders	tanding o	of the advances								
	description	that led to today's mar	ufacturing environmer	nt. They y	will understand								
	uesemption	how humans, machine	s and code work togeth	her to mal	ke things.								
8	Outline syllabi	1S			Co mapping								
-	Unit 1	Introduction to 3d prin	nting										
	А	Cutting, subtractive m	anufacturing										
		<i>b, c c c c c c c c c c</i>	C										
	В	Forming			Co1								
	С	Additive manufacturin	ıg		CO1, CO2								
	Unit 2	Mesh CO1,											
		CO2,CO4											
	A	Review of geometry terms											
	В	Things to consider wh	en preparing a mesh fil	e									
	С	Making process (a ren	ninder), making by shar	ring	CO1, CO2								
	Unit 3	Introduction to compu	ter numerical control (	cnc)	CO1, CO2								



А	Numerical co	ontrol, function	ons of a machine tool,	CO1,							
	concept of nu	imerical cont	rol, historical	CO2,CO5,CO6							
	development	, definition									
В	Advantages of	of cnc machir	ne tools, evolution of cnc,								
	advantages of	advantages of cnc, limitations of cnc, features of cnc									
С	The machine	control unit	(mcu) for cnc,								
	classification	of cnc mach	ine tools, cnc machining								
	centers										
Unit 4	Blue print rea	ading		CO1,CO2,CO3							
А	Reading the I	nachining sk	etches, different	CO1,CO2,CO3							
	geometrical t	olerance sym	ibols,								
В	Reading dime	ensional toler	ances, understanding the	CO1,CO2,CO3							
	views,										
С	Concept of fi	rst angle & tl	nird angle projection								
Unit 5	Cnc milling										
А	Fundamental	s of cnc milli	ng, familiarization of	CO2,CO3,CO4							
	control panel										
В	Fundamental	s of cnc prog	ramming, part	CO3,CO4							
	programming	g techniques									
С	Machining pr	ractice on cno	e milling, practice session	CO2,							
	at industry			CO4,CO5							
Mode of	Theory/jury/j	practical/viva	1								
examination											
Weightage	Ca	Mte	Ete								
distribution	25%	25%	50%								
Text book/s*	Liza Wallach	Kloski, Nicl	x Kloski – "Getting								
	Started with 3										
	Hardware, So										
	Manufacturir	ng Revolutior	n"-Maker Media, Inc								
	(2016)										
Other											
references											

## Co and PO mapping

S.	Course outcome	Program outcomes (po)
No.		& program specific
		outcomes (pso)
1.	Co1: apply the unique advantages of 3d printing to their	
	designs.	
2.	Co2: compare additive manufacturing to traditional	PO1, PO2, PO5, PO8,
	technologies and choose the best technology for a given	PO12, PSO3
	application.	
3.	Co3: distinguish between various 3d printing	PO1, PO2, PO3, PSO3
	technologies and materials and select appropriately for a	
	given application.	



4.	Co4: discuss the economic implications of 3d printing including its impact on startup businesses and supply chains	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
5.	Co5: evaluate real-life scenarios and recommend the appropriate use of 3d printing technology	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
6.	Co6: explain current and emerging 3d printing applications in a variety of industries	PO1, PO2, PO3, PO8, PO9, PSO2,

Po and pso mapping with level of strength for course name 3d printing and software tools (course code CSE073)

Cours e code_ cours e name	Co 's	P O 1	PO 2	P O 3	PO 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	P O 1	P O 1 2	PS O 1	PS O2	PS O3
	Co 1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	Co 2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
34	Co 3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
printi ng	Co 4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
and softw	Co 5	3	2	3	-	-	-	-	3	3	-	_	-	-	3	-
are tools	Co 6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Cour se code	Cours e name	Po 1	Po 2	P 0 3	P 0 4	P 0 5	Р 0 6	P 0 7	P 0 8	P 0 9	P 0 1 0	P 0 1 1	P 0 1 2	Ps o 1	Pso 2	Ps o 3
	3d printin g and softwa re tools	3	2. 7	1. 1	1	1. 5	1	.5	1. 3	.8	.5	.5	.8	1	1	1

Strength of correlation

3. Addressed to substantial (high=3) extent

<sup>1.</sup> Addressed to *slight* (*low=1*) *extent2*. Addressed to *moderate* (*medium=2*) *extent* 



## Syllabus: CSP 497, Capstone – 1

Sc	hool: SET	Batch: 2023-27	
Pr	ogram:	Current Academic Year: 2023-24	
B.	tech		
Br	anch: CSE	Semester: 7 <sup>th</sup>	
1	Course Code	CSP497 Course Name: Capstone - 1	
2	Course Title	Major Project -1	
3	Credits	2	
4	Contact	0-0-0	
	Hours		
	(L-T-P)		
	Course	Compulsory	
	Status		
5	Course	Project being the student's last activity at the institution,	it fulfills a purpose of
	Objective	synthesis of all the knowledge they have acquired through	out the different years.
		In addition, this knowledge must be used in a particular v	vay, in order to solve a
		specific problem, which lets student demonstrate their ap	titude by applying this
6	Carries	Knowledge.	
0	Outcomes	CO1: Identify problem statement in angineering and tech	alogy in calastad field
	Outcomes	of interest	lology in selected field
		CO2: Analyze the gathered information required to develop	on a project
		CO3: Apply prior knowledge of mathematics computer so	rience and engineering
		CO4: Participate in different teams and to focus on getting	a working project done
		on time with each student being held accountable for their	r part of the project.
		CO5: Prepare the designs requirements, functional and co	nceptual design.
		CO6: Initiate the actual implementation of the project	work to produce the
		deliverables and explain the work in written and oral form	ıs.
7	Course	The object of Major Project-I is to enable the student to take	e up investigative study
	Description	in the broad field of Computer Science & Engi	ineering, either fully
		theoretical/practical or involving both theoretical and	practical work to be
		assigned by the Department on an individual basis or t	wo/three students in a
		group, under the guidance of a Supervisor.	
8	Outline syllab		CO Mapping
	Unit I	Problem identification, Literature survey/Gather &	CO1, CO2,CO4,
	TI	analyze information from multiple sources	
	Unit 2	Formulate solution/ Problem Description: Project	001, 002, 003
		Management Project scheduling and Planning Tools:	
		Work Broakdown structure/ IPC/ Contt	
		charts/CPM/PERT Networks	
		Creating System Requirement Specifications (Functional	
		& Non Functional)	
	Unit 3	Preparing Design: Data Flow Diagrams & Flow Charts	CO3. CO4
	0	Use of appropriate tools and techniques for project design	
	Unit 4	Identify and Implement Project Modules.	CO4, CO5
	Unit 5	Use of appropriate tools/technologies for coding the	CO2, CO5, CO6
		modules	. ,
		Report on final problem statement, specifications, project	
		schedule, final concept design and project schedule	
		Report and Presentation - Project Modules development	



Mode of examination	Practical			
Weight age	CA	CE(Viva)	ETE	
Distribution	25%	25%	50%	
Text book/s*				
Other				
References				

S.	Course Outcome	Program Outcomes (PO)
No.		
1.	CO1: Identify problem statement in engineering	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	and technology in selected field of interest.	PO8, PO9, PO10, PO11,
		PO12,PSO1,PSO2,PSO3
2.	CO2: Analyze the gathered information required to	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	develop a project.	PO8, PO9, PO10, PO11,
		PO12,PSO1,PSO2,PSO3
3.	CO3: Apply prior knowledge of mathematics,	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	computer science and engineering.	PO8, PO9, PO10, PO11,
		PO12,PSO1,PSO2,PSO3
4.	CO4: Participate in different teams and to focus on	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	getting a working project done on time with each	PO8, PO9, PO10, PO11,
	student being held accountable for their part of the	PO12,PSO1,PSO2,PSO3
	project.	
5.	CO5: Prepare the designs requirements, functional	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	and conceptual design.	PO8, PO9, PO10, PO11,
		PO12,PSO1,PSO2,PSO3
6.	CO6: Initiate the actual implementation of the	PO1, PO2, PO3, PO4, PO5, PO8, PO9,
	project work to produce the deliverables and	PO10, PO11, PO12, PSO1, PSO2, PSO3
	explain the work in written and oral forms.	

## PO and PSO mapping with level of strength for Course Name Major Project -1 (Course Code CSP497)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	2	1	2	1	1	2	2	3	3
CO2	3	3	3	3	2	1	1	1	2	1	1	2	3	3	3
CO3	3	1	3	3	2	1	1	1	2	1	1	2	3	3	3
CO4	1	1	2	1	2	3	3	1	2	3	1	2	1	2	3
CO5	1	2	2	1	2	1	1	1	2	2	1	2	1	2	3
CO6	2	1	2	1	3	-	-	1	2	3	1	2	3	3	3

1-Slight (Low)

2-Moderate (Medium)

3-Substantial (High)



# TERM - VIII



## Syllabus: CSP498\_Capstone - 2

Sc	hool: SET		Batch: 2023-27											
Pr	ogram: B.tecl	1	Current Academic	Year: 2023-24										
Br	anch: CSE / 1	T	Semester: VIII											
1	Course Code		CSP498 (	Course Name	: Capstone -2									
2	Course Title		CSP498_Capston	ne - 2	•									
3	Credits		8											
4	Contact Hour	S	0-0-16	0-0-16										
	(L-T-P)													
	Course Status	3	Compulsory											
5	Course Object	tive	1. To understand the concept of project design after the											
			completio	on of project p	olanning									
			2. Students	making decisi	ions within a frameworl	K								
			3. Continuo	us evaluation	of the project									
6	Course Outer	mag	4. A final pi	oduct to be e	valuated for quality									
0	Course Oulco	mes	CO1: Demonstra	te the implement	entation of the project									
			CO2: Identify the	e test procedu	re for each implemente	d module								
			CO2: Identify the	l evaluate the	modules to verify the re	a module.								
			of the project.		inounos to vonny the re	quirea neea								
			CO4: Use different tools for communication, testing and report											
			writing.											
			CO5: Develop the attitude and ethics of a professional engineer.											
			CO6: Demonstrate an ability to present and defend their project											
			work to a panel of experts.											
7	Course Descr	iption	The objective of	ent to extend										
			further the development of project till testing and deployment											
			under the guidan											
8	Outline syllab	ous		CO										
	<b>T</b> T <b>•</b> 4 <b>4</b>		11 1 1	<u> </u>		Mapping								
	Unit I	Comp	blete the implemen	tation of the	project. Testing of the	CO1, CO2								
	TT	modul	es, Use of appropr	late tools/tech	iniques for testing	<u> </u>								
	Unit 2	Deplo	y & demonstrate d	eveloped mod	lules of the project	CO2, CO3								
	Unit 3	Prepar	tod by the Supervi	ort in the stand	lard format for being	004, 005								
	Unit A	Submi	lied by the Supervi	sui t and Pan	ort to Departmental	<u>CO4</u>								
	Umt 4	Comm	ission of Flojec	i allu Kepo	nt to Departmental	C04,								
<u> </u>	Unit 5	Final I	Joininuee											
	Mode of	Practic	ractical											
	examination	1 racin	ractical											
	Weight age	CA			MTE									
	Distribution													
		25%		CE(Viva)	ETE									
	Text			25%	50%									
	book/s*													



S. No.	Course Outcome	Program Outcomes (PO)
1.	CO1: Demonstrate the implementation	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8,
	of the project.	PO9, PO10, PO11, PO12, PS01, PS02, PS03
2.	CO2: Identify the test procedure for each	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8,
	implemented module.	PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
3.	CO3: Deploy and evaluate the modules	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8,
	to verify the required need of the project.	PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
4.	CO4: Use different tools for	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8,
	communication, testing and report	PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
	writing.	
5.	CO5: Develop the attitude and ethics of	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8,
	a professional engineer.	PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
6.	CO6: Demonstrate an ability to present	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8,
	and defend their project work to a panel	PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
	of experts.	

# PO and PSO mapping with level of strength for Course Name Major Project -2 (Course Code CSP498)

С	PO	PS	PS	PS											
Os	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	03
	2	1	2	2	3	2	2	2	2	2	2	2	3	3	3
C															
01															
	2	2	3	2	3	2	2	2	2	2	2	2	11	3	3
C															
O2															
	3	3	3	3	3	2	2	2	2	2	2	1	1	3	3
С															
03															
С	2	2	2	2	3	2	2	2	2	3	2	1	1	2	2
04															
С	1	2	2	1	3	2	2	2	2	3	2	1	1	2	2
05															
С	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
06															

1-Slight (Low)

2-Moderate (Medium)

3-Substantial (High)



Scho	ol: SET	Batch: 2023-27										
Prog	ram: B.Tech	Current Academic Year: 2023-24										
Brar	nch:CSE	Semester:										
1	Course Code	CSE250 Course Name: Theory of Computation and Compile	er Design									
2	Course Title	Theory of Computation and Compiler Design										
3	Credits	4										
4	Contact Hours	3-1-0										
	(L-T-P)											
	Course Status											
5	Course	The objective of this course is to provide fundamental knowledge of Finite automata										
	Objective	Learning about automata, grammar, language, and their r	elationships. Also,									
		Introduces the major phases of Compiler construction and also it	s theoretical aspects									
		including regular expressions, context-free grammars, Finite Au	tomata									
6	Course	After completing this course, students will be able to:	EA Construct									
	Outcomes	finite automata without output and with output	A. Construct									
		<b>CO2:Implement</b> regular expression and grammar corresponding	σ to DFA and vice-									
		versa Explain the concepts and different phases of compilation	with compile time									
		error handling.	while complete time									
		<b>CO3: Design</b> Push down Automata from Context Free Languag	e or Grammar and									
		vice-versa.										
		<b>CO 4:Compare</b> top down with bottom up parsers, and develop appropriate parser to										
		produce parse tree representation of the input										
		<b>CO 5: Design</b> syntax directed translation schemes for a given context free grammar.										
		CO 6:Generate intermediate code for statements in high level language, Benefits										
		and limitations of automatic memory management. optimiza	ation techniques to									
		intermediate code and generate machine code for high level language program										
7	Course	To provide students with an overview of the issues that arise in G	Compiler									
	Description	construction as well as to throw light upon the significant theoretical developments										
		and tools that are deep rooted into computer science.										
8	Outline syllabus		CO Mapping									
	Unit 1	Finite Automata and Regular Expression										
	А	Introduction to languages, Kleene closures, Finite Automata	CO1									
		(FA), Transition graph, Nondeterministic finite Automata										
		(NFA), Deterministic finite Automata (DFA).										
	В	Regular Expression, Finite Automata with null move, Regular	CO1,CO2									
		Expression to Finite Automata, Arden Theorem										
	С	FA with output: Moore machine, Mealy machine and	CO1									
		Equivalence.										
	Unit 2	<b>REGULAR &amp; CONTEXT FREE LANGUAGE</b>										
	А	Defining grammar, Chomsky hierarchy of Languages and	CO1,CO2									
		Grammar. Ambiguous to Unambiguous CFG.										
	В	Simplification of CFGs, Normal forms for CFGs, Derivation										
		and parse trees.	CO1,CO2									
	С	Introduction to Compiler, Phases and passes, Bootstrapping,	CO1,CO2,CO4									
		Cross-Compiler										
	Unit 3	PUSH DOWN AUTOMATA										

## Syllabus: CSE 250, Theory of Computation and Compiler Design



А	Description an PDA	nd definition of	f PDA and Non-Deterministic	CO3
В	Working of P	DA, Acceptanc	e of a string by PDA with final	CO3
0	state and with	Null store. 1 w	Vo stack PDA.	602
C	Two stack PD	A and PDA ap	plications	03
Unit 4	Introduction techniques	to Lexical and	d Syntax Analysis & Parsing	
А	Lexical analy	sis: Role of lex	ical analyser. Tokens, patterns &	CO4.CO5
	Lexemes			,
В	Basic Parsing	Techniques: R	cole of Parsers, Top Down Parsers,	CO4.CO5
	T and Follow, predictive parsers,	,		
	recedence parsing,			
С	CO4,CO5			
	during shift re	duce parsing, 1	Introduction to LR parsers, Items,	,
	Viable Prefixe	es, the canonic	cal Collection of $LR(0)$ items,	
Unit 5				
А	CO5,CO6			
	attributes, Eva			
	translation sch			
В	Intermediate of	CO5,CO6		
	variants			
С	Code Optimiz	ation : Machin	CO5,CO6	
	independent of	ptimization teo	chniques.	
Mode of	Theory			
examination			1	
Weightage	CA	MTE	ETE	
Distribution	25%	25%	50%	
Text book/s*	•Introduction	to Automata th	eory, Languages and	
	Computation,	John E. Hoper	oft, Rajeev Motwani, Jeffery D.	
	Ullman, Third	l Edition Pears	on education. 2007	
	•Aho, Sethi, U	Jlman, compile	ers Principles, Techniques, and	
	Tools, Pearson	n Education, 20	0	
Other	1. Lauden	, Principles of	Compiler Construction.	
References	2. Fundam			
	and Pra	ctice, Raymon	d Greenlaw, H. James Hoover,	
	Morgan	Kaufmann,19	98	
	3. Peter L	inz, "Formal L	anguages and Auomata", Narosa	
	Publish	ing House		

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: Design DFA and NDFA and conversion from NDFA to	PO1,PO2,PO3,PO4,PO5,PO8,
	DFA. Construct finite automata without output and with output.	PO9,PO12,PSO1
2.	CO2: Implement regular expression and grammar corresponding	PO1,PO2, PO3, PO4,PO5,
	to DFA and vice-versa. Explain the concepts and different phases	PO8, PSO2,PSO3
	of compilation with compile time error handling.	



3.	CO3: Design Push down Automata from Context Free Language	PO1,PO2,PO3,PO4, PO9,
	or Grammar and vice-versa.	PO12,PSO1,PSO2
4.	CO 4: Compare Top down with bottom up parsers, and develop	PO1,PO2,PO3,PO5 PO8,,PO9,
	appropriate parser to produce parse tree representation of the input	PO12, PSO1,PSO2,PSO2
5.	CO 5: Design syntax directed translation schemes for a given	PO1,PO2,PO3, PO4,PO5,
	context free grammar.	PSO1,PSO2,PSO3
6.	CO 6: Generate intermediate code for statements in high level	PO1, PO3,PO4, PO5,
	language, Benefits and limitations of automatic memory	PO8,PO9, PO12,
	management. optimization techniques to intermediate code and	PSO1,PSO2,PSO3
	generate machine code for high level language program	

PO and PSO mapping with level of strength for Course Name Theory of Computation and Compiler Design (Course Code CSE 250)

Cos	PO1	Р	PO	PO	PO	Р	PO	PO	PO9	PO	Р	PO	Р	PSO2	PSO3
		0	3	4	5	0	7	8		10	0	12	S		
		2				6					1		0		
											1		1		
CO1	3	2	2	2	3			2	2			2	3		
CO2	2	3	3	1	2			3						3	2
CO3	3	3	3	2					2			2	2	2	
CO4	1	2	3		2			3	3			3	3	3	2
CO5	1	2	2	2	2			1	2				1	2	2
CO6	2		3	2	1			2	3			3	3	2	3

1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	PO 3	РО 4	РО 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSE25 0	TOC& CD	2	2	2.6	1.5	1.6	0	0	1.8	2	0	0	1.6	2	2	1.5

## Strength of Correlation

1. Addressed to Slight (Low=1) extent

2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



|--|

School:		School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Prog	gram:	B.Tech								
Bra	nch:CSE	Semester:								
1	Course Code	CSP250								
2	Course Title	Theory of Computation & Compiler Design Lab								
3	Credits	1								
4	Contact Hours	0-0-2								
	(L-T-P)									
	Course Status									
5	Course	This laboratory course is intended to make the students exp	periment on the							
	Objective	basic techniques of automata theory, regular expression, for	ormal language,							
		syntax-directed translation of a high-level programming la	nguage into an							
		executable code. Students will design and implement lang	lage processors							
		in C by using tools to automate parts of the implementatio	n process. This							
		will provide deeper insights into the more advanced seman	ntics aspects of							
		programming languages, code generation, machine	e independent							
		optimizations.								
6	Course	CO1 <b>Apply</b> different compiler writing tools to implement the	he different							
	Outcomes	Phases								
		CO2: Implement regular expression and grammar correspondence of the second seco	onding to DFA							
		and vice-versa								
		CO3: <b>Construct</b> Push Down Automata.								
		CO5: Construct the intermediate representation								
		CO6: Compare various code optimization techniques								
7	Course	This self-paced course will discuss the major ideas used tod	av in the							
,	Description	implementation of programming language compilers, include	ling lexical							
	Description	analysis, parsing, syntax-directed translation, abstract syntax	x trees, types							
		and type checking, intermediate languages, dataflow analysis	is, program							
		optimization, code generation, and runtime systems. As a result, you will								
		learn how a program written in a high-level language designed for humar								
		is systematically translated into a program written in low-level assem-								
8	Outline syllabus		CO							
Ŭ	outilité synaou	,	Mapping							
	Unit 1	Practical based on Designing of Finite Automata	FF8							
		and Regular expression								
		1. Design a DFA which will accept all the	CO1,CO2							
		strings containing even number of 0's and								
		even number of 1's over an alphabet {0, 1}								
		and write a program to implement the DFA								
		2. Design a DFA which will accept all the								
		strings containing mod 3 of 0's over an								
		alphabet {0, 1} and write a program to								
		implament the DEA								
		implement the DFA.								



	3. Cons									
	Conv									
Unit 2	Practical re	Practical related to – Context free grammar &								
	Lexical Ana	lyzer								
	1. Write	CO1,CO2								
	CFG.									
	2. Write a code for simplification of Grammar.									
	3. Desig	gn a lexical anal								
	the le	exical analyzer s								
	space	spaces, tabs and new lines								
Unit 3	Practical re	lated to PUS	H DOWN AUTOMATA							
	I. Impl	ement Push D	own Automata	CO3						
	2. Conv	verting PDA to	o CFG							
	3. Conv	verting CFG to	PDA							
Unit 4	Practical re	elated to Par	sing techniques							
	1. V	Vrite an algori	thm and program on	CO4						
	F	Recursive Desc	cent parser.							
	2. V	2. Write an algorithm and program to								
	с	compute FIRST and FOLLOW function.								
	3. I	Develop an ope								
	a	given languag								
	4. I	mplementation								
	a	lgorithm and I								
Unit 5	Practical re	ractical related to Syntax Directed Translations								
	And Interme	ediate Code Ge	neration							
	1. Writ	e code to gene	rate abstract syntax tree.	CO5,CO6						
	2. Impl	ement Three A	Address codes							
	3. Impl	ementation of	Code Generation							
Mode of	Jury/Practic	al/Viva								
examination										
Weightage	CA	MTE	ETE							
Distribution	25%									
Text book/s*	/s* 1. Aho, Sethi, Ulman, compilers Principles,									
	Tech									
	2003	<ul><li>2003</li><li>2. Peter Linz, "Formal Languages and Auomata", Narosa Publishing House</li></ul>								
	2. Peter									
	Naro									
Other	Lauden	, Principles of	Compiler Construction.							
References	1. D. M.	Dhamdhere	Compiler Construction							
	Princip	oles and Practic	ce, Macmillan India,							
	- · r		. /	I						

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)



1.	CO1 <b>Apply</b> different compiler writing tools to implement the different Phases	PO1,PO5,PO6,PO9,PO12,PSO1,PSO2
2.	CO2: Implement regular expression and	PO1,PO2,PO3, PO4,PO5, PO12, PSO1,
	grammar corresponding to DFA and vice-	PSO2
	versa	
3.	CO3: Construct Push Down Automata.	PO1,PO2,PO3,PSO1,PSO2
4.	CO4: Implement a parser for different	PO1,PO2,PO3, PO4,PO5,PO9,
	context free grammars.	PSO2,PSO3
5.	CO5: Construct the intermediate	PO1,PO2,PO3,
	representation	PO4,PO5,PO9,PO12,PSO1,PSO2,PSO
		3
6.	CO6: Compare various code optimization	PO1, PO3,PO4, PO4,PO5,PO9,PO12
	techniques	PSO1,PSO2,PSO3

PO and PSO mapping with level of strength for Course Name Theory of Computation and compiler Design Lab (Course Code CSP250)

Cos	PO1	Р	PO3	PO4	PO5	Р	PO7	PO8	PO9	PO1	Р	PO1	PS	PSO2	PSO3
		O2				0				0	0	2	01		
						6					11				
CO1	3				3				2			3	2	1	
CO2	2	2	3	3	2							2	3	2	
CO3	3	3	3										3	2	
CO4	1	2	3	3	3				3					3	2
CO5	1	1	2	3	2				3			3	1	2	2
CO6	2		3	3	2				3			3	3	2	3

1-Slight (Low)2-Moderate (Medium)3-Substantial (High)

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	РО 3	PO 4	РО 5	PO 6	P O 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PSO 3
CSP250	TOC&C D	2	1.3	2.3	2	2	0	0	0	1.8	0	0	2	2	2	1.2

### Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



# B.Tech (CSE) with Specialization in Artificial Intelligence & Machine Learning



School:		School of Engineering & Technology									
Department		Computer Science & Engineering									
Program:		B. Tech									
Bra	nch:	CSE with Specialization in AI & ML									
1	Course	CSA10									
	Code	2									
2	Course	Introduction to Artificial Intelligence & Machine Learning									
	Title		8		8						
3	Credits	2									
4	Contact	2	0	0							
-	Hours		-	•							
	(L-T-P)										
	Course	Core									
	Status	0010									
5	Course	The objective of the c	ourse is to introduce basic t	fundamen	tal concepts						
	Objective	in Artificial Intelligen	ce (AI) and Machine Learn	ing (ML)	as well as to						
	5	give a strong foundation	on od AI Techniques.	U V							
6	Course	CO-1. Define the req	irement of Artificial Intell	ligence							
	Outcomes	CO-2. Classify the	functionality of agents	along wi	ith acting						
		environment o	f Intelligence in Artificial I	Intelligen	ce.						
		CO-3. Apply the con	cepts of Propositional Logi	ic for real	-world AI						
		based problems									
		CO-4. Analyse the va	rious ML techniques and a	apply the	m to solve						
		the real world societal problems									
		CO-5 Explain the Use Cases of AIML in real world societal									
		problems.	nroblems								
		CO-6. Discuss the	applicability of Artificia	l Intellig	ence and						
		Machine lear	ning Approaches to de	evelop s	ustainable						
		solutions using	professional ethics.	1							
7	Course	Artificial Intelligence	(AI) and Machine Learning	g (ML) ar	e increasingly						
	Description	necessary to translate	oday's data into direct busi	iness valu	e. This course						
	-	introduces learners to	the basic concepts of AI ar	nd ML, ar	nd covers how						
		learning algorithms w	ork. It illustrates how AI	and ML	fit in the data						
		science ecosystem, an	d presents several real-wo	rld use ca	uses that show						
		how companies are in	plementing.								
8	<b>Outline syll</b>	abus	СО								
	· ·	Mapping									
	Unit 1	Introduction of Arti	ficial Intelligence								
	А	Introduction to Artificial Intelligence, Foundation of Artificial CO1									
		Intelligence: Acting humanly: The Turing Test approach,									
		Thinking humanly: The cognitive modeling approach,									
		Thinking rationally: The laws of thought approach , Acting									
	D	History of Artificial Late	igent approach	n Dattarn	CO1 CO2						
	U	Recognition Autonom	us planning and scheduling	Game	CO1, CO0						
		playing. Spam filtering	. Logistics planning and	Machine							
		Translation.	Translation.								


С	Case Study o	Case Study on AI Solutions Vs. Conventional Soluti									
 <b>T</b> T <b>1</b> / <b>A</b>	Google Duples	x, Do you think	Al is good or evil?								
Unit 2	Introduction	to Intelligent	Agents								
А	Introduction t	o Intelligent A	gents, How Agents Should	CO2							
	Act, The ideal	mapping from p	percept sequences to actions,								
	Properties of A	gents: Intelliger	nce, Autonomy, Ability to								
D	Classification	ation.	estime Assesse Callebarding								
В		of Agents: Re	active Agents, Collaborative								
	Agents, Inter	lace Agents, M	lobile Agents, information								
0	gathering Age	ents Frankriger Start		000							
C	I ne nature of f	Environments: S	pecifying the task environment,	02							
	agents: Roboti	ask environment	r less cars								
Unit 3	Introduction	to Proposition	nel Logic								
	Introduction N	introduction What Is Logic? Why Logic is used in Artificial									
Λ	Intelligence I	Intelligence, Logical Operators, Translating between English									
	and Logic Not	ation. Truth Tab	les.								
	und 20gre 100										
В	Complex Truth	Complex Truth Tables, Tautology, Equivalence									
	_										
С	Propositional	Propositional Logic, Syntax, Semantics, Deduction, The									
	Deduction Th	Deduction Theorem									
Unit 4	Introduction to	o Machine Learn	ling								
А	Introduction, 7	raining, Rote L	earning, Learning Concepts, A	CO4, CO6							
	Simple Lear										
<b>D</b>	Unsupervised	Learning, Reinfo	orcement Learning								
В	Introduction t	o Linear Regro	ession, Application of Linear	CO4, CO6							
C	Introduction N	Jourons Artifici	al Nourons, Percentron, Nourol	CO1 CO6							
C	Networks Ar	chitecture Fee	d forward Neural Networks	04,000							
	Applications o	f Neural Netwo	rks								
Unit 5	Applications	of AIML									
A	Case Study	on application	ns of AI ML in Human	CO5, CO6							
	Resource: S	creening Ton	s Of Resumes. Attracting								
	Talent, Sched	ule Manageme	ent								
	Case Study o	n applications	of AI ML in Health Care:								
	Virtual assist	ance in health	care. Diagnostics assistance								
	and medical i	maging									
B	Use Cases on	applications o	f AIML in Banking Use	CO5 CO6							
D	Cases on app	lications of AI	ML in insurance.								
С	Use Cases on	Use Cases on applications of AI ML in cyber security									
C	Use Cases on	Use Cases on applications of AI ML in weather									
	forecasting	forecasting									
Mode of	Theory										
examination	5										
Weightage	CA	MTE	ETE	1							
Distribution	25%	25%	50%								
Text book/s*	Coppin Ben.	Artificial Intell	igence Illuminated. Jones								
	and Bartlett P	ublishers									



Other	1) Russell S & Norvig P, Artificial Intelligence: A	
References	Modern Approach, Prentice Hall	
	2) Rich E & Knight K, Artificial Intelligence, Tata	
	McGraw Hill, Edition 3	
	3) Dan W. Patterson, Artificial Intelligence & Expert	
	Systems, Pearson Education with Prentice Hall India.	
	Indian Edition.	
	https://analyticsindiamag.com/top-use-cases-ai-	
	human-resources/	

S.		Course Outcome	Program Outcomes (PO) &
No.			Program Specific Outcomes (PSO)
1.	CO-1.	Define the requirement of Artificial Intelligence	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	CO-2.	Classify the functionality of agents along with acting environment of Intelligence in Artificial Intelligence.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	CO-3.	Apply the concepts of Propositional Logic for real-world AI based problems.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	CO-4.	Analyse the various ML techniques and apply them to solve the real world societal problems.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	CO-5.	Explain the Use Cases of AIML in real world societal problems.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	CO-6.	Discuss the applicability of Artificial Intelligence and Machine learning Approaches to develop sustainable solutions using professional ethics.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3

**PO and PSO mapping with level of strength for Course Name** Introduction to Artificial Intelligence & Machine Learning (**Course Code** CSA-102)

Course Code_ Course Name	CO's	PO 1	PO 2	Р О 3	Р О 4	P O 5	P O 6	Р О 7	P O 8	Р О 9	PO 10	Р О 11	P O 12	PS O 1	P S O 2	P S O 3
	CO1	3	3	3	1	2	1	1	1	2	3	1	3	2	3	1
	CO2	3	3	3	1	2	3	3	1	2	3	1	3	2	3	2
Introduction to Artificial Intelligence	CO3	3	3	3	1	2	3	3	1	3	3	3	3	3	3	3
& Machine Learning	CO4	3	3	3	1	2	3	3	1	3	3	3	3	3	3	3
(CSA-102)	CO5	3	3	3	1	2	3	3	1	3	3	3	3	3	3	3
	CO6	3	3	3	1	2	3	3	3	3	3	3	3	3	3	3



Cour		Р	Р		Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
se	Course Name	0	0	РО	0	0	0	0	0	0	0	0	0	0	0	0
Code		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CSA-	Introduction to Artificial Intelligence & Machine Learning	3.	3.	3.	1.	2.	2.	2.	1.	2.	3.	2.	3.	2.	3.	2.
102		00	00	00	00	00	67	67	33	67	00	33	00	67	00	50

## Average of non-zeros entry in following table (should be auto calculated).



School: School of Engineering & Technology													
Dep	artment	<b>Computer</b> S	Science & Engineering										
Pro	gram:	B. Tech											
Bra	nch:	CSE with S	pecialization in AI & ML										
1	Course Code	CSA20 C	Concepts of Machine Learning										
		2	-										
2	Course Title	Concepts of	f Machine Learning										
3	Credits												
4	Contact	3	0 2										
	Hours												
	(L-T-P)												
	Course	Core											
	Status												
5	Course	Students are E	tudents are Expected to learn and develop Comprehensive Understanding of the of										
	Objective	the following (	he following Concepts and Techniques:										
	5	1. To introd	1. To introduce the ideas of learning rule and implement them based on human										
		experien	ce.										
		2. To conce	eptualize the working of numan brain using SVM, ne familiar with decision boundaries that can learn	KF and ANN. from available									
		examples	s and generalize to form appropriate learning rules	for inference									
		systems.											
		4. To provi	de the mathematical background for SVM, RF and	Neural Network									
		based cla	assification techniques.	<b>C 1 1 1 1 1 1 1 1 1 1</b>									
		5. To under series of	data using computer based learning algorithms	ng from a large									
6	Course	A Successful c	completion of this Course Ensures the following O	tcomes									
0	Outcomes	CO1 : Define	e basics of Machine Learning and stochastic conc	epts.									
	Outcomes	CO-2 : Classif	fy and Compare existing models to understand th	applicability in									
		solve real worl	ld societal problems.										
		CO-3 : Identi	fy develop and apply mathematical models to find	sustainable									
		solutions.											
		CO-4 : Analys	se the logical ability to apply feature engineering to	extract									
		hierarc	hical patterns existing in real life problems.										
		CO-5 : Evalua	ate the learning models to glance the upcoming wo	rld through it.									
		CO-6 : Discu	iss the applicability of Machine learning Approx	ches to develop									
7	Course	Sustainable sol	utions using professional etnics.	aal & implementable									
/	Description	understanding	for supervised and unsupervised learning based pr	oblem areas									
8	Description	understanding	for supervised and unsupervised rearning based pr	CO Manning									
0	Unit 1	Core Concent	s of Machine Learning										
		What is Machi	ne Learning?										
	A	What is Watch	problems can be tackled using machine learning?	he									
		ML Mindset	, Introduction to Machine Learning Probl	em									
		Framing(Com	mon ML Problems, ML Use Cases, Identifying Go	od									
		Problems for	ML, Hard ML Problems), Machine Learn	ng CO1									
		Applications(I Diagnosis Sta	Applications (Image Recognition, Speech Recognition, Medic Diagnosis Statistical Arbitrage Learning Associations) Standa										
		learning tasl	learning tasks(Machine Learning Pipeline, Classification										
		Regression, F	Regression, Ranking, Clustering, Dimensionality reduction of										
		Manifold learn											
	В	Learning Stag	ges(Features, Labels, Hyperparameters, Validat	on ng CO1 CO2									
		Scenarios( Su	pervised learning, Unsupervised learning, Sei	ng (001, 002 ni-									



	Supervised learning, Transductive inference, On-line learning, Reinforcement learning, Active learning), Generalization Supervised Learning, Unsupervised Learning, Reinforcement learning)	
С	Data Preparation and Feature Engineering in ML(Data and Features, Information, Knowledge, Data Types, Big Data), Data Preprocessing: An Overview(Data Quality: Why Preprocess the Data?, Major Tasks in Data Preprocessing), Data Cleaning(Missing Values, Noisy Data, Data Cleaning as a Process), Data Integration(The Entity Identification Problem, Redundancy and Correlation Analysis, Tuple Duplication, Detection and Resolution of Data Value Conflicts), Data Reduction( Overview of Data Reduction Strategies, Attribute Subset Selection, Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation), Data Transformation and Data Discretization(Overview of Data Transformation Strategies, Data Transformation by Normalization, Discretization by Binning, Discretization by Histogram Analysis, Discretization by Cluster, Decision Tree, and Correlation Analyses, Concept Hierarchy Generation for Nominal Data)	CO1, CO2
Unit 2	Supervised Learning Algorithms - Part One	
A	How Supervised Learning Algorithms Work ? Steps (Bias-variance trade off, Function complexity and amount of training data, Dimensionality of the input space, Noise in the output values, Algorithms, Other factors to consider (Heterogeneity of the data, Redundancy in the data, Presence of interactions and non- linearities	CO1, CO2, CO6
В	Linear Regression Model Representation, Linear Regression Learning the Model (Simple Linear Regression, Ordinary Least Squares, Gradient Descent), Regularization / Shrinkage Methods ( Bias-variance trade-off, Overfitting Issues, Lasso Regression, Ridge Regression), Making Predictions with Linear Regression(Cost Function, Feature Scaling, Normalization, Mean Normalization, Learning Rate, Automatic Convergence Test)	CO1, CO2, CO6
С	Logistic Regression, The Logistic Model ( Latent variable interpretation, Logistic function, odds, odds ratio, and logit, Definition of the logistic function, Definition of the inverse of the logistic function, Interpretation of these terms, Definition of the odds, The odds ratio, Multiple explanatory variables), Model fitting ("Rule of ten", Iteratively reweighted least squares (IRLS), Evaluating goodness of fit, Limitations of Logistic Regression), Linear discriminant analysis ( LDA for two classes, Assumptions, Discriminant functions, Discrimination rules, Eigenvalues, Effect size), Practical use and Applications ( Bankruptcy prediction, Face recognition, Marketing, Biomedical, studies), Comparison to Logistic Regression	CO1, CO2, , CO6
Unit 3	Supervised Learning Algorithms - Part Two	
A	Support Vector Machines, Linear SVM (Hard-margin, Soft- margin), Nonlinear Classification, Computing the SVM classifier(Primal, Dual, Kernel trick), Modern methods(Sub- gradient descent, Coordinate descent), Empirical risk minimization(Risk minimization, Regularization and stability, SVM and the hinge loss, Target functions), Properties(Parameter selection, Issues)	CO1,CO2,CO3 , , CO6
D	Functions, Weight-space symmetries), Network Training ( Parameter optimization, Local quadratic approximation, Use of gradient information, Gradient descent optimization), Error	CO1,CO2,CO3 , CO6



	Backpropagation	n(Evaluation of	error-function derivatives, Simple									
С	Decision Tree L algorithm, Entro Overfitting, Vali Trees, Minimur Random Forests Bagging, From I Variable importa	earning (Decision opy, Information dation Methods, n-Description La Algorithm (Pre bagging to random ance)	a tree representation, ID3 learning gain, Overfitting and Evaluation Avoiding Overfitting in Decision ength Methods, Noise in Data). liminaries: decision tree learning, m forests, Extra Trees, Properties	CO1,CO2,CO3 , CO6								
Unit 4	Unsupervised L	earning										
A	Unsupervised I Clustering Meth Based on Proba Based on Euclid	Learning (What ods (Method Base bilities, Hierarchit ean Distance)	at is Unsupervised Learning?), ed on Euclidean Distance, Method ical Clustering Methods, Method	CO2,CO3,CO4 , CO6								
В	k-means Cluste means), Initializ Cluster analysis Expectation-Ma	k-means Clustering Algorithm (Standard algorithm (naive k- means), Initialization methods), Applications (Vector quantization, Cluster analysis, Feature learning) Gaussian mixture models, Expectation-Maximization method										
С	Principal Compo component, Fu reduction, Singu of PCA (Prop covariance meth	Principal Component Analysis for making predictive models (First component, Further components, Covariances, Dimensionality reduction, Singular value decomposition), Properties and limitations of PCA (Properties, Limitations), Computing PCA using the covariance method, Typical Applications										
Unit 5	Parameter Es Methods	Parameter Estimation, Model Evaluation and Ensemble Methods										
А	Parameter Estin Estimation, Uni Mean, Two Mea	CO2,CO5,CO6										
В	Model Evaluation Validation Meth One-Out Cross-V and Test Method AI Model Simul Curve	Model Evaluation (ML Model Validation by Humans, Holdout Set Validation Method, Cross-Validation Method for Models, Leave- One-Out Cross-Validation, Random Subsampling Validation, Teach and Test Method, Bootstrapping ML Validation Method, Running AI Model Simulations, Overriding Mechanism Method ), The ROC										
С	Ensemble Meth and Averaging Average, State Aggregating)	ods ( Ensemble Based Ensembl cking, Bagging	Theory, Ensemble Size, Voting e Methods Boosting, Weightage g, Boosting and Bootstrap	CO4,CO5,CO6								
Mode of examination	Theory and P	ractical										
Weightage	CA	MTE	ETE									
Distribution	25%	25%	50%									
Text book/s*	<ol> <li>Bishop, C. Berlin: Spi</li> <li>Foundation By Mehry Talwalkar,</li> <li>Introduction Alpaydin, introduction</li> </ol>											
Other References	<ol> <li>Baldi, F Machin Press.</li> <li>Russel, Moderr</li> <li>Cohen, <u>Intellig</u></li> </ol>											



	7)	https://www.toptal.com/machine-learning/ensemble-	
		methods-machine-learning.	

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO 1 : Define basics of Machine Learning and stochastic	PO1,PO2,PO3,PO4,
	concepts.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
2.	CO-2 : Classify and Compare existing models to understand the	PO1,PO2,PO3,PO4,
	applicability in solve real world societal problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
3.	CO-3: Identify develop and apply mathematical models to find	PO1,PO2,PO3,PO4,
	sustainable solutions.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
4.	<b>CO-4</b> : <i>Analyse</i> the logical ability to apply feature engineering to	PO1,PO2,PO3,PO4,
	extract hierarchical patterns existing in real life problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
5.	<b>CO-5</b> : <i>Evaluate</i> the learning models to glance the upcoming world	PO1,PO2,PO3,PO4,
	through it.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
6.	<b>CO-6</b> : Discuss the applicability of Machine learning Approaches to	PO1,PO2,PO3,PO4,
	develop sustainable solutions using professional ethics.	PO5,PO6,PO7,PO8,
		PO9.PO10. PSO1.PSO2.PSO3

**PO and PSO mapping with level of strength for Course Name** Concepts of Machine Learning (**Course Code** CSA-202)

Subje	<b>PO'</b> s /	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
ct		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	130 \$	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Concepts	CO1	3	3	3	3	3	3	2	1	1	3	1	3	2	2	1
Machine Learning (Course Code CSA- 201)	CO2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
	CO3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
	CO4	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
	CO5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS 0 2	PS O 3
CSA- 201	Concepts of Machine Learning	3.00	3.0 0	3.0 0	3.0 0	3.0 0	3.0 0	2.8 3	2.0 0	2.0 0	3.0 0	2.6 7	3.0 0	2.8 3	2.8 3	2.6 7

Total- 41.83 Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent

2. Addressed to *Moderate (Medium=2) extent* 



Scho	ol: SET	Batch: 2023-27										
Prog	ram: B.Tech.	Current Academic Year: 2023-24										
Bran	ch: CSE/IT	Semester: III										
1	Course Code	CAL201										
2	Course Title	Machine Learning Lab										
3	Credits	1										
4	Contact Hours (L-T-P)	0-0-2										
	Course Status	Core										
5	Course Objective	<ol> <li>Learn the basic concepts of Machine Learning algorithms.</li> <li>Make use of Data sets in implementing the machine learning a</li> <li>Implement the machine learning concepts and algorithms language of choice.</li> </ol>	lgorithms. in any suitable									
6	Course Outcomes	<ul> <li>CO 1: Show the implementation of linear and logistic Regression on reapplications.</li> <li>CO-2: Interpretation of existing models to understand the solution environment CO-3: Application of existing mathematical solutions to test real world problem.</li> <li>CO-4: Analyze the logical ability to apply clustering approach to extract hierarchical patterns existing in real life problems.</li> <li>CO-5: Build the understanding of learning theory to glance the upcoming world through it.</li> </ul>										
7	Course Description	This course introduces computational learning paradigm for critical implementable understanding for supervised and unsupervised learn problem areas.	& ing based									
8	Outline syllabus		CO Mapping									
	Unit 1	Core Concepts of Machine Learning										
		Write a Program to load and view data set file.	CO1									
		Write a program to implement simple linear regression using housing price prediction problem.	CO1, CO2									
		Write a program to implement binary logistic regression using cancer identification problem.	CO1, CO2									
	Unit 2	Supervised Learning Algorithms - Part One										
		Write a program to implement gradient descent method for learning.	CO1, CO2, CO6									
		Write a program to implement regularized linear regression.	CO1, CO2, CO6									
		Write a program to implement regularized logistic regression.	CO1, CO2, , CO6									
		Write a program to Normalize the data used in linear regression problem above before predicting prices, and then predict the housing prices.	CO1, CO2, CO6									
	Unit 3	Supervised Learning Algorithms - Part Two										
		Write a program to implement Support Vector Machine regression using suitable dataset.	CO1,CO2,CO3 , , CO6									
		Build an Artificial Neural Network by implementing the Back- propagation algorithm and test the same using appropriate data sets.	CO1,CO2,CO3 , CO6									
		Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	CO1,CO2,CO3 , , CO6									
		Write a program to demonstrate the working of the Random Forest algorithm. Use an appropriate data set for classifying a new sample.	CO1,CO2,CO3 , CO6									
	Unit 4	Unsupervised Learning										
		Write a program to implement K-Means clustering algorithm using an appropriate dataset.	CO2,CO3,CO4 , CO6									



	Write a program	n to implement K- lataset.	Means clustering algorithm using	CO2,CO3,CO4 , CO6							
Unit 5	Hypothesis Tes and Ensemble	sting, Parameter Methods	Estimation, Model Evaluation								
	Write a program validation and t	n to implement da esting data.	ta split into training, cross	CO2,CO5,CO6							
	Implement an E to solve time se	Implement an Ensemble approach by combining different models to solve time series based prediction problem.									
	Conduct hypoth appropriate prol	Conduct hypothesis testing using some statistical toolkit on appropriate problem.									
Mode of examination	Practical										
Weightage	CA	MTE	ETE								
Distribution	25%	25%	50%								
Text book/s*	<ol> <li>Bishop Learni</li> <li>Founds Mehry Talwal</li> <li>Introdu Ethem</li> <li>introdu</li> </ol>	<ol> <li>Bishop, C. (2006). Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.</li> <li>Foundations of Machine Learning, Second Edition by Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar, MIT Press, Second Edition, 2018.</li> <li>Introduction to Machine Learning, Third Edition, By EthemAlpaydin, The MIT Pressmitpress.mit.edu &gt; books</li> </ol>									
Other References	<ol> <li>Baldi, P. and Learning Appro</li> <li>Russel, S. an Modern Approa</li> <li>Cohen, P.R. Intelligence. Ca</li> </ol>	<ul> <li>&gt; introduction-machine-learni</li> <li>1) Baldi, P. and Brunak, S. (2002). Bioinformatics: A Machine Learning Approach. Cambridge, MA: MIT Press.</li> <li>2) Russel, S. and Norvig, P. (2003). Artifical Intelligence: A Modern Approach. 2ndEdition. New York: Prentice-Hall.</li> <li>3) Cohen, P.R. (1995) Empirical Methods in Artificial Intelligence. Cambridge, MA: MIT Press.</li> </ul>									

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO 1 : Show the implementation of linear and logistic Regression on real life applications.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	CO-2 : Interpretation of existing models to understand the solution environment.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	CO-3 : Application of existing mathematical solutions to test real world problems.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	CO-4 : Analyse the logical ability to apply clustering approach to extract hierarchical patterns existing in real life problems.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	CO-5 : Build the understanding of learning theory to glance the upcoming world	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	CO-6: Appraise recent trends in machine learning and applications	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3



**PO and PSO mapping with level of strength for Course Name** Concepts of Machine Learning (**Course Code** CAL201)

Subjec	PO's /	P	P	P	P	P	Р	P	Р	P	P	P	P	PS	PS	PS
t	PSO's	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Concep	CO1	3	3	3	3	3	3	2	1	1	3	1	3	2	2	1
ts of	CO2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
Machin	CO3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
Learnin	CO4	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
g	CO5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
(Cours								3				3		3	3	3
e Code	CO6	3	3	3	3	3	3		3	3	3		3			
CAL-	000	5	5	5	5	5	5		5	5	5		5			
201)																

Average of non-zeros entry in following table (should be auto calculated).

Cou rse Cod e	Course Name	PO 1	P O 2	Р О 3	P O 4	Р О 5	P O 6	P O 7	P O 8	Р О 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	P S O 3
CSA -201	Concepts of Machine Learning	3.00	3. 00	3. 00	3. 00	3. 00	3. 00	2. 83	2. 00	2. 00	3. 00	2. 67	3. 00	2. 83	2. 83	2. 67

#### Total- 41.83 Strength of Correlation

1. Addressed to Slight (Low=1) extent
2. Addressed to Moderate (Medium=2) extent
3. Addressed to Substantial (High=3) extent



School: School of Engineering & Technology													
Dep	artment	<b>Computer Scien</b>	ce & E	ngineering									
Pro	gram:	B. Tech											
Bra	nch:	CSE with Specia	lizatio	n in AI & ML									
1	Course	CSA-203											
	Code												
2	Course	<b>Concepts of Neu</b>	ral Ne	tworks									
	Title	-											
3	Credits	3											
4	Contact	3		0	0								
	Hours												
	(L-T-P)												
	0	0											
	Course	Core	Core										
~	Status												
5	Course 1. 10 introduce the ideas of learning rule and implement them based o												
	Objective	JDjective         numan experience.           2         To concentualize the working of human brain using ANN.											
		2. To conceptual	nilior y	working of numan orall	using An	from available							
		3. TO become rai	liinai v	ralize to form appropri	oto loorn	ing rules for							
		inference syste	i gene	anze to torni appropri		ing fulles for							
		4 To provide th	ne matl	nematical background fo	r Neural	Network and							
		classification techniques											
		5 To provide the mathematical background for carrying out the											
		optimization a	and fan	niliarizing genetic algori	thm for s	eeking global							
		optimum in se	lf-learr	ning situation		coming groour							
6	Course	On successfu	l comr	pletion of this module stud	lents will	be able to:							
Ŭ	Outcomes	1 <b>Define</b> biolo	orical s	ignificance of Neural Net	work and	list ANN							
		components	gical 5										
		2 Classify var	ious le:	arning paradigms based o	n real file	problems							
		3. Apply basic	conce	<b>nts to build</b> single and m	ulti-laver	feed-forward							
		neural netwo	orks.		ann nagor	lood for ward							
		4. <b>Analyze</b> and	l train r	adial-basis function and i	recurrent	networks:							
		5. Explain self	-organ	<b>izing map</b> for real life pr	oblems.	,							
		6. <b>Discuss</b> and	adapt a	appropriate neural networ	ks model	for real life							
		applications		TI T									
7	Course	This course intro	duces t	he basic models, learnin	g algorith	ms, and some							
	Description	applications of n	eural n	etworks. After this cours	e. we sho	uld be able to							
	Ĩ	know how to use	neural	networks for solving dif	ferent nro	blems related							
		to pottom mooogn	tion f	mation approximation d	to vievoli	ration and as							
		to pattern recogn	11011, 11	menon approximation, da	ata visuali	ization, and so							
		on.											
8	<b>T</b> T <b>1</b> / 4	<b>.</b>											
	Unit 1	Introduction											
	А	Introduction, Mo	tivatior	and History, Componen	ts of a	CO1							
		Neuron-synapses	, dendr	ite, cell nucleus, axon									



В	Important Terminologies of ANNs: Propagation function.	
	Activation function output function. Components of	
	Artificial Neural Network: common activation functions	CO1
	network topologies- feed forward recurrent networks	001
	completely linked networks	
C	Neuron Activation order: Synchronous activation	
C	asynchronous activation Communication with the	
	outside world: input and output of data in and from	CO1
	neural networks	
Unit 2	Learning Paradigms	
	Learning Paradigms and their real Applications	
A	Learning ratadigins and uten real Applications,	
	Disupervised learning and Supervised learning,	CO2, CO6
	their applications based on real life problems	
D	Training not tooching inputs use of training	
В	Training patterns and teaching inputs, use of training	
	samples, data set split into training, valuation and testing	CO2, CO6
	data, implication of splitting of data set, Learning curves	
0		<u> </u>
 C	Gradient optimization procedures, Hebbian learning rule	CO2
Unit 3	The Perceptron, Backpropagation and its variants	
A	Single layer Perceptron network, Perceptron Learning	
	Algorithm and convergence theorem, Delta rule as a	CO3
	gradient based learning strategy, Limitations of Single	
	Layer Perceptron network	
В	Multilayer Perceptron Network, Backpropagation	CO3
	learning and its applications	
C	Analysing effect of learning rate on learning process,	CO3
	Variants of Backpropagation algorithm	
Unit 4	Radial Basis Function Neural Networks	
А	Components & Structure of an RBF network, Information	
	processing of an RBF network, Information Processing in	CO4
	RBF neurons, analytical thoughts prior to training	
В	Equation system and gradient strategies for training,	
	Growing RBF Networks, comparison of RBF Networks	CO4
	and Multilayer Perceptron's	
C	Recurrent Neural Networks: Jordan networks, Elman	
	Networks, Training Recurrent neural networks	CO4
Unit 5	Unsupervised Learning Network Paradigms	
А	Self-organizing feature maps, structure of a self-	
	organizing feature map, Training of SOM, Topology	CO5,CO6
	function, common distance and topology functions,	
Unit 2         A         B         C         Unit 3         A         B         C         Unit 4         A         B         C         Unit 4         A         B         C         Unit 5         A	Dataset workt, input and output of data in and from neural networksLearning ParadigmsLearning Paradigms and their real Applications, Unsupervised learning, Offline and online learning and their applications based on real life problems.Training patterns and teaching inputs, use of training 	CO2, CO6 CO2, CO6 CO2 CO3 CO3 CO3 CO3 CO4 CO4 CO4 CO4 CO4



	relationship b	etween learnin	ig rates an	d neighborhoods	8,							
	applications o	f SOMs										
В	Introduction t	o Adaptive R	esonance 7	Theory, Task and	d							
	structure of an	ART Network	, Learning <sub>I</sub>	process of an AR	Г							
	Network- top	down and bott	om up lear	ning, Extensions	- CO5,CO6							
	ART2, ART3	ART2, ART3										
С	Introduction t	o Hopfield Ne	twork, Ass	ociative Networ	k							
	(Homogenous	& Heterog	geneous),	Introduction t	o CO5,CO6							
	Restricted Bol	tzmann Machi	ne.									
Mode of												
examination												
Weightage	CA	MTE	ETE									
Distribution	25%	25%	50%									
Text	1. David F	Kriesel, 2007,	"A Brie	f Introduction t	0							
book/s*	Neural	Network	s", a	ivailable a	ıt							
	http://ww	ww.dkriesel.com	<u>n</u>		_							
	2. Simon	O. Haykin,	"Neural	Networks and	d							
	Learnin	g Machines",	Pearson									
Other	1. ANDEI	RSON, JAMES	S A., AN IN	TRODUCTION	-							
References	TO NE	URAL NETW	ORKS, PHI	Learning.								
	2. Christo	pher M. Bishop	o & Geoffre	ey Hinton, Neura	1							
	Networ	ks for Pattern H	Recognitior	n, Oxford								
	Univers	sity Press.										
	B C C Mode of examination Weightage Distribution Text book/s* Other References	relationship b applications oBIntroduction t structure of an Network- top ART2, ART3CIntroduction t (Homogenous) Restricted BolMode of examinationCAWeightage DistributionCAText book/s*1. David F Neural http://wy 2. Simon LearninOther References1. ANDEI TO NE 2. Christo Networ University	relationship between learnin applications of SOMsBIntroduction to Adaptive Re structure of an ART Network Network- top down and both ART2, ART3CIntroduction to Hopfield Ne (Homogenous & Heterog Restricted Boltzmann MachinMode of examinationCAMTE Distribution25%Text book/s*1. David Kriesel, 2007, Neural Network http://www.dkriesel.com 2. Simon O. Haykin, Learning Machines", Other ReferencesOther References1. ANDERSON, JAMES TO NEURAL NETWO 2. Christopher M. Bishop Networks for Pattern F University Press.	relationship between learning rates an applications of SOMsBIntroduction to Adaptive Resonance T structure of an ART Network, Learning p Network- top down and bottom up lear ART2, ART3CIntroduction to Hopfield Network, Ass (Homogenous & Heterogeneous), Restricted Boltzmann Machine.Mode of examinationCAWeightage DistributionCAMote of/examination25%25%25%25%50%Text book/s*1. David Kriesel, 2007, "A Brie Neural Learning Machines", PearsonOther References1. ANDERSON, JAMES A., AN IN TO NEURAL NETWORKS, PHI 2. Christopher M. Bishop & Geoffred Networks for Pattern Recognition University Press.	relationship between learning rates and neighborhoods applications of SOMs         B       Introduction to Adaptive Resonance Theory, Task an structure of an ART Network, Learning process of an AR' Network- top down and bottom up learning, Extensions ART2, ART3         C       Introduction to Hopfield Network, Associative Networ (Homogenous & Heterogeneous), Introduction to Restricted Boltzmann Machine.         Mode of examination       CA       MTE       ETE         Distribution       25%       25%       50%         Text       1. David Kriesel, 2007, "A Brief Introduction t Neural Networks", available a http://www.dkriesel.com       2. Simon O. Haykin, "Neural Networks and Learning Machines", Pearson         Other       1. ANDERSON, JAMES A., AN INTRODUCTION TO NEURAL NETWORKS, PHI Learning.       2. Christopher M. Bishop & Geoffrey Hinton, Neural Networks for Pattern Recognition, Oxford University Press.							

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	<b>Define</b> biological significance of Neural Network and list ANN components.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	<b>Classify</b> various learning paradigms based on real life problems	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	<b>Apply basic concepts to build</b> single and multi-layer feed-forward neural networks.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	Analyze and train radial-basis function and recurrent networks;	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	Explain self-organizing map for real life problems.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	<b>Discuss</b> and adapt appropriate neural networks model for real life applications.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3



## PO and PSO mapping with level of strength for Course Name: Neural networks (Course Code- CSA-203)

Course Code_ Course Name	CO's	PO 1	PO 2	Р О 3	P O 4	P O 5	P O 6	P O 7	P O 8	Р О 9	PO 10	Р О 11	P O 12	PS O 1	P S O 2	P S O 3
	CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
Noural notworks	CO2	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
(Course Code-	CO3	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
CSA-203)	CO4	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
	CO5	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
	CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3

#### Average of non-zeros entry in following table (should be auto calculated).

Course	Course Name	PO	PO	PO	РО	РО	PO	РО	РО	PO	PO	PO	PO	PS	PS	PS
Code		1	2	3	4	5	6	7	8	9	10	11	12	O 1	O 2	0 3
CSA- 203	Neural networks	3.0 0	3.0 0	3.0 0	3.0 0	2.8 3	2.3 3	2.3 3	1.1 7	2.3 3	3.0 0	2.6 7	3.0 0	3.00	3.00	2.67

#### **Total 40.3**

## **Strength of Correlation**

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment	Computer Science & Engineering									
Pros	gram:	B. Tech									
Bra	nch:	CSE with Specialization in AI & ML									
1	Course	CSA301									
-	Code										
2	Course	SOFT COMPUTING									
-	Title										
3	Credits	3									
4	Contact	3 0 0									
•	Hours										
	(L-T-P)										
		Corro									
	Status										
5	Course	The primary objective of this course is to provide an introduction to the	basic principles,								
	Objective techniques, and applications of soft computing.										
	-	• Upon successful completion of the course, students will have an	understanding of								
		the basic areas of Soft Computing including Artificial Neural	Networks, Fuzzy								
		<ul> <li>Provide the mathematical background for carrying out the optimi</li> </ul>	zation associated								
		with neural network learning.	Zution associated								
		• Aim of this course is to develop some familiarity with current research problem									
		and research methods in Soft Computing by working on a research or design project.									
6	Course	The Completion of this Course Will Enable the Students to be able to Learn									
	Outcomes	<b>CO1:</b> Define the basic concepts of soft computing.									
		<b>CO2:</b> Explain applications & operations of Fuzzy Logic in real life pro	oblems.								
		<b>CO3:</b> Apply different FIS models to solve optimization problems.	1								
		<b>CO4:</b> Analyze and examine Evolutionary and swarm algorithms in so	biving real world								
		<b>CO5:</b> Choose of different ontimization algorithms to solve real life	a multi objective								
		nrohlems	e muni objective								
		<b>CO6:</b> Discuss applications of Soft Computing and solve Problems in	Varieties of								
		Application Domains.	varieties of								
7	Course	This course will cover fundamental concepts used in Soft computing.	The concepts of								
	Description	Fuzzy logic (FL) will be covered first, followed by Artificial Neural N	letworks (ANNs)								
	-	and optimization techniques using Genetic Algorithm (GA). Appl	lications of Soft								
		Computing techniques to solve a number of real life problems will be	covered to have								
		hands on practices.	I								
8			CO								
			Mapping								
	Unit 1	Introduction to Soft Computing	~~.								
	A	Concept of computing systems. What is Soft Computing?	COl								
	В	"Soft" Computing versus "Hard" computing	COI								
	C	Characteristics of Soft computing, Some applications of Soft computing techniques	CO1, CO6								
	Unit 2										
		FULLI LUGIC	CO2								
	R R	Operations on Eugzy sets Eugzy relations rules propositions	02								
	D	operations on ruzzy sets. ruzzy relations, rules, propositions,	CO2								
		implications and interences.									



С	Defuzzification te life societal applie	CO2							
 Unit 3	Fuzzy inference	System	0						
А	Fuzzy Inference S	Systems, Differen	nt Fuzzy Models: Madman Fuzzy	CO2					
	Models, Surgeon	Fuzzy Models		005					
В	Tsukamoto Fuzzy Modeling.	Models, Input S	pace Partitioning and Fuzzy	CO3					
С	Neuro Fuzzy Systems, Archited Method that	CO3							
Unit 4	Swarm and Evol	utionary Algori	thms						
А	Concept of "Ge probabilistic search	Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques							
В	Basic GA framev Encoding, Crosso Solving single-ob	vork and differen wer, Selection, M jective optimizat	t GA architectures, GA operators: futation, ion problems	CO4					
C	Swarm Optimiza Particle Swarm O	Swarm Optimization: Introduction to Ant Colony Optimization, Particle Swarm Optimization etc.							
Unit 5	Multi-objective	Optimization Pr	oblem Solving						
А	Concept of mult issues of solving	Concept of multi-objective optimization problems (MOOPs) and issues of solving them.							
В	Multi-Objective approaches to so	Evolutionary A olve MOOPs, P	Algorithm (MOEA) Non-Pareto areto-based approaches to solve	CO5,CO6					
C	WOOD \$ , Solite a	pplications with I	NOLAS	CO5 CO6					
 Mode of	Theory and Pre	actical		005,000					
examination	Theory and The	actical							
 Weightage	CA	MTE	FTF						
Distribution	25%	25%	50%						
Text book/s*	<ol> <li>George J. Klir a Hall, USA.</li> <li>Goldberg D.I Machine Learning</li> <li>Timothy J. R McGraw Hill</li> </ol>								
Other References	<ol> <li>Jang J.S. computin</li> <li>An Intro MIT Press, 2</li> <li>Genetic Learning, Da Goldberg,</li> <li>Practical Haupt, John</li> </ol>								



S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	<b>CO1:</b> Define the basic concepts of soft computing.	PO1,PO2,PO3,PO4,
		PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
2.	CO2: Explain applications & operations of Fuzzy Logic in	PO1,PO2,PO3,PO4,
	real life problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
3.	CO3: Apply different FIS models to solve optimization	PO1,PO2,PO3,PO4,
	problems.	PO5,PO6,PO7,PO8,
	1	PO9,PO10, PSO1,PSO2,PSO3
4.	CO4: Analyse and examine Evolutionary and swarm	PO1,PO2,PO3,PO4,
	algorithms in solving real world Multi-Objective optimization	PO5,PO6,PO7,PO8,
	problems	PO9,PO10, PSO1,PSO2,PSO3
5.	<b>CO5:</b> Choose of different optimization algorithms to solve	PO1,PO2,PO3,PO4,
	real-life multi objective problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
6.	CO6: Discuss applications of Soft Computing and solve	PO1,PO2,PO3,PO4,
	Problems in Varieties of Application Domains.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3

**PO and PSO mapping with level of strength for Course Name** SOFT COMPUTING (Course Code CSA-202)

Subject	<b>PO'</b> s /	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
	PSO's	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	150 \$	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
SOFT	CO1	3	3	1	1	1	1	1	1	2	1	1	3	1	3	1
COMPU TING	CO2	3	3	3	3	2	3	2	2	2	2	3	3	3	3	3
CSA301	CO3	3	3	3	3	3	3	1	2	2	2	3	3	3	3	3
	CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
	CO5	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
	CO6	3	3	3	3	3	1	3	2	3	2	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	РО 1	PO 2	PO 3	PO 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
CSA	SOFT	3.0	3.0	3.0	3.0	3.0	3.0	2.8	2.0	2.0	3.0	2.6	3.0	2.8	2.8	2.6
301	COMPUTING	0	0	0	0	0	0	3	0	0	0	7	0	3	3	7

#### **Strength of Correlation**

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Pro	gram:	Computer Science & Engineering								
Bra	nch:	CSE								
1	Course Code	CSA303								
2	Course Title	Pattern Recognition								
3	Credits	3								
	Contact									
4	Hours	3-0-0								
	(L-T-P)									
	Course	CODE								
	Status	CORE								
		Students will try to learn to introduce the ideas of exit	isting patterns							
		and implement them based on data analysis. Also, to co	onceptualize the							
~	Course	working of patterns explorations using computational a	algorithms. In							
5	Objective	addition to it, students will aim to become familiar with	h feature							
	-	knowledge that can be extracted from available examp	les and							
		generalize to form appropriate feature models.								
		On successful completion of this module students	will be able to:							
		CO 1. Define Pattern concept and random process	ideas, understand							
		mathematical background.								
		CO 2. Explain preliminary models to understand the solution								
	Course	environment.								
6	Outcomes	CO 3. Apply of existing mathematical solutions to test problems. Perform Subspace analysis for classification problems CO 4. Classify patterns using Bayesian Decision Theory								
	Outcomes									
		CO 5. Evaluate patterns using Parametric and	Non-Parametric							
		techniques.	1,011 1 010110 0110							
		CO 6. Discuss trajectory of recent trend in patter	n recognition &							
		understand various real world applications.								
		Pattern recognition theory and practice is concerned with	ith the design,							
		analysis, and development of methods for the classification	ation or							
7	Course	description of patterns, objects, signals, and processes.	At the heart of							
,	Description	this discipline is our ability infer the statistical behavio	r of data from							
		limited data sets, and to assign data to classes based on	generalized							
		notions of distances in a probabilistic space.								
8	Outline syllabu	15	CO Mapping							
	Unit 1	Introduction and mathematical preliminaries								
	Α	Introduction to Pattern recognition; Applications areas in medical, defense, E-commerce, The Design Cvcle.								
	В	Clustering vs. Classification; Learning and Adaptation, Relevant basics of Linear Algebra.	CO1, CO2							
	С	Vector spaces, Probability Theory, Estimation Theory.	CO1, CO2							
	Unit 2	Bayes Decision Theory								



	Data measage	aina Outliana	Completion Expectation mean	CO1 $CO2$				
А	and covariar	nce, classifiers	Correlation, Expectation, mean	CO1, CO2, CO4				
	Normal Dist	esian Classification. The	CO2 CO4					
В	Nearest- Ne	CO5						
С	Introduction and discrimi	Decision Theory, Normal density s for the normal density	CO2, CO4					
Unit 3	Clustering							
	Basics of Cl	ustering; simi	larity / dissimilarity measures;	CO1 CO2				
А	Criterion Fu	nctions for Cl	larity / dissimilarity measures; CO1, CO2, ustering. Different distance					
	functions an	d similarity m	leasures, ,	003				
л	Clustering T	echniques: K-	-means algorithm,	CO1, CO2,				
В	Agglomerati	ive hierarchica	al clustering	CO3				
	K-medoids.	DBSCAN, Cl	uster validation	CO1. CO2				
С	,	,		CO3				
	<b>F</b>	4		005				
Unit 4	Feature ex	traction and	Feature selection					
	Principal Co	mponent Ana	lysis (PCA), Kernel PCA,	CO2 CO3				
А	Singular Va	lue Decompos	sition, Fisher Linear	CO5				
	discriminant	analysis		005				
D	Algorithms	- Branch and b	oound algorithm, sequential	CO2, CO3,				
В	forward / ba	ckward select	ion algorithms, Maximum-	CO5				
	Likelinood e	estimation,	based oritorian functions					
С	interclass di	stance-based of	vriterion functions K-Nearest	CO2, CO3,				
C	Neighbor Es	stance-based c	Interiori functions, R-ivearest	CO5				
Unit 5	Recent Ad	vances in Pa	tterns Recognitions					
	Introduction	to advanced 1	pattern recognition schemes,	CO2, CO3,				
А	Resources an	nd tools used,	Gaussian mixture models	CO6				
	Support Vec	tor Machine	Neural Networks, Hidden					
В	Markov Mo	dels (HMM)	Neural Networks, muden	CO2, CO3,				
				006				
C	Basics to Bi	ometrics: Bioi	netric methodologies: finger	CO2, CO3,				
C	prints, nand	geometry, fac	ial recognition, iris scanning,	CO6				
Mode of		ing						
avamination	Theory							
Weightage	CA	МТЕ	ETE					
Weightage Distribustion			50%					
 Distribution	25%							
	1. R.O.	lassification, John						
Text book/s*	Wiley	1 1 .						
	2. Chris	topher M.	Bishop, "Pattern Recognition	on and Machine				
	Learn	ing", Springe	er publication, 2006	•,• 4.1 111				
	3. S.Th	eodoridis and	d K.Koutroumbas, Pattern Rec	ognition, 4th Ed.,				
Other		iemic Press,	2009.	1.04 4 1				
	4. Robe	cal, Structural						
References	and	Neural Appro	Dacnes", John Wiley & Sons, li	nc.1992.				
	5. K.Ja	in, K.Bolle, S	S.Pankanti, "Biometric: Person	al Identification				
	in ne	twork societ	y", Kluwer academic publisher	rs, 1999.				



		Program Outcomes (PO) &
S. No.	Course Outcome	Program Specific Outcomes
		(PSO)
1.	Define Pattern concept and random process ideas,	
	understand mathematical background.	
2	Explain preliminary models to understand the solution	
2.	environment.	
3	Apply of existing mathematical solutions to test problems.	
5.	and Perform Subspace analysis for classification problems	
4.	Classify patterns using Bayesian Decision Theory.	
5	Evaluate patterns using Parametric and Non-Parametric	
5.	techniques.	
6.	Discuss trajectory of recent trend in pattern recognition &	
	understand various biometric technologies.	

## PO and PSO mapping with level of strength for Course Name Pattern Recognition

		Program Outcomes (PO) &
S. No.	Course Outcome	Program Specific Outcomes
		(PSO)
	Define Pattern concept and random process ideas,	PO1,PO2,PO3,PO4,
1.	understand mathematical background	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
	Explain preliminary models to understand the solution	PO1,PO2,PO3,PO4,
2.	environment	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
	Apply of existing mathematical solutions to test problems.	PO1,PO2,PO3,PO4,
3.	and Perform Subspace analysis for classification problems	PO5,PO6,PO7,PO8,
	and remorn Subspace analysis for classification problems	PO9,PO10, PSO1,PSO2,PSO3
	Classify patterns using Bayesian Decision Theory.	PO1,PO2,PO3,PO4,
4.		PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
	Evaluate patterns using Parametric and Non-Parametric	PO1,PO2,PO3,PO4,
5.	techniques	PO5,PO6,PO7,PO8,
	teeninques.	PO9,PO10, PSO1,PSO2,PSO3
	Discuss trajectory of recent trend in pattern recognition &	PO1,PO2,PO3,PO4,
6.	understand various biometric technologies	PO5,PO6,PO7,PO8,
	understand various orometrie technologies.	PO9,PO10, PSO1,PSO2,PSO3



PO and PSO mapping with level of strength for	Course Name Pattern Recognition
CSA- 302	

Course Code_ Course Name	CO's	PO 1	PO 2	Р О З	Р О 4	P O 5	P O 6	P O 7	P O 8	Р О 9	PO 10	Р О 11	P O 12	PS O 1	P S O 2	P S O 3
	CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
Pattern	CO2	3	3	3	3	2	3	1	1	3	3	1	3	3	3	3
Recognition	CO3	3	3	3	3	2	2	2	1	2	3	1	3	3	3	3
CSA- 302	CO4	3	3	3	3	2	2	2	1	2	3	1	3	3	3	3
	CO5	3	3	3	3	2	3	1	1	2	3	1	3	3	3	3
	CO6	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3

#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	P 0 1	РО 2	P 0 3	P 0 4	P O 5	P 0 6	P O 7	P O 8	P O 9	P O 10	P 0 11	P O 12	PS O 1	PS 0 2	PS 0 3
CSA-	Pattern	3.0	3.0	3.0	3.0	2.1	2.3	1.5	1.1	2.1	3.0	0.0	3.0	3.0	3.0	2.6
302	Recognition	0	0	0	0	7	3	0	7	7	0	0	0	0	0	7

#### Total 36

## Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Pro	gram:	B. Tech									
Bra	nch:	Computer Science & Engineering									
1	Course Code	CAL302									
2	Course Title	Pattern Recognition Lab									
3	Credits	1									
	Contact										
4	Hours	0-0-2									
	(L-T-P)										
	Course	CORE									
	Status										
		Students will try to learn to introduce the ideas of exit	isting patterns								
		and implement them based on data analysis. Also, to co	onceptualize the								
5	Course	working of patterns explorations using computational a	algorithms. In								
5	Objective	addition to it, students will aim to become familiar with	h feature								
		knowledge that can be extracted from available examp	les and								
		generalize to form appropriate feature models.									
		On successful completion of this module students	will be able to:								
		CO 1. Define and Show naïve Bayesian Classifier for real world pro									
		CO 2. Classify patterns using Bayesian Decision Theory.									
6	Course	CO 3. Apply clustering techniques on read world problems CO 4. Classify Feature extraction and Feature selection techniques									
0	Outcomes	CO 5. Evaluate patterns using Parametric and Non-Parametric									
		techniques.	Non-1 arametric								
		CO 6. Discuss trajectory of recent trend in patter	n recognition &								
		understand various biometric technologies.	C								
7	Course	This course introduces neural computational paradigm	for critical &								
/	Description	implementable understanding of feature engineering.									
8	Outline syllabu	15	CO Mapping								
	Unit 1	Introduction and mathematical preliminaries									
		A suming a set of desurrents that used to be slassified									
		Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this									
	1	task. Built-in Java classes/API can be used to write the	CO1								
	1	program. Calculate the accuracy, precision, and recall for	COI								
		your data set									
		classifier for a sample training data set stored as a .CSV									
	2	file. Compute the accuracy of the classifier, considering									
		few test data sets									
	Unit 2	Baves Decision Theory									
		Write a program to construct a Bayesian network	CO1, CO2.								
	3	considering medical data. Use this model to demonstrate	CO4								



	the diagnosis of heart patient Disease Data Set from Repos	s using standard Heart sitory.	
	ľ	5	
Unit 3	Clustering		
4	Apply EM algorithm to clust .CSV file. Use the same data Means algorithm. Compare t algorithms and comment on can add Java/Python ML libr program	er a set of data stored in a set for clustering using k- he results of these two the quality of clustering. You rary classes/API in the	CO1, CO2, CO3
5	Write a program to construct considering medical data. Us the diagnosis of heart patient Disease Data Set from Repos	a Bayesian network be this model to demonstrate is using standard Heart sitory.	
Unit 4	Feature extraction and F		
5	Write a program to implement learn on Iris Data-set	nt PCA example using scikit-	CO2, CO3, CO5
7	Write a program to implement classification on Iris Data-set boundaries for each class.		
 Unit 5	<b>Recent Advances in Patte</b>		
8	Write a program to perform I non-linear SVC with RBF ke	binary classification using ernel.	CO2, CO3, CO6
8 9	Write a program to perform I non-linear SVC with RBF kee Write a program to implement standard dataset	binary classification using ernel. nt SVM for classification on	CO2, CO3, CO6
8 9 10	Write a program to perform I non-linear SVC with RBF ke Write a program to implement standard dataset Write a program to implement classification on standard data	binary classification using ernel. nt SVM for classification on nt Neural network for taset	CO2, CO3, CO6
 8 9 10 Mode of examination	Write a program to perform I non-linear SVC with RBF ke Write a program to implement standard dataset Write a program to implement classification on standard dat Theory	binary classification using ernel. nt SVM for classification on nt Neural network for taset	CO2, CO3, CO6
8 9 10 Mode of examination Weightage	Write a program to perform I non-linear SVC with RBF keeWrite a program to implement standard datasetWrite a program to implement classification on standard dataTheoryCAMTE	binary classification using ernel. nt SVM for classification on nt Neural network for taset ETE	CO2, CO3, CO6
8 9 10 Mode of examination Weightage Distribution	Write a program to perform I non-linear SVC with RBF keWrite a program to implement standard datasetWrite a program to implement classification on standard dataTheoryCAMTE25%25%	binary classification using ernel. nt SVM for classification on nt Neural network for taset ETE 50%	CO2, CO3, CO6
8 9 10 Mode of examination Weightage Distribution Text book/s*	Write a program to perform I non-linear SVC with RBF ker         Write a program to implement standard dataset         Write a program to implement classification on standard data         Theory         CA       MTE         25%       25%         3. R. O. Duda, P. E. Hat Wiley, 2001.         4. Christopher M. Bit Learning", Springer	binary classification using ernel. nt SVM for classification on nt Neural network for taset ETE 50% rt and D. G. Stork, Pattern C shop, "Pattern Recognitic publication, 2006	CO2, CO3, CO6
<ul> <li>8</li> <li>9</li> <li>10</li> <li>Mode of examination</li> <li>Weightage Distribution</li> <li>Text book/s*</li> <li>Other References</li> <li>Web Link</li> </ul>	Write a program to perform I non-linear SVC with RBF kee         Write a program to implement standard dataset         Write a program to implement classification on standard data         Theory         CA       MTE         25%       25%         3. R. O. Duda, P. E. Hat Wiley, 2001.         4. Christopher M. Bit Learning", Springer         6. S.Theodoridis and F Academic Press, 20         7. Robert Schalkoff, "I and Neural Approad         8. K.Jain, R.Bolle, S.P in network society".         https://scikit_learn.org	binary classification using ernel. nt SVM for classification on nt Neural network for taset ETE 50% rt and D. G. Stork, Pattern C shop, "Pattern Recognition publication, 2006 X.Koutroumbas, Pattern Rec 09. Pattern Recognition: Statistiches", John Wiley & Sons, In Pankanti, "Biometric: Person , Kluwer academic publisher (stable/auto, examples/	CO2, CO3, CO6 lassification, John on and Machine ognition, 4th Ed., cal, Structural nc.1992. al Identification rs, 1999.



		Program Outcomes (PO) &
S. No.	Course Outcome	Program Specific Outcomes
		(PSO)
	Define and Show naïve Bayesian Classifier for real world	PO1,PO2,PO3,PO4,
1.	pro	PO5,PO6,PO7,PO8,
	p	PO9,PO10, PSO1,PSO2,PSO3
	Classify patterns using Bayesian Decision Theory.	PO1,PO2,PO3,PO4,
2.		PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
	Apply clustering techniques on read world problems	PO1,PO2,PO3,PO4,
3.		PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
	Classify Feature extraction and Feature selection	PO1,PO2,PO3,PO4,
4.	techniques	PO5,PO6,PO7,PO8,
	teeninques.	PO9,PO10, PSO1,PSO2,PSO3
	Evaluate patterns using Parametric and Non-Parametric	PO1,PO2,PO3,PO4,
5.	tachniquag	PO5,PO6,PO7,PO8,
	techniques.	PO9,PO10, PSO1,PSO2,PSO3
	Discuss trajectory of recent trend in pattern recognition &	PO1,PO2,PO3,PO4,
6.	understand various biometric technologies	PO5,PO6,PO7,PO8,
	understand various biometric technologies.	PO9,PO10, PSO1,PSO2,PSO3

PO and PSO mapping with level of strength for Course Name Pattern Recognition CAL- 302

Course Code_ Course Name	CO's	PO 1	PO 2	Р О З	Р О 4	Р О 5	P O 6	P O 7	P O 8	Р О 9	PO 10	Р О 11	P O 12	PS O 1	P S O 2	P S O 3
	CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
Pattern	CO2	3	3	3	3	2	3	1	1	3	3	1	3	3	3	3
Recognition	CO3	3	3	3	3	2	2	2	1	2	3	1	3	3	3	3
CAL- 302	CO4	3	3	3	3	2	2	2	1	2	3	1	3	3	3	3
	CO5	3	3	3	3	2	3	1	1	2	3	1	3	3	3	3
	CO6	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	P 0 1	PO 2	P 0 3	P 0 4	P O 5	P 0 6	P 0 7	P O 8	P O 9	P O 10	P 0 11	P O 12	PS O 1	PS O 2	PS 0 3
CAL-	Pattern	3.0	3.0	3.0	3.0	2.1	2.3	1.5	1.1	2.1	3.0	0.0	3.0	3.0	3.0	2.6
302	Recognition	0	0	0	0	7	3	0	7	7	0	0	0	0	0	7

Total 36

## **Strength of Correlation**

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Scho	ool: SET	Batch: 2023-27							
Prog	gram: B-TECH	Current Academic Year: 2023-24							
Bra	nch: CSE	Semester:							
1	Course Code	CSA303							
2	Course Title	Deep Leaning and its Applications							
3	Credits	3							
4	Contact Hours (L-T-P)	3-0-0							
	Course Status	CORE							
5	Course Objective	This course aims to present the mathematical computational challenges of building stable re- high-dimensional data, such as images, text a delve into selected topics of Deep Learning, of models from both supervised and unsupervised emphasis will be on convolutional architect learning, unsupervised learning and non-convex	I, statistical and presentations for nd data. We will discussing recent learning. Special tures, invariance coptimization.To						
		a large series of data using computer based deep le							
6	Course Outcomes (CO's)	<ul> <li>On successful completion of this module studen to:</li> <li>1. Recall Neural Networks relate it with Deep Lea to solve real life applications</li> <li>2. Compare and classify Regularization approache Learning.</li> <li>3. Build Convolutional Neural Networks models f analysis and its applicability in societal problem so</li> <li>4. Examine the Sequence models and analyse the among them.</li> <li>5. Assess the different Deep learning models base processes.</li> <li>6. Predict the behaviour of Deep learning models at to solve real life applications.</li> </ul>	Its will be able rning concepts es for Deep for image olving. relationships d on their design and apply them						
7	<b>Course Description</b>	This course starts with introduction to Deep Lear	ning and further						
		build, train, and deploy real world applications recognition and Computer Vision, image and video analytics, Natural Language Processing, recommen other types of classifiers.	such as object processing, text der systems, and						
8	Syllabus Outline	1	CO Mapping						
	Unit 1	Deep Feed forward Networks							
	A	Recall Neural networks, Deep learning and its Practical aspects for real life applications ,Introduction to Simple Deep Neural Networks, Platform for Deep Learning, Deep Learning Software Libraries	CO1, CO6						



	В	Introduction to Deep Feed Forward Networks	
		,Learning XOR, Gradient-Based Learning, Activation	CO1
		Functions, ReLU, Softmax, Sigmoid, Error Functions	
	C	Architecture Design- Hidden Units Back-Propagation	CO1
	II::4 0	and Other Differentiation Algorithms	
	Unit 2	Regularization for Deep Learning	
	A	Parameter Norm Penalties, Norm Penalties as	
		Constrained Optimization, Regularization and Under-	
		Constrained Problems, Dataset Augmentation, Noise	
		Robustness, Semi-Supervised Learning, Multitask	CO2
		Learning, Early Stopping, Parameter Tying and	
		Parameter Sharing, Bagging, Drop Out, Difficulty of	
		training deep neural networks, Greedy layer wise	
		training, Adversarial Training	
	В	How Learning Differs from Pure Optimization,	
		Challenges in Neural Network Optimization,	
		Basic Algorithms: Stochastic Gradient Descent,	CO2
		Nomentum, Nesterov Momentum	02
		Algorithma with Adaptiva Learning Datas AdaCrad	
		Algorithms with Adaptive Learning Rates, AdaOrad.	
	C	Introduction to Autoencoder Undercomplete	
	C	Autoencoder Begularized Autoencoders	
		Representational Power Layer Size and Depth	CO2
		Stochastic Encoders and Decoders Applications of	002
		Fncoder Decoder models	
-			
	Unit 3	Convolutional Neural Networks	
	Unit 3	Convolutional Neural Networks	
	Unit 3	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in	
	Unit 3	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation,	CO1, CO3,
	Unit 3	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for	CO1, CO3, CO6
	Unit 3	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks	CO1, CO3, CO6
	Unit 3 A B	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling	CO1, CO3, CO6
	Unit 3 A B	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic	CO1, CO3, CO6
	Unit 3 A B	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types	CO1, CO3, CO6 CO1, CO3
	Unit 3 A B	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel	CO1, CO3, CO6 CO1, CO3
	Unit 3 A B C	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or	CO1, CO3, CO6 CO1, CO3 CO1, CO3,
	Unit 3 A B C	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization,	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6
	Unit 3 A B C	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNet	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6
	Unit 3 A B C Unit 4	Convolutional Neural NetworksWhy CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional NetworksPrior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channelEfficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNetSequence Modeling: Recurrent Neural	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6
	Unit 3 A B C Unit 4	Convolutional Neural NetworksWhy CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional NetworksPrior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channelEfficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNetSequence Modeling: Recurrent Neural Networks	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6
	Unit 3 A B C Unit 4 A	Convolutional Neural NetworksWhy CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional NetworksPrior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channelEfficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNetSequence Modeling: Recurrent Neural NetworksSequence Learning Problems , Recurrent Neural	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6
	Unit 3           A           B           C           Unit 4           A	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNet Sequence Modeling: Recurrent Neural Networks Sequence Learning Problems , Recurrent Neural Network and its significance in real world, RNN	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6 CO4, CO6
	Unit 3           A           B           C           Unit 4           A	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNet Sequence Modeling: Recurrent Neural Networks Sequence Learning Problems , Recurrent Neural Network and its significance in real world, RNN model, Backpropagation through time ,Bidirectional	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6 CO4, CO6
	Unit 3           A           B           C           Unit 4           A	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNet Sequence Modeling: Recurrent Neural Networks Sequence Learning Problems , Recurrent Neural Network and its significance in real world, RNN model, Backpropagation through time ,Bidirectional RNNs	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6 CO4, CO6
	Unit 3           A           B           C           Unit 4           A           B	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNet Sequence Modeling: Recurrent Neural Networks Sequence Learning Problems , Recurrent Neural Network and its significance in real world, RNN model, Backpropagation through time ,Bidirectional RNNs Different types of RNNs, Gated Recurrent Unit (GRU)	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6 CO4, CO6
	Unit 3           A           B           C           Unit 4           A           B	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNet Sequence Modeling: Recurrent Neural Networks Sequence Learning Problems , Recurrent Neural Network and its significance in real world, RNN model, Backpropagation through time ,Bidirectional RNNs Different types of RNNs, Gated Recurrent Unit (GRU) Recursive Neural Networks , The Challenge of Long-	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6 CO4, CO6 CO4
	Unit 3 A B C Unit 4 A B C	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNet Sequence Modeling: Recurrent Neural Networks Sequence Learning Problems , Recurrent Neural Network and its significance in real world, RNN model, Backpropagation through time ,Bidirectional RNNs Different types of RNNs, Gated Recurrent Unit (GRU) Recursive Neural Networks , The Challenge of Long- Term Dependencies	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6 CO4, CO6 CO4
	Unit 3           A           B           C           Unit 4           A           B           C	Convolutional Neural Networks         Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks         Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel         Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNet         Sequence Modeling: Recurrent Neural Networks         Sequence Learning Problems , Recurrent Neural Network and its significance in real world, RNN model, Backpropagation through time ,Bidirectional RNNs         Different types of RNNs, Gated Recurrent Unit (GRU) Recursive Neural Networks , The Challenge of Long-Term Dependencies         Introduction of Long Short Term Memory Neural	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6 CO4, CO6 CO4
	Unit 3           A           B           C           Unit 4           A           B           C	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNet Sequence Modeling: Recurrent Neural Networks Sequence Learning Problems , Recurrent Neural Network and its significance in real world, RNN model, Backpropagation through time ,Bidirectional RNNs Different types of RNNs, Gated Recurrent Unit (GRU) Recursive Neural Networks , The Challenge of Long- Term Dependencies Introduction of Long Short Term Memory Neural Networks, Learning Algorithm of LSTM/ RNN Pidmetice LSTM	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6 CO4, CO6 CO4 CO4
	Unit 3 A B C Unit 4 A C Unit 4 C Unit 4 Unit 5	Convolutional Neural Networks Why CNN?, Its role, significance and applicability in societal problem solving , The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel Efficient Convolution Algorithms, Random or Unsupervised Features of CNN , Normalization, Applications of CNN in Computer Vision – ImageNet Sequence Modeling: Recurrent Neural Networks Sequence Learning Problems , Recurrent Neural Network and its significance in real world, RNN model, Backpropagation through time ,Bidirectional RNNs Different types of RNNs, Gated Recurrent Unit (GRU) Recursive Neural Networks , The Challenge of Long- Term Dependencies Introduction of Long Short Term Memory Neural Networks, Learning Algorithm of LSTM/ RNN Bidirectional LSTMs	CO1, CO3, CO6 CO1, CO3 CO1, CO3, CO6 CO4, CO6 CO4 CO4



-						
	А	Introdu	iction to Gei	nerative Ad	versarial Networks,	CO5,CO6
		Genera	tive Adversar	ial Network	s – Architecture,	,
	В	DCGA	N, GAN ha	ck, Applica	ations of Generative	CO5 CO6
		Advers	arial Network	KS		005,000
	С	Practic	al design pro	cess for dee	p learning techniques	
		based of	on real world	problems:		
		Perform	nance Metrie	cs , Defau	lt Baseline Models,	CO5,CO6
		Determ	ining Whethe	More Data, Selecting		
		Hyperp	barameters, De	rategies		
	Mode of	Theory				
	examination					
	Weightage	CA		MTE	ETE	
	Distribution	25%		25%	50%	
	Text Books	1.	Deep Learni	ng, by Goodf	ellow I., Bengio Y. & Co	ourville A. (2016)
		2.	Visualizing a	nd Understa	nding Convolutional Ne	tworks, by Matt
			Zeiler, Rob F	Fergus		
		3.	<b>TensorFlow:</b>	a system for	· large-scale machine lea	rning, by Martín
			A., Paul B., J	lianmin C., Z	Chifeng C., Andy D. et al	. (2019)
	<b>Reference Books</b>	1.	Deep learni	ng in neura	al networks, by Juerge	nSchmidhuber
		2	(2013) https://cs230.	stanford adu/	evllabue/	
		2.	https://cs250.	stamoru.cuu/s	synabus/	· · · h · · · · · 1 · · · · · · ·
		5.	nups://toward	com/september-edition-m	lachine-learning-	
			case-studies-a	158010094125		1.0.4
		4.	Deep Learni	ng: A Practit	ioner's Approach by Jo	sh Patterson,
			Oremy.			
1						

S. No.	Course Outcome (CO)	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1	Recall Neural Networks relate it with Deep Learning concepts to solve real life applications	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2	Compare and classify Regularization approaches for Deep Learning.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3	Build Convolutional Neural Networks models for image analysis and its applicability in societal problem solving.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4	Examine the Sequence models and analyse the relationships among them.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5	Assess the different Deep learning models based on their design processes.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6	Predict the behaviour of Deep learning models and apply them to solve real life applications.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3

# PO and PSO mapping with level of strength for Course Name: Introduction to Deep Leaning

(Course Code- CSA302)



Course Code_ Course Name	CO's	PO 1	PO 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	Р О 11	P O 12	PS O 1	P S O 2	P S O 3
Deep Leaning	CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
and its	CO2	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
Applications	CO3	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
(Course Code	CO4	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
(Course Code- CSA 303)	CO5	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
	CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3

## Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	P 0 1	Р О2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	Р О 9	P O 10	P O 11	P O 12	P S O 1	P S O 2	P S O 3
CSA	Deep Leaning and its	3.	3.	3.	3.	2.	2.	2.	1.	2.	3.	2.	3.	3.	3.	2.
303	Applications	00	00	00	00	83	33	33	17	33	00	67	00	00	00	67

#### **Total 40.3**

## Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sc	hool: SET	Batch : 2023-27							
Pr	ogram: B-TECH	Current Academic Year: 2023-24							
Br	anch: CSE	Semester:							
1	Course Code	CAL303							
2	Course Title	Deep Leaning and its Applications Lab							
3	Credits	1							
4	Contact Hours (L-T-P)	0-0-2							
	Course Status	CORE							
5	Course Objective	This course aims to present the mathematical, statis	tical and						
		dimensional data, such as images, text and data. We will delve into							
		dimensional data, such as images, text and data. we will	dimensional data, such as images, text and data. We will delve into						
		selected topics of Deep Learning, discussing recent models	from both						
		supervised and unsupervised learning. Special emphasis w	vill be on						
		convolutional architectures, invariance learning, unsupervise	d learning						
		and non-convex optimization. To understand and demonstra	te how to						
		solve general learning from a large series of data using comm	uter based						
		doon looming algorithms	uter bused						
(	0-4		11 /						
6	(CO's)	On successful completion of this module students will be a	ible to:						
	(003)	1. Define and show the implementation of Deep Learning co	ncepts to						
		solve real life applications							
		2. Compare and classify Regularization approaches for Deep	Learning.						
		3. Build Convolutional Neural Networks models for image a	nalysis						
		and its applicability in societal problem solving.							
		4. Examine the Sequence models and analyses the relationships among them.							
		5 Assess the different Deep learning models based on their design							
		5. Assess the different Deep learning models based on their design							
		processes. 6 Predict the behavior of Deep learning models and apply them to							
		solve real life applications							
7	Course Descriptio	This course starts with introduction to Deen Learning and fur	ther build						
'	e ourse 2 esemptio	train and deploy real world applications such as object reco	nition and						
		Computer Vision image and video processing text analytic	s Natural						
		Language Processing recommender systems and other	types of						
		classifiers	types of						
8	Outline syllabus	5	СО						
	2		Mapping						
	Unit 1	Deep Feed Forward Networks							
	1	Write a program to implement Deep Feed Forward Network to	CO1						
	1	predict Housing price available on Kaggle.							
		Write a program to implement classification using Deep Feed	CO1						
	2	Forward Network on dataset available on Kaggle.							
	Unit 2	Regularization for Deep Learning							



3	Write a program to	Trite a program to implement regularization to overcome over tting problem in Housing price Prediction									
5	fitting problem in	Housing price Predi	iction								
Unit 3	C	onvolutional Neura	al Networks								
	Digit Recognition	from MNIST : Giv	ven a zip codes hand written	CO1							
	on envelops, ident	ify the digit for each	h hand written character. A								
4	model of this prob	lem would allow a o	computer program to read	CO3, ,							
	and understand ha	ndwritten zip codes	and sort envelops by	CO6							
	geographic region										
	Dog-Breed Classif	tier: Design and trai	n a convolutional neural								
5	hetwork to analyze	e images of dogs and	a correctly identify their	CO1,							
5	improve this mode	this is availant	-Known architectures to	CO3							
	advanced applicati	ions	preparation for more								
 Unit A	Sequence N	Modelling: Recurre	ont Noural Networks								
Unit 4	Stock market pre										
	and past price mov	CO4.									
6	stock should be be	CO6									
	problem could pro	problem could provide decision support to financial analysts.									
	The Slot-Filling (S	Spoken Language U	nderstanding) consists in								
7	assigning a label to	o each word given a	sentence. It's a	CO4							
	classification task.										
0	Write a program to	CO4									
8	prediction	004									
Unit 5	Dee	ep Networks and d	esign process								
	Implement Convo	lutional Autoencode	ers in Python with Keras on	CO5 CO							
9	MNIST dataset			6							
				0							
10	Write a program to	o implement Genera	tive Adversarial Network	CO5,CO							
				6							
Mode of	Practical										
examination											
Weightage	CA	MTE	ETE								
Distribution	25%	25%	50%								
Text book/s*	1. Lipschutz, "Dat	a Structures" Schau	m's Outline Series, TMH								
Other	1. Aaron M. Tener	nbaum, Yedidyah L	angsam and Moshe J.								
References	Augenstein "Data	Structures Using C	and C++", PHI								
	2. Horowitz and S	ahani, "Fundamenta	als of Data Structures",								
	Galgotia Publicati	Galgotia Publication									
	3. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to										
	Data Structures with applications", McGraw Hill A. P. Kruse et al. "Data Structures and Program Design in C"										
	4. N. Muse etal, Data Structures and Program Design in C <sup>*</sup> , Pearson Education										
	5 G A V Pai "Data Structures and Algorithms" TMH										
Weblink	https://towardsdatascience.com/getting-rich-quick-with-										
,, connx	machine-learning	-and-stock-marke	t-predictions-								
	<u>69680</u> 2da94fe										



https://www.datacamp.com/community/tutorials/autoencoder	
-keras-tutorial	
http://deeplearning.net/tutorial/rnnslu.html	

S. No.	Course Outcome (CO)	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1	Define and show the implementation of Deep Learning concepts to solve real life applications	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2	Compare and classify Regularization approaches for Deep Learning.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3	Build Convolutional Neural Networks models for image analysis and its applicability in societal problem solving.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4	Examine the Sequence models and analyse the relationships among them.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5	Assess the different Deep learning models based on their design processes.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6	Predict the behaviour of Deep learning models and apply them to solve real life applications.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3

PO and PSO mapping with level of strength for Course Name: Introduction to Deep Leaning

				(00					<i></i> ,							
Course Code_ Course Name	CO's	PO 1	PO 2	Р О З	Р О 4	Р О 5	P O 6	Р О 7	Р О 8	Р О 9	PO 10	Р О 11	P O 12	PS O 1	P S O 2	P S O 3
Deep Leaning	CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
and its	CO2	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
Applications	CO3	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
Lab	CO4	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
(Course Code-	CO5	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CAL303)																
	CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3

## (Course Code- CAL303)

## Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	Р О 1	P O 2	Р О 3	P O 4	P O 5	P O 6	P O 7	P O 8	Р О 9	P O 10	P O 11	P O 12	P S O 1	P S O 2	P S O 3
CAL	Deep Leaning and its	3.	3.	3.	3.	2.	2.	2.	1.	2.	3.	2.	3.	3.	3.	2.
303	Applications Lab	00	00	00	00	83	33	33	17	33	00	67	00	00	00	67

## Total 40.3

Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sch	ool: SET	Batch: 2023-27	1	
Pro	gram: B-TECH	Current Acade	emic Year: 2023-24	
Bra	nnch: CSE	Semester: VII		
1	Course Code	CSA402	Course Name: Applications of A	AIML in
			healthcare/ ICT/ Computer Netw	orks
2	Course Title	Applications of	AIML in healthcare/ ICT/ Compu	ter Networks
3	Credits	1		
4	Contact Hours	1-0-0		
	(L-T-P)			
	Course Status	Program Electiv	ve 5	
5	Course Objective	Students will the	ry to apply:	
		1. Fundamen	tal principles of AI & ML.	
		2. To find the	e solutions of real life problems an	d design its
		solutions	ant the designed solution	
6	Course	Students will b	e able to:	
0	Outcomes	1 Demons	trate a good understanding of	key concepts and
	Outcomes	terminology in	healthcare/ICT and Computer Net	work
		2. Illustrate	e and describe major characteris	stics and potential
		applications of	various AI-based platforms, tools	and techniques
		3. Examine	e and analyse major issues faced i	n implementing AI
		applications in	healthcare/ICT and Computer Net	work
		4. Discuss	current AI trends and predict	future trends in
		5. Analyse	key data challenges in healthcard	e and develop data
		science proposa	als with clear objectives towards	overcoming these
		challenges	-	_
		6. Design	n AI frameworks and leverage of	on existing Python
		toolboxes and	techniques for solving data sci	ence problems in
7	Course	This course pro	vides students with a working kno	wledge of methods
/	Description	for design and a	analysis of AL& ML based applice	tions in the field of
	Description	healthcare/ICT	and Computer Network	uolis ili ule field of
8	Outline syllabus	neartificare/ IC I	and Computer Network.	CO Manning
0	Outline synabus	Constan	a Draigat Cuidaling	CO Mapping
	The Constant Dus:	<u>Capsion</u>	<u>le Project Guidennes</u>	in high level mode
	focusing on an are	a of specialization	population profession Capstone	in high-level work
	be inquiry and practice	ctice-oriented an	d will draw upon areas of interest	to the student All
	Capstones aim to	bridge theory an	d practice and are aimed to have	e an impact on the
	professional life o	f students wheth	er they work in classrooms, stud	lios or community
	spaces.		-	•
	Students will iden	tify the topics for	or their Capstone Project during	their course work.
	Capstone projects	often take their	inspiration from projects, paper	s, and experiences
	related to course w	ork in the degree	program. However, to ascertain st	udents' abilities for

independent work and their capacity for self-directed inquiry, capstone projects must



demonstrate in what ways individual graduate students have researched, developed, and extended, or applied the ideas and strategies under investigation.

Capstone Projects encourage the application of knowledge gained on teaching and learning throughout the Bachelor of Technology program. Additionally, the Capstone Project should demonstrate the depth and extent of knowledge of students. Capstone projects may take a variety of formats (e.g., video, web, traditional text, media) of scholarly work. These may be, but are not limited to, the investigation of practices and educational ideas, the development of curricular materials, or teaching approaches.

A successful Capstone Project shall:

1) Illuminate and bring new insight to an area of the technology;

2) Demonstrate a depth and breadth of knowledge and the application of this knowledge to scholarship and/or practice;

3) Present a clearly articulated investigative framework, while situating projects within established academic practices and/or ideas;

4) Offer inquiry-based argumentation for educational/curricular change and adaptation where conceptual propositions are tied to in-the-world realities.

## **General Guidelines**

In consultation with faculty, students will select a topic and submit a proposal to the Department of Computer Science & Engineering. Upon acceptance, students may proceed with their Capstone Project. Proposals must be submitted to the department no later than two weeks into the semester in which the capstone is to be completed. To gain proposal approval, students will submit a 5-page outline of their projects as delineated below. All capstone projects require a substantive final and polished format and will be archived by the Department of Computer Science & Engineering upon completion.

## Proposals

A Capstone Project Proposal should contain the following:

1) Introduction – Explains the interest in the topic and situates the project in a scholarly and/or practical context.

2) Goals and Process – Describes the goals and purpose of the project. The section will detail the activities that will take place during the project, including who will be involved, and the role the student will play.

3) Final Product and Timeframe – Outlines the timeline for the project. This section will also detail the final format of the project and how it will be presented.

## **Format of Capstone Projects**

A Capstone Project should encompass the following minimum parameters:

 $\cdot$  A capstone project may take several forms and often yields the production of materials for teaching, learning, research, or for a variety of applications within the field.

· Each capstone project must show:

(a) depth and breadth of scholarly understanding, and

(b) the application of this understanding to practice.

• A condition of the capstone project is that students demonstrate the ability to gather materials, review current literature, and to examine sufficient background material to inform the development of original work.

• To this end, the capstone projects should be though in two parts:

1) A narrative-focused segment that describes and reflects upon the process, as well as

- a literature review sufficient to provide a scholarly contextualization of the project.
- a) Length will vary but a good expectation for this section would be 20 to 25



Pages including references									
2) A practic	tice-oriented segment where original and collected materials will be								
collected.									
a) Multim	edia and web-based	formats are	e highly encouraged	in this segment					
of the c	apstone.								
b) Materia	ls should be 'sharab	le' and ain	ned at impacting an a	rea of work					
within t	echnology domain.								
Mode of	Theory								
examination									
Weightage	СА	MTE	ETE						
Distribution	25%	25%	50%						
References	1. https://www	v.coursera.	org/learn/ai-deep-lea	arning-capstone					

S. No.	Course Outcome	Program Outcomes (PO) & Program
		Specific Outcomes (PSO)
1.	Demonstrate a good understanding of key concepts and terminology in healthcare/ICT and Computer Network	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	Illustrate and describe major characteristics and potential applications of various AI-based platforms, tools and techniques	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	Examine and analyse major issues faced in implementing AI applications in healthcare/ICT and Computer Network	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	Discuss current AI trends and predict future trends in healthcare	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	Analyse key data challenges in healthcare and develop data science proposals with clear objectives towards overcoming these challenges	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	Design AI frameworks and leverage on existing Python toolboxes and techniques for solving data science problems in healthcare	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3



# PO and PSO mapping with level of strength for Course Name Applications of AIML in healthcare/ ICT/ Computer Networks (Course Code CSA402)

Course	PO	РО	РО	РО	РО	PO	РО	РО	РО	PO1	PO1	PO1	PSO	PSO	PSO
Objectives	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	3	3	3	3	3	1	2	3	1	3	1	3	3	3	1
CO2	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	2	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	2	2	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO6	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 0 1	PS O 2	PS O 3
CSA40 2	Applications of AIML in healthcare/ ICT/ Computer Networks	3.00	3. 00	3. 00	3. 00	3. 00	1. 83	2. 00	3. 00	2. 33	3. 00	0. 00	3. 00	3. 00	3. 00	2. 67

## Total- 33.83 Strength of Correlation

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Program: B-TECH       Current Academic Year: 2023-24         Branch: CSE       Semester: VII         1       Course Code       CAL402       Course Name: Applications of AIML in healthcare/ ICT/ Computer Networks Lab         2       Course Title       Applications of AIML in healthcare/ ICT/ Computer Networks Lab
Branch: CSE         Semester: VII           1         Course Code         CAL402         Course Name: Applications of AIML in healthcare/ ICT/ Computer Networks Lab           2         Course Title         Applications of AIML in healthcare/ ICT/ Computer Networks Lab
1       Course Code       CAL402       Course Name: Applications of AIML in healthcare/ ICT/ Computer Networks Lab         2       Course Title       Applications of AIML in healthcare/ ICT/ Computer Networks Lab
2         Course Title         Applications of AIML in healthcare/ ICT/ Computer Networks Lab
2 Course Title Applications of AIML in healthcare/ ICT/ Computer Networks Lab
3 Credits 3
4 Contact Hours 0-0-3
(L-T-P)
Course Status Program Elective 5
5 Course Objective Students will try to apply:
4. Fundamental principles of AI & ML.
5. To find the solutions of real life problems and design its
solutions
6 Course Students will be able to:
Outcomes 1 Demonstrate a good understanding of key concepts an
terminology in healthcare/ICT and Computer Network
2. Illustrate and describe major characteristics and potentia
applications of various AI-based platforms, tools and techniques
3. Examine and analyse major issues faced in implementing A
applications in healthcare/ICT and Computer Network
4. Discuss current AI trends and predict future trends in healthcare
5. Analyse key data challenges in healthcare and develop dat
science proposals with clear objectives towards overcoming thes
challenges
6. Design AI frameworks and leverage on existing Pytho
healthcare
7 Course This course provides students with a working knowledge of method
Description for design and analysis of AI& ML based applications in the field of
healthcare/ICT and Computer Network.
8 Outline syllabus CO Mapping
Capstone Project Guidelines
The Capstone Project provides an opportunity for students to engage in high-level wor
focusing on an area of specialization within the profession. Capstone projects (CP) will
be inquiry and practice-oriented, and will draw upon areas of interest to the student. A
Capstones aim to bridge theory and practice and are aimed to have an impact on th
professional life of students whether they work in classrooms, studios or communit
spaces.
Sudenits will identify the topics for their Capstone Project during their course work
related to course work in the degree program However to ascertain students' abilities for

independent work and their capacity for self-directed inquiry, capstone projects must


demonstrate in what ways individual graduate students have researched, developed, and extended, or applied the ideas and strategies under investigation.

Capstone Projects encourage the application of knowledge gained on teaching and learning throughout the Bachelor of Technology program. Additionally, the Capstone Project should demonstrate the depth and extent of knowledge of students. Capstone projects may take a variety of formats (e.g., video, web, traditional text, media) of scholarly work. These may be, but are not limited to, the investigation of practices and educational ideas, the development of curricular materials, or teaching approaches.

A successful Capstone Project shall:

1) Illuminate and bring new insight to an area of the technology;

2) Demonstrate a depth and breadth of knowledge and the application of this knowledge to scholarship and/or practice;

3) Present a clearly articulated investigative framework, while situating projects within established academic practices and/or ideas;

4) Offer inquiry-based argumentation for educational/curricular change and adaptation where conceptual propositions are tied to in-the-world realities.

## **General Guidelines**

In consultation with faculty, students will select a topic and submit a proposal to the Department of Computer Science & Engineering. Upon acceptance, students may proceed with their Capstone Project. Proposals must be submitted to the department no later than two weeks into the semester in which the capstone is to be completed. To gain proposal approval, students will submit a 5-page outline of their projects as delineated below. All capstone projects require a substantive final and polished format and will be archived by the Department of Computer Science & Engineering upon completion.

## **Proposals**

A Capstone Project Proposal should contain the following:

1) Introduction – Explains the interest in the topic and situates the project in a scholarly and/or practical context.

2) Goals and Process – Describes the goals and purpose of the project. The section will detail the activities that will take place during the project, including who will be involved, and the role the student will play.

3) Final Product and Timeframe – Outlines the timeline for the project. This section will also detail the final format of the project and how it will be presented.

## **Format of Capstone Projects**

A Capstone Project should encompass the following minimum parameters:

 $\cdot$  A capstone project may take several forms and often yields the production of materials for teaching, learning, research, or for a variety of applications within the field.

 $\cdot$  Each capstone project must show:

(a) depth and breadth of scholarly understanding, and

(b) the application of this understanding to practice.

 $\cdot$  A condition of the capstone project is that students demonstrate the ability to gather materials, review current literature, and to examine sufficient background material to inform the development of original work.

• To this end, the capstone projects should be though in two parts:

1) A narrative-focused segment that describes and reflects upon the process, as well as

a literature review sufficient to provide a scholarly contextualization of the project.

- b) Length will vary but a good expectation for this section would be 20 to
  - 25



		Pages including refe	erences		
	2) A prac	tice-oriented segment	where orig	inal and collected n	naterials will be
	collected.	_	-		
	c)	Multimedia and we	eb-based for	ormats are highly	encouraged in this
		segment			
		of the capstone.			
	d)	Materials should be	'sharable'	and aimed at impac	ting an area of work
		within technology d	omain.		
		SAMPLE MACHI	NE LEAR	NING PROBLEM	<u>S</u>
	I. HEALTI	HCARE DOMAIN:			
	(1). Wine	Quality Test			
	(ii). Perso	onality Prediction			
	(iii) Senti	ment Analysis			
	(iv) Speed	ch Emotion Recognition	on		
	(v) Parkir	nson Disease Identifica	ation		
	(vi) Breas	st Cancer Identification	n		
	(vii) Age	and gender prediction			
	2. NETWO	<b>RKING DOMAIN</b>			
	(i). Fake l	News Detection			
	(ii). Credi	t Card Fraud Detectio	n		
	(iii) Custo	omer Segmentation			
	(iv) Catch	ning Illegal Fishing			
	(11) Caro				
	3. ICT DO	MAIN			
	(i) Ir	is Flowers Classificati	on		
	(ii) Lo	oan Prediction using N	Aachine Le	arning	
	(iii) H	ousing Prices Prediction	on		
	(iv) D	igit Classification			
	$(\mathbf{v})$ St	ock Price Prediction			
	(V1) B:	itcoin Price Predictor	mandation	using Collaborative	Filtonina
	(VII) U	Infine Grocery Recommendation	n System	using Conadorative	rmenng
Mod	le of	Theory	n System		
exa	nination	j			
Wei	ohtage	CA	MTE	ETE	
Diet	ribution	25%	25%	50%	
Dist	rences	2.3 /0	2370		
Kelo		2. https://www	w.coursera.	org/learn/al-deep-le	earning-capstone

S. No.	Course Outcome	Program Outcomes (PO) & Program
		Specific Outcomes (PSO)
1.	Demonstrate a good understanding of key concepts and terminology in healthcare/ICT and Computer Network	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8,



		PO9,PO10, PSO1,PSO2,PSO3
2.	Illustrate and describe major characteristics and potential applications of various AI-based platforms, tools and techniques	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	Examine and analyse major issues faced in implementing AI applications in healthcare/ICT and Computer Network	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	Discuss current AI trends and predict future trends in healthcare	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	Analyse key data challenges in healthcare and develop data science proposals with clear objectives towards overcoming these challenges	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	Design AI frameworks and leverage on existing Python toolboxes and techniques for solving data science problems in healthcare	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3

## PO and PSO mapping with level of strength for Course Name Applications of AIML in healthcare/ ICT/ Computer Networks Lab (Course Code CAL402)

Course	РО	PO	PO	РО	РО	РО	РО	РО	РО	PO1	PO1	PO1	PSO	PSO	PSO
Objectives	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	3	3	3	3	3	1	2	3	1	3	1	3	3	3	1
CO2	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	2	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	2	2	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO6	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3

## Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS 0 2	PS O 3
CAL40 2	Applications of AIML in healthcare/ ICT/ Computer Networks Lab	3.00	3. 00	3. 00	3. 00	3. 00	1. 83	2. 00	3. 00	2. 33	3. 00	0. 00	3. 00	3. 00	3. 00	2. 67

#### Total- 33.83 Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sc	hool: SET	Batch: 2023-27										
Pr	ogram: B.Tecl	h Current Academic Year: 2023-24										
Br	anch: ALL	Semester: VII										
1	Course Code	CSA401 Course Name: Computer Vision										
2	Course Title	Computer Vision										
3	Credits	3										
4	Contact Hou	rs 3-0-0										
•	(L-T-P)											
	Course Statu	s Program Elective										
5	Course Object	ive 1. To implement fundamental image processing tech	1. To implement fundamental image processing techniques									
-		required for computer vision										
		2. To develop applications using computer vision tec	hniques									
6	Course	Students will be able to have thorough Understanding of:	Students will be able to have thorough Understanding of									
Ŭ	Outcomes	CO-1 Define the Fundamentals of Computer Vision and C	Computer									
	0	Graphics and relate them with real world application	ns									
		CO-2 Explain Image formation models and Foundations for	or									
		Mathematical basis for various Projection Systems										
		CO- 3 Apply Image processing techniques such as Segme	ntation									
		and Edge Detection for real time and real world app	lications.									
		CO- 4 Analyze various feature extraction techniques for d	ifferent									
		problem domain.	problem domain.									
		CO-5 Evaluate Pattern Recognition Using Clustering,										
		Classification, Supervised Learning and Unsupervis	sed									
		Learning Techniques										
		CO-6 Build computer vision applications for real world	CO-6 Build computer vision applications for real world									
		Applications.										
7	Course	In this course students will learn basic principles of image formation,										
	Description	image processing algorithms, extracting the features	and then									
		analyzing the underlying patterns.										
8	Outline syllab	us	CO									
			Mappin									
			g									
	Unit 1	Introduction to Computer Vision										
	A	Computer Vision and Computer Graphics, What is Computer	CO1									
		Vision - Low-level, Mid-level, High-level	~ ~ 1									
	В	Overview of Diverse Computer Vision Applications:	CO1									
		Document Image Analysis, Biometrics, Object Recognition,										
	~	Tracking, Medical Image Analysis	~ ~ 1									
	C	Face detection, Face recognition, Eigen faces, Active	CO1									
		appearance and 3D shape models of faces, Surveillance,										
		preground-background separation, vehicle vision system:										
		cating roadway, road markings, identifying road signs,										
		locating pedestrians										
	Unit 2	Image Formation Models	<b>~</b> ~									
	А	Monocular imaging system, Radiosity: The 'Physics' of	CO2									
		Image Formation, Radiance, Irradiance, Brightness, color										
		etc,										



ח		D		COD						
В	Orthographic & Perspecti	002								
9	Camera calibration, Binoc	cular imagi	ng systems	<b>G Q Q</b>						
C	Multiple views geometry,	Structure	determination, shape	CO2						
	from shading, Weak persp	pective pro	jection and orthographic							
	projection, Concept of image	age coordi	nate system and camera							
	coordinate system;									
Unit 3	Image Processing	mage Processing								
А	Image preprocessing: The	Discrete F	Fourier Transform (DFT)	СОЗ,						
	of Two Variables, Propert	ies of the 2	2-D DFT, Discrete	CO6						
	Cosine Transform (DCT)									
В	Wavelet Transforms in Or	ne Dimens	ion-The Discrete	CO3,						
	Wavelet Transform (DW)	() and The	Continuous Wavelet	CO6						
	Transform. Wavelet Deco	mposition.								
С	Orthogonal Euclidean A	ffine Proje	ective etc. Convolution	CO3						
C	and Filtering Image Enha	ncement I	Restoration Histogram	CO6						
	Processing	incentent, i	Cestoration, mstogram	000						
Unit 1	Imaga Processing Onora	tions								
	Image Filtering (spatial de	main) Ma	nsk hasad (a g	CO4						
A	correlation convolution)	Smoothing	ask-based (e.g.,	004						
	Sharpening (e.g. gradient	) )	g (e.g., Gaussian),							
D	Sharpennig (e.g., gradient	) d (a.g. voi	ting optimization	<u>CO4</u>						
D	perceptual grouping) Div	u (e.g., vo	a clustoring)	04						
C	Colour fundamentale Col	er-Daseu (e	.g., clustering)	<u>CO4</u>						
C	Colour lundamentals, Col		s, Colour transformation,	004						
 TT:4 5	Smoothing and Sharpenin	g, Colour s	segmentation							
	Feature Extraction		f Conscione Line	CO5						
А	Luge detection: Canny, L		i Gaussian; Line	COS,						
D	Correctors (Hough Hanston	inn Affina	Orientation History	C00						
D	SIET SUDE LOC CLO	ian Anne.	, Orientation Histogram,	COS,						
C	SIFT, SUKF, HOG, GLO	<u>п</u> 	ide and Conseine	C00						
C	Scale-Space Analysis- Im	age Pyram	ids and Gaussian	CO5,						
 Mada af	The series	mers		000						
Mode of	Theory									
 examination	<u>C</u> A	MTT	DUD							
Weightage		MIE	EIE 500/							
 Distribution	25%	25%	50%							
Text	1. Milan Sonka, Vaclav H	lavac, Rog	ger Boyle," Digital Image							
book/s*	Processing and Compute	er Vision'	Cengage Learning, 1 <sup>st</sup>							
	Edition, 2008									
	2. Computer Vision - A m									
	J. Ponce, Prentice Hall									
 <b>D</b> (1	McGraw-Hill.									
Reference	1, Introductory Technique									
Books	Trucco and A. Verri, Publ									
	2. R. C. Gonzalez, R. E.									
	Addison Wesley Longman	n, Inc., 199	02.							
	3. D. H. Ballard, C. M. H	Brown. Co	mputer Vision. Prentice-							
	Hall, Englewood Cliffs, 1	982.								



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO-1 Define the Fundamentals of Computer Vision and Computer Graphics and relate them with real world applications	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	CO-2 Explain Image formation models and Foundations for Mathematical basis for various Projection Systems	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	CO- 3 Apply Image processing techniques such as Segmentation and Edge Detection for real time and real world applications.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	CO- 4 Analyze various feature extraction techniques for different problem domain.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	CO-5 Evaluate Pattern Recognition Using Clustering, Classification, Supervised Learning and Unsupervised Learning Techniques	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	CO-6 Build computer vision applications for real world applications.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3

**PO and PSO mapping with level of strength for Course Name** Computer Vision (**Course Code** CSA-401)

Subject	PO's /	P O	PS O	PS O	PS O											
	PSO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Comput	CO1	3	3	3	3	1	1	1	1	1	2	1	3	2	3	1
er	CO2	3	3	3	3	2	1	1	1	1	2	1	3	2	3	2
Vision	CO3	3	3	3	3	2	1	1	1	1	2	1	3	3	3	2
CSA-	CO4	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
401	CO5	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
	CO6	3	3	3	3	2	3	3	1	3	2	1	3	3	3	3

## Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 0 1	PS 0 2	PS O 3
CSA-	Computer	3.00	3.0	3.0	3.0	1.8	1.6	1.3	1.0	1.3	2.0	1.0	3.0	2.6	3.0	2.0
401	Vision		0	0	0	3	7	3	0	3	0	0	0	7	0	0

### Total- 32.83 Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent 3. Addressed to Substantial (High=3) extent

3. Addressed to Substantial (High=3) extent



Sc	hool: SET		Batch: 2023-27								
Pr	ogram: B.Tecl	n	Current Academic Year: 2023-24								
Br	anch: ALL		Semester: VII								
1	Course Code		CAL401 Course Name: Computer Vision La	b							
2	Course Title		Computer Vision Lab	~							
3	Credits		1								
4	Contact Hou	<b>.</b>	0-0-2								
•	(L-T-P)										
	Course Status	s	Core								
5	Course Object	ive	To implement fundamental image processing tech	niques							
	5		required for computer vision	1							
			To develop applications using computer vision tec	chniques							
6	Course		Students will be able to have thorough Understanding of:								
	Outcomes		CO-1 Define and show the Fundamentals of Computer V	ision							
			techniques on images								
			CO-2 Show the Image filtering and opening / closing ope	erations on							
			Color images								
			CO- 3 Apply Image transformation techniques such as fo	r real time and							
			real world applications.								
			CO- 4 Analyze various feature extraction techniques for o	different							
			Problem domains.								
			CO-5 Evaluate Pattern Recognition Using Clustering,								
			Classification Techniques								
			CO-6 Build computer vision applications for real world								
			Problems.								
7	Course		In this course students will learn basic principles of image formation,								
	Description		image processing algorithms, extracting the features and then analyzing								
			the underlying patterns.								
8	Outline syllab	us		CO Mapping							
	Unit 1	Intr	oduction to Computer Vision								
	1	To c	create a program to display grayscale image using read and	CO1							
		writ	e operation.								
	2	To c	reate a vision program to find histogram value and display	CO1							
		histo	ograph of a grayscale and color image.								
	Unit 2	vv r1	te a program for color image processing								
	2 Unit 2		ige rormation Models	CO2							
	<u> </u>	Droc	ream for opening and closing of the image	CO2							
	4		ill the region of interest for the image.	CO2							
	J Unit 2	IUI	nn me region of interest for me intage	02							
			ige r focessing	CO2 CO6							
	0	usin	g edge detection	005,000							
	7	To c	reate a program to discretize an image using Fourier	CO3, CO6							
		trans	sformation.	,							
	8	To c	create a vision program to determine the edge detection of an CO3								
		imag	ge using different operators.								
	Unit 4	Fea	ture Extraction								
	9	Prog	gram of sharpen image using gradient mask.	CO4							



10	Program for morphological	operation: e	rosion and dilation.	CO4						
11	Write a program for image s	egmentation	n using local and global	CO4						
	thresholding									
Unit 5	Pattern Analysis	attern Analysis								
12	Write a program to impleme	ent image cla	assification.	CO5, CO6						
13	Write a program to impleme	nt image clu	ustering.	CO5, CO6						
Mode of	Lab									
examination										
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Text	1. Milan Sonka, Vaclav H	lavac, Rog	er Boyle," Digital							
book/s*	Image Processing and Con	mputer Vis	ion" Cengage Learning,							
	1 <sup>st</sup> Edition, 2008	-								
	2. Computer Vision - A m	odern appi	roach, by D. Forsyth and							
	J. Ponce, Prentice Hall Ro	obot Visio	n, by B. K. P. Horn,							
	McGraw-Hill.									
Reference	1, Introductory Technique	es for 3D C	omputer Vision, by E.							
Books	Trucco and A. Verri, Publ	isher: Pren	tice Hall.							
	2. R. C. Gonzalez, R. E. V	Voods. Dig	ital Image Processing.							
	Addison Wesley Longman	n, Inc., 199	02.							
	3. D. H. Ballard, C. M. B	rown. Con	puter Vision. Prentice-							
	Hall, Englewood Cliffs, 19	982.	-							

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO-1 Define and show the Fundamentals of Computer	PO1,PO2,PO3,PO4,
	Vision techniques on images	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
2.	CO-2 Show the Image filtering and opening / closing	PO1,PO2,PO3,PO4,
	operations on Color images	PO5,PO6,PO7,PO8,
	operations on color mages	PO9,PO10, PSO1,PSO2,PSO3
3.	CO- 3 Apply Image transformation techniques such as	PO1,PO2,PO3,PO4,
	for real time and real world applications	PO5,PO6,PO7,PO8,
	for real time and real works appreadous.	PO9,PO10, PSO1,PSO2,PSO3
4.	CO- 4 Analyze various feature extraction techniques for	PO1,PO2,PO3,PO4,
	different Problem domains	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
5.	CO-5 Evaluate Pattern Recognition Using Clustering,	PO1.PO2.PO3.PO4.
	Classification Techniques	PO5.PO6.PO7.PO8.
	ermonia i ermidiae	PO9,PO10, PSO1,PSO2,PSO3
6	CO-6 Build computer vision applications for real world	PO1.PO2.PO3.PO4.
0.	CO-0 Dund computer vision applications for real world	PO5 PO6 PO7 PO8
	Problems.	PO9.PO10. PSO1.PSO2.PSO3

**PO and PSO mapping with level of strength for Course Name** Computer Vision (Course Code CSA-301)



Subject	PO's / PSO's	P 0 1	P 0 2	P 0 3	P 0 4	P O 5	P 0 6	P O 7	P O 8	P 0 9	P O 10	P O 11	P 0 12	PS O 1	PS O 2	PS O 3
Comput	CO1	3	3	3	3	1	1	1	1	1	2	1	3	2	3	1
er	CO2	3	3	3	3	2	1	1	1	1	2	1	3	2	3	2
Vision	CO3	3	3	3	3	2	1	1	1	1	2	1	3	3	3	2
CAL-	CO4	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
401	CO5	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
	CO6	3	3	3	3	2	3	3	1	3	2	1	3	3	3	3

## Average of non-zeros entry in following table (should be auto calculated).

Cours														PS	PS	PS
e	Course Name		PO	0	0	0										
Code		PO 1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CAL	Computer															
CAL- 401	Vision		3.0	3.0	3.0	1.8	1.6	1.3	1.0	1.3	2.0	1.0	3.0	2.6	3.0	2.0
401		3.00	0	0	0	3	7	3	0	3	0	0	0	7	0	0

## Total- 32.83 Strength of Correlation

1. Addressed to Slight (Low=1) extent

- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool: SET	Batch: 2023-27						
Pro	gram:B.Tech	Current Academic Year: 2023-24						
Bra	nch:IT	Semester: IV						
1	Course Code	CSA02 Course Name						
		1						
2	Course Title	Human Computer Interaction						
3	Credits	3						
4	Contact	3-0-0						
	Hours							
	(L-T-P)							
	Course	Specialization Elective						
	Status							
5	Course	1. Understand fundamental design and evaluation	methodologies of					
	Objective	human computer interaction.						
		2. Demonstrate knowledge of human computer in	teraction design					
		concepts and related methodologies.						
		3. Apply theories and concepts associated with eff	ective work design to					
6	Course	CO1: Define the capabilities of both humans and	computers from the					
0	Outcomes	viewpoint of human information processing	computers from the					
	Outcomes	CO2: Explain typical human–computer interaction (HC	CI) models, styles, and					
		various historic HCI paradigms.	, , <u>,</u> ,					
		CO3: Apply HCI design principles, standards and guide	lines.					
		CO4: Analyse and identify user models, user support	, socio-organizational					
		issues, and stakeholder requirements of HCI systems.						
		CO5: Analyse the tasks of HCI systems.	(h 1') ( f					
		interface	g the quality of a user					
7	Course	Students will learn the fundamental concepts of human-	computer interaction					
Ĺ	Description	and user centred design thinking, through working in tea	ams on an interaction					
	-	design project, supported by lectures, readings, and disc	ussions. They will					
		learn to evaluate and design usable and appropriate soft	ware based on					
		psychological, social, and technical analysis. They will	become familiar with					
0		the variety of design and evaluation methods used in int	eraction design.					
8	Outline syllabus		CO Mapping					
	Unit 1	Introduction						
	Α	Why Human–Computer Interaction?, What is Hci?, Who is Involved in Hci? Models of Interaction Theory And Hci	COI					
		Human Introduction. Input–Output Channels(Vision.						
		Hearing, Touch, Movement), Human Memory(Sensory						
		Memory,Long-Term Memory,), Psychology And The						
		Design Of Interactive Systems,						
	В	Input Devices For Interactive Use, Allowing Text Entry, Drawing And Selection From The Screen: (Text Entry)	COI					
		Pointing, 3d Interaction Devices). Output Display Devices						
		For Interactive Use, Virtual Reality Systems And 3d						
		Visualization, Various Devices In The Physical World,						
		Paper Output And Input, Memory(Short-Term Memory, Long Term Memory, Access Methods), Processing (Effects						
		Long-remi memory, Access memous), Processing(Effects, Limitations Networks And Impact On System						
		Performance)						
	С	The Interaction:Introduction, Models Of Interaction	CO1					
		(Execution-Evaluation Cycle, Interaction Framework),						



	Frameworks And Hci, Ergonomics, Interaction Styles, Elements Of The Wimp Interface, Interactivity, Context Of	
	The Interaction, Experience, Engagement And Fun	
Unit 2	Design Process	
A	Interaction Design Basics: Introduction, The Process of Design, User Focus, Scenarios, Navigation Design (Local Structure, Global Structure), Screen Design And Layout (Tools For Layout, User Action And Control, Appropriate Appearance), Iteration And Prototyping	CO2
В	HCI in The Software Process: Introduction, The Software Life Cycle (Activities, Validation and Verification, Management and Contractual Issues, Interactive Systems for Software Lifecycle), Usability Engineering, Iterative Design and Prototyping, Techniques For Prototyping, Design Rationale (Process-Oriented Design Rationale, Design Space Analysis, Psychological Design Rationale)	CO2
С	Design Rules: Introduction, Principles to Support Usability (Learnability, Flexibility, Robustness), Standards, Guidelines, Golden Rules and Heuristics (Shneiderman's Eight Golden Rules 0f Interface Design, Norman's Seven Principles for Transforming Difficult Tasks into Simple Ones), HCI Patterns	CO2
Unit 3	Implementation Support	
A	Introduction of Implementation Support, Elements of Windowing Systems: Examples of Imaging Models, Architectures of Windowing Systems, Programming The Application, Using Toolkits, Usability Principles, User Interface Management Systems: UIMS As A Conceptual Architecture, Implementation Considerations)	CO3
В	Evaluation Techniques, what is Evaluation? Goals of Evaluation, Evaluation Through Expert Analysis: Cognitive Walkthrough, Heuristic Evaluation, Model-Based Evaluation, Evaluation Through User Participation, Empirical Methods: Experimental Evaluation, Observational Techniques, Query Techniques, Evaluation Through Monitoring Physiological Responses, Choosing an Evaluation Method, A Classification Of Evaluation Techniques	CO3
C	Universal Design: Introduction, Universal Design Principles, Multi-Modal Interaction, Sound in The Interface, Touch In The Interface, Handwriting Recognition, Gesture Recognition, Designing For Diversity: Designing For Users With Disabilities, Designing For Different Age Groups, Designing For Cultural Differences	CO3
Unit 4	Models and Theories	
A	Cognitive Models: Introduction, Goal And Task Hierarchies(GOMS, Cognitive Complexity Theory, Problems And Extensions Of Goal Hierarchies), Linguistic Models(BNF, Task–Action Grammar), Challenge Of Display-Based Systems, Physical And Device Models(Keystroke-Level Model, Three-State Model), Cognitive Architectures(The Problem Space Model, Interacting Cognitive Subsystems)	CO4
В	Socio-Organizational Issues And Stakeholder Requirements: Introduction, Organizational Issues: Cooperation or Conflict? Invisible Worker, Automating	CO4



	Processes –	Workflow and	BPR, Capturing Requirements							
	(Stakeholder	s, Socio-Tecl	nnical Models, Soft Systems							
	Methodology Methodol	y, Participat	tory Design, Ethnographic							
С	Communicat Face-To-Fac Personal Spa Language, B Turn-Taking Based Comm Grounding C Pace And G	Communication And Collaboration Models: Introduction, Face-To-Face Communication(Transfer Effects and Personal Space, Eye Contact and Gaze, Gestures and Body Language, Back Channels, Confirmation and Interruption, Turn-Taking), Conversation, Speech Act Theory, Text- Based Communication(Back Channels and Affective State, Grounding Constraints, Turn-Taking, Context And Deixis, Page And Communication Linear Text Value and Constraints, Context And Deixis,								
	Working.		ear rent vis. Hypertent), croup							
Unit 5	Task Analys	is								
A	Introduction and Other T Based Anal Sources o (Documentat Sorting and 0	Introduction of Task, Differences Between Task Analysis and Other Techniques, Task Decomposition, Knowledge- Based Analysis, Entity–Relationship-Based Techniques, Sources of Information and Data Collection (Documentation, Observation, Interviews, Initial Analysis, Sorting and Classification). Uses Of Task Analysis								
В	Dialog Not Structured I Diagrammati Hierarchical Combinatori State Charts, Notations, D	Dialog Notations and Design Introduction, Dialog: Structured Human Dialogs, Dialog Design Notations, Diagrammatic Notations (State Transition Networks, Hierarchical State Transition Nets, Concurrent Dialogs and Combinatorial Explosion of States, Escapes, Petri Nets, State Charts, Flow Charts, JSD Diagrams), Textual Dialog								
С	Standard Fo Notations a Logics, Inte Observability Modeling R Contexts (Co Placeholders	rmalisms, For nd Issues, A raction Mode y, Reachabil ich Interaction ollaboration, I ), Low Intentio	mal Notations, Model-Oriented lgebraic Notations, Temporal els (Pie Model, Predictability, lity), Continuous Behavior, n, Status–Event Analysis, Rich nformation, Triggers, Artifacts, on and Sensor-Based Interaction	CO5, CO6						
Mode of	Theory	), <u>Low</u> meening	and Bensor Based Interaction							
examination										
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	5. Alar russ third									
Other	1. Raj									
References	Inte Nev									
	2. Ber Inte	2. Ben Shneiderman, "Design the User Interface: Strategies for Effective Human-								
	Cor	nputer Intera	ction" Pearson Education.							

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: Define the capabilities of both humans and computers	PO1,PO2,PO3,PO4,
	from the viewpoint of human information processing.	PO5,PO6,PO7,PO8,
	1 1 0	PO9,PO10, PSO1,PSO2,PSO3



2.	CO2: Explain typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	CO3: Apply HCI design principles, standards and guidelines.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	CO4: Analyse and identify user models, user support, socio- organizational issues, and stakeholder requirements of HCI systems.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5	CO5:Analyse the tasks of HCI systems.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6	CO6:Adopt a variety of simple methods for evaluating the quality of a user interface.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3

## **PO and PSO mapping with level of strength for Course Name** Human Computer Interaction (**Course Code** CSA-021)

Subject	DO's /	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	P50'S	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Human	CO1	3	3	2	2	1	1	1	1	1	2	1	3	2	2	1
Comput	CO2	3	3	3	3	2	1	1	1	1	2	1	3	2	3	2
er Interacti	CO3	3	3	3	3	2	1	1	1	1	2	1	3	3	3	2
on	CO4	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
(Course	CO5	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
Code								1				1		3	3	3
CSA-	CO6	3	3	3	3	2	1		1	1	2		3			
021)																

#### Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS 0 2	PS 0 3
CSA -021	Human Computer Interaction	3.00	3. 00	2. 83	2. 83	1. 83	1. 33	1. 00	1. 00	1. 00	2. 00	0. 00	3. 00	2. 67	2. 83	2. 00

## Total- 30.33

**Strength of Correlation** 

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



School: SET Batch: 2023-27											
Pro	ogram: B-TECH	Current Academic Year: 2023-24									
Bra	anch: CSE	Semester: V									
1	Course Code	CSA-022 Course Name: Introduction to Cloud Co	omputing with ML								
2	<b>Course Title</b>	Introduction to Cloud Computing with ML									
3	Credits	3									
4	Contact Hours (L-T-P)	3-0-0									
	Course Status	Specialization Elective									
5	Course Objective	his introductory course on Cloud computing will teach both the fundamental concepts f how and why Cloud systems works, as well as Cloud technologies that manifest nese concepts.									
6	Course Outcomes (CO's)	<ul> <li>CO1. Define the basics of cloud and recall the computer Science concepts which are helpful in understanding on demand service architecture.</li> <li>CO2. Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory, and data and task parallel computing.</li> <li>CO3. Apply the PAAS and SAAS to manage the workflow and use of cloud in scientific application.</li> <li>CO4. Categorize and Characterize between Infrastructure services, deployment models, and governance in cloud computing. Examine the design of task and data parallel distributed algorithms for Clouds and use them to construct Cloud applications.</li> <li>CO5. Evaluate the importance of cloud using monitoring and management of services for performance improvement of HPC and to follow the Governance and Compliances.</li> <li>CO6. Elaborate the design concept and formulate to build the solution using cloud service providers as AWS as EC2, LAMBDA, S3 and Machine Learning Service as AWS SageMaker.</li> </ul>									
7	Course Description	This course is an introductory course for cloud computing understanding the core functionalities, algorithms, models a environment. In this course Students will get demonstrations of for better exposure and research understanding.	concepts and helps in nd workflows in cloud real-time cloud services								
8	Syllabus Outli	ine	CO Mapping								
	Unit 1	FOUNDATIONS									
	A	<b>Introduction to compute</b> Types of Computing, Grid computing, distributed computing, Client-server computing, Three Tier Architecture, use of Sockets and Remote Procedure Call, working of RMI and CORBA, Web services, Web Sockets, Message Queues and Message Brokers.	CO1								
	В	Introduction to Cloud Computing	CO1								
	0	Cloud Computing definition, Roots of Cloud Computing, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks									
	С	Migrating and Integrating into Cloud Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era, Evolution and Challenges of SaaS Paradigm, Integration Scenarios, The Integration Methodologies	CO1								



	Unit 2	ENTERPRISE CLOUD COMPUTING AND IAAS	
	А	The Enterprise Cloud Computing Paradigm	CO1,CO2
		Issues for Enterprise Applications on the Cloud,	
		Transition Challenges, Enterprise Cloud Technology	
		and Market Evolution, Business Drivers Toward a	
		Marketplace for Enterprise Cloud Computing, The	
		Cloud Supply Chain	
	В	Virtual Machines Provisioning and Migration	CO1,CO2
		Services	
		Introduction to Virtual Machines, The Anatomy of	
		Cloud Infrastructures, VM Provisioning and	
		Manageability, Virtual Machine Migration Services,	
		Management of Virtual Machines for Cloud	
		Infrastructures,, Distributed Management of Virtual	
		Infrastructures, Scheduling Techniques	
	С	Enhancing Cloud Computing Environments Using a	CO1,CO2
		Cluster as a Service	
		Introduction and Related Work, RVWS Design, Cluster	
		as a Service: The Logical Design, Secure Distributed	
		Data Storage in Cloud Computing, Cloud Storage,	
		Technologies for Data Security in Cloud Computing	
	Unit 3	PLATFORM AND SOFTWARE AS A SERVICE	~~~~~
	А	Aneka and CometCloud	CO1,CO3
		Aneka—Integration of Private and Public Clouds,	
		Technologies and Tools for Cloud Computing, Aneka	
		Cloud Platform, CometCloud: An Autonomic Cloud	
		Engine, Introduction of CometCloud (Architecture,	
	D	Autonomic Benavior, Applications overview)	CO1 CO2 CO6
	D	Cloud Based Solutions for Business Applications	01,005,000
		(Introduction of Enterprises Demand and Cloud	
		Computing Dynamic ICT Services) Workflow Engine	
		for Clouds Workflow Management Systems	
		Architecture of Workflow Management Systems,	
	С	Scientific Applications and MapReduce Model	CO1.CO3.CO6
	-	Scientific Application for Cloud Environments.	
		Classification of Scientific Applications and Services in	
		the Cloud, SAGA-based Scientific Applications,	
		MapReduce Programming Model, MapReduce Impacts	
		and Research Directions	
	Unit 4	MONITORING, MANAGEMENT &	
		GOVERNANCE	
	А	SLA Management in Cloud Computing	CO1,CO4
		Introduction of typical Use Cases, Model for Federated	
		Cloud Computing, Security Considerations, SLA	
		Management in Cloud Computing: A Service	
		Provider's Perspective, Types of SLA, Life Cycle of	
	<b>D</b>	SLA, Automated Policy-based Management	
	В	Performance Predictions for HPC on Clouds	CO1,CO4
		Introduction and Background of Grid and Cloud, HPC	
1		in the Cloud: Performance-related Issues, Game Hosting	



	on Cloud Re Networks Usin	esources, Build g Clouds, Resour	ing Content Delivery rce Cloud Mashups						
С	Security and C Basic Concept Changes: Con Security and R Identity, Contex Issues in Cloud Security Issues	Governance of Organizationa nmon Change isk in the Cloud nt Level Security Computing(PCI	l Readiness, Drivers for Management Models, , Cloud Computing and —Pros and Cons, Legal DSS), Data Privacy and	CO1,CO4					
Unit 5	AWS with Ma	chine Learning							
A	AWS Services Amazon SageM SageMaker, Ex a Model with A Amazon SageM Amazon SageM	EC2, IAM, S3, 1 Iaker, Machine I plore, Analyze, a mazon SageMak Iaker, Set Up An Iaker Notebook 1	Lambda, Introduction to Learning with Amazon and Process Data, Train ter, Deploy a Model in nazon SageMaker, Instance	CO1,CO5,CO6					
В	Amazon SageM Amazon SageM reference, Actio automate mode Create and Mar Labeling( Built Tool, Data Lab Custom Labelin	Iaker Studio, Per Iaker Studio, Am ons and Data Typ I development ar nage Workforces -in Task Types, A eling, Input and ( ng Workflows)	form Common Tasks in hazon SageMaker API bes, Use Autopilot to hd Problem types, , Use Ground Truth for Auto-Segmentation Output Data,Creating	CO1,CO5,Co6					
С	Process Data an Choose an Algo Perform Autom Algorithms, Us Training, Depl Inference Pipel and Deploy Mo Automatically	Process Data and Evaluate Models, Build Models and Choose an Algorithm, Train Models, Debugger, Perform Automatic Model Tuning, Tune Multiple Algorithms, Use Reinforcement Learning, Incremental Training, Deploy Models, Multi-Model Endpoints, Inference Pipelines, Use Batch Transform, Compile and Deploy Models with Neo, Elastic Inference,							
Mode of	Theory	,							
examination		-							
Weightage	CA	MTE							
Distribution	$\frac{25\%}{1 \text{ CLOUD CO}}$	25%	50%	ted by Deilmon					
I CAL DUUKS	Buyya, Jam 2. Cloud Comp Robert Elsenpe	Velte, Toby J. Velte,							
Reference	Amazon SageN	laker, Developer	Guide,	1 1 10"					
B00KS Online	https://docs.aw	s.amazon.com/sa	gemaker/latest/dg/sagem	aker-dg.pdf#gs					
Materials	learning-model	-sagemaker/	-starteu/nanus-on/bund-t	ram-deproy-machine-					
	https://aws.ama	zon.com/machin	e-learning/						



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Define the basics of cloud and recall the computer Science concepts which are helpful in understanding on demand service architecture. Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory, and data and task parallel computing.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	Define the basics of cloud and recall the computer	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	Apply the PAAS and SAAS to manage the workflow and use of cloud in scientific application.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	Categorize and Characterize between Infrastructure services, deployment models, and governance in cloud computing. Examine the design of task and data parallel distributed algorithms for Clouds and use them to construct Cloud applications.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	Evaluate the importance of cloud using monitoring and management of services for performance improvement of HPC and to follow the Governance and Compliances	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	Elaborate the design concept and formulate to build the solution using cloud service providers as AWS as EC2, LAMBDA, S3 and Machine Learning Service as AWS SageMaker.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3

**PO and PSO mapping with level of strength for Course Name** Introduction to Cloud Computing with Machine Learning

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
Introduction to Cloud Computing with Machine Learning <b>CSA-022</b>	CO2	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
	СО3	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
	CO4	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
	CO5	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
	CO6	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3



## Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	РО 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 0 1	PS 0 2	PS 0 3
CSA- 022	Introduction to Cloud Computing with Machine Learning	3.00	3.0 0	3.0 0	3.0 0	1.8 3	1.6 7	1.3 3	1.0 0	1.3 3	2.0 0	1.0 0	3.0 0	2.6 7	3.0 0	2.0 0

#### **Total- 39.00 Strength of Correlation**

#### Strength of Correlation

- 1. Addressed to Slight (Low=1) extent2.3. Addressed to Substantial (High=3) extent 2. Addressed to Moderate (Medium=2) extent



Scho	ool SET	Batch: 2023-27	
Prog	gram B-TECH	Current Academic Year: 2023-24	
Brai	nch CSE	Semester VI	
1	Course Code	CSA041 Course Name Natural Language Processin	ıg
2	Course Title	Natural Language Processing	-
3	Credits	3	
4	Contact Hours	3-0-0	
	(L-T-P)		
	Course Status	Specialization Elective	
5	Course Objective	Students will try to learn	
		3. Basics of natural language processing.	
		4. How to apply basic algorithms in natural language pro	ocessing.
		5. Algorithmic description of the main language levels m	norphology,
		syntax, semantics, and pragmatics.	1
		6. Basics of knowledge representation, inference, and representation, inference, and representation	ations to the
		7 Techniques such as tokenization stemming and lemn	natization
6	Course Outcomes	Students will be able to	iunzunon.
		CO-1. <b>Define</b> Computational Linguistics phenomena and ma	aking decisions
		using it.	0
		CO-2. Explain how to access Text Corpora and Lexical Reso	ources.
		CO-3. Apply processing of raw text using NLP programming	g concepts.
		CO-4. Analyze tagging of words and Extracting Information	from Text.
		CO-5. <b>Discuss</b> analysis of sentences using CFG and Propositi	onal Logic.
7	Course Description	CO-6. <b>Design</b> NLP based applications for different business.	environment.
/	Course Description	ake netural language processing (NLD). We will learn how to	araata gustama
		that can understand and produce language for applice	tions such as
		information extraction machine translation extension	uons such as
		automation extraction, machine translation, automatic s	
		linguistic (knowledge based) and statistical approaches	to language
		iniguistic (knowledge-based) and statistical approaches	
		processing in the three major subhelds of NLP. syntax (language	age structures),
		of language in context)	
8	Outline syllabus	of language in context).	CO Manning
0	Unit 1		CO Mapping
		Introduction and Computational Linguistics What is Natural Language Processing hands on demonstrations	CO1
	Λ	Ambiguity and uncertainty in language. The Turing test	COI
	В	Computing with Language Texts and Words Implementation of	CO1
		NLTK, Searching Text, Counting Vocabulary, A Closer Look at	
		Python Texts as Lists of Words, Computing with Language	
		Sumple Statistics, Frequency Distributions, Fine-grained Selection of Words, Collocations and Bigrams	



С	Making Decisions and Taking Control, Conditionals, Operating on Every Element, Nested Code Blocks, Looping with Conditions	CO1
Unit 2	Accessing Text Corpora and Lexical Resources	
A	Automatic Natural Language Understanding, Word Sense Disambiguation, Pronoun Resolution, Generating Language Output, Machine Translation, Spoken Dialog Systems, Textual Entailment, Limitations of NLP	CO2
В	Accessing Text Corpora, Gutenberg Corpus, Web and Chat Text, Brown Corpus, Reuters Corpus, Inaugural Address Corpus, Annotated Text Corpora, Corpora in Other Languages	CO2
C	Text Corpus Structure, Loading your own Corpus, Conditional Frequency Distributions, Conditions and Events, Counting Words by Genre, Plotting and Tabulating Distributions, Generating Random Text with Bigrams,	CO2
Unit 3	Processing Raw Text	
A	Lexical Resources, Wordlist Corpora, A Pronouncing Dictionary, Comparative Wordlists, Shoebox and Toolbox Lexicons, WordNet, Senses and Synonyms, The WordNet Hierarchy, Lexical Relations, Semantic Similarity	CO3
В	Accessing Text from the Web and from Disk, Strings Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation,Formatting From Lists to Strings	CO3
С	NLP Programming Sequences, Style, Functions for text processing, Program Development & Algorithm Design using, Python Libraries	CO3
Unit 4	Tagging & Information Extraction	
A	Categorizing and Tagging Words Using a Tagger, Tagged Corpora, Mapping Words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformation-Based Tagging, Determine the Category of a Word	CO4
В	Text classification Supervised Classification, Examples of Supervised Classification, Evaluation, Decision Trees, Naive Bayes Classifiers, Maximum Entropy Classifiers, Modeling Linguistic Patterns	CO4
С	Extracting Information from Text Information Extraction, Chunking, Developing and Evaluating Chunkers, Recursion in Linguistic Structure, Named Entity Recognition, Relation Extraction	CO4
Unit 5	Analysis of sentences	
A	Analyzing Sentence Structure Grammatical Dilemmas,What's the Use of Syntax?,Context-Free Grammar,Parsing with Context- Free Grammar,Dependencies and Dependency Grammar,Grammar Development	CO5



В	Analyzing the Meani	ng of Sente	nces Natural Language	CO5				
	Understanding, Propo	sitional Log	gic, First-Order Logic, The					
	Semantics of English	Sentences,	Discourse Semantics					
С	Managing Linguistic	DataCorpu	s Structure, The Life Cycle of a	CO5				
	Corpus, Acquiring Da	ata,Working	with XML,Working with					
	Toolbox Data, Descri	bing Langu	age Resources Using OLAC					
	Metadata							
Mode of	Theory							
examination								
Weightage	CA	MTE	ETE					
Distribution	25%	25%						
Text book/s*	1. Speech and La	eech and Language processing an introduction to Natural Language						
	Processing, Co	omputation	al Linguistics and speech Recog	gnition by				
	Daniel Jurafsk	y and Jame	es H. Martin (ISBN13: 978-013)	1873216)				
	2. Ruslan Mitkov	, The Oxfo	ord Handbook of Computational	Linguistics,				
	Oxford Univer	Oxford University Press, 2005						
Other References	3. Charu C. Agga	. Charu C. Aggarwal and Cheng Xiang Zhai, Mining Text						
	Springer, 2012							
	4. Hopcroft, J.E.	and Ullma	n, J.D., Introduction to Automat	ta, Theory and				
	Languages, Ad	ldison-Wes	sley, 1979	-				

S. No.	Course Outcome	Program Outcomes (PO)
		& Program Specific
		Outcomes (PSO)
1.	<b>Define</b> Computational Linguistics phenomena and making decisions using it.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	Explain how to access Text Corpora and Lexical Resources.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	Apply processing of raw text using NLP programming concepts.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	Analyze tagging of words and Extracting Information from Text.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	<b>Discuss</b> analysis of sentences using CFG and Propositional Logic.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	<b>Design</b> NLP based applications for different business environment.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3



# **PO and PSO mapping with level of strength for Course Name** Natural Language Processing (**Course Code CSA041**)

CO	PO	РО	PO	PO	PO	PO	PO	PO	РО	PO1	PO1	PO1	PSO	PSO	PSO
0	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	3	3	3	3	3	1	1	1	1	3	1	3	2	3	1
CO2	3	3	3	3	3	1	1	1	1	3	1	3	3	3	2
CO3	3	3	3	3	3	2	1	1	1	3	1	3	3	3	1
CO4	3	3	3	3	3	1	2	1	1	3	1	3	3	3	3
CO5	3	3	3	3	3	2	2	1	2	3	1	3	3	3	3
CO6	3	3	3	3	3	3	3	1	3	3	2	3	3	3	3

## Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS 0 3
CSA	Natural															
041	Language Processing	3.00	3.0 0	3.0 0	3.0 0	3.0 0	1.6 7	1.6 7	1.0 0	1.5 0	3.0 0	0.0 0	3.0 0	2.8 3	3.0 0	2.1 7

### Total- 34.83 Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sc	chool: SET	Batch: 2023-27								
Pı	rogram:	Current Academic Year: 2023-24								
B.	Tech.									
B	ranch: CSE	Semester: VII								
1	<b>Course Code</b>	CSA051 Course Name- RECOMENDER SYS	ГЕМЅ							
2	Course Title	RECOMENDER SYSTEMS								
3	Credits	3								
4	Contact	3-0-0								
	Hours									
	(L-T-P)									
	Course Statu	s Specialization Elective								
5	Course	To develop state-of-the-art recommender systems that aut	omate a							
	Objective	variety of choice-making strategies with the goal of provide	ding							
	- <b>J</b>	affordable, personal, and high-quality recommendations	-							
		1. To introduce fundamental techniques in recommen	nder systems.							
		2. To introduce the ideas of Non-personalized and pr	oject-							
		association recommenders through content-based	and							
		collaborative techniques.								
		3. To become familiar with to various approaches for	r building							
		recommender systems including collaborative, cor	itent-based,							
6	Course	Knowledge-based, and hybrid methods.	1 ha ahla ta							
0	Course	After Successful completion of this course the student with	i be able to:							
	Outcomes	CO-1. Define the basics of Recommender Systems and its	types.							
		co-2. Explain the similarity measures used in	Iormation of							
		$CO_{-3}$ Apply various techniques of content and know	wledge based							
		recommendation for real life applications	wiedge based							
		CO-4. <b>Analyse</b> and categorize the various recommendation	techniques for							
		hybridization.								
		CO-5. Choose the suitable type of Recommender system	ms for societal							
		problems								
		CO-6. <b>Design</b> the recommender system to support all onli	ne applications							
		of folksonomies and Social Networking sites.								
			• • •							
1	Course	Recommender systems offer personalized access to online	e information							
	Description	in product catalogs, social media networks, and document collections, among other applications. It will introduce students to various								
	among other applications. It will infloduce students to various approaches for building recommender systems including collaborative									
		content based knowledge based and hybrid methods	conaborative,							
8	Outline svlla	is	CO Manning							
	Unit 1	Introduction	2 - Impping							
	Δ	Introduction	CO1							
	<b>^</b>	hased methods Recommendation Applications of	,							
		recommender systems. Case study of movie lens group								
		lens and amazon.com etc.								



В	Introduction	to Information	retrieval,	Introduction to	CO1,			
	collaborative f	iltering			~~ .			
C	Knowledge so	urces, Neighbou	irhood-based	methods.	CO1			
Unit 2	Memory and Recommenda	Model-based C tion	ollaborative					
A	Similarity mea based Collab reduction. Regression: SI Naïve Bayes n	asures used in Co porative Recon ope1 and SLIM nodels,	ollaborative I nmendation models. Asso	Filtering, Model- Dimensionality	CO2, CO6			
В	Factorization Latent factor r	Methods of Col nodels.	llaborative R	ecommendation,	CO2, CO6			
С	Optimization t constrained m	echniques. Sing atrix factorizatio	ular value de m.	composition,	CO2, CO6			
Unit 3	Content-base							
A	High level arc Advantages ar Content-based extraction, and	CO3, CO6						
В	User profiles. Learning models, Item profiles, Discovering features of documents, Obtaining item features from tags							
С	C Knowledge-based Recommendation Constraint-based recommendation. Critiquing systems.							
Unit 4	Hybrid recon	nmendation and	l Evaluation		CO3, CO6			
Α	Hybrid Recom recommendati	nmendation Com on techniques ar	plementaritie d knowledge	es between e sources.	CO3, CO6			
В	Combining re- for recommen	commendation r der systems	nethods. Typ	bes of evaluation	CO3, CO6			
С	Evaluation des A/B Testing	Evaluation design. Prediction metrics and ranking metrics. A/B Testing						
Unit 5	Context-awar	e recommenda	tion					
А	Context effe	Context effects in recommendation. Types and representations of context.						
В	Pre-filtering, Temporal and	CO5, CO6						
С	Recommender collaboration a search, Social Recommendat applications in	CO5, CO6						
Mode of	Theory		riverents.					
examination n	, Theory							



	Weightage	25%	25%	50%								
	Distributio											
	n											
	Text	Aggarwal, C. C	C. Recommende	er Systems: The Textbook. Spri	nger 2019.							
	book/s*	ISBN 978-3-3	ISBN 978-3-319-29657-9. Available through the DePaul library.									
	Other	http://www.de	itel.com/Resour	ceCenters/Web20/Recommend	lerSystems/Rec							
	References	ommenderSystemsCourseSyllabi/tabid/1321/Default.aspx										
	Other	Francesco Ricci, LiorRokach and BrachaShapira Recommender Systems										
	References	Handbook, 200	)5									
1												

S. No.	Course Outcome	Program Outcomes (PO) &
		Program Specific Outcomes (PSO)
1.	Define the basics of Recommender Systems and its	PO1,PO2,PO3,PO4, PO5,PO6, PO7,PO8,
	types.	P09,P010, PS01,PS02,PS03
2.	<b>Explain</b> the similarity measures used in formation of	PO1,PO2, PO3,PO4,PO5,PO6, PO7,PO8,
	neighbourhood of samples of data.	PO9,PO10, PSO1,PSO2,PSO3
3.	Apply various techniques of content and knowledge	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO8,
	based recommendation for real life applications.	PO9,PO10, PSO1,PSO2,PSO3
4.	Analyse and categorize the various recommendation	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO8,
	techniques for hybridization.	PO9,PO10, PSO1,PSO2,PSO3
5.	<b>Choose</b> the suitable type of Recommender systems	PO1,PO2,PO3,PO4, PO5,PO6, PO7,PO8,
	for societal problems	PO9,PO10, PSO1,PSO2,PSO3
6.	<b>Design</b> the recommender system to support all online	PO1,PO2,PO3,PO4, PO5,PO6, PO7,PO8,
	applications of folksonomies and Social Net. sites.	PO9,PO10, PSO1,PSO2,PSO3

## PO and PSO mapping with level of strength for RECOMENDER SYSTEMS (Course Code CSA051)

Subject	Cours	D	D	D	D	D	D	D	D	D				PS	PS	PS
	e										PO	PO	PO	01	O2	03
	Objec		0	0	0		0 ć	0	0	0	10	11	12			
	tives	1	2	3	4	Э	6	/	8	9						
RECOM	CO1	3	3	2	3	2	1	1	1	2	1	-	3	3	2	2
ENDER System	CO2	3	3	3	3	3	2	2	1	2	2	-	3	3	3	2
S CSA-	CO3	3	3	3	3	3	3	3	1	3	2	-	3	3	2	2
051	CO4	3	3	3	3	3	2	2	1	3	2	-	3	3	3	2
	CO5	3	3	3	3	3	3	3	1	3	2	-	3	3	3	2
	CO6	3	3	3	3	3	3	3	1	3	3	-	3	3	3	3

## Average of non-zeros entry in following table (should be auto calculated).

Cour se Code	Course Name	PO 1	P 02	P 0 3	P 0 4	Р О 5	P 0 6	P 0 7	P 0 8	P O 9	P O 10	P 0 11	P O 12	PS O 1	PS O 2	PS O 3
CSA -051	RECOME NDER	2.00	3.0	2.8	3.0	2.8	2.3	2.3	1.0	2.6	2.0	0.0	3.0	3.0	2.6	2.

## Total- 35.83



Sch	ool: SET	Batch: 2023-27								
Pro	gram: B-TECH	Current Aca	demic Year: 2023-24							
Bra	unch: CSE	Semester: V	П							
1	<b>Course Code</b>	CSA061	Course Name: Robotics and Intel	ligent Systems						
2	<b>Course Title</b>	<b>Robotics and</b>	l Intelligent Systems							
3	Credits	3								
4	<b>Contact Hours</b>	3-0-0								
	(L-T-P)									
	<b>Course Status</b>	Specializatio	on Elective							
5	Course Objective	Students wil	l try to learn:							
		<ol> <li>Fundam</li> <li>How to and gea</li> <li>To designation</li> <li>To implication</li> </ol>	nental principles of robot system designapply concepts of translational and rors to robot construction. gn and program simple autonomous relement algorithms that enables the users to facilitate intelligent behavior, leavers	gn and operation. otational motion, obots. e of sensors and arning and						
6	Course	Students wil	1011. I be able to:							
	Outcomes	<ul> <li>CO-1. Define the concept and key components of robotics technologies.</li> <li>CO-2. Classify various robot sensors and their perception principles that enable a robot to analyze their environment, reason and take appropriate actions toward the given goal.</li> <li>CO-3. Apply the learned knowledge and skills in practical robotics laboratories and experiments.</li> <li>CO-4. Analyze problems in spatial coordinate representation and spatial transformation, robot locomotion design, kinematics, motion control, localization and mapping, navigation and path planning.</li> <li>CO-5. Assess stochastic control and multi agent systems for development of a robotic system.</li> <li>CO-6. Adapt intelligent system methodology suitable for a given</li> </ul>								
7	Course	Basic concep	ts of Robotics, Intelligent Systems an	nd transformational						
	Description	modeling. The of methods for Particular attend and controllic courses of ac	nis course provides students with a v or design and analysis of robotic and ention is given to modeling dynamic s ng their behavior, and making deci tion	vorking knowledge intelligent systems. systems, measuring isions about future						
8	Outline syllabus			CO Mapping						
	Unit 1	Overview an	nd Preliminaries							
	А	Mobile Robo	ts, Position, and Orientation	CO1						
	В	Translational	and Rotational Dynamics	CO1, CO2						



С	Flying and Swimm Robots	ing Robots	, Articulated	CO1, CO2			
Unit 2	Transformation,						
А	Path Planning, and	Trajectorie	es	CO1, CO2			
В	Time Response of	Dynamic S	ystems	CO1, CO2			
С	Dynamic Effects of	Feedback	Control, Control	CO1, CO2			
	Systems						
Unit 3	Optimization						
А	Sensors and Actuat	ors		CO1, CO2, CO4			
В	Numerical Optimiz	ation		CO1, CO2, CO4			
С	Dynamic Optimal	Control		CO1, CO2, CO4			
Unit 4	Formal Logic, Alg	orithms, a	and				
	Incompleteness						
A	Computers, Compu	ting, and S	Sets	CO3, CO5			
В	Probability and Sta	tistics		CO3, CO5			
С	Machine Learning,	Neural Ne	tworks	CO3, CO5			
Unit 5	Information, Sear	Information. Search and Expert Systems					
			Peresjoenno				
А	State Estimation, S	tochastic C	Control	CO3, CO5, CO6			
A B	State Estimation, S Parameter Estimati	tochastic C on and Ad	Control aptive Control	CO3, CO5, CO6 CO3, CO5, CO6			
A B C	State Estimation, S Parameter Estimati Task Planning and	tochastic C on and Ad Multi-Age	Control aptive Control nt Systems	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6			
A B C Mode of	State Estimation, S Parameter Estimati Task Planning and Theory	tochastic C on and Ad Multi-Age	Control aptive Control nt Systems	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6			
A B C Mode of examination	State Estimation, S Parameter Estimati Task Planning and Theory	tochastic C on and Ada Multi-Age	Control aptive Control nt Systems	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6			
A B C Mode of examination Weightage	State Estimation, S Parameter Estimati Task Planning and Theory CA	tochastic C on and Ada Multi-Age MTE	Control aptive Control nt Systems ETE	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6			
A B C Mode of examination Weightage Distribution	State Estimation, S Parameter Estimati Task Planning and Theory CA 25%	tochastic C on and Ada Multi-Age MTE 25%	Control aptive Control nt Systems ETE 50%	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6			
A B C Mode of examination Weightage Distribution Text book/s*	State Estimation, S Parameter Estimation Task Planning and Theory CA 25% 3. http://www.pri	tochastic C on and Ada Multi-Age MTE 25% nceton.edu	Control aptive Control nt Systems ETE 50% /~stengel/RISVirTe	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6			
A B C Mode of examination Weightage Distribution Text book/s*	State Estimation, S Parameter Estimati Task Planning and Theory CA 25% 3. http://www.pri 4. J. J. Craig, Intr	tochastic C on and Ada Multi-Age <u>MTE</u> 25% nceton.edu oduction to	Control aptive Control nt Systems ETE 50% I/~stengel/RISVirTe: o Robotics, Addison	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6			
A B C Mode of examination Weightage Distribution Text book/s*	State Estimation, S Parameter Estimation Task Planning and Theory CA 25% 3. http://www.pri 4. J. J. Craig, Intr Publishers, 200	MTE 25% nceton.edu 05,	Control aptive Control nt Systems ETE 50% /~stengel/RISVirTe: p Robotics, Addison	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6			
A B C Mode of examination Weightage Distribution Text book/s*	State Estimation, S Parameter Estimati Task Planning and Theory CA 25% 3. http://www.pri 4. J. J. Craig, Intr Publishers, 200 5. Computational	tochastic C on and Ada Multi-Age MTE 25% nceton.edu oduction to 05, Principles	ETE 50% i/~stengel/RISVirTe of Mobile Robotics	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6 xt.html. Wesley by Gregory			
A B C Mode of examination Weightage Distribution Text book/s*	State Estimation, S Parameter Estimati Task Planning and Theory CA 25% 3. http://www.pri 4. J. J. Craig, Intr Publishers, 200 5. Computational Dudek and Mid	MTE 25% nceton.edu oduction to 5, Principles chael Jenki	Control         aptive Control         nt Systems         ETE         50%         /~stengel/RISVirTe:         problematics         problematics         Addison         of Mobile Robotics         and Edition         and Intelligence	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6 xt.html. Wesley by Gregory			
A B C Mode of examination Weightage Distribution Text book/s* Other References	State Estimation, S Parameter Estimati Task Planning and Theory CA 25% 3. http://www.pri 4. J. J. Craig, Intr Publishers, 200 5. Computational Dudek and Mid 5. M. Negnevitsk systems Addis	tochastic C on and Ada Multi-Age MTE 25% nceton.edu oduction to 05, Principles chael Jenki y, Artificia	ETE 50% aptive Control nt Systems ETE 50% a/~stengel/RISVirTe b Robotics, Addison c of Mobile Robotics an, Second Edition al Intelligence – A gu	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6 xt.html. Wesley by Gregory uide to intelligent			
A B C Mode of examination Weightage Distribution Text book/s*	State Estimation, S Parameter Estimati Task Planning and Theory CA 25% 3. http://www.pri 4. J. J. Craig, Intr Publishers, 200 5. Computational Dudek and Mid 5. M. Negnevitsk systems Addis 6. Bharati A., Sat	MTE 25% MICE 25% nceton.edu oduction to 5, Principles chael Jenki y, Artificia on-Wesley	Control         aptive Control         nt Systems         ETE         50%         /~stengel/RISVirTe:         po Robotics, Addison         of Mobile Robotics         in, Second Edition         al Intelligence – A gu, 2005,         aitanyaVNatural la	CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6 CO3, CO5, CO6 xt.html. Wesley by Gregory uide to intelligent nguage			

S. No.	Course Outcome	Program Outcomes (PO) & Program
		Specific Outcomes (PSO)
1.	CO-1. <b>Define</b> the concept and key components	PO1,PO2,PO3,PO4,
	of robotics technologies	PO5,PO6,PO7,PO8,
	of foodles technologies.	PO9,PO10, PSO1,PSO2,PSO3
2.	CO-2. <b>Classify</b> various robot sensors and their perception principles that enable a robot to analyze their environment, reason and take	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
	appropriate actions toward the given goal.	



3.	CO-3. <b>Apply</b> the learned knowledge and skills in practical robotics laboratories and experiments.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	CO-4. <b>Analyze</b> problems in spatial coordinate representation and spatial transformation, robot locomotion design, kinematics, motion control, localization and mapping, navigation and path planning.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	CO-5. Assess stochastic control and multi agent systems for development of a robotic system.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	CO-6. Adapt intelligent system methodology suitable for a given type of real world application problem.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3

# **PO and PSO mapping with level of strength for Course Name** Robotics and Intelligent Systems (**Course Code CSA061**)

Course	PO	РО	PO1	PO1	PO1	PSO	PSO	PSO							
Objectives	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	3	3	3	3	3	1	1	1	1	2	3	2	3	3	1
CO2	3	3	3	3	3	1	2	1	2	2	3	2	3	3	2
CO3	3	3	3	3	3	2	1	1	2	2	3	3	3	3	3
CO4	3	3	3	3	3	1	1	1	2	2	3	2	3	3	3
CO5	3	3	3	3	3	1	1	1	2	2	3	2	3	3	3
CO6	3	3	3	3	3	2	2	2	3	3	2	2	3	3	3

#### Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS 0 2	PS 0 3
CSA06 1	Robotics and Intelligent Systems	3.00	3.0 0	3.0 0	3.0 0	3.0 0	1.3 3	1.3 3	1.1 7	2.0 0	2.1 7	0.0 0	2.1 7	3.0 0	3.0 0	2.5 0

### Total- 33.83 Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Pro	gram:	B.Tech								
Bra	nch:	CSE with Specialization in Artificial Intelligence & M	achine							
		Learning								
1	Course Code	CSI024								
2	Course Title	Basics of Internet of Things and Raspberry Pi								
3	Credits	2								
4	Contact	2-0-0								
	Hours (L-T-									
	P)									
	Course	Elective								
	Status									
5	Course	The primary objective of this course to provide a platform	n to get started							
	Objective	with the Internet of Things with Raspberry Pi along	with the basic							
	9	knowledge of programming and interfacing of the input/o	utput devices.							
6	Course	CO1: Understand the general concepts of Internet of Thin	gs.							
	Outcomes	CO2: Explore the loT components and its architecture								
		CO3: List the hardware components of Raspberry Pl	haway Di							
		CO5. Evaluation the challenges in LoT encepts using Kasp	berry PI							
		CO5: Explain the chanenges in for specific application.	horry Di							
7	Course	This course provides a gradual page of basic concept	to advanced							
/	Description	interfacing and programming of Paspherry Pi for IoT base	s to advanced							
8	Outline syllabi	interfacing and programming of Raspberry 11101 101 bas	CO							
0	Outline Synabl	15	Manning							
	Unit 1	Introduction to IoT	inupping							
	A	Defining IoT. History of IoT. Importance of IoT. IoT	CO1. CO6							
		Basic Characteristics								
	В	About Objects / things in the IoT, Enabling	CO1, CO6							
		Technologies of IoT	,							
	С	About the Internet in IoT, IoT Advantages and	CO1, CO6							
		Disadvantages								
	Unit 2	IoT Architecture								
	А	Basic Building blocks of IoT system: Sensors,	CO2, CO6							
		Processors, gateways, Applications								
	В	Physical design of IoT: Things in IOT, IoT Protocols,	CO2, CO6							
		Logical design of IoT: IoT Functional Blocks, IoT								
		Communication Models. IoT Communication API's								
	C	IoT Service Oriented Architecture (SOA), API Oriented	CO2							
		Architecture.								
	Unit 3	Basics of Raspberry Pi								
	A	Introduction to Raspberry Pi, Raspberry Pi Components	<u>CO3</u>							
	В	Installation of NOOBS on SD Card and Raspbian on SD	CO3							
		Lard, Terminal Commands, Installation of Libraries on								
	C	Kaspoerry P1	<u> </u>							
	C	Getting the Static IP Address of Kaspberry Pi, Program	003							
		on Kaspberry P1, Installing the Remote Desktop Server	1							



Unit 4	Programmin	g with Raspb	erry Pi							
А	Installation of	f I2C Driver or	n Raspberry Pi, Serial	CO4						
	Peripheral Int	erface with Ra	spberry Pi							
В	Implementati	on of LED and	l Raspberry Pi, LED Blink	CO4						
	Using Function	Using Function, Reading the Digital Input								
С	Reading an E	dge-Triggered	Input: Reading Switch in	CO4						
	Pull-Down C	onfiguration, F	Reading Switch in Pull-Up							
	Configuration	ı								
Unit 5	Interfacing v	vith Raspberr	y Pi							
А	Interfacing of	Relay with Ra	aspberry Pi	CO5,CO6						
В	Interfacing of	DC Motor wi	th Raspberry Pi	CO5, CO6						
	Interfacing of	LCD with Ra	spberry Pi							
С	Home automa	ation concept a	nd case study	CO5, CO6						
	Industry appl	ications concep	ot and case study							
Mode of	Theory									
 examination										
Weightage	CA	MTE	ETE							
 Distribution	25%	25%	50%							
Text book/s*	1. Intern	et of Things w	ith Raspberry Pi and							
	Ardui	no, Rajesh Sin	gh, Anita Gehlot, Lovi Raj							
	Gupta	Gupta et.al, CRC Press								
Other	1. Progra									
References	with H	with Python, Simon Monk, Mc Graw Hill								
	2. Pytho	n Programmin	g for Raspberry Pi, Richard							
	Blum	, Christine Bre	snahan, Pearson Education							

C		
<b>S</b> .	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	CO1: Understand the general concepts of	PO1, PO2, PO3, PO6, PO7, PO12,
	Internet of Things.	PSO1
2.	CO2: Explore the IoT components and its	PO1, PO2, PO3, PO4, PO6, PO7,
	architecture	PO12, PSO1
3.	CO3: List the hardware components of	PO1, PO2, PO3, PO5, PO6, PO7,
	Raspberry Pi	PO9, PO10, PO11, PO12, PSO1,
		PSO2
4.	CO4: Demonstrate the programming concepts	PO1, PO2, PO3, PO5, PO6, PO7,
	using Raspberry Pi	PO8, PO9, PO10, PO11, PO12,
		PSO1, PSO2
5.	CO5: Explain the challenges in IoT specific	PO1, PO2, PO3, PO4, PO5, PO6,
	application.	PO7, PO12, PSO1
6.	CO6: Design and develop various applications	PO1, PO2, PO3, PO4, PO5, PO6,
	using Raspberry Pi	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3



## PO and PSO mapping with level of strength for Course Name Raspberry Pi and its Programming (Course Code CSI024)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
Basics of	CO1	3	1	1	-	-	2	1	-	-	-	-	3	3	-	-
	CO2	3	1	1	2	-	2	1	-	-	-	-	3	3	-	-
Internet of Things	CO3	2	1	1	-	3	1	1	-	1	1	2	2	1	1	-
and	CO4	2	2	2	-	3	2	2	2	1	1	1	2	3	2	2
Pi	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	РО 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	P 0 9	PO 10	PO 11	PO 12	PS O 1	PSO 2	PS O 3
	Basics of Internet of Things and Raspberry Pi	2.6 7	1.6 7	1.6 7	2.6 7	3.00	2.0 0	1.6 7	2.3 3	2. 0 0	2.0 0	2.2 5	2.6 7	2.6 7	2.00	2.0 0

## Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology						
Dep	artment	Computer Science & Engineering						
Pro	gram:	B.tech CSE						
Bra	nch:	CSE						
1	Course Code							
2	Course Title	Brain Computer Interface						
3	Credits	4						
4	Contact	3-0-2						
	Hours							
	(L-T-P)							
	Course							
	Status							
5	Course	To learn different concepts of Brain Computer Interface						
	Objective							
6	Course	after studying this course student will be able to:						
	Outcomes	CO1: Understand the fundamental principles of br	rain-computer					
		interfaces.						
		<b>CO2:</b> <i>Demonstrate</i> knowledge of the different types of BCIs and the						
		applications.						
		CO3: Develop proficiency in designing and implementing						
		classification algorithms for decoding brain signals.						
		<b>CO4:</b> <i>Evaluate</i> the performance and effectiveness of BC	CI systems.					
		<b>CO5:</b> Assess different techniques and tools of Bra	in Computer					
		Interface.						
		<b>CO6:</b> <i>Plan</i> the opportunities of research and development in the arear						
		of Brain Computer Interface						
7	Course							
	Description	The Brain-Computer Interfaces (BCI) course is design	ed to provide					
		students with a comprehensive understanding of th	ne principles,					
		techniques, and applications of brain-computer interfa	ces. BCIs are					
		innovative systems that enable direct communication	between the					
		human brain and external devices, opening up new po	ossibilities for					
		assistive technology, human-computer interaction, and n	euroscientific					
		research.						
8	Outling sullab	16	CO					
0		10	Manning					
	Unit 1	Introduction to Brain-Computer Interfaces	mapping					
		Neurophysiology and Neuroimaging						
	Α	Overview of brain-computer interfaces, Historical	CO1					
		development and milestones in BCI research, Types of BCIs						

Game Development using Unreal Engine



		(invasive, non	-invasive, hybri	id), Ethical considerations and							
		societal implic	ations of BCIs								
	В	Basics of neu	rophysiology	and neuroanatomy, Neuronal	CO2						
		signaling and	l brain activit	ty measurement techniques,							
		Electroenceph	alography (EEC	G) and event-related potentials							
		(ERPs), Functi	ional magnetic	resonance imaging (fMRI) and							
		other neuroima	aging methods								
	Unit 2	Signal Proces	Signal Processing and Feature Extraction, and Machine								
		Learning for									
	А	Time-domain	domain analysis techniques	CO2							
		Feature extrac	tion algorithms	for BCI applications, Artifact							
		removal and n	oise reduction r	nethods							
	В	Introduction to machine learning and its relevance to BCI,									
		Classification									
		Supervised and	d unsupervised	learning techniques, Cross-							
		validation and									
	Unit 3	Brain Signal									
		and BCI App									
	А	Invasive BCIs	: Neural implan	ts, microelectrode arrays	CO3						
		Non-invasive	G, functional near-infrared								
		spectroscopy									
		signal acquisit	signal acquisition modalities, Signal processing challenges								
		and methods f	or different BC	I types							
	В	Motor imagery	-based BCIs fo	or assistive technologies	CO3						
		Open BCI-bas	ed BCIs for cor	nmunication and control							
		Brain-controll	ed gaming and	virtual reality, Neurofeedback							
		and cognitive	enhancement								
	Unit 4	Human-Com	puter Interacti	on and BCI Design							
	A	User-centered	design principl	es for BCIs	CO4, CO5						
		Interface desig	n and usability	considerations							
	В	Real-time feed	lback and adapt	ive BCI systems	CO4, CO5						
		BCI applicatio	ons in healthcare	e and rehabilitation							
	Unit 5	Emerging Tro	ends and Futu	re Directions							
	А	Advanced sig	nal processing	g techniques (deep learning,	CO5, CO6						
		adaptive algor	rithms), Closed	-loop BCI systems and brain							
		stimulation									
	В	Brain-machine	CO5, CO6								
		augmentation,									
L		technology									
	Mode of	Theory/Jury/P									
	examination										
	Weightage	CA	MTE	ETE							
	Distribution	25%	25%	50%							
	Text book/s*			1							



	1.	"Brain-Computer Interfaces: Principles and Practice" by	
		Jonathan Wolpaw and Elizabeth Winter Wolpaw. Publisher:	
		Oxford University Press."	
	2.	"Brain-Computer Interfaces: Revolutionizing Human-	
		Computer Interaction" by Bernhard Graimann, Brendan	
		Allison, and Gert Pfurtscheller. Publisher: Springer."	
	3.	"Brain-Computer Interfaces: Applying our Minds to	
		Human-Computer Interaction" by Desney Tan and	
		Anton Nijholt. Publisher: Springer.	
	4.	"Brain-Computer Interfaces Handbook:	
		Technological and Theoretical Advances" edited	
		by Chang S. Nam, Anton Nijholt, and Fabien	
		Lotte. Publisher: CRC Press.	
Other	1.	"Brain-Computer Interfaces: An International	
References		Assessment of Research and Development Trends"	
		edited by Richard A. Normann and Christoph	
		Guger. Publisher: Springer.	
	2.	"Introduction to Neural Engineering for Motor	
		Rehabilitation" by Dario Farina, Winnie Jensen,	
		and Metin Akay. Publisher: Wiley.	
	3.	"Neuroergonomics: The Brain at Work" edited by	
		Raja Parasuraman and Matthew Rizzo. Publisher:	
		Oxford University Press.	
	4.	"Cognitive Neuroscience Robotics B: Analytic	
		Approaches to Human Understanding" edited by	
		Toshio Inui and Hiroshi Murase. Publisher:	
		Springer.	



S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	<b>CO1:</b> <i>Understand</i> the fundamental principles of brain-computer interfaces.	PO1, PO5, PO8, PO12
2.	<b>CO2:</b> <i>Demonstrate</i> knowledge of the different types of BCIs and their applications.	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
3.	<b>CO3:</b> <i>Develop</i> proficiency in designing and implementing classification algorithms for decoding brain signals.	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10, PO12, PSO1, PSO2
4.	<b>CO4:</b> <i>Evaluate</i> the performance and effectiveness of BCI systems.	PO1, PO2, PO3, PO4, PO5, PO9, PO10, PO12, PSO1, PSO2, PSO3
5.	<b>CO5:</b> <i>Assess</i> different techniques and tools of Brain Computer Interface.	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10, PO12, PSO1, PSO2, PSO3
6.	<b>CO6:</b> <i>Plan</i> the opportunities of research and development in the arear of Brain Computer Interface	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3

## PO and PSO mapping with level of strength

Course Code_ Course Name	CO's	РО 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO1	PSO2
	CO1	3	-	-	-	2	-	-	2	-	-	-	2
	CO2	3	2	2	2	3	2	-	-	2	2	2	2
	CO3	3	2	2	2	3	2	-	2	2	2	-	2
Drain	CO4	3	3	3	3	3	-	-	-	2	2	-	2
Computer	CO5	3	3	3	3	3	3	-	2	2	2	-	3
Interface	CO6	3	3	3	3	3	3	3	2	3	3	3	3

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
	Brain Computer Interface	3.0	2.6	2.6	2.6	2.8	2.5	3.0	2.0	2.2	2.2	2.5	2.3

## Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Prog	gram:	B.tech CSE								
Bra	nch:	CSE								
1	Course Code									
2	Course Title	Brain Computer Interface Lab								
3	Credits	2								
4	Contact Hours	0-0-2								
	(L-T-P)									
	Course Status	Compulsory/Elective								
5	Course	To learn different concepts of Brain Computer Interface								
	Objective									
6	Course	after studying this course student will be able to:								
	Outcomes	CO1: Understand the fundamental principles of b	orain-computer							
		interfaces.	-							
		CO2: Demonstrate knowledge of the different types of l	BCIs and their							
		applications.								
	<b>CO3:</b> Develop proficiency in designing and									
	classification algorithms for decoding brain signals.									
		CO4: Evaluate the performance and effectiveness of BC	CI systems.							
		CO5: Assess different techniques and tools of Br								
		Interface.								
		CO6: Plan the opportunities of research and development	nt in the arear							
		of Brain Computer Interface								
7	Course	The course basically deals with the concepts of unreal er	ngine for the							
	Description	game development								
8	Outline syllabus		CO Mapping							
	Unit 1	Introduction to BCI Lab and Tools								
		1.1 Overview of the BCI Lab and its equipment	CO1, CO2,							
		1.2 Introduction to software tools used in BCI research	CO3							
		1.3 Familiarization with hardware components								
		1.4 Setting up EEG acquisition systems 1.5 Unreal								
		Engine Editor Interface								
		1.6 Applying electrodes and ensuring good signal								
		quality								
		1.7 Preprocessing techniques: filtering, artifact								
	II	removal, referencing								
	Unit 2	Wiotor imagery-Based BUI								
		2.1 Understanding motor imagery and its role in BCI	CO1, CO2,							
		2.2 Experimental setup for motor imagery-based BCI								
		2.5 Collecting and analyzing motor imagery EEG data								
		2.4 Implementing classification algorithms for motor								
		Imagery Event Deleted Detentials (EDDs) and On an DCI								
	Unit 3	Event-Kelated Potentials (EKPs) and OpenBCI								
		Hardware -Based BUIs								


	2 1 Intereduced		nd OnenDCI Vit	CO1	CO2
	3.1 Introduct	100  to EKPS a		COI,	CO2,
	3.2 Designin	g and conduct	ting OpenBCI Kit	005	
	Experiments				
	3.3 ERP data				
	3.4 Impleme				
	using classifi				
Unit 4	Feature Ex	traction and	<b>Classification Algorithms</b>		
	and Hybrid	BCIs	_		
	4 1 Feature e	extraction met	hods for BCI applications	CO1.	CO2.
	4 2 Time-do	main and frequ	uency-domain feature	CO6	002,
	extraction	inam and noq	actively activitient reactive	000	
	A 3 Impleme	nting commor	classification algorithms		
	4.5  mpleme	I DA Noivo B			
	(e.g., S v w, I)	LDA, Naive E	ayes)		
	4.4 Combine (NUDC) in her	ing multiple of	ani signais (e.g., EEG,		
TT. •4 7	INIKS) in hy				
Unit 5	Multimodal	Integration a	and Real-Time Feedback		
	and BCI Ap	plications			
	5.1 Understa	nding multim	odal integration techniques	CO1,	CO2,
	5.2 Collectin	g and integrat	ing data from different	CO6	
	modalities				
	5.3 Designin	g and implem	enting hybrid BCI systems		
	5.4 Impleme	nting real-time	e feedback mechanisms		
	5.5 Developi	ing BCI applic	cations for control and		
	communicati	ion			
	5.6 Testing a	nd evaluating	BCI performance with		
	users	C	-		
	5.7 Iterative	design and im	provement of BCI		
	applications	0	r		
Mode of	Jury/Practica	l/Viva			
examination	var j/1 raetiet	u) / 1 / u			
Weightage	CA	CE(viva)	FSF		
Distribution	250/	25%	<b>ESE 5</b> 0%		
Trant has 1/2*	23%	23%			
Text DOOK/S*	I. Brain-C	omputer Inter	Taces: Principles and		
	Practice	by Jonathan	wolpaw and Elizabeth		
	Winter W	Volpaw. Publi	sher: Oxford University		
	Press."				
	2. "Brain-C	omputer Inter	faces: Revolutionizing		
	Human-C	Computer Inte	raction" by Bernhard		
	Graiman	n, Brendan Al	lison, and Gert		
	Pfurtsche	eller. Publishe	r: Springer."		
	3. "Brain-C	omputer Inter	faces: Applying our Minds		
	to Huma	n-Computer Ir	nteraction" by Desney Tan		
	and Anto	on Nijholt. Puł	olisher: Springer.		
	4. "Brain-C				
	Technolo				
	by Chang	g S. Nam, Ant	on Nijholt, and Fabien		
	Lotte. Pu	blisher: CRC	Press		
Other	1. "Brain-Co	omputer Interf	aces: An International		
References		I			



	Assessment of Research and Development Trends"	
	edited by Richard A. Normann and Christoph	
	Guger. Publisher: Springer.	
	2. "Introduction to Neural Engineering for Motor	
	Rehabilitation" by Dario Farina, Winnie Jensen, and	
	Metin Akay. Publisher: Wiley.	
	3. "Neuroergonomics: The Brain at Work" edited by	
	Raja Parasuraman and Matthew Rizzo. Publisher:	
	Oxford University Press.	
	4. "Cognitive Neuroscience Robotics B: Analytic	
	Approaches to Human Understanding" edited by	
	Toshio Inui and Hiroshi Murase. Publisher:	
	Springer.	

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	<b>CO1:</b> <i>Understand</i> the fundamental principles of	PO1,PO2,PO3,PO10
	brain-computer interfaces.	
2.	CO2: Demonstrate knowledge of the different	PO1 PO5 PO8 PO12
	types of BCIs and their applications.	101,103,100,1012
3.	CO3: Develop proficiency in designing and	PO1, PO2, PO3, PO4, PO5, PO6,
	implementing classification algorithms for	PO9, PO10, PO11, PO12, PSO1,
	decoding brain signals.	PSO2, PSO3
4.	<b>CO4:</b> <i>Evaluate</i> the performance and effectiveness	PO1, PO2, PO3, PO4, PO5, PO6,
	of BCI systems.	PO8, PO9, PO10, PO12, PSO1,
		PSO2
5.	<b>CO5:</b> Assess different techniques and tools of	PO1, PO2, PO3, PO4, PO5, PO9,
	Brain Computer Interface.	PO10, PO12, PSO1, PSO2,
		PSO3
6.	CO6: Plan the opportunities of research and	PO1, PO2, PO3, PO4, PO5, PO6,
	development in the arear of Brain Computer	PO8, PO9, PO10, PO12, PSO1,
	Interface	PSO2, PSO3

### PO and PSO mapping with level of strength

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO1	PSO2
	CO1	3	-	-	-	2	-	-	2	-	-	-	2
	CO2	3	2	2	2	3	2	-	-	2	2	2	2
	CO3	3	2	2	2	3	2	-	2	2	2	-	2
Brain	CO4	3	3	3	3	3	-	-	-	2	2	-	2
Computer	CO5	3	3	3	3	3	3	-	2	2	2	-	3
Interface Lab	CO6	3	3	3	3	3	3	3	2	3	3	3	3



Course	Course	PO	PSO	PSO									
Code	Name	1	2	3	4	5	6	7	8	9	10	1	2
	Brain Computer Interface Lab	3.0	2.6	2.6	2.6	2.8	2.5	3.0	2.0	2.2	2.2	2.5	2.3

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



### B.Tech CSE with Specialization in Artificial Intelligence for IoT Applications



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Pro	gram:	B.Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	Т									
		Applications										
1	Course Code											
2	Course Title	Introduction to AIoT										
3	Credits	2										
4	Contact	2-0-0										
	Hours											
	(L-T-P)											
	Course Status	Core										
5	Course	The objective of this course to explore various concer	ots of Artificial									
	Objective	Intelligence of Things (AIoT) and to identify the variation	ious aspects of									
		artificial intelligence (AI) and its implementation to a	nake your IoT									
		solutions smarter.										
6	Course	CO1: Define the general concepts of Artificial Intelligence	e (AI) and									
	Outcomes	Internet of Things (IoT).										
		CO2: Interpret the infusion of AI in IoT and various AI-Io	T platforms.									
		CO3: Illustrate the IoT components and its architecture.										
		CO4: Explain the knowledge representation, reasoning, ar	nd theorem									
		proving techniques to real-world problems										
		CO5: Summarize the various domains where Artificial Int	elligence of									
		Things (AloT) can be applied successfully.										
		CO6: Support independent (or in a small group) research a	and									
7	Carrier	communicate it effectively.										
/	Course	and how we can ambed it into our daily lives for the daya	arment of life									
	Description	and how we can embed it into our daily lives for the development of life										
		style. It will also help students to understand the applications according										
8	Outline syllaby		CO Manning									
0	Unit 1	Dringinles and Foundations of IoT and AI	CO Mapping									
		Foundation and Defining AI and IoT History of AI and	CO1									
	Α	IoT Applications of AL and IoT	COI									
	B	About Objects / things in the IoT Introduction to	CO1									
	D	Enabling Technologies of IoT	COI									
	С	AI Solutions Vs Conventional Solutions, a philosophical	CO1									
	C	approach: a practical approach	001									
	Unit 2	Artificial Intelligence of Things (AIoT)										
	A	Infusion of AI – data science in IoT. Importance of	CO1. CO2									
		AIoT, The Potential of AI and the Intelligence of Things	- ,									
	В	Advantages of AI-Enabled IoT, The major AIoT CO1. CO2										
		segments										
	С	AI platforms and IoT platforms	CO1, CO2									
	Unit 3	IoT Architecture	,									
	А	Basic Building blocks of IoT system, IoT Working	CO1, CO3									



В	Physical design of IoT: Things in IOT, IoT Protocols,	CO1, CO3
	Logical design of IoT: IoT Functional Blocks, IoT	
	Communication Models. IoT Communication API's	
C	Introduction to IoT Service Oriented Architecture	CO1, CO3
TT •4 4	(SOA), API Oriented Architecture	
Unit 4	Intelligent Agents and Logics	
A	Structure of Agent	C01, C04, C05
В	Propositional logic. Inference. Predicate Logic (first	CO1. CO4.
	order logic), Resolution	CO5
С	ML in AI domain, Learning types, Classification and	CO1, CO4,
	Clustering basics	CO5
Unit 5	Domain specific applications of AIoT	<u> </u>
A	AIoT-based waste management systems and case study	CO1, CO3, CO6
В	AIoT technologies and applications for smart	CO1, CO3,
	environments and case study	CO6
C	AIoT-based e-commerce and case study, Other AIoT	CO1, CO3,
Mada of	applications	CO6
wode of	Theory/Jury/Practical/ viva	
 Weightage	CA MTE ETE	
Distribution	25% 25% 50%	
Text book/s*	1. The Internet of Things: Connecting Objects to the	
	Web edited by Hakima Chaouchi Reference for	
	Unit-1	
	2. Introduction to Internet of Things Prof. Sudip Misra	
	NPTEL Lectures Notes Department of Computer	
	Science & Engineering, Indian Institute of	
	Tachnology Kharagnur, Pafarance for Unit 2, 2 (a)	
	$\Delta$	
	3 Internet of Things Raikumar Buyya Reference for	
	Unit 3 (c)	
	4. Arshdeep Bahga and Vijay Madisetti, "Internet of	
	Things – A Hand-on Approach", Universities press,	
	2015, Reference for Unit 3 (B)	
	5. Russell S & Norvig P. Artificial Intelligence: A	
	Modern Approach, Prentice Hall	
Other	1. Charalampos Doukas, "Building Internet of	
References	Things with the Arduino". Create space. April	
	2002	
	2. Dr. Ovidiu Vermesan and Dr. Peter Friess	
	"Internet of Things: From research and	
	innovation to market deployment" River	
	Publishers 2014	
	1 4011511615 2014.	



3.	Contiki : The open source for IOT, www.contiki-	
	os.org	
4.	Rich E & Knight K, Artificial Intelligence, Tata	
	McGraw Hill, Edition 3	
5.	Dan W. Patterson, Artificial Intelligence &	
	Expert Systems, Pearson Education with Prentice	
	Hall India. Indian Edition.	

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Define the general concepts of	PO1, PO2, PO3, PO6, PO7, PO12,
	Artificial Intelligence (AI) and Internet of	PSO1
	Things (IoT).	
2.	CO2: Interpret the infusion of AI in IoT	PO1, PO2, PO3, PO6, PO7, PO12,
	and various AI-IoT platforms.	PSO1
3.	CO3: Illustrate the IoT components and its	PO1, PO2, PO3, PO4, PO6, PO7, PO12,
	architecture.	PSO1
4.	CO4: Explain the knowledge	PO1, PO2, PO3, PO4, PO6, PO7, PO12,
	representation, reasoning, and theorem	PSO1
	proving techniques to real-world problems	
5.	CO5: Summarize the various domains	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	where Artificial Intelligence of Things	PO12, PSO1
	(AIoT) can be applied successfully.	
6.	CO6: Support independent (or in a small	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	group) research and communicate it	PO9, PO12, PSO1
	effectively.	

PO and PSO mapping with level of strength for Course Name Introduction to AIoT (Course Code )

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	1	1	-	-	2	1	-	-	-	-	3	3	-	-
	CO2	2	2	1	-	-	1	3	-	-	-	-	3	3	-	-
CSI104_Introduction	CO3	3	1	1	2	-	2	1	-	-	-	-	3	3	-	-
10 A101	CO4	3	2	3	2	-	1	2	-	-	-	-	3	3	-	-
	CO5	3	3	3	3	3	2	3	-	-	-	-	3	3	-	-
	CO6	2	2	2	2	3	2	3	-	-	-	-	3	3	-	-



#### Average of non-zeros entry in following table (should be auto calculated).

Course	Course	РО	PO2	РО	РО	РО	PO	РО	РО	PO	PO	PO	PO	PSO	PSO	PSO
Code	Name	1		3	4	5	6	7	8	9	10	11	12	1	2	3
CSI104	Introduction to IoT	2.7	1.8	1.8	2.3	3.0	1.7	2.2	-	-	-	-	3.0	3.0	-	-

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Sch	ool:	School of I	Engineering & Technology									
Dep	artment	Computer	Science & Engineering									
Pro	gram:	B. Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for IoT										
		Application	ns									
1	Course Code	CSA20	Concepts of Machine Learning									
		2	2									
2	Course Title	Concepts o	of Machine Learning									
3	Credits											
4	Contact	3	0 2									
	Hours											
	(L-T-P)											
	Course	Core										
	Status											
5	Course	Students are I	Expected to learn and develop Comprehensive Understa	nding of the of								
	Objective	the following	Concepts and Techniques:									
		1. To intro	oduce the ideas of learning rule and implement them bas	ed on human								
		2 To conc	nce.	and ANN								
		3. To beco	ome familiar with decision boundaries that can learn fro	m available								
		example	es and generalize to form appropriate learning rules for	inference								
		systems	5.									
		4. To prov	vide the mathematical background for SVM, RF and Ne	ural Network								
		based cl	lassification techniques.	Suc 1								
		5. 10 unde series of	f data using computer based learning algorithms	rom a large								
	~											
6	Course	A Successful	completion of this Course Ensures the following Outco	mes								
	Outcomes	CO1 : Deni CO-2 : Class	sify and Compare existing models to understand the an	plicability in								
		solve real wor	rld societal problems.	p								
		CO-3 : Ident	tify develop and apply mathematical models to find sus	stainable								
		solutions.										
		CO-4 : Analy	<b>yse</b> the logical ability to apply feature engineering to ex	tract hierarchical								
		$CO_{-5} \cdot Evalu$	ing in real life problems.	through it								
		CO-5: Evaluation $CO-6$ : Disc	cuss the applicability of Machine learning Approache	es to develop								
		sustainable so	olutions using professional ethics.	Ĩ								
7	Course	This course introduces computational learning paradigm for critical & implementation										
	Description	understanding	g for supervised and unsupervised learning based proble	m areas.								
8		~~~~		CO Mapping								
	Unit 1	Core Concep	ots of Machine Learning									
	А	What is Mach	hine Learning?									
		MI Mindee	problems can be tackled using machine learning? The	COL								
		Framing(Con	nmon ML Problems, ML Use Cases. Identifying Good									
		Problems fo	or ML, Hard ML Problems), Machine Learning									

-



	Applications(Image Recognition, Speech Recognition, Medical Diagnosis, Statistical Arbitrage, Learning Associations), Standard learning tasks(Machine Learning Pipeline, Classification, Regression, Ranking, Clustering, Dimensionality reduction or Manifold learning)	
В	Learning Stages(Features, Labels, Hyperparameters, Validation Samples, Test Samples, Loss Function, Hypothesis Tests), Learning Scenarios( Supervised learning, Unsupervised learning, Semi- Supervised learning, Transductive inference, On-line learning, Reinforcement learning, Active learning), Generalization Supervised Learning, Unsupervised Learning, Reinforcement learning )	CO1, CO2
C	Data Preparation and Feature Engineering in ML(Data and Features, Information, Knowledge, Data Types, Big Data), Data Preprocessing: An Overview(Data Quality: Why Preprocess the Data?, Major Tasks in Data Preprocessing), Data Cleaning( Missing Values, Noisy Data, Data Cleaning as a Process), Data Integration(The Entity Identification Problem, Redundancy and Correlation Analysis, Tuple Duplication, Detection and Resolution of Data Value Conflicts), Data Reduction( Overview of Data Reduction Strategies, Attribute Subset Selection, Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation), Data Transformation and Data Discretization(Overview of Data Transformation Strategies, Data Transformation by Normalization, Discretization by Binning, Discretization by Histogram Analysis, Discretization by Cluster, Decision Tree, and Correlation Analyses, Concept Hierarchy Generation for Nominal Data)	CO1, CO2
Unit 2	Supervised Learning Algorithms - Part One	
A	How Supervised Learning Algorithms Work ? Steps (Bias-variance trade off, Function complexity and amount of training data, Dimensionality of the input space, Noise in the output values, Algorithms, Other factors to consider (Heterogeneity of the data, Redundancy in the data, Presence of interactions and non- linearities	CO1, CO2, CO6
В	Linear Regression Model Representation, Linear Regression Learning the Model (Simple Linear Regression, Ordinary Least Squares, Gradient Descent), Regularization / Shrinkage Methods ( Bias-variance trade-off, Overfitting Issues, Lasso Regression, Ridge Regression), Making Predictions with Linear Regression(Cost Function, Feature Scaling, Normalization, Mean Normalization, Learning Rate, Automatic Convergence Test)	CO1, CO2, CO6
C	Logistic Regression, The Logistic Model ( Latent variable interpretation, Logistic function, odds, odds ratio, and logit, Definition of the logistic function, Definition of the inverse of the logistic function, Interpretation of these terms, Definition of the odds, The odds ratio, Multiple explanatory variables), Model fitting ("Rule of ten", Iteratively reweighted least squares (IRLS), Evaluating goodness of fit, Limitations of Logistic Regression), Linear discriminant analysis ( LDA for two classes, Assumptions, Discriminant functions, Discrimination rules, Eigenvalues, Effect size), Practical use and Applications ( Bankruptcy prediction, Face	CO1, CO2, , CO6



	recognition, Marketing, Biomedical, studies), Comparison to	
	Logistic Regression	
Unit 3	Supervised Learning Algorithms - Part Two	
A	Support Vector Machines, Linear SVM (Hard-margin, Soft-margin), Nonlinear Classification, Computing the SVM classifier(Primal, Dual, Kernel trick), Modern methods(Sub-gradient descent, Coordinate descent), Empirical risk minimization(Risk minimization, Regularization and stability, SVM and the hinge loss, Target functions), Properties(Parameter selection, Issues)	CO1,CO2,CO3 , , CO6
В	Introduction to Artificial Neural Networks (Feed-forward Network Functions, Weight-space symmetries), Network Training ( Parameter optimization, Local quadratic approximation, Use of gradient information, Gradient descent optimization), Error Backpropagation(Evaluation of error-function derivatives, Simple examples, Efficiency of backpropagation)	CO1,CO2,CO3 , CO6
C	Decision Tree Learning (Decision tree representation, ID3 learning algorithm, Entropy, Information gain, Overfitting and Evaluation, Overfitting, Validation Methods, Avoiding Overfitting in Decision Trees, Minimum-Description Length Methods, Noise in Data), Random Forests Algorithm (Preliminaries: decision tree learning, Bagging, From bagging to random forests, Extra Trees, Properties, Variable importance)	CO1,CO2,CO3 , CO6
Unit 4	Unsupervised Learning	
A	Unsupervised Learning (What is Unsupervised Learning?), Clustering Methods (Method Based on Euclidean Distance, Method Based on Probabilities, Hierarchical Clustering Methods, Method Based on Euclidean Distance)	CO2,CO3,CO4 , CO6
В	k-means Clustering Algorithm (Standard algorithm (naive k-means), Initialization methods), Applications (Vector quantization, Cluster analysis, Feature learning) Gaussian mixture models, Expectation- Maximization method	CO2,CO3,CO4 , CO6
С	Principal Component Analysis for making predictive models (First component, Further components, Covariances, Dimensionality reduction, Singular value decomposition), Properties and limitations of PCA (Properties, Limitations), Computing PCA using the covariance method, Typical Applications	CO2,CO3,CO4 , CO6
Unit 5	Parameter Estimation, Model Evaluation and Ensemble Methods	
A	Parameter Estimation (Point Estimation, Maximum Likelihood Estimation, Unbiased Estimation, Confidence Intervals for One Mean, Two Mean, Variances)	CO2,CO5,CO6
В	Model Evaluation (ML Model Validation by Humans, Holdout Set Validation Method, Cross-Validation Method for Models, Leave- One-Out Cross-Validation, Random Subsampling Validation, Teach and Test Method, Bootstrapping ML Validation Method, Running AI Model Simulations, Overriding Mechanism Method ), The ROC Curve	CO3,CO5,CO6
С	Ensemble Methods (Ensemble Theory, Ensemble Size, Voting and Averaging Based Ensemble Methods Boosting, Weightage	CO4,CO5,CO6



	Average, Sta	cking, Bagging	g, Boosting and	Bootstrap									
	Aggregating)												
Mode of	Theory and F	ractical											
examination													
Weightage	CA	A MTE ETE											
Distribution	25%	% 25% 50%											
Text book/s*	1. Bishop, C	Bishop, C. (2006). Pattern Recognition and Machine Learning.											
	Berlin: Sp	Berlin: Springer-Verlag.											
	2. Foundatio	ns of Machine Lea	arning, Second Edition										
	By Mehr	yar Mohri, Afs	shin Rostamizadeh a	nd Ameet									
	Talwalkar	, MIT Press, Seco	nd Edition, 2018.										
	3. Introducti	on to Machine Lea	arning, Third Edition, B	y Ethem									
	Alpaydin,	The MIT	Pressmitpress.mit.edu	> books >									
	introducti	on-machine-learni	•••										
Other	1) Baldi,	P. and Brunak, S.	(2002). Bioinformatics	: A									
References	Machi	ne Learning Appro	oach. Cambridge, MA:	MIT Press.									
itereneeds	2) Russel	, S. and Norvig, P	(2003). Artifiical Intel	ligence: A									
	Moder	n Approach. 2ndE	dition. New York: Prer	tice-Hall.									
	3) Cohen	3) Cohen, P.R. (1995) Empirical Methods in Artificial											
	Intellig	<u>ence</u> . Cambridge,	MA: MIT Press.										
	4) https://	www.toptal.com/ ls-machine-learni	machine-learning/ensen	nble-									

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1 : Define basics of Machine Learning and stochastic	PO1,PO2,PO3,PO4,
	concepts.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
2.	CO-2: Classify and Compare existing models to understand the	PO1,PO2,PO3,PO4,
	applicability in solve real world societal problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
3.	CO-3: Identify develop and apply mathematical models to find	PO1,PO2,PO3,PO4,
	sustainable solutions.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
4.	<b>CO-4 :</b> <i>Analyse</i> the logical ability to apply feature engineering to	PO1,PO2,PO3,PO4,
	extract hierarchical patterns existing in real life problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
5.	<b>CO-5</b> : <i>Evaluate</i> the learning models to glance the upcoming world	PO1,PO2,PO3,PO4,
	through it.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
6.	<b>CO-6</b> : Discuss the applicability of Machine learning Approaches to	PO1,PO2,PO3,PO4,
	develop sustainable solutions using professional ethics.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3



### **PO and PSO mapping with level of strength for Course Name** Concepts of Machine Learning (**Course Code** CSA-202)

Subject	BO'a /	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	r50's	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Concepts of Machine	CO1	3	3	3	3	3	3	2	1	1	3	1	3	2	2	1
Learning	CO2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
(Course Code	CO3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
CSA-201)	CO4	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
	CO5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

		-	•		-											
Course Code	Course Name	PO 1	PO2	PO 3	РО 4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS 0 3
CSA- 201	Concepts of Machine Learning	3.00	3.00	3.00	3.00	3.00	3.00	2.83	2.00	2.00	3.00	2.67	3.00	2.83	2.83	2.67

#### Total- 41.83 Strength of Correlation

1. Addressed to *Slight* (*Low=1*) *extent* 

2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Schoo	ol: SET	Batch: 2023-27											
Prog	ram: B.Tech.	Current Academic Year: 2023-24											
Bran	ch: CSE/IT	CSE with Specialization in Artificial Intelligence for IoT Application	ons Semester:										
		ш											
1	Course Code	CAL201											
2	<b>Course Title</b>	Machine Learning Lab											
3	Credits	1											
4	<b>Contact Hours</b>	0-0-2											
	(L-T-P)												
	Course Status	Core											
5	Course Objective	<ol> <li>Learn the basic concepts of Machine Learning algorithms.</li> <li>Make use of Data sets in implementing the machine learning algorithms.</li> </ol>											
		<ol> <li>Make use of Data sets in implementing the machine learning algorithms.</li> <li>Implement the machine learning concepts and algorithms in any suitable</li> </ol>											
		language of choice	in any suitable										
6	Course Outcomes	CO 1: Show the implementation of linear and logistic Regression on real	life applications.										
		CO-2: Interpretation of existing models to understand the solution envir	conment.										
		CO-3: Application of existing mathematical solutions to test real world	problems.										
		CO-4: Analyse the logical ability to apply clustering approach to extrac	t										
		hierarchical patterns existing in real life problems.											
		CO-5 : Build the understanding of learning theory to glance the upcoming world											
		through it.											
		CO-6: Appraise recent trends in machine learning and applications.											
7	Course	This course introduces computational learning paradigm for critical & i	mplementable										
	Description	understanding for supervised and unsupervised learning based problem	areas.										
8	Outline syllabus		CO Mapping										
	Unit 1	Core Concepts of Machine Learning											
		Write a Program to load and view data set file.	CO1										
		Write a program to implement simple linear regression using housing	CO1, CO2										
		price prediction problem.											
		Write a program to implement binary logistic regression using cancer	CO1, CO2										
		identification problem.											
	Unit 2	Supervised Learning Algorithms - Part One											
		Write a program to implement gradient descent method for learning.	CO1, CO2,										
			C06										
		Write a program to implement regularized linear regression.	CO1, CO2,										
		White a new group to implement a sub-size d la sistic responsion											
		write a program to implement regularized logistic regression.	CO1, CO2, ,										
		Write a program to Normaliza the data used in linear regression	00										
		problem above before predicting prices, and then predict the bousing	CO1, CO2,										
		problem above before predicting prices, and then predict the nousing	CO6										
	Unit 3	Supervised Learning Algorithms - Part Two											
		Write a program to implement Support Vector Machine regression	CO1.CO2.CO3										
		using suitable dataset.	,, CO6										
		Build an Artificial Neural Network by implementing the Back-	C01,C02,C03										
		propagation algorithm and test the same using appropriate data sets.	, CO6										

-



	Write a program ID3 algorithm. tree and apply th Write a program algorithm. Use a	to demonstrate the Use an appropriate his knowledge to c n to demonstrate the an appropriate data	e working of the decision tree based e data set for building the decision lassify a new sample. the working of the Random Forest set for classifying a new sample.	CO1,CO2,CO3 ,,CO6 CO1,CO2,CO3 ,CO6							
Unit 4	Unsupervised I Write a program appropriate data Write a program appropriate data	Learning to implement K-N set. to implement K-N set	Means clustering algorithm using an Means clustering algorithm using an	CO2,CO3,CO4 , CO6 CO2,CO3,CO4 CO6							
Unit 5	Hypothesis Tes and Ensemble	,									
	and testing data	Write a program to implement data split into training, cross validation and testing data.									
	Implement an E solve time series	Implement an Ensemble approach by combining different models to solve time series based prediction problem.									
	Conduct hypoth appropriate prob	Conduct hypothesis testing using some statistical toolkit on appropriate problem.									
Mode of examination	Practical										
Weightage	CA	MTE	ETE								
Distribution	25%	25%	50%								
Text book/s*	<ol> <li>Bishop Learnin</li> <li>Founda Mehrys Talwal</li> <li>Introdu Ethem. introdu</li> </ol>	<ol> <li>Bishop, C. (2006). Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.</li> <li>Foundations of Machine Learning, Second Edition By Mehryar Mohri, Afshin Rostamizadeh and Ameet Talwalkar, MIT Press, Second Edition, 2018.</li> <li>Introduction to Machine Learning, Third Edition, By EthemAlpaydin, The MIT Pressmitpress.mit.edu &gt; books &gt;</li> </ol>									
Other References	<ol> <li>Baldi, P. and Learning Appro</li> <li>Russel, S. and Approach. 2ndE</li> <li>Cohen, P.R. ( Cambridge, MA</li> <li>https://www.i machine-learning</li> </ol>	EthemAlpaydin, The MIT Pressmitpress.mit.edu > books > introduction-machine-learni 1) Baldi, P. and Brunak, S. (2002). Bioinformatics: A Machine Learning Approach. Cambridge, MA: MIT Press. 2) Russel, S. and Norvig, P. (2003). Artifical Intelligence: A Modern Approach. 2ndEdition. New York: Prentice-Hall. 3) Cohen, P.R. (1995) Empirical Methods in Artificial Intelligence. Cambridge, MA: MIT Press. 4) https://www.toptal.com/machine-learning/ensemble-methods- machine-learning									

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO 1 : Show the implementation of linear and logistic Regression on	PO1,PO2,PO3,PO4,
	real life applications.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
2.	CO-2 : Interpretation of existing models to understand the solution	PO1,PO2,PO3,PO4,
	environment.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
3.	CO-3 : Application of existing mathematical solutions to test real	PO1,PO2,PO3,PO4,
	world problems.	PO5,PO6,PO7,PO8,



		PO9,PO10, PSO1,PSO2,PSO3
4.	CO-4 : Analyse the logical ability to apply clustering approach to	PO1,PO2,PO3,PO4,
	extract hierarchical patterns existing in real life problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
5.	CO-5 : Build the understanding of learning theory to glance the	PO1,PO2,PO3,PO4,
	upcoming world	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
6.	CO-6: Appraise recent trends in machine learning and applications	PO1,PO2,PO3,PO4,
		PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3

**PO and PSO mapping with level of strength for Course Name** Concepts of Machine Learning (**Course Code** CAL201)

Subject	PO's / PSO' s	P 0 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PS O 3
Concep	CO1	3	3	3	3	3	3	2	1	1	3	1	3	2	2	1
ts of	CO2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
Machin	CO3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
Learnin	CO4	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
g	CO5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
(Cours								3				3		3	3	3
<b>e Code</b> CAL- 201)	CO6	3	3	3	3	3	3		3	3	3		3			

Average of non-zeros entry in following table (should be auto calculated).

Cour	Cours	Р		Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
se	e	0	РО	0	0	0	0	0	0	0	0	0	0	0	0	0
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
	Conce															
	pts of															
CAL	Machi															
-201	ne															
	Learni	3.0	3.0	3.0	3.0	3.0	3.0	2.8	2.0	2.0	3.0	2.6	3.0	2.8	2.8	2.6
	ng	0	0	0	0	0	0	3	0	0	0	7	0	3	3	7

Total- 41.83 Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Scho	ool:	School of Engineering & Technology												
Dep	artment	Computer Science &	: E	ngineering										
Prog	gram:	B. Tech												
Bra	nch:	CSE with Specializa	tio	n in Artificial Intelligen	ce for Io	Γ								
		Applications		_										
1	Course Code	CSA-203												
2	Course	Concepts of Neural	Net	tworks										
	Title													
3	Credits	3		_										
4	Contact	3		0	0									
	Hours													
	(L-T-P)													
	Course	Core												
	Status													
5	Course	6. To introduce the i	5. To introduce the ideas of learning rule and implement them based on											
	Objective	human experience	human experience.											
		7. To conceptualize t	To conceptualize the working of human brain using ANN.											
		8. To become familia	r w	vith neural networks that c	an learn	from available								
		examples and ge	ner	alize to form appropria	ate learn	ing rules for								
		inference systems.	inference systems.											
		9. To provide the m	atł	ematical background fo	r Neural	Network and								
		classification tech	niqu	ues.										
		10. To provide the	ie	mathematical backgroun	d for car	rying out the								
		optimization and	fan	niliarizing genetic algorit	thm for s	eeking global								
		optimum in self-le	arn	ing situation.		00								
6	Course	On successful co	mp	letion of this module stud	lents will	be able to:								
-	Outcomes	7. <b>Define</b> biologica	ı l si	gnificance of Neural Net	work and	list ANN								
		components.		0										
		8. <b>Classify</b> various	lea	rning paradigms based or	n real file	problems								
		9 Apply basic con	Cei	nts to build single and m	ulti-laver	feed-forward								
		neural networks	cej	to build single and in	and hayon	leeu loi wurd								
		10 <b>Analyze</b> and trai	n r	adial-basis function and	recurrent	networks								
		11 <b>Evolution self-or</b>	an	izing man for real life nr	oblems	networks,								
		12 Discuss and ada	an st a	ppropriate neural network	ks model	for real life								
		12. <b>Discuss</b> and ada	ла	ippropriate neural networ	ks mouer	Ioi ieai iiie								
7	Course	This source introduces	a +	ha hasia madala laamin	م ما م <u>م</u> شنه	ma and some								
/	Description	anniactions of recent	st	tworks. A fter this accurate	g algorith	ms, and some								
	Description	applications of neural	. 116 	tworks. After this course	e, we sho	ulu be able to								
		know now to use neu	ral	networks for solving dif	ierent pro	bolems related								
		to pattern recognition	tu	nction approaximation, da	ata visual	ization, and so								
		on.												
8														
	Unit 1	Introduction												

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А	Introduction, Motivation and History, Components of a	CO1
D	Induction-synapses, dendrite, cen nucleus, axon	
D	Activation function output function. Components of	
	Activation function, output function, Components of	CO1
	Artificial Neural Network: common activation functions,	COI
	network topologies- feed forward, recurrent networks,	
9	completely linked networks	
C	Neuron Activation order: Synchronous activation,	
	asynchronous activation, Communication with the	CO1
	outside world: input and output of data in and from	
	neural networks	
Unit 2	Learning Paradigms	
А	Learning Paradigms and their real Applications,	
	Unsupervised learning and Supervised learning,	CO2 $CO6$
	Reinforcement learning, Offline and online learning and	002,000
	their applications based on real life problems.	
В	Training patterns and teaching inputs, use of training	
	samples, data set split into training, validation and testing	CO2 $CO6$
	data, Implication of splitting of data set, Learning curves	02,000
C	Gradient optimization procedures. Hebbian learning rule	CO2
C	Oracient optimization procedures, ricobian learning rule	002
 Unit 3	The Perceptron, Backpropagation and its variants	002
Unit 3 A	The Perceptron, Backpropagation and its variantsSingle layer Perceptron network, Perceptron Learning	
Unit 3 A	The Perceptron, Backpropagation and its variantsSingle layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as a	CO3
Unit 3 A	The Perceptron, Backpropagation and its variantsSingle layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as agradient based learning strategy, Limitations of Single	CO3
Unit 3 A	The Perceptron, Backpropagation and its variants Single layer Perceptron network, Perceptron Learning Algorithm and convergence theorem, Delta rule as a gradient based learning strategy, Limitations of Single Layer Perceptron network	CO3
Unit 3 A B	<b>The Perceptron, Backpropagation and its variants</b> Single layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as agradient based learning strategy, Limitations of SingleLayer Perceptron networkMultilayer Perceptron Network, Backpropagation	CO3
Unit 3 A B	Gradient optimization procedures, recordance framing ruleThe Perceptron, Backpropagation and its variantsSingle layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as a gradient based learning strategy, Limitations of Single Layer Perceptron networkMultilayer Perceptron Network, Backpropagation learning and its applications	CO3
Unit 3 A B C	Gradient optimization procedures, recordance framing ruleThe Perceptron, Backpropagation and its variantsSingle layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as agradient based learning strategy, Limitations of SingleLayer Perceptron networkMultilayer Perceptron Network, Backpropagationlearning and its applicationsAnalysing effect of learning rate on learning process,	CO3
Unit 3 A B C	Oracle of learning ruleThe Perceptron, Backpropagation and its variantsSingle layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as a gradient based learning strategy, Limitations of Single Layer Perceptron networkMultilayer Perceptron networkMultilayer Perceptron Network, Backpropagation learning and its applicationsAnalysing effect of learning rate on learning process, Variants of Backpropagation algorithm	CO3 CO3 CO3
Unit 3 A B C Unit 4	<b>The Perceptron, Backpropagation and its variants</b> Single layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as agradient based learning strategy, Limitations of SingleLayer Perceptron networkMultilayer Perceptron Network, Backpropagationlearning and its applicationsAnalysing effect of learning rate on learning process,Variants of Backpropagation algorithmRadial Basis Function Neural Networks	CO3 CO3 CO3
Unit 3 A B C Unit 4 A	<b>The Perceptron, Backpropagation and its variants</b> Single layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as agradient based learning strategy, Limitations of SingleLayer Perceptron networkMultilayer Perceptron Network, Backpropagationlearning and its applicationsAnalysing effect of learning rate on learning process,Variants of Backpropagation algorithmRadial Basis Function Neural NetworksComponents & Structure of an RBF network, Information	CO3 CO3 CO3
Unit 3 A B C Unit 4 A	Oracle of learning FulleThe Perceptron, Backpropagation and its variantsSingle layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as agradient based learning strategy, Limitations of SingleLayer Perceptron networkMultilayer Perceptron Network, Backpropagationlearning and its applicationsAnalysing effect of learning rate on learning process,Variants of Backpropagation algorithmRadial Basis Function Neural NetworksComponents & Structure of an RBF network, Informationprocessing of an RBF network, Information Processing in	CO3 CO3 CO3 CO4
Unit 3 A B C Unit 4 A	<b>The Perceptron, Backpropagation and its variants</b> Single layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as agradient based learning strategy, Limitations of SingleLayer Perceptron networkMultilayer Perceptron Network, Backpropagationlearning and its applicationsAnalysing effect of learning rate on learning process,Variants of Backpropagation algorithmRadial Basis Function Neural NetworksComponents & Structure of an RBF network, Informationprocessing of an RBF network, Information Processing inRBF neurons, analytical thoughts prior to training	CO3 CO3 CO3 CO4
Unit 3 A B C Unit 4 A B	Conductive optimization procedures, recordance learning ruleThe Perceptron, Backpropagation and its variantsSingle layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as a gradient based learning strategy, Limitations of Single Layer Perceptron networkMultilayer Perceptron networkMultilayer Perceptron Network, Backpropagation learning and its applicationsAnalysing effect of learning rate on learning process, Variants of Backpropagation algorithmRadial Basis Function Neural NetworksComponents & Structure of an RBF network, Information processing of an RBF network, Information Processing in RBF neurons, analytical thoughts prior to trainingEquation system and gradient strategies for training,	CO3 CO3 CO3 CO4
Unit 3 A B C Unit 4 A B	<ul> <li>The Perceptron, Backpropagation and its variants</li> <li>Single layer Perceptron network, Perceptron Learning</li> <li>Algorithm and convergence theorem, Delta rule as a gradient based learning strategy, Limitations of Single</li> <li>Layer Perceptron network</li> <li>Multilayer Perceptron Network, Backpropagation</li> <li>learning and its applications</li> <li>Analysing effect of learning rate on learning process,</li> <li>Variants of Backpropagation algorithm</li> <li>Radial Basis Function Neural Networks</li> <li>Components &amp; Structure of an RBF network, Information processing of an RBF network, Information Processing in RBF neurons, analytical thoughts prior to training</li> <li>Equation system and gradient strategies for training, Growing RBF Networks, comparison of RBF Networks</li> </ul>	CO3 CO3 CO3 CO4 CO4
Unit 3 A B C Unit 4 A B	<ul> <li>The Perceptron, Backpropagation and its variants</li> <li>Single layer Perceptron network, Perceptron Learning</li> <li>Algorithm and convergence theorem, Delta rule as a gradient based learning strategy, Limitations of Single</li> <li>Layer Perceptron network</li> <li>Multilayer Perceptron Network, Backpropagation</li> <li>learning and its applications</li> <li>Analysing effect of learning rate on learning process,</li> <li>Variants of Backpropagation algorithm</li> <li>Radial Basis Function Neural Networks</li> <li>Components &amp; Structure of an RBF network, Information processing of an RBF network, Information Processing in RBF neurons, analytical thoughts prior to training</li> <li>Equation system and gradient strategies for training, Growing RBF Networks, comparison of RBF Networks and Multilayer Perceptrons</li> </ul>	CO3 CO3 CO3 CO4 CO4
Unit 3 A B C Unit 4 A B B	<ul> <li>The Perceptron, Backpropagation and its variants</li> <li>Single layer Perceptron network, Perceptron Learning</li> <li>Algorithm and convergence theorem, Delta rule as a gradient based learning strategy, Limitations of Single</li> <li>Layer Perceptron network</li> <li>Multilayer Perceptron Network, Backpropagation</li> <li>learning and its applications</li> <li>Analysing effect of learning rate on learning process,</li> <li>Variants of Backpropagation algorithm</li> <li>Radial Basis Function Neural Networks</li> <li>Components &amp; Structure of an RBF network, Information processing of an RBF network, Information Processing in RBF neurons, analytical thoughts prior to training</li> <li>Equation system and gradient strategies for training,</li> <li>Growing RBF Networks, comparison of RBF Networks and Multilayer Perceptrons</li> <li>Recurrent Neural Networks: Jordan networks, Elman</li> </ul>	CO3 CO3 CO3 CO4 CO4
Unit 3 A B C Unit 4 A B B	Oradient optimization procedures, neopain rearing ruleThe Perceptron, Backpropagation and its variantsSingle layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as a gradient based learning strategy, Limitations of Single Layer Perceptron networkMultilayer Perceptron networkMultilayer Perceptron Network, Backpropagation learning and its applicationsAnalysing effect of learning rate on learning process, Variants of Backpropagation algorithmRadial Basis Function Neural NetworksComponents & Structure of an RBF network, Information processing of an RBF network, Information Processing in RBF neurons, analytical thoughts prior to training Equation system and gradient strategies for training, Growing RBF Networks, comparison of RBF Networks and Multilayer PerceptronsRecurrent Neural Networks: Jordan networks, Elman Networks, Training Recurrent neural networks	CO3 CO3 CO3 CO4 CO4 CO4
Unit 3 A B C Unit 4 A B C	Oradient optimization procedures, recordant learning rateThe Perceptron, Backpropagation and its variantsSingle layer Perceptron network, Perceptron LearningAlgorithm and convergence theorem, Delta rule as agradient based learning strategy, Limitations of SingleLayer Perceptron networkMultilayer Perceptron Network, Backpropagationlearning and its applicationsAnalysing effect of learning rate on learning process,Variants of Backpropagation algorithmRadial Basis Function Neural NetworksComponents & Structure of an RBF network, Informationprocessing of an RBF network, Information Processing inRBF neurons, analytical thoughts prior to trainingEquation system and gradient strategies for training,Growing RBF Networks, comparison of RBF Networksand Multilayer PerceptronsRecurrent Neural Networks: Jordan networks, ElmanNetworks, Training Recurrent neural networks	CO3 CO3 CO3 CO4 CO4 CO4
Unit 3 A B C Unit 4 A B B C Unit 5	<b>The Perceptron, Backpropagation and its variants</b> Single layer Perceptron network, Perceptron Learning         Algorithm and convergence theorem, Delta rule as a         gradient based learning strategy, Limitations of Single         Layer Perceptron network         Multilayer Perceptron Network, Backpropagation         learning and its applications         Analysing effect of learning rate on learning process,         Variants of Backpropagation algorithm <b>Radial Basis Function Neural Networks</b> Components & Structure of an RBF network, Information         processing of an RBF network, Information Processing in         RBF neurons, analytical thoughts prior to training         Equation system and gradient strategies for training,         Growing RBF Networks, comparison of RBF Networks         and Multilayer Perceptrons         Recurrent Neural Networks: Jordan networks, Elman         Networks, Training Recurrent neural networks	CO3 CO3 CO3 CO4 CO4 CO4



A	Self-organizing feature maps, structure of a self- organizing feature map, Training of SOM, Topology function, common distance and topology functions, relationship between learning rates and neighbourhoods, applications of SOMs	CO5,CO6
В	Introduction to Adaptive Resonance Theory, Task and structure of an ART Network, Learning process of an ART Network- top down and bottom up learning, Extensions- ART2, ART3	CO5,CO6
С	Introduction to Hobbfield Network, Associative Network (Homogenous & Heterogeneous), Introduction to Restricted Boltzman Machine.	CO5,CO6
Mode of examination		
Weightage	CA MTE ETE	
Distribution	25% 25% 50%	
Text	3. David Kriesel, 2007, "A Brief Introduction to	
book/s*	Neural Networks", available at	
	http://www.dkriesel.com	
	4. Simon O. Haykin, "Neural Networks and	
	Learning Machines", Pearson	
Other	9. ANDERSON, JAMES A., AN INTRODUCTION	
References	TO NEURAL NETWORKS, PHI Learning.	
	10. Christopher M. Bishop & Geoffrey Hinton, Neural	
	Networks for Pattern Recognition, Oxford	
	University Press.	

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	<b>Define</b> biological significance of Neural Network and list ANN components.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	<b>Classify</b> various learning paradigms based on real life problems	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	<b>Apply basic concepts to build</b> single and multi-layer feed-forward neural networks.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	Analyze and train radial-basis function and recurrent networks;	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	Explain self-organizing map for real life problems.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8,



		PO9,PO10, PSO1,PSO2,PSO3
6.	<b>Discuss</b> and adapt appropriate neural networks model for real life applications.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3

## PO and PSO mapping with level of strength for Course Name: Neural networks (Course Code- CSA-203)

															Р	P
Course Code_	CO's			Р	Р	Р	Р	Р	Р	Р		Р	Р	PS	S	S
Course Name	003	РО	PO	0	0	0	0	0	0	0	РО	0	0	0	0	0
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
	CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
Neural networks	CO2	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
(Course Code-	CO3	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
CSA-203)	CO4	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
	CO5	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
	CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3

#### Average of non-zeros entry in following table (should be auto calculated).

Course	Course Name	РО	PO	PO	PO	PO	PS	PS	PS							
Code		1	2	3	4	5	6	7	8	9	10	11	12	O 1	O 2	03
CSA- 203	Neural networks	3.0 0	3.0 0	3.0 0	3.0 0	2.8 3	2.3 3	2.3 3	1.1 7	2.3 3	3.0 0	2.6 7	3.0 0	3.00	3.00	2.67

#### **Total 40.3**

#### **Strength of Correlation**

Addressed to Slight (Low=1) extent
 Addressed to Moderate (Medium=2) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology											
Dep	artment	Computer Science & Engineering											
Pro	gram:	B.Tech											
Bra	nch:	CSE with Specialization in Artificial Intelligence for	or IoT										
		Applications											
1	Course Code	CSI202											
2	Course Title	IoT: Architecture and Programming											
3	Credits	2											
4	Contact	2-0-0											
	Hours												
	(L-T-P)												
	Course Status	Core											
5	Course	This course provides a preliminary view on Logical a	nd Physical										
	Objective	Design of IoT systems and gives an overview of Data	analytics for IoT.										
6	Course	CO1: Recall the basic concepts of Internet of Things											
	Outcomes	CO2: Explain the concepts of logical design of IoT Sy	stem using										
		Python.											
		CO3: Demonstrate the Raspberry Pi interfaces with P	ython										
		CO4: Interpret the IoT Physical Servers and Cloud Of	ferings										
		CO5: Make use of data analytics for IoT using Apache Hadoop											
		COb: Utilize the IoT reference architecture required in building IoT											
_		based solutions.											
1	Course	The course focuses on understanding the vision of	lo1 from a global										
	Description	perspective, understand its applications, and desi-	Ermine its market										
		state of out analite sture in IoT and its applications in as	gement, building a										
		state of art arcmeeture in for and its applications in co	ommercial building										
8	Outline syllabi		CO Mapping										
0	Unit 1	Introduction to IoT											
		Introduction Physical Design of IOT I ogical design											
	Λ	of IoT IoT Levels & Development Templates	CO1										
	В	Difference between IoT and M2M_SDN and NFV											
	D	for IoT. Need for IoT systems management. Simple	CO1										
		Network Management Protocol (SNMP)											
	С	Network operator requirements, NETCONF,											
		YANG, IoT systems Management with NETCONF,	CO1										
		YANG											
	Unit 2	IoT Systems- Logical Design using Python											
	А	Language features of Python, Data types, data	CO1 CO2										
		structures, Control of flow											
	В	Functions, modules, packaging, file handling,	CO1, CO2										
		data/time operations, classes											
	С	Python packages for Internet of Things	CO1, CO2										
	Unit 3	IoT Physical Devices and Endpoints											
	A	Basic building blocks of an IoT device, Exemplary Device: Raspberry Pi	CO1, CO2, CO3										
	В	About the board, Raspberry Pi interfaces	CO1, CO2, CO3										



С	Programming	Raspberry Pi	with Python	CO1, CO2, CO3					
Unit 4	IoT Physical	Servers and	Cloud Offerings						
А	Introduction t	to Cloud Stora	ge models and	CO1, CO2, CO4					
В	Webserver -	Web server fo	r IoT, Cloud for IoT	CO1, CO2, CO4					
С	Python web a services for Io	pplication fram T	nework, Amazon Web	CO1, CO2, CO4					
Unit 5	Data analyti	cs for IoT							
А	Introduction, MapReduce f	Apache Hado or Batch Data	op, Using Hadoop Analysis	CO5, CO6					
В	Apache Oozie	e, Apache Spa	rk, Apache Storm	CO5, CO6					
С	Using Apache	e Storm for Re	eal-time Data Analysis	CO5, CO6					
Mode of examination	Theory/Jury/I								
Weightage	CA	A MSE ESE							
Distribution	25%								
Text book/s*	<ol> <li>Arshdeep B Approach "Int 2015.</li> <li>"Internet of Hillar,Publish 35 Livery Stre 1-78588-138-</li> </ol>	<ol> <li>Arshdeep Bahga and Vijai Madisetti : A Hands-on Approach "Internet of Things", Universities Press 2015.</li> <li>"Internet of Things with Python" Gastón C. Hillar, Published by Packt Publishing Ltd. Livery Place 35 Livery Street Birmingham B3 2PB, UK. ISBN 978- 1-78588-138-1</li> </ol>							
Other References	<ol> <li>Kamal, R., Architecture a Mcgraw Hill.</li> <li>Misra, S., I NPTEL Cour Science &amp; En Technology F https://nptel.a</li> <li>Samuel Gree MIT press, 20</li> <li>Adrian McI the Internet of</li> </ol>	<ol> <li>Kamal, R., (2017), Internet of Things - Architecture and Design Principles, 1st Edition, Mcgraw Hill.</li> <li>Misra, S., Introduction to Internet of Things, NPTEL Course Material, Department of Computer Science &amp; Engineering, Indian Institute of Technology Kharagpur, https://nptel.ac.in/courses/106105166/</li> <li>Samuel Greengard, "The Internet of Things", The MIT press, 2015.</li> <li>Adrian McEwen and Hakim Cassimally "Designing the Internet of Things "Wiley,2014.</li> </ol>							

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Recall the basic concepts of Internet of Things	PO1, PO9, PO12, PSO2
2.	CO2: Explain the concepts of logical design of IoT System using Python.	PO1, PO9, PO12, PSO1, PSO2



3.	CO3: Demonstrate the Raspberry Pi interfaces with Python	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PO12, PSO1, PSO2
4.	CO4: Interpret the IoT Physical Servers and Cloud Offerings	PO1, PO4, PO5, PO7, PO9, PO10, PO12, PSO2
5.	CO5: Make use of data analytics for IoT using Apache Hadoop	PO1, PO2, PO5, PO9, PO10, PO12, PSO2, PSO3
6.	CO6: Utilize the IoT reference architecture required in building IoT based solutions.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3

## PO and PSO mapping with level of strength for Course Name IoT: Architecture and Programming (Course Code CSI202)

Course Code_ Course Name	CO's	PO 1	РО 2	РО 3	Р О4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PS O2	PS O3
	CO1	2	-	-	-	-	-	-	-	1	-	-	2	-	2	-
CSI202 _IoT:	CO2	2	-	-	-	-	-	i.	-	2	i.	1	2	2	2	-
Archite	CO3	2	3	2	3	3	-	2	1	2	3	-	2	3	2	-
and	CO4	2	-	-	2	2	-	2	-	2	2	-	2	-	2	-
Progra mming	CO5	2	2	-	-	3	-	-	-	2	3	-	2	-	2	2
	CO6	3	3	3	3	3	2	3	3	3	3	2	2	3	3	3

#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	РО 3	РО 4	P O 5	PO 6	Р О 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSI202	IoT: Architect ure and Program ming	2.2	2.7	2.5	2.7	2. 8	2.0	2.3	2.0	2.0	2.8	2.0	2.0	2.7	2.2	2.5

#### Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Prog	gram:	B.Tech								
Bra	nch:	CSE with Specialization in Artificial Intelligence for	or IoT							
		Applications								
1	Course Code	CIP202								
2	Course Title	IoT: Architecture and Programming Lab								
3	Credits	1								
4	Contact Hours	0-0-2								
	(L-T-P)									
	Course Status	Core								
5	Course	This course provides a preliminary view on Logical at	nd Physical							
	Objective	Design of IoT systems and gives an overview of Data	analytics for							
		IoT.								
6	Course	CO1: Demonstrate the concepts of IoT for home auto	mation and							
	Outcomes	security.								
		CO2: Develop of logical design of IoT System using	Python.							
		CO3: Construct the Raspberry Pi interfaces with Pyth	on							
		CO4: Interpret the IoT Physical Servers and Cloud Of	terings							
		COS: Evaluate data analytics for IoT using Apache H	adoop							
		CO6: Utilize the 101 reference architecture required in	n building to I							
7	Course	Dased solutions.	oT from a alabal							
/	Description	ne course rocuses on understanding the vision of perspective understand its applications and dESE	rmine its market							
	Description	perspective, understand its applications, and desp	ement building a							
		state of art architecture in IoT and its application	s in commercial							
		building automation and real world design constraints								
8	Outline syllabus	building automation and rear world design constraints	CO Manning							
	Unit 1	Introduction to IoT								
		Sending e-mail from IoT kit.	CO1							
		Internet based home automation and home security	C01							
		system								
	Unit 2	IoT Systems- Logical Design using Python								
		Python-Based Multicolored-LED control	CO1, CO2							
		Water level monitoring using Python and Moisture	CO1, CO2							
		sensing and logging using python.								
	Unit 3	IoT Physical Devices and Endpoints								
		Touchscreen photo-booth with a Raspberry Pi	CO1, CO2,							
			CO3							
		Raspberry Pi weather forecast display and	CO1, CO2,							
		Programming Raspberry Pi for Home automation	CO3							
		system.								
	Unit 4	IoT Physical Servers and Cloud Offerings								
		Internet or intranet controlled motor	CO1, CO2,							
		Design 101-Enabled Embedded Web Server and	CO1, CO2,							
	TI:4 5	Server-less based web application.	004							
	Unit 5	Data analytics for IoT								



	Improvement pollution level	hnologies to reduce	CO5, CO6	
	Enhance traffi control	c conditions and	l Internet-based street light	CO5, CO6
Mode of examination	Jury/Practica	l/Viva		
Weightage	СА	CE (Viva)	ESE	
Distribution	25%	25%	50%	
Text book/s*	<ol> <li>Arshdeep I Approach "In 2015.</li> <li>"Internet o Hillar,Publish 35 Livery Str 1-78588-138-</li> </ol>	3ahga and Vijai iternet of Thing f Things with P red by Packt Pu eet Birminghan -1	Madisetti : A Hands-on s", Universities Press ython" Gastón C. blishing Ltd. Livery Place n B3 2PB, UK. ISBN 978-	
Other References	<ol> <li>Kamal, R. Architecture Mcgraw Hill</li> <li>Misra, S., NPTEL Cours Science &amp; En Technology https://nptel.a</li> <li>Samuel Gro MIT press, 20</li> <li>Adrian Mc the Internet o</li> </ol>	, (2017), Intern and Design Pr Introduction to rse Material, D ngineering, Ind Kharagpur, ac.in/courses/1 eengard, "The D15. Ewen and Haki f Things "Wile	et of Things - inciples, 1st Edition, Internet of Things, epartment of Computer lian Institute of 06105166/ Internet of Things", The m Cassimally "Designing y,2014.	

# PO and PSO mapping with level of strength for IoT: Architecture and Programming Lab (Course Code CIP202)

Course Code_ Course Name	CO's	PO 1	РО 2	РО 3	PO4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	2	2	1	2	2	2	2	-	2	1	3	3	2	2	-
CIP202_IoT:	CO2	2	2	2	1	2	-	-	-	2	-	2	3	2	2	-
Architecture	CO3	2	2	2	1	2	-	-	-	2	-	3	3	2	2	-
Programming	CO4	2	2	2	1	2	-	-	2	2	-	3	3	2	2	-
Lab	CO5	2	2	2	2	2	-	-	2	2	-	3	3	3	3	-
	CO6	2	2	2	2	2	3	2	2	3	1	3	3	3	3	2



#### Average of non-zeros entry in following table (should be auto calculated).

Course	Course	РО	PO	PO	PO	РО	РО	РО	РО	PO	PO	PO	PO	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	0 1	2	O 3
CIP202	IoT: Architect ure and Program ming Lab	2.0	2.0	1.8	1.5	2.0	2.5	2.0	2.0	2.2	1.0	2.8	3.0	2.3	2.3	2.0

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Prog	gram:	B.Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for Io	T									
		Applications										
1	Course Code	CSI302										
2	Course Title	IoT: Sensing & Actuator Devices										
3	Credits	3										
4	Contact	3-0-0										
	Hours											
	(L-T-P)											
	Course Status	Core										
5	Course	The objective of this course is to introduce the students the	e fundamental									
	Objective	principles of sensing technology. Also to explain the chara	acteristics and									
		interfacing techniques with different types of sensors and	actuators.									
6	Course	CO1: Define the general concepts of sensors used in IoT										
	Outcomes	CO2: Classify proximity, ultrasound and motion sens	ors based on									
		knowledge and principles of working.										
		CO3: Compare various environmental sensors.										
		CO4: List the various optical device drivers and displays	s actuators for									
		CO5: Examine the mechanical drivers, DC motor and	servo motor									
		actuators for IoT.										
	0	CO6: Develop the small lo1 projects based on sensors & a	actuators.									
/	Course	This course gives an overview of sensors used in 101 y	with sampling									
	Description	irequency and bandwidth requirements for different senso	rs. The course									
		also describes the interface common sensors and action development kits	uators to 101									
8	Outline syllabi		CO									
0	Outline synabl	15	Manning									
	∐nit 1	Introduction to Sensors and Sensing	wiapping									
	A	Understanding and classification of sensors and										
	1	actuators Characteristics of Sensors Touch sensors:	CO1									
		Button Force sensor Capacitive sensor	001									
	В	Light sensors: Photoresistor, Photodiode, Phototransistor	CO1									
	C C	Electrical characteristic sensors: Voltage sensor Current										
	0	sensor	CO1									
-	Unit 2	Sensors and Sensing-I										
	A	Proximity and distance sensors: Optocoupler, Infrared	CO1, CO2,									
		sensor	CO6									
	В	Ultrasound sensor, Motion dESEctor	CO1, CO2,									
			CO6									
	С	Angle sensors: PotentiomESEr, The inertial										
		measurement unit (IMU), Hall sensor, Global	CO1, CO2,									
		positioning system	00									
	Unit 3	Sensors and Sensing-II										
	A	Environment sensors: Temperature sensor	CO1, CO3,									
			CO6									



В	Humidity sen	isor	CO1, CO3,								
	5	,		CO6							
С	Chemical/sm	oke and gas se	nsor Level sensor	CO1, CO3,							
		C		CO6							
Unit 4	Actuator-I										
А	Optical devic	e drivers and t	heir devices: Light-emitting	CO1, CO4,							
	diode			CO6							
В	Displays: Liq	Displays: Liquid-crystal display (LCD),									
				CO6							
С	Organic light	-emitting diod	e display (OLED), Electronic	CO1, CO4,							
	ink display (F	ink display (E ink)									
Unit 5	Actuator-II										
А	Mechanical d	Mechanical drivers, Relay, Solenoid, Speaker									
-	22			<u>CO6</u>							
В	DC motor (or	COI, CO5,									
C	Ctown on a star	C06									
C	Stepper moto	CO1, CO5,									
 Mode of	Theory/Jumy/	00									
examination	Theory/Jury/J										
 Weightage	CA	MSE	ESE								
Distribution	25%	25%	50%								
 Text book/s*	1. Internet of	f Things, by th	e IOT-OPEN.EU								
	consortiu	m: 2016–2019	Erasmus+								
	2 Dr Guilla	ume Girardin	Antoine Bonnabel Dr. Fric								
	2. Di Guine Mounier	Technologies	& Sansors for the Internet of								
	Things D	vincento & M	arket Tranda 2014								
			t Conversion to 2014 -								
	2024,101	e Developmen	a Copyrights ,2014.								
	3. PESEr W	g Internet of Things', Packt									
	Publishin	g, 2015									
Other	1. Editors C	OvidiuVermesa	an PESEr Friess,'Internet of								
References	Things -	– From Res	search and Innovation to								
	Market.D	Market.Deployment', River Publishers, 2014.									
	2. N. Ida,	Sensors, Actu	ators and Their Interfaces,								
	Scitech P	ublishers, 2014	4.								



S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Define the general concepts of	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	sensors used in IoT	PO8, PO10, PO12, PSO1
2.	CO2: Classify proximity, ultrasound and	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	motion sensors based on knowledge and	PO8, PO9, PO10, PO11, PO12, PSO1,
	principles of working.	PSO2, PSO3
3.	CO3: Compare various environmental	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	sensors.	PO8, PO9, PO10, PO11, PO12, PSO1,
		PSO2, PSO3
4.	CO4: List the various optical device drivers	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	and displays actuators for IoT.	PO8, PO9, PO10, PO11, PO12, PSO1,
		PSO2, PSO3
5.	CO5: Examine the mechanical drivers, DC	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	motor and servo motor actuators for IoT.	PO8, PO9, PO10, PO11, PO12, PSO1,
		PSO2, PSO3
6.	CO6: Develop the small IoT projects based	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	on sensors & actuators.	PO8, PO9, PO10, PO11, PO12, PSO1,
		PSO2, PSO3

## PO and PSO mapping with level of strength for Course Name IoT: Sensing & Actuator Devices (Course Code CSI302)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	2	1	1	1	1	1	1	1	-	1	-	2	1	-	-
	CO2	2	2	1	1	1	2	2	1	2	2	2	2	2	1	1
CSI302_IoT: Sensing &	CO3	2	2	1	1	1	2	3	1	2	2	2	2	2	1	1
Actuator Devices	CO4	2	2	1	1	1	2	1	1	2	2	2	2	2	1	1
Devices	CO5	2	2	1	1	1	2	1	1	2	2	2	2	2	1	1
	CO6	3	3	3	3	2	3	2	1	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO2	РО	РО	РО	PO	РО	РО	PO	PO	PO	PO	PSO	PSO	PSO
Code	Name	1		3	4	5	6	7	8	9	10	11	12	1	2	3
CSI302	IoT: Sensing & Actuator Devices	2.2	2.0	1.3	1.3	1.2	2.0	1.7	1.0	2.2	2.0	2.2	2.2	2.0	1.4	1.2

- Addressed to Slight (Low=1) extent
   Addressed to Substantial (High=3) extent
- \_\_\_\_\_



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Pro	gram:	B.Tech								
Bra	nch:	CSE with Specialization in Artificial Intelligence for	ГоТ							
		Applications								
1	Course Code	CIP302								
2	Course Title	IoT: Sensing & Actuator Devices Lab								
3	Credits	1								
4	Contact Hours	0-0-2								
	(L-T-P)									
	Course Status	Compulsory								
5	Course	The objective of this course is to introduce the students t	he							
	Objective	fundamental principles of sensing technology. Also to ex	xplain the							
		characteristics and interfacing techniques with different	types of							
		sensors and actuators.								
6	Course	CO1: Demonstrate the use of general sensors in IoT								
	Outcomes	CO2: Illustrate the use of electrical, proximity and distar	nce sensors.							
		CO3: Experiment with various ultrasound and motion se	ensors							
		CO4: Examine the use of various environmental sense	ors and optical							
		devices.								
		CO5: Design the IoT application using mechanical driv	ers, DC motor							
		and servo motor actuators.								
	~	CO6: Develop the small loT projects based on sensors &	z actuators.							
7	Course	This course gives an overview of sensors used in IoT	with sampling							
	Description	frequency and bandwidth requirements for different sense	ors. The course							
		also describes the interface common sensors and act	tuators to IoT							
0	Outline exultation		CO							
ð	Outline synabus		CO							
	Unit 1	Introduction to Sonsors and Sonsing	Mapping							
		Touch sensors: Button Force sensor Conscitive sensor	CO1 CO6							
		Light sansors: Diotoragistor Diotodioda	CO1, CO6							
		Phototransistor	001,000							
	Unit 2	Sensors and Sensing-I								
		Flectrical characteristic sensors: Voltage sensor	CO2 CO6							
		Current sensor	002,000							
		Proximity and distance sensors: Ontocoupler Infrared	CO2 CO6							
		sensor	002,000							
	Unit 3	Sensors and Sensing-II								
		Ultrasound sensor. Motion dESEctor	CO3. CO6							
		Angle sensors: PotentiomESEr. The inertial	CO3. CO6							
		measurement unit (IMU). Hall sensor, Global								
		positioning system								
	Unit 4	Actuator-I								
		Implementation of Environment sensors	CO4, CO6							
		Implementation of LCD, LED, OLED	CO4, CO6							
	Unit 5	Actuators-II	,							
		Mechanical drivers, Relay, Solenoid, Speaker	CO5, CO6							



	DC motor (o	DC motor (one direction), Stepper motor, Servomote									
Mode of	Jury/Practica	l/Viva									
examination											
Weightage	CA	CA CE (Viva) ESE									
Distribution	25%	25%	50%								
Text book/s*	4. Internet of	of Things, by th	e IOT-OPEN.EU								
	consortiu	m: 2016–2019	, Erasmus+								
	5. Dr. Guill	aume Girardin	, Antoine Bonnabel, Dr.								
	Eric Mou	nier, 'Technolo	ogies &Sensors for the								
	Internet of	of Things Busir	esses & Market Trends								
	2014 - 20	24',Yole Deve	lopment Copyrights ,2014.								
	6. PESEr W	aher, 'Learning	g Internet of Things', Packt								
	Publishin	g, 2015									
Other	3. Editors (	DvidiuVermesa	n PESEr Friess,'Internet of								
References	Things	– From Res	earch and Innovation to								
	Market.D	iver Publishers, 2014.									
	4. N. Ida,	Sensors, Actua	ators and Their Interfaces,								
	Scitech P	ublishers, 2014	4.								

## PO and PSO mapping with level of strength for IoT: Sensing & Actuator Devices Lab (Course Code CIP302)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	Р О4	РО 5	PO 6	PO 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
CIP302	CO1	3	2	2	2	3	1	1	-	3	3	3	2	1	-	-
_IoT:	CO2	3	3	2	2	3	2	2	-	3	3	3	2	2	2	-
Sensing &	CO3	3	3	2	2	3	2	3	-	3	3	3	2	2	2	-
Actuato	CO4	3	3	2	2	3	2	1	-	3	3	3	2	2	2	-
Devices	CO5	3	3	2	2	3	2	1	2	3	3	3	2	2	2	-
Lab	CO6	3	3	3	3	3	3	2	2	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO	PO	PO	РО	PO	РО	РО	PO	PO	PO	PO	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	O 1	2	O 3
CIP302	IoT: Sensing & Actuator Devices Lab	3.0	2.8	2.2	2.2	3.0	2.0	1.7	2.0	3.0	3.0	3.0	2.2	2.0	2.2	2.0

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	School: School of Engineering & Technology										
Dep	artment	Computer Science & Engineering									
Pro	gram:	B.Tech									
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	T								
		Applications									
1	Course Code	CSI303									
2	Course Title	Wireless Technologies for IoT									
3	Credits	3									
4	Contact	3-0-0									
	Hours										
	(L-T-P)										
	Course Status	Core									
5	Course	This aim of this course is to introduce relevant concepts a	nd emerging								
	Objective	trends in wireless technology and its applications.									
6	Course	CO1: Develop the basic concept of RF signals and wireles	SS								
	Outcomes	communication									
		CO2: Identify the concepts of cellular network and genera	tions of								
		mobile communication									
		CO3: List the various organization protocols of WLAN									
		CO4: Interpret Wi-Fi hardware and software for appropria	ate functions								
		CO5: Explain the functions of wireless PAN with Bluetoc	oth, wifi and								
		6LoPAN									
		CO6: Design IoT based solutions using the wireless techn	ologies.								
7	Course	Wireless and mobile systems have become ubiquitor	us; playing a								
	Description	significant role in our everyday life. However, the increasi	ng demand for								
		wireless connectivity and the emergence of new areas such	as the Internet								
		of Things present new research challenges.	1								
8	Outline syllabu	15	CO								
			Mapping								
	Unit 1	<b>RF Basics: Radio Frequency (RF) Fundamentals:</b>									
	А	Introduction to RF & Wireless Communications	CO1								
		Systems, RF and Microwave Spectral Analysis,									
		Communication Standards									
	В	Understanding RF & Microwave Specifications.	CO1								
		Spectrum Analysis of RF Environment, Protocol									
		Analysis of RF Environment, Units of RF measurements									
	C	Factors affecting network range and speed,	CO1								
		Environment, Line-of-sight, Interference, Defining									
		differences between physical layers- OFDM.									
	Unit 2	Cellular Standards	<u> </u>								
	А	Cellular carriers and Frequencies, Channel allocation,	CO1, CO2								
		Cell coverage, Cell Splitting, Microcells, Picocells									
	В	Handott, 1st, 2nd, 3rd and 4th Generation Cellular	CO1, CO2								
		Systems (GSM, CDMA, GPRS, EDGE, UMTS),									
	C	Mobile IP, WCDMA, Data Protocols (MQTT, CoAP)	CO1, CO2								
	Unit 3	WLAN									
	А	Wi-Fi Organizations and Standards: IEEE, Wi-Fi	CO1, CO2,								
		Alliance, WLAN Connectivity	CO3								



В	WLAN QoS	& Power-Save	, IEEE 802.11 Standards	CO1, CO2,							
				CO3							
С	IEEE 802.11	Standards: 802	2.11-2007, 802.11a/b/g,	CO1, CO2,							
	IEEE 802.110	e/h/i,802.11n		CO3							
Unit 4	Wi-Fi Hardy	vare & Softwa	are								
А	Access Points	s, WLAN Rou	ters, WLAN Bridges, WLAN	CO1, CO2,							
	Repeaters,			CO4							
В	Direct-conne	ct Aps, Distrib	uted connect Aps, PoE	CO1, CO2,							
	Infrastructure			CO4							
С	Endpoint, Cli	CO1, CO2,									
	Applications	CO4									
Unit 5	WSN & WP										
А	Wireless Pers	CO5, CO6									
	Standards, Bl	Standards, BlueTooth Protocol Architecture,									
В	UWB, IEEE	802.15.4 stand	ards, ZigBee, 6LoWPAN,	CO5, CO6							
	Sub GHz, Ser	nsor Networks	,								
С	Coexistence s	strategies in Se	ensor Networks, Routing	CO5, CO6							
	protocols in V	Wireless Senso	r Networks.								
Mode of	Theory/Jury/	Practical/Viva									
examination											
Weightage	CA	MSE	ESE								
Distribution	25%	25%	50%								
Text book/s*	1. Rappa										
	Comr	nunication, Pri	nciple and Practice", Second								
	Editio	on, Pearson, 20	15.								
Other	1. Adity	a K Jagannatha	am, Principles of Modern								
References	Wirel										
	Mcgra										



S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: Develop the basic concept of RF signals and	PO1, PO3, PO9, PO10,
	wireless communication	PO12
2.	CO2: Identify the concepts of cellular network and	PO1, PO2, PO8, PO9, PO10,
	generations of mobile communication	PO12
3.	CO3: List the various organization protocols of	PO1, PO2, PO4, PO8, PO9,
	WLAN	PO10, PO11, PO12
4.	CO4: Interpret Wi-Fi hardware and software for	PO1, PO2, PO3, PO8, PO9,
	appropriate functions	PO10, PO11, PO12
5.	CO5: Explain the functions of wireless PAN with	PO1, PO2, PO4, PO5, PO7,
	Bluetooth, wifi and 6LoPAN	PO8, PO9, PO10, PO11,
		PO12, PSO1
6.	CO6: Design IoT based solutions using the wireless	PO1, PO2, PO3, PO4, PO5,
	technologies.	PO7, PO8, PO9, PO10,
		PO11, PO12, PSO1, PSO2,
		PSO3

## PO and PSO mapping with level of strength for Course Name Wireless Technologies for IoT (Course Code CSI303)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	-	2	-	-	-	-	-	1	2	-	1	-	-	-
	CO2	3	2	-	-	-	-	-	1	1	2	-	1	-	-	-
CSI303_Wireless	CO3	3	2	-	2	-	-	-	2	2	2	2	2	-	-	-
IoT	CO4	3	2	2	-	-	-	-	2	2	2	2	2	-	-	-
	CO5	3	2	-	2	3	-	3	2	3	2	3	3	2	-	-
	CO6	3	3	3	3	3	-	3	3	3	3	3	3	2	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO2	РО	РО	PO	PO	РО	РО	PO	PO	PO	PO	PSO	PSO	PSO
Code	Name	1		3	4	5	6	7	8	9	10	11	12	1	2	3
CSI303	Wireless Technologies for IoT	3.0	2.2	2.3	2.3	3.0	-	3.0	2.0	2.0	2.2	2.5	2.0	2.0	3.0	3.0

#### Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment	Computer Science & Engineering									
Pro	gram:	B.Tech									
Bra	nch:	CSE with Specialization in Artificial Intelligence for 1	loT								
		Applications									
1	Course Code	CIP303									
2	Course Title	Wireless Technologies for IoT Lab									
3	Credits	1									
4	Contact Hours (L-T-P)	0-0-2									
	Course Status	Core									
5	Course Objective	Study the wireless channel characteristics and perform Discuss cellular communication and modulation scher next generation cellular standards.	ance issues. • nes. • Review								
6	Course Outcomes	CO1: Utilize the path loss model to find the losses CO2: Experiment with Communication Tool box in MA CO3: Inspect WLAN Multipath Channel CO4: Make use of Simulink in MATLAB CO5: Develop Spread spectrum schemes on Simulink CO6: Utilize the wireless technologies for IoT based sol	TLAB								
7	Course Description	This course reviews the various communication standard domain. This course will provide students an understand wireless standards, modes of communication and efficient	s in wireless ing about the ncy criteria								
8	Outline syllabus	S	CO Mapping								
	Unit 1	Free space Propagation									
		Path Loss model to dESErmine the free space loss.	CO1,CO6								
		Path Loss model to dESErmine the power received using Matlab program	CO1,CO6								
	Unit 2	Introduction to the IEEE80211.a WLAN PHY									
		Communication Toolbox in MATLAB									
		What is IEEE 802.11a WLAN PHY? Briefly explain the functions of each blue block in the model diagram.	CO2,CO6								
		What type of shadowing is IEEE802.11 WLAN based on.	CO2,CO6								
	Unit 3	Investigation on WLAN Multipath Channel									
		Plot BER-SNR and Bit Rate-SNR graphs for different types of fading channel i. No Fading ii. Flat Fading iii. Dispersive Fading	CO3,CO6								
		Plot BER-SNR and Bit Rate-SNR graphs for different types of fading channel for Dispersive Fading	CO3,CO6								
	Unit 4	Introduction to Simulink									
		Familiarize with the block components of Simulink in MATLAB	CO4,CO6								
		Setup a basic integrator for a square wave input and note the paramESErs like amplitude, frequency etc	CO4,CO6								
	Unit 5	Implementation of Spread spectrum Simulink									



	Implement a Matlab Simu	Implement a Direct Sequence Spread Spectrum with Matlab Simulink										
	Implement a send a hidder signal using	simple stegand n text message DSSS	ography system which can enveloped by a speech	CO5,CO6								
Mode of	Jury/Practica	Jury/Practical/Viva										
examination												
Weightage	CA	CE (Viva)	ESE									
Distribution	25%	25%	50%									
Text book/s*	Rappaport T	heodore S "Wi	reless Communication,									
	Principle and	Principle and Practice", Second Edition, Pearson, 2015										
Other	Aditya K Jag	Aditya K Jagannatham , Principles of Modern Wirele										
References	Communicat	ion Systems' .1	st Edition, Mcgraw Hill.									

## PO and PSO mapping with level of strength for Course Name Wireless Technologies for IoT Lab (Course Code CIP303)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	PO4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	3	-	-	2	-	-	-	2	-	-	3	-	-	-
	CO2	3	3	2	-	3	3	-	-	2	-	-	3	3	2	-
CIP303_Wireless	CO3	3	3	3	2	3	3	-	-	3	-	2	3	3	2	-
IoT Lab	CO4	3	3	3	2	3	3	-	-	3	-	2	3	3	2	-
	CO5	3	3	3	2	3	3	-	-	3	-	3	3	3	3	-
	CO6	3	3	3	3	3	3	-	-	3	-	3	3	3	3	-

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO2	РО	РО	РО	PO	РО	РО	PO	PO	PO	PO	PSO	PSO	PSO
Code	Name	1		3	4	5	6	7	8	9	10	11	12	1	2	3
CIP303	Wireless Technologies for IoT Lab	3.0	3.0	2.8	2.3	2.8	3.0	-	-	2.7	-	2.5	3.0	3.0	2.4	-

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent


School: SET Batch : 2023-27											
Pro	ogram: B-	Current Academic Year:2023-24									
TE	CH	CSE with Specialization in Artificial Intelligence for IoT Applications									
Bra	anch: CSE	CSE with Specia Semester: V	lization in Artificial Intelligence for Ic	oT Applications							
1	Course Code	CSA-022	Course Name: Introduction to Cloud	d Computing with							
2	Course Title	Introduction to	Cloud Computing with ML								
3	Credits	3									
4	Contact	3-0-0									
	Hours										
	(L-T-P)										
	<b>Course Status</b>										
5	Course	This introductory	course on Cloud computing will teach b	oth the fundamental							
	Objective	s Cloud technologies									
		e concepts.									
6	Course	e course, students will have achieved	the following learning								
	Outcomes	objectives.									
	(CO's)	CO7. Define	the basics of cloud and recall the comp	outer Science concepts							
		which a	are helpful in understanding on demand s	service architecture.							
		CO8. Classif	y and describe the architecture and tax	onomy of parallel and							
		distribu	ited computing, including shared and di	stributed memory, and							
		data an	d task parallel computing.	1-61							
		kilow and use of cloud									
		CO10 Cotogo	fractructure corrigoe								
		deploy	mant models and governance in cloud or	mouting Examine the							
		design	of task and data parallel distributed algo	orithms for Clouds and							
		ucsign	m to construct Cloud applications	fittining for Clouds and							
		CO11 Evaluat	te the importance of cloud using monitori	ng and management of							
		service	s for performance improvement of H	PC and to follow the							
		Govern	ance and Compliances.	e une to fonoti the							
		CO12. Elabora	ate the design concept and formulate to b	build the solution using							
		cloud s	ervice providers as AWS as EC2, LAM	BDA, S3 and Machine							
		Learnir	ng Service as AWS SageMaker.	, ,							
7	Course	This course is an	introductory course for cloud computing	g concepts and helps in							
	Description	understanding the	e core functionalities, algorithms, mod	els and workflows in							
		cloud environment	nt. In this course Students will get demo	onstrations of real-time							
		cloud services for	better exposure and research understand	ling.							
8	Syllabus Outlin		10	CO Mapping							
	Unit I	FOUNDATION	NS	CO1							
	A	Introduction to	compute	COI							
		Types of Com									
		ent-server computing, Three Tier									
		Architecture, use	U sockets and kemote Procedure Call,								
		Sockets Massac	a Outputs and Massaga Brokers								
	B	Introduction to	Cloud Computing	CO1							
	U	Cloud Comput	ing definition Roots of Cloud	COI							
		Computing Law	vers and Types of Clouds Desired								
		Features of a Clo	oud, Cloud Infrastructure Management.								



	Infrastructure as a Service Providers, Platform as a	
	Service Providers, Challenges and Risks	
С	Migrating and Integrating into Cloud	CO1
	Broad Approaches to Migrating into the Cloud, The	
	Seven-Step Model of Migration into a Cloud, Enriching	
	the 'Integration as a Service' Paradigm for the Cloud	
	Era, Evolution and Challenges of SaaS Paradigm,	
	Integration Scenarios, The Integration Methodologies	
Unit 2	ENTERPRISE CLOUD COMPUTING AND IAAS	
А	The Enterprise Cloud Computing Paradigm	CO1,CO2
	Issues for Enterprise Applications on the Cloud,	,
	Transition Challenges, Enterprise Cloud Technology	
	and Market Evolution, Business Drivers Toward a	
	Marketplace for Enterprise Cloud Computing, The	
	Cloud Supply Chain	
В	Virtual Machines Provisioning and Migration	CO1,CO2
	Services	
	Introduction to Virtual Machines, The Anatomy of	
	Cloud Infrastructures, VM Provisioning and	
	Manageability, Virtual Machine Migration Services,	
	Management of Virtual Machines for Cloud	
	Infrastructures,, Distributed Management of Virtual	
	Infrastructures, Scheduling Techniques	
С	Enhancing Cloud Computing Environments Using a	CO1,CO2
	Cluster as a Service	
	Introduction and Related Work, RVWS Design, Cluster	
	as a Service: The Logical Design, Secure Distributed	
	Data Storage in Cloud Computing, Cloud Storage,	
	Technologies for Data Security in Cloud Computing	
Unit 3	PLATFORM AND SOFTWARE AS A SERVICE	
А	Aneka and CometCloud	CO1,CO3
	Aneka—Integration of Private and Public Clouds,	
	Technologies and Tools for Cloud Computing, Aneka	
	Cloud Platform, CometCloud: An Autonomic Cloud	
	Engine, Introduction of CometCloud (Architecture,	
	Autonomic Behavior, Applications overview)	
В	Business Solutions and WorkFlow	CO1,CO3,CO6
	Cloud-Based Solutions for Business Applications	
	(Introduction of Enterprises Demand and Cloud	
	Computing, Dynamic ICT Services), Workflow Engine	
	for Clouds, Workflow Management Systems,	
	Architecture of Workflow Management Systems	
C	Scientific Applications and MapReduce Model	CO1,CO3,CO6
	Scientific Application for Cloud Environments,	
	Classification of Scientific Applications and Services in	
	the Cloud, SAGA-based Scientific Applications,	
	MapReduce Programming Model, MapReduce Impacts	
	and Research Directions	
 TT •/ 4		
Unit 4	MUNITUKING, MANAGEMENT &	
	GUVEKNANCE	001 004
A	SLA Management in Cloud Computing	CO1,CO4



	Introduction of typi	cal Use Cases,	Model for Federated									
	Cloud Computing, S											
	Management in Clo											
	Provider's Perspecti	ive, Types of S	LA, Life Cycle of									
	SLA, Automated Po	olicy-based Ma	nagement									
В	Performance Pred	lictions for HI	<b>PC on Clouds</b>	CO1,CO4								
	Introduction and Ba	ckground of G	rid and Cloud, HPC in									
	the Cloud: Perform	ance-related I	ssues, Game Hosting									
	on Cloud Resour	ces, Building	g Content Delivery									
	Networks Using Clo	ouds, Resource	Cloud Masnups									
С	Security and Gove	rnance		CO1,CO4								
	Basic Concept of O	Basic Concept of Organizational Readiness, Drivers for										
	Changes: Common	lanagement Models,										
	Security and Risk in											
	Identity, Content Le											
	Issues in Cloud Con											
	Security Issues											
Unit 5	AWS with Machin	e Learning	117, 1									
А	AWS Services:EC2	C01,C05,C06										
	Amazon Sageiviakei	r, Machine Lea	Ining with Amazon									
	a Model with Amor	e, Analyze, and	Deploy a Model in									
	a Model with Amaz	on Sagewiaker	, Deploy a Model III									
	Amazon SageMaker	r Notebook Ins	tonco									
B	Amazon SageMaker	r Studio Perfo	rm Common Tasks in	CO1 CO5 Co6								
D	Amazon SageMaker	r Studio, Amaz	on SageMaker API	001,000,000								
	reference, Actions a	nd Data Types	, Use Autopilot to									
	automate model dev	elopment and	Problem types,									
	Create and Manage	Workforces, U	Jse Ground Truth for									
	Labeling	,										
С	Process Data and Ev	valuate Models	, Build Models and	CO1,CO5,CO6								
	Choose an Algorithm	m, Train Mode	els, Debugger,									
	Perform Automatic	Model Tuning	, Tune Multiple									
	Algorithms, Use Re	inforcement Lo	earning, Incremental									
	Training, Deploy M	Iodels, Multi-N	Aodel Endpoints,									
Mode of	Theory											
 examination	~ .											
Weightage		MTE										
 Distribution	25%	25%	<u> </u>	( 11 D '1								
Text Books	I. CLOUD COMPU	TING Princip	les and Paradigms, Edi	ted by Rajkumar								
	Buyya, Jam 2. Claud Commutin	- A Due eties 1	anneach Anthony T	Valta Taha I Valta								
	2. Cloud Computing	g: A Practical A	Approach, Anthony I.	vene, roby J. vene,								
	Kobert Elsenpeter	Robert Elsenpeter										
Reference	Amazon SageMaker	r, Developer G	uide,									
Books	https://docs.aws.ama	azon.com/sage	maker/latest/dg/sagema	aker-dg.pdf#gs								
Online	https://aws.amazon	.com/getting-s	tarted/hands-on/build-t	rain-deploy-machine-								
Materials	learning-model-sage	emaker/										
	https://aws.amazon.	com/machine-l	learning/									



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Define the basics of cloud and recall the computer Science concepts which are helpful in understanding on demand service architecture. Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory, and data and task parallel computing.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	Define the basics of cloud and recall the computer	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	Apply the PAAS and SAAS to manage the workflow and use of cloud in scientific application.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	Categorize and Characterize between Infrastructure services, deployment models, and governance in cloud computing. Examine the design of task and data parallel distributed algorithms for Clouds and use them to construct Cloud applications.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	Evaluate the importance of cloud using monitoring and management of services for performance improvement of HPC and to follow the Governance and Compliances	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	Elaborate the design concept and formulate to build the solution using cloud service providers as AWS as EC2, LAMBDA, S3 and Machine Learning Service as AWS SageMaker.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3



PO and PSO mapping with level of strength for Course Name Introduction to Cloud Computing with
Machine Learning

Course Code_ Course Name	CO's	РО 1	PO 2	PO 3	PO4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
Introduction to	CO2	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
Cloud Computing with Machine	CO3	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
Learning	CO4	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
0011-022	CO5	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3
	CO6	3	3	3	3	3	3	3	1	2	3	1	3	3	3	3

#### Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	РО 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS 0 2	PS 0 3
CSA- 022	Introduction to Cloud Computing with Machine Learning	3.00	3.0 0	3.0 0	3.0 0	1.8 3	1.6 7	1.3 3	1.0 0	1.3 3	2.0 0	1.0 0	3.0 0	2.6 7	3.0 0	2.0 0

# **Total- 39.00 Strength of Correlation**

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology												
Dep	artment	Computer Science & Engineering												
Pro	gram:	B.Tech												
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	т											
		Applications												
1	Course Code	CSI401												
2	Course Title	IoT Security												
3	Credits	3												
4	Contact	3-0-0												
	Hours													
	(L-T-P)	Corp												
_	Course Status	Uore The aim of this course is to educate students on key areas in IoT security												
5	Course	The aim of this course is to educate students on key areas i	n loT security.											
	Objective	I have to express fully manage for accurity and build a sofe	ies answers on											
		how to successfully manage IoT security and build a safe infrastructure for smart devices												
6	Course	CO1: Define the concepts to IoT security in enterprise												
Ŭ	Outcomes	CO2: Outline IoT security and vulnerability threats.												
		CO3: Compare different IoT protocols and their security i	neasures.											
		CO3. Compare different for protocols and their security measures. CO4: Examine how to secure an IoT development												
		CO5: Explain the Identity and Access Management (IAM) Solutions for												
		the IoT												
		CO6: Choose individual components that can affect the se	curity posture											
		of the entire system												
7	Course	This course describes how to implement cybersecurity solutions, IoT												
	Description	design best practices, and risk mitigation methodologies to	o address											
		device and intrastructure threats to IoT solutions.												
8	Outline syllabi	15	CO											
	Unit 1	IoT in the Enternrise	wiapping											
		Defining the IoT Cybersecurity versus IoT security and												
	11	cyber-physical systems. IoT uses today	CO1											
	В	IoT device lifecycle. The hardware. Operating systems.												
		IoT communications, Messaging protocols, Transport	CO1											
		protocols, Network protocols												
	С	Data link and physical protocols, IoT data collection,												
		storage, and analytics, IoT integration platforms and	CO1											
		solutions, Need to secure IoT												
	Unit 2	Vulnerabilities, Attacks, and Countermeasures												
	Α	Primer on threats, vulnerability, and risks (TVR)	CO2, CO6											
	B	Common IoT attacks, Today's IoT attacks	CO2, CO6											
	C	Threat modeling an IoT system	CO2, CO6											
	Unit 3	Security Engineering for IoT Development												
	A	Building security in to design and development, Security												
		in ague developments, Focusing on the lol device in	003,006											
	D	Operation Sofaty and accurity design Processes and acrossests	$CO^2 CO^2$											
	D	Safety and security design, Processes and agreements	CUS, CUb											



C	Tashnalass	CO2 CO6										
C	Technology s	C03, C06										
Unit 4	Cryptograp											
A	Types and us	Types and uses of cryptographic primitives in the IoT, Encryption and decryption. Hashes, Digital Signatures.										
	Encryption a	nd decryption,	Hashes, Digital Signatures,	CO4, CO6								
	Random num	ber generation	, Cipher suites									
В	Cryptographi	ic key manager	nent fundamentals	CO4, CO6								
С	Cryptographi	Cryptographic controls built into IoT communication and messaging protocols Identity and Access Management (IAM) Solutions										
	and messagir											
Unit 5	<b>Identity and</b>											
	for the IoT	for the IoT The identity lifecycle, Establish naming conventions and uniqueness requirements Authentication credentials: Passwords, Symmetric Keys, Certificates, Biometrics										
А	The identity											
	uniqueness re											
В	Authenticatio											
	Certificates,											
С	IoT IAM infi	IoT IAM infrastructure, Authorization and access control										
	control											
Mode of	Theory/Jury/	Practical/Viva										
examination												
Weightage	CA	MSE	ESE									
Distribution	25%	25%	50%									
Text book/s*	1. Practi	ical Internet of	Things Security, Brian									
	Russe	ell, Drew Van I	DurenCopyright © 2016									
	Packt	Publishing										
 Other		ginner's Guide	to Internet of Things									
Duferences	I. A DC		to internet of finings									
Kelefences	Secur											
	and F											
	Tewa											
	2. Interr	2. Internet of Things Security, Challenges,										
	Adva	nces, and Anal	ytics, Chintan Patel and									
	Nisha	nt Doshi CRC	Press									



S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: Define the concepts to IoT security in	PO1, PO2, PO3, PO4, PO8,
	enterprise.	PO12
2.	CO2: Outline IoT security and vulnerability threats.	PO1, PO2, PO3, PO4, PO8,
		PO12
3.	CO3: Compare different IoT protocols and their	PO1, PO2, PO3, PO4, PO5,
	security measures.	PO8, PO12
4.	CO4: Examine how to secure an IoT development	PO1, PO2, PO3, PO4, PO5,
		PO6, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3
5.	CO5: Explain the Identity and Access Management	PO1, PO2, PO3, PO4, PO5,
	(IAM) Solutions for the IoT	PO6, PO8, PO9, PO11, PO12,
		PSO1
6.	CO6: Choose individual components that can affect	PO1, PO2, PO3, PO4, PO5,
	the security posture of the entire system	PO6, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3

# PO and PSO mapping with level of strength for Course Name Internet of Things Security (Course Code CSI401)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	1	2	1	-	-	-	2	-	-	-	2	-	-	-
	CO2	3	1	1	1	-	-	-	2	-	-	-	2	-	-	-
CSI401_Internet	CO3	3	2	2	2	2	-	-	2	-	-	-	2	-	-	-
of Things Security	CO4	3	3	3	3	2	2	-	3	3	3	3	3	2	2	3
	CO5	3	3	3	3	2	2	-	1	2	-	2	3	2	-	-
	CO6	3	3	3	3	3	3	-	2	3	3	3	3	2	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO2	РО	РО	PO	PO	РО	PO	PO	PO	PO	PO	PSO	PSO	PSO
Code	Name	1		3	4	5	6	7	8	9	10	11	12	1	2	3
CSI401	Internet of Things Security	3.0	2.2	2.3	2.2	2.3	2.3		2.0	2.7	3.0	2.7	2.5	2.0	2.5	3.0

### Strength of Correlation

Addressed to Slight (Low=1) extent
Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology												
Dep	artment	Computer Science & Engineering												
Pro	gram:	B.Tech												
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	т											
		Applications												
1	Course Code	CSI023												
2	Course Title	Micro-controller programming using Arduino												
3	Credits	2												
4	Contact	2-0-0												
	Hours													
	(L-T-P)													
	Course Status	Core												
5	Course	This Course provides the basics of micro-controllers an	d sensors very											
	Objective	quickly and can start building prototype with very little in	vestment. This											
		course is intended to make you comfortable in gettin	g started with											
	~	Arduino.												
6	Course	1: Define Arduino programming language and IDE												
	Outcomes	<i>J2</i> : Illustrate the syntax and structure of Arduino Programming for												
		CO2: Explain various desision making statements and us	I applications											
		1/0 functions available	e with digital											
		$\Gamma O I $ unchoirs available.	J functions available.											
		CO5: DESErmine the working of advance functions and i	nterrupts with											
		the Arduino's hardware interrupt pins	interrupts with											
		CO6: Design embedded applications using Arduino Platfo	orm											
7	Course	Arduino is a prototype platform (open-source) based on	an easy-to-use											
, ·	Description	hardware and software. It consists of a circuit board.	which can be											
	I I I	programed (referred to as a microcontroller) and a ready-	made software											
		called Arduino IDE (Integrated Development Environm	ent), which is											
		used to write and upload the computer code to the p	hysical board.											
		Arduino provides a standard form factor that breaks the f	unctions of the											
		micro-controller into a more accessible package.												
8	Outline syllabu	18	CO											
			Mapping											
	Unit 1	The Arduino Ecosystem												
	А	The Arduino Platform, Hardware List, Installing the	CO1. CO6											
	5	Software												
	В	Connecting the Arduino, Opening a Sketch, Selecting	CO1, CO6											
	C	the Board and Serial Port, Uploading a Sketch												
	Un:4 2	The Structure of Andwine C	CO1, CO0											
		Lising Comments Basic Functions Statements and	CO1 CO2											
	Λ	Syntax	CO1, CO2,											
	B	Verifying and Unloading Working with Variables.	C01 C02											
		Variables, Declaring Variables, Variable Names, Data	CO6											
		Types												
	С	Variable Qualifiers, Predefined Constants, Variable	CO1, CO2											
	-	Scope, Using Operators	CO6											



Unit 3	<b>Decision Making S</b>			
А	Comparative and L	ogical Op	perators, Control	CO1 CO2
	Statements: If, For,	While, D	Do, Control Statements:	CO3, CO6
	Switch, Break, Con	tinue		005,000
В	Arduino I/O Demys	stified, D	igital Functions: pinMode(),	CO1, CO2,
	digitalWrite(), digit	alRead()		CO3, CO6
C	State Changes, Tog	gle, Cour	nting, Modality	CO1, CO2,
				CO3, CO6
Unit 4	Analog I/O			
А	Analog Demystified	CO1, CO2,		
	analogWrite(), anal-	CO4, CO6		
В	Analog Serial Moni	CO1, CO2,		
	the Serial Monitor	CO4, CO6		
С	Mapping Values: m	CO1, CO2,		
				CO4, CO6
Unit 5	<b>Advanced Functio</b>	ns		
А	Timing Functions, I	Random !	Functions, Writing	CO5 CO6
	Functions			005,000
В	Declaring Function	s, Calling	g Functions, Function	CO5, CO6
В	Declaring Function Returns, Function F	s, Calling <u>ParamESI</u>	g Functions, Function Ers	CO5, CO6
B C	Declaring Function Returns, Function P Hardware Interrupts	s, Calling ParamESI s: attachI	g Functions, Function Ers nterrupt(), detachInterrupt()	CO5, CO6 CO5, CO6
B C Mode of	Declaring Functions Returns, Function F Hardware Interrupts Theory/Jury/Practic	s, Calling <u>ParamESI s: attachI</u> al/Viva	g Functions, Function Ers nterrupt(), detachInterrupt()	CO5, CO6 CO5, CO6
B C Mode of examination	Declaring Function Returns, Function F Hardware Interrupts Theory/Jury/Practic	s, Calling ParamESI s: attachI ral/Viva	g Functions, Function Ers nterrupt(), detachInterrupt()	CO5, CO6 CO5, CO6
B C Mode of examination Weightage	Declaring Functions Returns, Function F Hardware Interrupts Theory/Jury/Practic CA MSE	s, Callin <u>ParamESI</u> <u>s: attachI</u> cal/Viva	g Functions, Function Ers nterrupt(), detachInterrupt() ESE	CO5, CO6 CO5, CO6
B C Mode of examination Weightage Distribution	Declaring FunctionsReturns, Function FHardware InterruptsTheory/Jury/PracticCAMSE25%25%	s, Calling ParamESI s: attachI cal/Viva	g Functions, Function Ers nterrupt(), detachInterrupt() ESE 50%	CO5, CO6 CO5, CO6
B C Mode of examination Weightage Distribution Text book/s*	Declaring Functions Returns, Function F Hardware Interrupts Theory/Jury/Practic CA MSE 25% 25% 1. Beginning A	s, Calling ParamESI s: attachI cal/Viva	g Functions, Function Ers nterrupt(), detachInterrupt() ESE 50% Programming, Brian Evans,	CO5, CO6 CO5, CO6
B C Mode of examination Weightage Distribution Text book/s*	Declaring FunctionsReturns, Function FHardware InterruptsTheory/Jury/PracticCAMSE25%25%1. Beginning AApress	s, Calling ParamES1 s: attachI cal/Viva	g Functions, Function Ers nterrupt(), detachInterrupt() ESE 50% Programming, Brian Evans,	CO5, CO6 CO5, CO6
B C Mode of examination Weightage Distribution Text book/s* Other	Declaring Functions Returns, Function F Hardware Interrupts Theory/Jury/Practic CA MSE 25% 25% 1. Beginning A Apress 1. Arduino: A	s, Calling ParamESI s: attachI cal/Viva	g Functions, Function Ers nterrupt(), detachInterrupt() ESE 50% Programming, Brian Evans, tart Guide, Second Edition,	CO5, CO6 CO5, CO6



S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	CO1: Define Arduino programming language and IDE	PO1, PO4, PO5, PO6, PO9, PO10,
		PO11, PO12, PSO1, PSO2, PSO3
2.	CO2: Illustrate the syntax and structure of Arduino	PO1, PO2, PO3, PO4, PO5, PO6,
	Programming for IoT applications	PO7, PO9, PO10, PO11, PO12,
		PSO1, PSO2, PSO3
3.	CO3: Explain various decision making statements and	PO1, PO2, PO3, PO4, PO5, PO6,
	use with digital I/O functions available.	PO7, PO9, PO10, PO11, PO12,
		PSO1, PSO2, PSO3
4.	CO4: Identify functions to read, interpret, and output	PO1, PO2, PO3, PO4, PO5, PO6,
	analog signals.	PO7, PO9, PO10, PO11, PO12,
		PSO1, PSO2, PSO3
5.	CO5: DESErmine the working of advance functions	PO1, PO2, PO3, PO4, PO5, PO6,
	and interrupts with the Arduino's hardware interrupt	PO7, PO8, PO9, PO10, PO11,
	pins.	PO12, PSO1, PSO2, PSO3
6.	CO6: Design embedded applications using Arduino	PO1, PO2, PO3, PO4, PO5, PO6,
	Platform	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3

# PO and PSO mapping with level of strength for Course Name Micro-controller programming using Arduino (Course Code CSI023)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	PO4	РО 5	PO 6	РО 7	РО 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	2	-	-	1	2	2	-	-	1	1	1	2	2	1	1
	CO2	2	2	2	1	2	2	2	-	1	1	1	2	2	1	1
CSI023_Micro- controller	CO3	2	2	2	2	3	2	2	-	2	2	2	2	3	2	1
programming using Arduino	CO4	2	3	2	2	3	2	2	-	2	2	2	2	3	2	1
using Artunno -	CO5	2	3	3	3	3	2	2	2	2	2	2	2	3	3	1
	CO6	3	3	3	3	3	2	2	3	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO2	РО 3	РО 4	РО 5	РО 6	РО 7	РО 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSI023	Micro- controller programming using Arduino	2.2	2.6	2.4	2.0	2.7	2.0	2.0	2.5	1.8	1.8	1.8	2.2	2.7	2.0	1.2

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Scho	ool:	School of Engineering & Technology											
Depa	artment	Computer Sc	ience & Engin	eering									
Prog	gram:	<b>B.Tech</b>											
Brai	nch:	CSE with Spe	ecialization in A	Artificial Intelligence of Thin	ngs (AIoT)								
1	Course Code	CIP023											
2	Course Title	Micro-contro	ller programmi	ng using Arduino Lab									
3	Credits	1											
4	Contact Hours	0-0-2											
	(L-T-P)												
	Course Status	Core											
5	Course	With Arduino	Vith Arduino, the student can get to know the basics of mi-										
	Objective	and sensors v	ery quickly and	l can start building prototype	with very little								
		investment. This course is intended to make you comfortable in getting											
		started with A	rduino.										
6	Course	CO1: Demonstrate Arduino programming language and IDE											
	Outcomes	CO2: Experim	CO2: Experiment with variables in Arduino Programming										
		CO3: Constru	CO3: Construct various decision making statements and use										
		I/O functions	O functions available.										
		CO4: Impleme	CO4: Implement functions to read, interpret, and output ana										
		CO5: Elaborat	CO5: Elaborate the working of advance functions with the A										
7	Course	CO6: Design e	CO6: Design embedded applications using Arduino Platform										
/	Description	hordwara and	Arduino is a prototype platform (open-source) based on an										
	Description	naruware and	ardware and software. It consists of a circuit board, which can										
		called Arduin	o IDF (Integrate	d Development Environment	which is used								
		to write and	upload the cor	nputer code to the physical	hoard Arduino								
		provides a sta	andard form fa	ctor that breaks the functions	of the micro-								
		controller into	a more accessi	ble package	, or the intero								
8	Outline syllabus	••••••••••	••••••••		CO Mapping								
-	Unit 1	Arduino Plat	form										
		Introduction to	o Arduino Platf	orm, the components that	CO1, CO6								
		make up an A	rduino board an	d their functions.	,								
		Installing and	working with A	Arduino.	CO1, CO6								
	Unit 2	Working with	h Variables										
		Implement RC	GB Blink: Uploa	ading the Source Code	CO2, CO6								
		Implement 7-0	Color Blink: Up	loading the Source Code	CO2, CO6								
	Unit 3	Digital Ins an	nd Outs										
		Implement Til	lt Blink: Upload	ling the Source Code	CO3, CO6								
		Implement No	oisy Cricket: Up	loading the Source Code	CO3, CO6								
	Unit 4	Analog Ins ar	nd Outs										
		Implement Te	lematic Breath:	Uploading the Source Code	CO4, CO6								
		Implement An	CO4, CO6										
	Unit 5	Advanced Fu	nctions										
		Implement HS	SB Color Mixer	: Uploading the Source Code	CO5, CO6								
		Implementing	a case study ba	ased on the above concepts.	CO5, CO6								
	Mode of	Jury/Practical/	/Viva										
	examination												
	Weightage	CA	MTE	ETE									
	Distribution	60%	0%	40%									
	Text book/s*	-											



PO and PSO mapping with level of strength for Course Name Micro-controller programming using Arduino Lab (Course Code CIP023)

Cour se Code																
Cour	CO's			Р							Р	Р	Р	PS		Р
se		Р	РО	0	Р	Р	Р	Р	Р	Р	0	0	0	0	PS	S
Nam		0			0	0	0	0	0	0	1	1	1		0	0
e		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CIP0 23	CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
Micr	CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
o- cont	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
rolle r	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
prog ram	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
ming usin g Ard uino Lab	COG	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
Lau																



Cour se Code	Cours e Name	Р О 1	P O 2	P O 3	Р О 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	P 0 1 1	P O 1 2	PS O 1	PS O 2	PS 0 3
CIP0 23	Micro - contro ller progr ammi ng using Ardui no Lab	2. 3	2. 0	2. 0	2. 0	3. 0	2. 0	2. 0	2. 2	2. 5	2. 5	2. 5	2. 7	2.7	2.0	2.0

Average of non-zeros entry in following table (should be auto calculated).

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Scho	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Prog	gram:	B. Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	T									
		Applications										
1	<b>Course Code</b>	CSA301										
2	<b>Course Title</b>	SOFT COMPUTING										
3	Credits	3										
4	Contact	3 0 0										
	Hours											
	(L-T-P)											
	Course Status	Core										
5	Course	The primary objective of this course is to provide an introduction to the	e basic principles,									
	Objective	techniques, and applications of soft computing.										
	5	Upon successful completion of the course, students will have an understanding of										
		the basic areas of Soft Computing including Artificial Neural Networks, Fuzzy										
		Logic and Genetic Algorithms.										
		• Provide the mathematical background for carrying out the optimi	zation associated									
		with neural network learning.										
		• Aim of this course is to develop some familiarity with current r	esearch problems									
		and research methods in Soft Computing by working on a re	search or design									
6	Course	The Completion of this Course will Enable the Students to be able to	Learn									
0	Outcomes	<b>CO1:</b> Define the basic concepts of soft computing.	Louin									
	Outcomes	<b>CO2:</b> Explain applications & operations of Fuzzy Logic in real life p	roblems.									
		<b>CO3:</b> Apply different FIS models to solve optimization problems.										
		<b>CO4:</b> Analyse and examine Evolutionary and swarm algorithms in s	olving real world									
		Multi-Objective optimization problems										
		CO5: Choose of different optimization algorithms to solve real-lif	e multi objective									
		problems.										
		<b>CO6:</b> Discuss applications of Soft Computing and solve Problems in	Varieties of									
7	Course	Application Domains. This course will cover fundamental concepts used in Soft computing	The concepts of									
/	Description	Fuzzy logic (FL) will be covered first followed by Artificial Neural N	Jetworks (ANNs)									
	Description	and optimization techniques using Genetic Algorithm (GA). App	lications of Soft									
		Computing techniques to solve a number of real life problems will be	e covered to have									
		hands on practices.										
8			СО									
			Mapping									
	Unit 1	Introduction to Soft Computing										
	А	Concept of computing systems. What is Soft Computing?	CO1									
	В	"Soft" Computing versus "Hard" computing	CO1									
	С	Characteristics of Soft computing, Some applications of Soft	CO1, CO6									
	11 11 0	computing techniques	,									
	Unit 2	FUZZY LOGIC										
	A	Introduction to Fuzzy logic, Fuzzy sets and membership functions	CO2									
	В	Operations on Fuzzy sets. Fuzzy relations, rules, propositions,	CO2									
		implications and inferences.										



	С	Defuzzification	techniques, Fuzzy	logic controller design, Some real	CO2							
	Unit 3	Fuzzy inference	e System	10810.								
	А	Fuzzy Inference	Systems, Differe	ent Fuzzy Models: Mamdani								
		Fuzzy Models, S	Sugeno Fuzzy Mo	dels	CO3							
	В	Tsukamoto Fuzz	y Models, Input	Space Partitioning and Fuzzy								
		Modeling.	, , , , , , , , , , , , , , , , , , ,		CO3							
	С	Neuro Fuzzy	Modelling: Ada	ptive Neuro-Fuzzy Inference								
		Systems, Archite	ecture, Hybrid	Learning Algorithm, Learning	CO3							
		Method that	Cross- fertilize	ANFIS and RBFN								
	Unit 4	Swarm and Eve										
	А	Concept of "G	Concept of "Genetics" and "Evolution" and its application to									
		probabilistic sea	CO4									
	В	Basic GA frame	Basic GA framework and different GA architectures, GA operators:									
		Encoding, Cross	over, Selection, N	Autation,	CO4							
		Solving single-o	Solving single-objective optimization problems									
	С	Swarm Optimiz	ation: Introducti	on to Ant Colony Optimization,	CO4							
		Particle Swarm	04									
	Unit 5	Multi-objective										
	А	Concept of mu	lti-objective optim	mization problems (MOOPs) and	CO5 CO6							
		issues of solving	005,000									
	В	Multi-Objective	Evolutionary	Algorithm (MOEA) Non-Pareto								
		approaches to	solve MOOPs, I	Pareto-based approaches to solve	CO5,CO6							
		MOOPs, Some	applications with	MOEAs								
	С				CO5,CO6							
	Mode of	Theory and P	ractical									
	examination											
	Weightage	CA	MTE	ETE								
	Distribution	25%	25%	50%								
	Text book/s*	1. George J. K	lir and Bo Yuan	, "Fuzzy sets and Fuzzy Logic",								
		Prentice Hall, U	SA.									
		2. Goldberg D.	E., Genetic Algor	ithms in Search, Optimization, and								
		Machine Learnin	ng Addison Wesle	ey.								
		3. Timothy J. I	Ross, "Fuzzy Log	ic with Engineering Applications",								
		McGraw Hill										
	Other	2. Jang J.	nd Mizutani E, "Neuro-Fuzzy and									
	References	Soft co	e Hall.									
		2. An Intr	oduction to Gene	etic Algorithms, Melanie Mitchell,								
		MIT Press,	2000.									
		3. Genetic	Algorithms In S	earch, Optimization And Machine								
		Learning, D	avid E.									
		Goldberg	g, Pearson Educat	ion, 2002.								
		4. Practical	Genetic Algorith	ims, Kandy L. Haupt and sue Ellen								
1		Haupt, Johr	i willey & Sons,	2002	1							



S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	<b>CO1:</b> Define the basic concepts of soft computing.	PO1,PO2,PO3,PO4,
		PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
2.	CO2: Explain applications & operations of Fuzzy Logic in	PO1,PO2,PO3,PO4,
	real life problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
3.	CO3: Apply different FIS models to solve optimization	PO1,PO2,PO3,PO4,
	problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
4.	CO4: Analyse and examine Evolutionary and swarm	PO1,PO2,PO3,PO4,
	algorithms in solving real world Multi-Objective optimization	PO5,PO6,PO7,PO8,
	problems	PO9,PO10, PSO1,PSO2,PSO3
5.	<b>CO5:</b> Choose of different optimization algorithms to solve	PO1,PO2,PO3,PO4,
	real-life multi objective problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
6.	CO6: Discuss applications of Soft Computing and solve	PO1,PO2,PO3,PO4,
	Problems in Varieties of Application Domains.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3

**PO and PSO mapping with level of strength for Course Name** SOFT COMPUTING (**Course Code** CSA-301)

Subject	PO's /	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	150 \$	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
SOFT	CO1	3	3	1	1	1	1	1	1	2	1	1	3	1	3	1
COMPU TING	CO2	3	3	3	3	2	3	2	2	2	2	3	3	3	3	3
CSA301	CO3	3	3	3	3	3	3	1	2	2	2	3	3	3	3	3
	CO4	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3
	CO5	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3
	CO6	3	3	3	3	3	1	3	2	3	2	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	РО 3	PO 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
CSA	SOFT	3.0	3.0	3.0	3.0	3.0	3.0	2.8	2.0	2.0	3.0	2.6	3.0	2.8	2.8	2.6
301	COMPUTING	0	0	0	0	0	0	3	0	0	0	7	0	3	3	7

# **Strength of Correlation**

**1.** Addressed to Slight (Low=1) extent**2.** Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Pro	gram:	B.Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	T									
		Applications										
1	Course Code	CSI024										
2	Course Title	Raspberry Pi and its Programming										
3	Credits	2										
4	Contact	2-0-0										
	Hours (L-T-											
	P)											
	Course Status	Elective										
5	Course	The primary objective of this course to provide a platform	n to get started									
	Objective	with the Internet of Things with Raspberry Pi along v	with the basic									
	-	knowledge of programming and interfacing of the input/or	utput devices.									
6	Course	CO1: List the hardware components of Raspberry Pi										
	Outcomes	CO2: Demonstrate the programming concepts using Rasp	berry Pi									
		CO3: Build Relay, DC Motor and LCD interfaces using R	aspberry Pi									
		CO4: Construct interfaces for DHT11, ultrasonic sense	or and camera									
		using Raspberry Pi										
		CO5: Implementation of various analog and digital	sensors using									
		Raspberry Pi										
		CO6: Design and develop various applications using Rasp	berry Pi									
7	Course	This course provides a gradual pace of basic concepts	s to advanced									
0	Description	interfacing and programming of Raspberry Pi for IoT base	ed projects.									
8	Outline syllabu	IS										
	TT 4 1	De sien of De such source Di	Mapping									
		Basics of Raspberry Pl										
	A	Introduction to Raspberry PI, Raspberry PI Components	CO1, CO6									
	В	Installation of NOOBS on SD Card and Raspolan on SD Card Terminal Commonds, Installation of Librarias on	CO1, CO6									
		Card, Terminal Commands, Instantation of Libraries of										
	C	Catting the Static ID Address of Beenharry Di Dun e	CO1 CO6									
	C	Drogrom on Deenberry Di Installing the Demote	001,000									
		Deskton Server										
	Unit 2	Programming with Raspherry Pi										
		Installation of I2C Driver on Raspherry Pi Serial	CO2 CO6									
	11	Perinheral Interface with Raspherry Pi	002,000									
	В	Implementation of LED and Raspherry Pi LED Blink	CO2 CO6									
	D	Using Function, Reading the Digital Input	002,000									
	С	Reading an Edge-Triggered Input: Reading Switch in	CO2									
	-	Pull-Down Configuration, Reading Switch in Pull-Up	001									
		Configuration										
	Unit 3	Interfacing with Raspberry Pi - I										
	А	Interfacing of Relay with Raspberry Pi	CO3									
	В	Interfacing of DC Motor with Raspberry Pi	CO3									
	С	Interfacing of LCD with Raspberry Pi	CO3									

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Unit 4	Interfacing v	with Raspberr	y Pi - II								
А	Interfacing of	f DHT11 Sense	or with Raspberry Pi	CO4							
В	Interfacing of	f Ultrasonic Se	nsor with Raspberry Pi	CO4							
С	Interfacing of	f Camera with	Raspberry Pi	CO4							
Unit 5	Interfacing v	with Raspberr	y Pi and Arduino								
А	Install Arduin	no IDE on Rasj	oberry Pi	CO5,CO6							
В	Implementati	mplementation of Digital and Analog Sensor									
С	Implementati	Implementation of Actuators									
Mode of	Theory/Jury/	Theory/Jury/Practical/Viva									
examination											
Weightage	CA	MSE	ESE								
Distribution	25%	25%	50%								
Text book/s*	2. Intern	et of Things w	ith Raspberry Pi and								
	Ardui	no, Rajesh Sin	gh, Anita Gehlot, Lovi Raj								
	Gupta	et.al, CRC Pro	ess								
Other	3. Progr										
References	with I	with Python, Simon Monk, Mc Graw Hill									
	4. Pytho	4. Python Programming for Raspberry Pi, Richard									
	Blum	, Christine Brea	snahan, Pearson Education								

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	CO1: List the hardware components of	PO1, PO2, PO3, PO5, PO6, PO7,
	Raspberry Pi	PO9, PO10, PO11, PO12, PSO1,
		PSO2
2.	CO2: Demonstrate the programming concepts	PO1, PO2, PO3, PO5, PO6, PO7,
	using Raspberry Pi	PO8, PO9, PO10, PO11, PO12,
		PSO1, PSO2
3.	CO3: Build Relay, DC Motor and LCD	PO1, PO2, PO3, PO4, PO5, PO6,
	interfaces using Raspberry Pi	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3
4.	CO4: Construct interfaces for DHT11,	PO1, PO2, PO3, PO4, PO5, PO6,
	ultrasonic sensor and camera using Raspberry Pi	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3
5.	CO5: Implementation of various analog and	PO1, PO2, PO3, PO4, PO5, PO6,
	digital sensors using Raspberry Pi	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3
6.	CO6: Design and develop various applications	PO1, PO2, PO3, PO4, PO5, PO6,
	using Raspberry Pi	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3



# PO and PSO mapping with level of strength for Course Name Raspberry Pi and its Programming (Course Code CSI024)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	PO4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	2	1	1	-	3	1	1	-	1	1	2	2	1	1	-
	CO2	2	2	2	-	3	2	2	2	1	1	1	2	3	2	2
CSI024_Raspberry	CO3	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
Programming	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO2	РО 3	РО 4	PO 5	РО 6	РО 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSI024	Raspberry Pi and its Programming	2.3	2.0	2.0	2.5	3.0	2.0	2.0	2.2	2.3	2.3	2.5	2.7	2.7	2.0	2.0

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer S	cience & Engi	ineering								
Prog	gram:	B.Tech	-									
Bra	nch:	CSE with S	pecialization in	n Artificial Intelligence for	ІоТ							
		Application	S	C								
1	Course Code	CIP024										
2	Course Title	Raspberry Pi	and its Progra	mming Lab								
3	Credits	1	0	C								
4	Contact Hours	0-0-2										
	(L-T-P)											
	Course Status	Elective										
5	Course	The primary	objective of th	is course to provide a platfor	m to get started							
	Objective	with the Inte	ernet of Thing	s with Raspberry Pi along	with the basic							
		knowledge o	f programming	and interfacing of the input/	output devices.							
6	Course	CO1: List the	e basic compor	nents of Raspberry Pi								
	Outcomes	CO2: Demo	onstrate the H	Face recognition and LED	D Blink using							
		Raspberry Pi	ĺ									
		CO3: Demo	nstrate the Pu	ll-Down and Pull-Up Confi	guration using							
		Raspberry Pi	ĺ									
		CO4: Build I	Relay and DC	Motor using Raspberry Pi								
		CO5: Const	ruct interfaces	s for LCD and ultrasonic	sensor using							
		Raspberry Pi	Raspberry Pi									
		CO6: Design and develop various applications using Raspberry Pi										
7	Course	This course p	provides a grad	ual pace of basic concepts to	advanced							
	Description	interfacing a	nd programmir	ng of Raspberry Pi for IoT ba	used projects.							
8	Outline syllabus	5			CO							
		1			Mapping							
	Unit 1	<b>Basics of Ra</b>	spberry Pi									
		Installing the	e Remote Desk	top Server	CO1, CO6							
		Raspberry Pi	Camera as a U	JSB Video Device	CO1, CO6							
	Unit 2	Programmi	ng with Raspb	erry Pi-I								
		Face Recogn	ition Using Ra	spberry Pi	CO2, CO6							
		LED Blink U	<b>Jsing Function</b>		CO2, CO6							
	Unit 3	Programmi	ng with Raspb	erry Pi-II								
		Pull-Down C	Configuration		CO3, CO6							
		Pull-Up Con	figuration		CO3, CO6							
	Unit 4	Interfacing	with Raspberr	ry Pi - I								
		Interfacing of Relay with Raspberry Pi CO4, CO6										
		Interfacing o	f DC Motor wi	th Raspberry Pi	CO4, CO6							
	Unit 5	Interfacing	with Raspberr	ry Pi - II								
		Interfacing o	f LCD with Ra	spberry Pi	CO5, CO6							
		Interfacing o	f Ultrasonic Se	ensor with Raspberry Pi	CO5, CO6							
	Mode of	Jury/Practica	l/Viva									
	examination											
	Weightage	CA	CE (Viva)	ESE								
	Distribution	25%	25%	50%								



Text book/s*	3.	Internet of Things with Raspberry Pi and	
		Arduino, Anita Gehlot, Lovi Raj Gupta et.al,	
		CRC Press	
Other	5.	Programming the Raspberry Pi, Getting started	
References		with Python, Simon Monk, Mc Graw Hill	
	6.	Python Programming for Raspberry Pi, Richard	
		Blum, Christine Bresnahan, Pearson Education	

# PO and PSO mapping with level of strength for Raspberry Pi and its Programming Lab (Course Code CIP024)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	Р О4	РО 5	PO 6	PO 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
	C01	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
CIP024 Raspb	CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
erry Pi	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
Progra	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
mming Lab	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	РО 1	РО 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PSO 2	PS O 3
CIP02 4	Raspberry Pi and its Programming Lab	2.3	2.0	2.0	2.0	3.0	2.0	2.0	2.2	2.5	2.5	2.5	2.7	2.7	2.0	2.0

#### Strength of Correlation

Addressed to Slight (Low=1) extent
Addressed to Substantial (High=3) extent



Sch	School: School of Engineering & Technology											
Dep	artment	Computer Science & Engineering										
Pro	gram:	B.Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for Io	Т									
		Applications										
1	Course Code	CSI022										
2	Course Title	Wireless Sensor Network										
3	Credits	2										
4	Contact	2-0-0										
	Hours (L-T-											
	P)											
	Course Status	Elective										
5	Course	This course aim to give knowledge of mobile ad hoc net	works, design									
	Objective	and implementation issues, and available solutions. The	is course also									
	5	covers routing mechanisms and the three classes of	f approaches:									
		proactive, on-demand, and hybrid, clustering mechar	nisms, 802.11									
		Wireless Lan (WiFi) and Bluetooth standards.										
6	Course	CO1: Define the constraints and challenges of sensor netw	/orks									
	Outcomes	CO2: Outline issues and challenges in various wireless ser	nsor network									
		CO3: Explain Wireless sensor network architecture	and different									
		communication standards used in WSN										
		CO4: Categorize various routing protocols for WSN										
		CO5: Assess various energy-aware routing protocols for wireless sensor										
		networks										
		CO6: Experiment with TinyOS platform for sensor networ	rks									
7	Course	A wireless sensor network (WSN) generally consists of	compact low									
	Description	power sensors, which collect information and pass the ir	formation via									
		wireless networks to achieve a high level of desired m	onitoring and									
		control in coordinated manners. WSN applications can be	found in areas									
		such as environmental monitoring, smart energy system	ns, battle field									
		surveillance, home automation, medical monitoring, mob	ile computing,									
		etc. WSN has integrated network engineering, embe	edded system									
		engineering and sensor technology.	[									
8	Outline syllabu	18	CO									
			Mapping									
	Unit 1	Introduction										
	A	Introduction to Sensor Networks, Unique constraints and	CO1, CO6									
		challenges										
	В	Advantage of Sensor Networks, Applications of Sensor	CO1, CO6									
		Networks										
	C	Types of wireless sensor networks	CO1, CO6									
	Unit 2	Issues and challenges in Wireless Sensor Networks										
	А	Mobile Ad-hocNetworks (MANETs) and Wireless	CO2, CO6									
		Sensor Networks										
	В	Enabling technologies for Wireless Sensor Networks	CO2, CO6									
	С	Issues and challenges in wireless sensor networks	CO2									
	Unit 3	Wireless Sensor Network Architecture										
	Α	Network Protocol Stack	CO3									



В	Communicati	on Standards:	IEEE 802.11, IEEE 802.15.4	CO3						
С	Communicati	on Standards:	ZigBee, 6LoWPAN	CO3						
Unit 4	Routing in V	VSN								
А	Flat-based Ro	outing Algorith	ms, Hierarchical Routing	CO4						
	Algorithms									
В	Information C	Gathering Base	ed on Geographic Locations:	CO4						
	Geographical	Routing, Land	Imark-based Routing							
С	Data Aggrega	Data Aggregation, Content-based Naming								
Unit 5	Energy Man	Energy Management in WSN								
А	Duty Cycling	CO5,CO6								
В	Energy-aware	CO5, CO6								
	aware Routin	aware Routing								
С	Location-base	ed Routing and	l Data Aggregation-based	CO5, CO6						
	Routing									
Mode of	Theory/Jury/I	Theory/Jury/Practical/Viva								
examination		1								
Weightage	CA	MSE	ESE							
Distribution	25%	25%	50%							
Text book/s*	1. Walte	negus Dargie ,	Christian Poellabauer,							
	"Fund	lamentals Of V	Vireless Sensor Networks							
	Theor	y And Practice	e", By John Wiley & Sons							
	Public	ations, 2011								
Other	1. Sabrie Sol	oman, "Sensor	rs Handbook" by McGraw							
References	Hill publicati	on. 2009	-							
	2. Feng Zhao	, Leonidas Gui	bas, "Wireless Sensor							
	Networks", E	lsevier Publica	ations,2004							
	3. Kazem Soł	3. Kazem Sohrby, Daniel Minoli, "Wireless Sensor								
	Networks": T	echnology, Pr	otocols and							
	Applications,	Wiley-Inter so	cience							
	4. Philip Levi	s, And David	Gay "TinyOS Programming"							
	by Cambridge	e University Pr	ress							
	2009									



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes
		(PSO)
1.	CO1: Define the constraints and challenges of sensor	PO1, PO2, PO4, PO6, PO9,
	networks	PO12, PSO2
2.	CO2: Outline issues and challenges in various wireless	PO1, PO2, PO4, PO6, PO9,
	sensor network	PO12, PSO2
3.	CO3: Explain Wireless sensor network architecture and	PO1, PO2, PO3, PO4, PO6,
	different communication standards used in WSN	PO9, PO10, PO12, PSO2
4.	CO4: Categorize various routing protocols for WSN	PO1, PO2, PO3, PO4, PO6,
		PO7, PO9, PO10, PO12,
		PSO2
5.	CO5: Assess various energy-aware routing protocols for	PO1, PO2, PO3, PO4, PO6,
	wireless sensor networks	PO7, PO9, PO10, PO11,
		PO12, PSO1, PSO2
6.	CO6: Experiment with TinyOS platform for sensor	PO1, PO2, PO3, PO4, PO5,
	networks	PO6, PO7, PO8, PO9,
		PO10, PO11, PO12, PSO1,
		PSO2, PSO3

# PO and PSO mapping with level of strength for Course Name Wireless Sensor Network (Course Code CSI022)

Course Code_ Course Name	CO's	PO 1	РО 2	РО 3	Р О4	РО 5	PO 6	PO 7	РО 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PS O2	PS O3
	CO1	2	2	-	2	-	2	-	-	1	-	-	2	-	1	-
CSI022	CO2	2	2	-	2	-	2	-	-	1	-	-	2	-	1	-
_Wirele ss	CO3	2	1	1	2	-	2	-	-	2	2	-	2	-	2	-
Sensor Networ	CO4	2	2	1	2	-	2	2	-	2	2	-	3	-	2	-
k	CO5	2	2	3	2	-	2	2	-	3	2	2	3	2	3	-
	CO6	3	3	3	2	3	2	2	2	3	2	2	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	РО 4	P O 5	PO 6	Р О 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS 0 1	PS O 2	PSO 3
CSI022	Wireless Sensor Network	2.2	2.0	2.0	2.0	3. 0	2.0	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.0	2.0

### Strength of Correlation

1. Addressed to Slight (Low=1) extent

2. Addressed to *Moderate* (*Medium=2*) *extent* 

3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Prog	gram:	B.Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for 1	loT									
		Applications										
1	Course Code	CIP022										
2	Course Title	Wireless Sensor Network IoT Lab										
3	Credits	1										
4	Contact Hours	0-0-2										
	(L-T-P)											
	Course Status	Elective										
5	Course	The aim of this course is to provide practical knowled	ge of wireless									
	Objective	sensor network components with their design principles.										
6	Course	CO1: Outline the basic wireless sensor network compone	ents.									
	Outcomes	CO2: Demonstrate TinyOS required for compiling and e	xecuting									
		example codes.										
		CO3: Utilize TinyOS programming concepts required to	gather and									
		sending the data.										
		CO4: Evaluate the simulation of WSN with Tiny OS.										
		COS: Interpret and visualize the data collected from sens	Sors.									
7	Course	CO6: Experiment with TinyOS platform for sensor netw	Orks									
/	Course	I his lab is an introductory course for wireless sensor netw	orks. Students									
	Description	application development through simulation and implement	es and ThiyOS									
		application development through simulation and implementation of real hardware										
8	Outline syllabus		CO									
0	Outime synabul	3	Mapping									
	Unit 1	Basics of WSN components										
		Practical study of all hardware components related to	CO1. CO6									
		WSNs	,									
		Basics of WSN programming concept, General	CO1, CO6									
		overview of TinyOS										
	Unit 2	Practice with TinyOS										
		Downloading, installing the most recent version of	CO2, CO6									
		TinyOS										
		Simple example code that compiles, Guide to getting	CO2, CO6									
		going with TelosB motes										
	Unit 3	Getting Relevant Data										
		An introduction to TinyOS programming	CO3, CO6									
		Sensing data using WSN motes, Gathering relevant	CO3, CO6									
		data only										
	Unit 4	Simulation in TinyOS	<u></u>									
		Simulating WSNs made up of motes running TinyOS	CO4, CO6									
		TinyOS simulation framework TOSSIM	CO4, CO6									
	Unit 5	Visualization										
		Sensing audio data and interpreting results.	CO5, CO6									
		Sensing positioning data using GPS and transmitting it.	CO5, CO6									



Mode of	Jury/Practica	ul/Viva		
examination				
Weightage	CA	CE (Viva)	ESE	
Distribution	25%	25%	50%	
Text book/s*	1. Hand			
	Kapo	or, Publisher: 1	Packt Publishing	
Other				
References				

# PO and PSO mapping with level of strength for Wireless Sensor Network IoT Lab (Course Code CIP022)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	2	1	-	-	2	-	-	-	-	-	-	2	-	-	-
	CO2	3	2	1	1	3	-	2	-	1	1	1	2	1	2	2
CIP022_Wireless	CO3	3	1	2	2	3	1	3	-	2	2	2	2	3	2	2
IoT Lab	CO4	3	2	2	2	2	1	3	-	2	2	2	2	1	2	2
	CO5	3	2	2	2	3	2	3	-	3	3	3	3	2	3	3
	CO6	3	2	3	2	3	2	3	2	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	РО	РО	РО	PO	РО	РО	PO	PO	PO	PO	PO	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	01	2	03
	Wireless															
CIP022	Sensor	28	17	2.0	1.8	27	15	28	2.0	22	22	22	23	2.0	24	24
CH 022	Network	2.0	1.7	2.0	1.0	2.7	1.5	2.0	2.0	2.2	2.2	2.2	2.5	2.0	2.4	2.4
	IoT Lab															

#### Strength of Correlation

- 1. Addressed to Slight (Low=1) extent
  - 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent

-



Sch	ool:	School of Engineering & Technology											
Dep	artment	Computer Science & Engineering											
Pro	gram:	B.Tech											
Bra	nch:	CSE with Specialization in Artificial Intelligence for	ІоТ										
		Applications											
1	Course Code	CSI301											
2	Course Title	Programming with SENSEnuts IoT Platform											
3	Credits	2											
4	Contact	2-0-0											
	Hours												
	(L-T-P)												
	Course Status	Core											
5	Course	The objective of the course is to deploy a network for s	tatistical analysis										
	Objective	or control applications. This course can help in connecti	ng the sensors to										
		platform to get the desired readings using extender.											
6	Course	CO1: Outline the concepts of SENSEnut platform											
	Outcomes	CO2: Explain basic sensor functions available with SEI	<b>NSEnuts</b> devices										
		CO3: Explain advance sensor functions available with	SENSEnuts										
		devices.											
		CO4: Discuss simulation study of Sensory Range, Tran	smission Range.										
		CO5: Identify localization of the event area and Send and	nd Receive Data										
		from a node.											
	~	CO6: Design embedded applications using SENSEnut Platform											
7	Course	SENSEnuts platform can be used to test newly develo	oped routing and										
	Description	application layer algorithms. It provides a flexible ma	ic with around 9										
		paramESErs that can be controlled at mac and 4 at phy	sical giving user										
0		the kind of flexibility to control their network environm	ent.										
8	Utine syllabl	IS	CO Mapping										
		The SENSE and Defense Handress List Installing the											
	A	Software	CO1, CO6										
	В	Peripheral Hardware Specific Calls: DIO Functions,	CO1, CO6										
		I <sup>2</sup> C Functions	,										
	С	MAC functions: General Functions, Coordinator	CO1, CO6										
		Functions, genMac Functions											
	Unit 2	Sensor Functions											
	А	Phy Layer Functions, Routing Functions	CO1, CO2,										
			CO6										
	В	Sensor Functions: Light Sensor Functions,	CO1, CO2,										
		Temperature Sensor Functions, Humidity Sensor	CO6										
		Functions											
	C	Pressure and Temperature sensor Functions, GPS	CO1, CO2,										
		Functions, Passive Infrared Functions	CO6										
	Unit 3	Advanced Functions											
	А	Task Management Functions	CO1, CO2,										
			CO3, CO6										
	В	Gateway Communication Functions	CO1, CO2,										
			CO3, CO6										



С	Node Functio	ns, Applicatio	n Functions	CO1, CO2.
		, FF		CO3, CO6
 Unit 4	Simulation S	tudies-I		
А	Sensory Rang	ge, Transmissi	on Range	CO1, CO2,
			-	CO4, CO6
В	Defining the	Sensory Range	e of a Sensor using	CO1, CO2,
	SENSEnuts			CO4, CO6
С	Setting the Tr	ansmission Ra	ange of a Sensor using	CO1, CO2,
	SENSEnuts			CO4, CO6
Unit 5	Simulation S	tudies-II		
А	Localization of	of the event ar	ea of a Sensor using	CO5 CO6
	SENSEnuts			005,000
В	Send and Rec	eive Data fror	n a Single Node	CO5, CO6
С	Embedded A	oplications Ca	se Study	CO5, CO6
Mode of	Theory/Jury/I	Practical/Viva		
examination				
Weightage	CA	MSE	ESE	
Distribution	25%	25%	50%	
Text book/s*	1. API R	EFERENCE	GUIDE: SENSEnuts WSN	
	sensat	ion		
Other				
References				

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	CO1: Outline the concepts of SENSEnut platform	PO1, PO4, PO5, PO6, PO9, PO10,
		PO11, PO12, PSO1, PSO2, PSO3
2.	CO2: Explain basic sensor functions available	PO1, PO2, PO3, PO4, PO5, PO6,
	with SENSEnuts devices	PO7, PO9, PO10, PO11, PO12,
		PSO1, PSO2, PSO3
3.	CO3: Explain advance sensor functions available	PO1, PO2, PO3, PO4, PO5, PO6,
	with SENSEnuts devices.	PO7, PO9, PO10, PO11, PO12,
		PSO1, PSO2, PSO3
4.	CO4: Discuss simulation study of Sensory Range,	PO1, PO2, PO3, PO4, PO5, PO6,
	Transmission Range.	PO7, PO9, PO10, PO11, PO12,
	č	PSO1, PSO2, PSO3
5.	CO5: Identify localization of the event area and	PO1, PO2, PO3, PO4, PO5, PO6,
	Send and Receive Data from a node.	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3
6.	CO6: Design embedded applications using	PO1, PO2, PO3, PO4, PO5, PO6,
	SENSEnut Platform	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3



# PO and PSO mapping with level of strength for Course Name Programming with SENSEnuts IoT Platform (Course Code CSI301)

Course Code_ Course Name	CO's	PO 1	РО 2	PO 3	P O4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PS O2	PS O3
CSI301	CO1	2	-	-	1	2	2	-	-	1	1	1	2	2	1	1
_Progr ammin	CO2	2	2	2	1	2	2	2	-	1	1	1	2	2	1	1
g with	CO3	2	2	2	2	3	2	2	-	2	2	2	2	3	2	1
nuts	CO4	2	3	2	2	3	2	2	-	2	2	2	2	3	2	1
IoT Platfor	CO5	2	3	3	3	3	2	2	2	2	2	2	2	3	3	1
m	CO6	3	3	3	3	3	2	2	3	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	РО 4	P O 5	PO 6	Р О 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSI301	Program ming with SENSEnu ts IoT Platform	2.2	2.6	2.4	2.0	2. 7	2.0	2.0	2.5	1.8	1.8	1.8	2.2	2.7	2.0	1.2

#### Strength of Correlation

Addressed to Slight (Low=1) extent
Addressed to Substantial (High=3) extent



Scho	ool:	School of Engineering & Technology										
Depa	artment	Computer Science & Engineering										
Prog	gram:	B.Tech										
Brai	nch:	CSE with Specialization in Artificial Intelligence of Thir	ngs (AIoT)									
1	Course Code	CIP301										
2	Course Title	Programming with SENSEnuts IoT Platform Lab										
3	Credits	1										
4	Contact Hours (L-T-P)	0-0-2										
	Course Status	Core										
5	Course	The objective of the course is to deploy a network for statis	tical analysis or									
	Objective	control applications. This course can help in connecting	the sensors to									
		platform to get the desired readings using extender.										
6	Course	CO1: Outline the concepts of SENSEnut platform										
	Outcomes	CO2: Demonstrate Blink application using SENSEnuts devi	ices									
		CO3: Experiment with environment sonsors on SENSEnuts	GUI.									
		CO4: Make use of broadcast function.										
		CO5: Identify different channel frequencies supported by 80	02.15.4.									
		CO6: Design embedded applications using SENSEnut Platf	orm									
7	Course	SENSEnuts platform can be used to test newly developed routing and										
	Description	application layer algorithms. It provides a flexible mac with around 9										
		parameters that can be controlled at mac and 4 at physical giving user the										
		kind of flexibility to control their network environment.										
8	Outline syllabus		CO Mapping									
	Unit 1	Sensenut Platform										
		Introduction to SENSEnuts Platform, the components that	CO1, CO6									
		make up an SENSEnuts board and their functions.										
		Installing and working with SENSEnuts.	CO1, CO6									
	Unit 2	Working with SENSEnuts device										
		To develop a code for LED blinks operation for	CO2, CO6									
		SENSEnuts device.										
		To develop a code for RGB blinks operation for	CO2, CO6									
		SENSEnuts device.										
	Unit 3	Working with Environment Sensors										
		To develop a code to read temperature and light sensor	CO3, CO6									
		data from sensor module attached										
		To develop a code to program the temperature and light	CO3, CO6									
		sensor with threshold values, and catch the interrupt										
	<b>T</b> T <b>1</b> / 4	generated by them when threshold is passed.										
	Unit 4	Broadcast Function	<b>GO</b> ( <b>GO</b> (									
		To develop a code to broadcast the temperature and light	CO4, CO6									
		sensor data in the network, catch it at destination and										
		display it in GUI.										
		For the previous experiment, check the change in link	CU4, CU6									
	TT •4 <b>F</b>	quanty as the distance between two nodes increase.										
	Unit 5	Communication Protocol										
		To check previous experiment at three different channel	CO5, CO6									
		trequencies supported by 802.15.4.										



	To check the PAN coordin switched off non-acknowl broadcast net	To check the impact of dynamic channel selection by PAN coordinator on the network when Pan Coordinator is switched off and then on while the network is running in a non-acknowledged broadcast network.								
Mode of examination	Jury/Practica	Jury/Practical/Viva								
Weightage	CA	MTE	ETE							
Distribution	60%	0%	40%							
Text book/s*	-									
Other										
References										

# PO and PSO mapping with level of strength for Course Name Programming with SENSEnuts IoT Platform (Course Code CIP301)

Cour se Code - Cour se Nam e	CO's	P O 1	PO 2	Р О З	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	P O 1 1	P O 1 2	PS O 1	PS O 2	P S O 3
CIP3	CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
rogr	CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
amm ing	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
with SEN	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
SEn uts	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
IoT Platf orm Lab	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2



Course Code	Course Name	<b>PO</b> 1	PO 2	PO 3	PO 4	P O 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CIP30 1	Program ming with SENSEn uts IoT Platform Lab	2.3	2.0	2.0	2.0	3.0	2.0	2.0	2.2	2.5	2.5	2.5	2.7	2.7	2.0	2.0

Average of non-zeros entry in following table (should be auto calculated).

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology											
Dep	artment	Computer Science & Engineering											
Pro	gram:	B.Tech											
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	T										
		Applications											
1	Course Code	CSI031											
2	Course Title	Artificial Intelligence for IoT											
3	Credits	2											
4	Contact	2-0-0											
	Hours												
	(L-T-P)												
	Course Status	Elective											
5	Course	The aim of this course is to cover various aspects of artific	cial										
	Objective	intelligence (AI) and its implementation to make IoT solu	tions smarter.										
6	Course	CO1: Understand the principles and foundations of IoT ar	nd AI										
	Outcomes	CO2: Demonstrate different ML paradigms for IoT based	applications										
	CO3: Construct IoT based applications with Naïve Bayes, Decision												
		nd ensemble learning.											
	CO4: Improving the model using various techniques												
	CO5: Implementing AI from case study of Smart Cities												
		CO6: Apply different AI techniques including machine le	arning using										
	TensorFlow and Keras												
7	Course	This course describes basic understanding of machine lear	ning concepts.										
	Description	This course also involves the AI and ML techniques to	develop smart										
		systems for IoT.											
8	Outline syllabu	18	CO										
			Mapping										
	Unit 1	Principles and Foundations of IoT and AI											
	А	IoT Reference Model, IoT platforms, IoT verticals	CO1										
	В	Big data and IoT, Infusion of AI- data science in IoT	CO1										
	С	Cross-industry standard process for data mining, AI	CO1										
		platforms and IoT platforms											
	Unit 2	Machine Learning for IoT-I											
	А	ML and IoT, Learning paradigms, Prediction using	CO2, CO6										
		linear regression											
	В	Logistic regression for classification: Cross-entropy loss	CO2, CO6										
		function											
	С	Classification using support vector machines, Maximum	CO2, CO6										
		margin hyperplane, Kernel trick											
	Unit 3	Machine Learning for IoT-II											
	А	Naive Bayes	CO3, CO6										
	В	Decision trees: Decision trees in scikit, Decision trees in	CO3, CO6										
		action											
	С	Ensemble learning: Voting classifier, Bagging and	CO3, CO6										
		pasting											
	Unit 4	Improving the model											
	Α	Feature scaling to resolve uneven data scale	CO4, CO6										



В	Overfitting: F	Regularization,	Cross-validation	CO4, CO6								
С	No Free Lund	ch theorem		CO4, CO6								
Unit 5	AI for Smar											
А	Need of smar	onents of a smart city	CO5, CO6									
В	Smart traffic	management,	Smart parking, Smart waste	CO5, CO6								
	management	management										
С	Smart policin	Smart policing, Smart lighting, Smart governance										
Mode of	Theory/Jury/											
examination												
Weightage	CA	MSE	ESE									
Distribution	25%	25%	50%									
Text book/s*	1. Hands	s-On Artificial	Intelligence for IoT, Amita									
	Kapoo	Kapoor, Publisher: Packt Publishing										
Other												
References												

S.	Course Outcome	Program Outcomes (PO) & Program						
No.		Specific Outcomes (PSO)						
1.	CO1: Understand the principles and foundations of IoT and AI	PO1, PO8, PO12						
2.	CO2: Demonstrate different ML paradigms for	PO1, PO2, PO3, PO4, PO5, PO6,						
	IoT based applications	PO9, PO10, PO11, PO12, PSO1,						
		PSO2, PSO3						
3.	CO3: Construct IoT based applications with	PO1, PO2, PO3, PO4, PO5, PO6,						
	Naïve Bayes, Decision tree and ensemble	PO7, PO8, PO9, PO10, PO11,						
	learning.	PO12, PSO1, PSO2, PSO3						
4.	CO4: Improving the model using various	PO1, PO2, PO3, PO4, PO5, PO9,						
	techniques	PO10, PO11, PO12, PSO1, PSO2,						
		PSO3						
5.	CO5: Implementing AI from case study of	PO1, PO2, PO3, PO4, PO5, PO6,						
	Smart Cities	PO7, PO8, PO9, PO10, PO12,						
		PSO1, PSO2, PSO3						
6.	CO6: Apply different AI techniques including	PO1, PO2, PO3, PO4, PO5, PO6,						
	machine learning using TensorFlow and Keras	PO8, PO9, PO10, PO11, PO12,						
		PSO1, PSO2, PSO3						



# PO and PSO mapping with level of strength for Course Name Artificial Intelligence for IoT (Course Code CSI031)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	Р О4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PS O2	PS O3
	CO1	3	-	-	-	-	-	-	2	-	-	-	2	-	-	-
CSI031	CO2	3	2	2	2	3	2	-	-	2	2	2	2	2	2	2
_Artific ial	CO3	3	2	2	2	3	2	3	2	2	2	2	2	2	2	-
Intellig ence for IoT	CO4	3	3	3	3	3	-	-	-	2	2	-	2	2	2	2
	CO5	3	3	3	3	3	3	3	2	2	2	3	3	2	3	2
	CO6	3	3	3	3	3	3	-	2	3	3	3	3	2	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	РО 2	PO 3	РО 4	P O 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSI031	Artificial Intelligen ce for IoT	3.0	2.6	2.6	2.6	3. 0	2.5	3.0	2.0	2.2	2.2	2.5	2.3	2.0	2.4	2.3

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent


Scho	ool:	School of Er	ngineering & ]	<b>Fechnology</b>								
Dep	artment	<b>Computer S</b>	cience & Engi	neering								
Prog	gram:	B.Tech	8	8								
Bra	nch:	CSE with Sr	pecialization in	n Artificial Intelligence for 1	[oT							
		Application	8		-							
1	Course Code	CIP031										
2	Course Title	Artificial Inte	elligence for Io	T Lab								
3	Credits	1										
4	Contact Hours	0-0-2										
	(L-T-P)											
	Course Status	Elective										
5	Course	The aim of	this course	is to cover various aspect	s of artificial							
	Objective	intelligence (	AI) and its imp	plementation to make IoT solu	utions smarter.							
6	Course	CO1: Unders	tand the specia	l DL libraries, Access and pro	cess data from							
	Outcomes	various distri	buted sources									
		CO2: Perform	n regression ar	d logistic regressor machine	learning							
		technique for	· IoT data									
		CO3: Perform	n SVM and Ga	usian Naive Bayes learning f	for IoT data							
		CO4: Improv	ving the model	using various techniques								
		CO5: Implen	nenting AI fror	n case study of Smart Cities								
		CO6: Apply	CO6: Apply different AI techniques including machine learning using									
		TensorFlow	CensorFlow and Keras									
7	Course	This course	This course describes basic understanding of machine learning									
	Description	concepts. This course also involves the AI and ML techniques to										
		develop smar	rt systems for I	oT.								
8	Outline syllabus	5			CO							
					Mapping							
	Unit 1	Special DL l	ibraries									
		Installing Te	nsor Flow & K	eras and download datasets	CO1, CO6							
		Working with	h different data	set formats	CO1, CO6							
	Unit 2	Machine Le	arning for IoT	]-I								
		Electrical por	wer output pre-	diction using regression	CO2, CO6							
		Classifying v	vine using logi	stic regressor	CO2, CO6							
	Unit 3	Machine Le	arning for IoT	<u>-II</u>								
		Classifying v	vine using SVN	A	CO3, CO6							
		Gaussian Na	ive Bayes for v	vine quality	CO3, CO6							
	Unit 4	Improving t	he model									
		Feature scali	CO4, CO6									
		Hyperparam	CO4, CO6									
	Unit 5	AI for Smar										
		Adapting Io7	for smart citie	es and the necessary steps	CO5, CO6							
		DESEcting c	rime using city	's crime data	CO5, CO6							
	Mode of	Jury/Practica	l/Viva									
	examination											
	Weightage	CA	CE (Viva)	ESE								
	Distribution	25%	25%	50%								

-



Text book/s*	1.	Hands-On Artificial Intelligence for IoT, Amita Kapoor, Publisher: Packt Publishing	
Other References			

# PO and PSO mapping with level of strength for Artificial Intelligence for IoT Lab (Course Code CIP031)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	P O4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS 03
CIP031	C01	2	2	1	-	3	1	1	-	2	2	2	2	1	1	-
-	CO2	3	3	2	2	3	2	2	2	1	1	1	3	3	2	3
artifici	CO3	3	2	2	2	3	2	2	2	3	3	3	3	3	2	3
Intellig ence	CO4	3	3	2	2	3	2	2	2	3	3	3	3	3	2	3
for IoT	CO5	3	3	2	3	3	2	2	2	3	3	3	3	3	2	3
Lab	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO	PO	PO	РО	PO	РО	РО	PO	PO	PO	PO	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	0 1	2	O 3
CIP031	Artificial Intelligen ce for IoT Lab	2.8	2.7	2.0	2.4	3.0	2.0	2.0	2.2	2.5	2.5	2.5	2.8	2.7	2.0	3.0

- 1. Addressed to Slight (Low=1) extent 2. A
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment	Computer Science & Engineering									
Pro	gram:	B.Tech									
Bra	nch:	CSE with Specialization in Artificial Intelligence of T	hings								
		(AIoT)	0								
1	Course Code	CSI032									
2	Course Title	Data Analytics for IoT									
3	Credits	3									
4	Contact	3-0-0									
	Hours										
	(L-T-P)										
	Course Status	Elective									
5	Course	The objective of this course is to learn techniques to solv	ve unique								
	Objective	problems associated with IoT and examine and analyze	data from								
		your IoT devices									
6	Course	CO1: Identify the main challenges of IoT analytics syste	ems								
	Outcomes	development and deployment.									
		CO2: Utilize IoT, Cloud and BigData Integration for Io	T Analytics								
		CO3: Evaluate the development tools for real-life applic	ations using								
		oT analytics									
		CO4: Explain the paradigm for on-demand IoT analytics as a service									
		based on the open source framework.									
		CO5: Analyze the data in smart buildings, including data stemming									
		from sensors and lol devices.	• 4 • 4								
		CO6: Assess the popular tools for 101 data analytics, alo	ong with their								
7	Course	Use in practical projects and applications.	h and avaaaaa								
/	Description	of IoT applications and investments. There are different	types of data								
	Description	analytics that can be used and applied in the IoT investments	lypes of uata								
		advantages	ients to gain								
8	Outline syllabi		CO								
0	Outline synabl	40	Manning								
	Unit 1	Introducing IoT Analytics	mapping								
	A	Defining IoT analytics and IoT. The concept of									
		constrained	CO1, CO6								
	В	IoT Data and BigData. Challenges of IoT Analytics									
		Applications	CO1, CO6								
	С	IoT Analytics Lifecycle and Techniques	CO1, CO6								
	Unit 2	IoT, Cloud and BigData Integration for IoT									
		Analytics									
	А	Cloud-based IoT Platform, Data Analytics for the IoT,	CO2								
		Data Collection Using Low-power, Long-range Radios									
	В	WAZIUP Software Platform	CO2								
	С	iKaaS Software Platform CO2, CO6									
	Unit 3	Development Tools for IoT Analytics Applications	evelopment Tools for IoT Analytics Applications								



А	Introduction,	The VITAL A	Architecture for IoT	CO3, CO6						
	Analytics Ap	plications								
В	VITAL Deve	lopment Envi	ronment: Overview,	CO3 CO6						
	VITAL Node	S		005,000						
С	IoT Analytics	CO3, CO6								
Unit 4	An Open So	An Open Source Framework for IoT Analytics as a								
	Service	Service								
А	Architecture	for IoT Analy	tics-as-a-Service, Sensing-	CO4 CO6						
	as-a-Service	Infrastructure	Anatomy	004,000						
В	Scheduling, N	Metering and	Service Delivery	CO4, CO6						
С	From Sensing	g-as-a-Service	e to IoT-Analytics- as-a-	CO4 CO6						
	Service	Service								
Unit 5	Data Analyti	Data Analytics in Smart Buildings								
А	Addressing E	nergy Efficie	ncy in Smart Buildings	CO5, CO6						
В	General Arch	itecture for M	Ianagement Systems of	CO5 CO6						
	Smart Buildin	ngs		005,000						
С	IoT-based Inf	formation Ma	nagement System for							
	Energy			CO5, CO6						
	Efficiency in	Smart Buildin	ngs							
Mode of	Theory/Jury/	Practical/Viva	1							
examination										
Weightage	CA									
Distribution	30%	20%	50%							
Text book/s*										
Other										
References										



G		
<b>S</b> .	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: Identify the main challenges of IoT analytics	PO1, PO2, PO4, PO12,
	systems development and deployment.	PSO2
2.	CO2: Utilize IoT, Cloud and BigData Integration for	PO1, PO4, PO5, PO11,
	IoT Analytics	PO12, PSO1, PSO2
3.	CO2: Evaluate the development tools for real life	PO1, PO2, PO3, PO4,
		PO5, PO10, PO11,
	applications using 101 analytics	PO12, PSO1, PSO2
4.	CO4: Explain the paradigm for on-demand IoT analytics as a service based on the open source framework.	PO1, PO4, PO10, PO11, PO12, PSO2
5.		PO1, PO2, PO3, PO4,
	CO5: Analyze the data in smart buildings, including	PO5, PO6, PO7, PO9,
	data stemming from sensors and IoT devices.	PO10, PO11, PO12,
		PSO1, PSO2
6.	COG. Access the nonview tools for LoT data analytics	PO1, PO2, PO3, PO4,
	clong with their use in prestical projects and	PO5, PO6, PO7, PO8,
	along with their use in practical projects and	PO9, PO10, PO11,
	applications.	PO12, PSO1, PSO2

# PO and PSO mapping with level of strength for Course Name Data Analytics for IoT (Course Code CSI032)

Course Code_ Course Name	CO's	РО 1	PO 2	РО 3	РО 4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
	C01	2	3	-	2	-	-	-	-	-	-	-	2	-	1	-
CCMAAA	CO2	3	-	-	2	2	-	-	-	-	-	2	2	2	1	-
CS1032_ Data	CO3	3	2	3	2	2	-	-	-	-	2	2	2	2	1	•
for IoT	CO4	2	-	-	2	-	-	-	-	-	2	2	2	-	1	-
	CO5	3	3	3	2	2	3	2	-	2	2	2	2	2	2	-
	CO6	3	3	3	2	3	3	2	2	2	2	2	2	3	2	-



#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	РО 3	PO 4	P O 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSI032	Data Analytics for IoT	2.7	2.8	3.0	2.0	2.3	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3	1.3	0.0

Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Prog	gram:	B.Tech								
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	T							
		Applications								
1	Course Code	CSI033								
2	Course Title	Image Processing with IoT								
3	Credits	2								
4	Contact	2-0-0								
	Hours									
	(L-T-P)									
	Course Status	Elective								
5	Course	The objective of this course is to explore multipl	e techniques,							
	Objective	frameworks, and libraries for capturing, processing, a	nd displaying							
		digital images.								
6	Course	Durse CO1: Recall the list the basic components of Raspberry Pi								
	Outcomes	omes CO2: Illustrate the concept of image processing using IoT platform								
		CO3: Make use of different basic operations on Images								
		CO4: Assess the different advance operations on Images								
		CO5: Apply the transformations and filter methods on ima	ages							
		CO6: Design and develop image processing applications u	using							
		Raspberry Pi								
7	Course	The course describes the concept of image processing w	ith the help of							
	Description	Python and Raspberry Pi. This course covers an interactiv	ve GUI for the							
		image processing demos using Tkinter, scipy.misc and scip	by.ndimage etc							
		to process images.								
8	Outline syllabu	18	CO							
	TT . 4 1	L ( ) L ( ) L D L L D P O D ( )	Mapping							
		Introduction to Raspberry Pi & Python	CO1							
	A	The Raspberry Pi, Raspberry Pi Setup, The Raspbian OS	COI							
	В	Connecting the Raspberry Pi to a Network and to the	CO1							
		Internet, Updating the Pi, Shutting Down and Restarting	COI							
	C	Pl Eastures of Duthon, Dunning a Duthon Descreen and								
	C	Preatures of Python, Running a Python Program and Dython Modes, IDEs for Dython	CO1							
	Unit 2	Introduction to Digital Image Processing								
		Signal Processing Image Processing Using IoT								
	A	Distform and Python for Digital Image Processing (DIP)	CO1, CO2							
	B	Image Sources: Using the Webcam and The Pi Camera	CO1 CO2							
	D	Module	001,002							
	C	Working with Images Build in Functions Image	CO1 CO2							
	C	Properties CO1, CO								
	Unit 3	Rasic Operations on Images								
		Image Module: Splitting and Merging Image Channels								
	11	Image Mode Conversion Image Blending	CO3, CO6							
	B	Resizing an Image Rotating an Image Crop and Paste								
		Operations Conving and Saving Images to a File	CO3, CO6							
	1	perations, copying and baying images to a rite								

-



С	Knowing the	Value of a P	articular Pixel, ImageChops	CO3, CO6
	Module, Imag	geOps Modu	le	,
Unit 4	Advanced O	perations on	n Images	
А	The ImageFil	ter Module		CO4, CO6
В	The ImageEn	hance Modu	le	CO4, CO6
С	Color Quantiz	CO4, CO6		
Unit 5	Transformat	tions and Fil	ters	
А	Transformation	ons: shift(), z	coom()	CO5, CO6
В	Measurement	CO5, CO6		
С	Filters: Low-	CO5, CO6		
Mode of	Theory/Jury/I	Practical/Viv	a	
examination				
Weightage	CA	MSE	ESE	
Distribution	25%	25%	50%	
Text book/s*	1. Raspb			
	Ashw			
		-	-	
Other				
References				

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Recall the list the basic components of Raspberry Pi	PO1, PO5, PO8, PO12
2.	CO2: Illustrate the concept of image	PO1, PO2, PO3, PO4, PO5, PO6,
	processing using loT platform	PO9, PO10, PO11, PO12, PSO1,
		PSO2, PSO3
3.	CO3: Make use of different basic operations	PO1, PO2, PO3, PO4, PO5, PO6,
	on Images	PO8, PO9, PO10, PO12, PSO1, PSO2
4.	CO4: Assess the different advance operations	PO1, PO2, PO3, PO4, PO5, PO9,
	on Images	PO10, PO12, PSO1, PSO2, PSO3
5.	CO5: Apply the transformations and filter	PO1, PO2, PO3, PO4, PO5, PO6,
	methods on images	PO8, PO9, PO10, PO12, PSO1,
		PSO2, PSO3
6.	CO6: Design and develop image processing	PO1, PO2, PO3, PO4, PO5, PO6,
	applications using Raspberry Pi	PO8, PO9, PO10, PO11, PO12, PSO1,
		PSO2, PSO3



# PO and PSO mapping with level of strength for Course Name Image Processing with IoT (Course Code CSI033)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	P O4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PS O2	PS 03
	C01	3	-	-	-	2	-	-	2	-	-	-	2	-	2	-
CSI033	CO2	3	2	2	2	3	2	-	-	2	2	2	2	2	2	2
_Image Process	CO3	3	2	2	2	3	2	-	2	2	2	-	2	2	2	-
ing with	CO4	3	3	3	3	3	-	-	-	2	2	-	2	2	2	2
ІоТ	CO5	3	3	3	3	3	3	-	2	2	2	-	3	2	3	2
	CO6	3	3	3	3	3	3	3	2	3	3	3	3	2	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	РО 3	РО 4	P O 5	PO 6	P O 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PSO 3
CSI033	Image Processing with IoT	3.0	2.6	2.6	2.6	2. 8	2.5	3.0	2.0	2.2	2.2	2.5	2.3	2.0	2.3	2.3

- 1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology Computer Science & Engineering									
Dep	artment	Computer Science & Engineering									
Pro	gram:	B.Tech									
Bra	nch:	CSE with Specialization in Artificial Intelligence for	IoT								
		Applications									
1	Course Code	CIP033									
2	Course Title	Image Processing with IoT Lab									
3	Credits	1									
4	Contact Hours	0-0-2									
	(L-T-P)										
	Course Status	Elective									
5	Course	The objective of this course is to explore multip	le techniques,								
	Objective	frameworks, and libraries for capturing, processing, a	and displaying								
	-	digital images.	1								
6	Course	CO1: Recall the list the basic components of Raspberry	Pi								
	Outcomes	CO2: Demonstrate the Python IDEs for image processin	g								
		CO3: Demonstrate the Tkinter Library to implement im	age properties								
		CO4: Make use of Pillow library for image processing us	sing Raspberry								
		Pi									
		CO5: Apply the transformations and filter methods on in	nages								
		CO6: Design and develop image processing appli	ications using								
		Raspberry Pi									
7	Course	The course describes the concept of image processing w	ith the help of								
	Description	Python and Raspberry Pi. This course covers an interacti	ve GUI for the								
		image processing demos using Tkinter, scipy.misc and	scipy.ndimage								
		etc to process images.									
8	Outline syllabus	8	CO								
	TT •/ 4		Mapping								
	Unit I	Introduction to Raspberry Pi	001.007								
		Introduction and Setup of Raspberry P1, The Raspbian	CO1, CO6								
		US Connection the Development Distance Network and to the									
		Internet Undering the Di Shutting Down and	001,000								
		Restarting Pi									
	Unit 2	IDEs for Python									
		Introduction and implementation of Geany Sat Build	CO2 $CO6$								
		Commands window and Execute Commands	002,000								
		Connect a Raspherry Pi to Webcam and Pi Camera	CO2 CO6								
		Module to acquire images	002,000								
	Unit 3	Using Tkinter Library									
		Implement Python's built-in GUI module "Tkinter" for	CO3 CO6								
		displaying images	005,000								
		Implement different image properties	CO3. CO6								
	Unit 4	Pillow library for image processing	,								
		Implement basic operations on images	CO4. CO6								
		Implement advanced operations on images	CO4. CO6								
	Unit 5	Transformations and Filters									
		Use the scipy ndimage library for processing images	CO5 CO6								
L	I	processing mages	,								



	Implement L	ow-Pass and H	ligh-Pass filters on images	CO5, CO6							
Mode of	Jury/Practica	l/Viva									
examination											
Weightage	CA	CA CE (Viva) ESE									
Distribution	25%										
Text book/s*	1. Raspl Ashw	1. Raspberry Pi Image Processing Programming, Ashwin Pajankar, Apress									
Other											
References											

### PO and PSO mapping with level of strength for Image Processing with IoT Lab (Course Code CIP033)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	P O4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PS O2	PS O3
	CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
CIP033 _Image	CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
Process	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
with	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
IoT Lab	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO	PO	PO	РО	РО	РО	PO	PO	PO	PO	PO	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	O 1	2	03
CIP033	Image Processin g with IoT Lab	2.3	2.0	2.0	2.0	3.0	2.0	2.0	2.2	2.5	2.5	2.5	2.7	2.7	2.0	2.0

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Scho	hool SETBatch: 2023-27ogram B-TECHCurrent Academic Year: 2023-24										
Prog	gram B-TECH	Current Acade	mic Year: 2023-24								
Brar	nch CSE	CSE with Spec	ialization in Artificial Intelligence for IoT A	Applications							
		Semester VI									
1	Course Code	CSA041	Course Name Natural Language Processin	ng							
2	Course Title	Natural Langu	age Processing	0							
3	Credits	3	0 0								
4	Contact Hours	3-0-0									
	(L-T-P)										
	Course Status	Specialization 1	Elective								
5	Course Objective	Students will tr	tudents will try to learn								
U	course cojeca e	12 Basics o	f natural language processing								
		12. Dastes o	13. How to apply basic algorithms in natural language processing.								
		14 Algorith	14. Algorithmic description of the main language levels morphology.								
		in. Aigoitti	syntax semantics and pragmatics								
		15 Decise o	syntax, semantics, and pragmatics.								
		15. Dasies 0	artificial intelligence								
			artificial intelligence.								
6		16. Techniq	16. Techniques such as tokenization, stemming, and temmatization.								
6	Course Outcomes	Students will be	udents will be able to D-7 <b>Define</b> Computational Linguistics phenomena and making decisions								
		CO-7. Define (	D-7. Define Computational Linguistics phenomena and making decisions								
		using it.	using it.								
		CO-8. Explain	how to access Text Corpora and Lexical Reso	ources.							
		CO-9. <b>Apply</b> p	rocessing of raw text using NLP programming	g concepts.							
		CO-10.Analyze	tagging of words and Extracting Information	from Text.							
		CO-11.Discuss	analysis of sentences using CFG and Propositi	ional Logic.							
		CO-12. Design	NLP based applications for different business	environment.							
7	Course Description	This course prov	vides an introduction to the field of computation	onal linguistics,							
		aka natural lang	uage processing (NLP). We will learn how to	create systems							
		that can under	rstand and produce language, for applica	tions such as							
		information ex	traction, machine translation, automatic	summarization,							
		question-answer	ring, and interactive dialogue systems. The co	ourse will cover							
		linguistic (kno	wledge-based) and statistical approaches	to language							
		processing in the	e three major subfields of NLP: syntax (langu	age structures),							
		semantics (lang	uage meaning), and pragmatics/discourse (th	e interpretation							
		of language in c	ontext).								
8	Outline syllabus			CO Mapping							
	Unit 1	Introduction and	d Computational Linguistics								
	А	What is Natural I	Language Processing, hands-on demonstrations.	CO1							
		Ambiguity and un	ncertainty in language. The Turing test								
	В	Computing with	Language Texts and Words Implementation of	CO1							
		NLTK, Searching	g Text, Counting Vocabulary, A Closer Look at								
		Simple Statistics	Frequency Distributions Fine-grained								
		Selection of Wor	ds. Collocations and Bigrams.								



С	Making Decisions and Taking Control, Conditionals, Operating on Every Element, Nested Code Blocks, Looping with Conditions	CO1
Unit 2	Accessing Text Corpora and Lexical Resources	
A	Automatic Natural Language Understanding, Word Sense Disambiguation, Pronoun Resolution, Generating Language Output, Machine Translation, Spoken Dialog Systems, Textual Entailment, Limitations of NLP	CO2
В	Accessing Text Corpora, Gutenberg Corpus, Web and Chat Text, Brown Corpus, Reuters Corpus, Inaugural Address Corpus, Annotated Text Corpora, Corpora in Other Languages	CO2
C	Text Corpus Structure, Loading your own Corpus, Conditional Frequency Distributions, Conditions and Events, Counting Words by Genre, Plotting and Tabulating Distributions, Generating Random Text with Bigrams,	CO2
Unit 3	Processing Raw Text	
A	Lexical Resources,, Wordlist Corpora, A Pronouncing Dictionary, Comparative Wordlists, Shoebox and Toolbox Lexicons, WordNet, Senses and Synonyms, The WordNet Hierarchy, Lexical Relations, Semantic Similarity	CO3
В	Accessing Text from the Web and from Disk, Strings Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation,Formatting From Lists to Strings	CO3
С	NLP Programming Sequences, Style, Functions for text processing, Program Development & Algorithm Design using, Python Libraries	CO3
Unit 4	Tagging & Information Extraction	
A	Categorizing and Tagging Words Using a Tagger, Tagged Corpora, Mapping Words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformation-Based Tagging, Determine the Category of a Word	CO4
В	Text classification Supervised Classification, Examples of Supervised Classification, Evaluation, Decision Trees, Naive Bayes Classifiers, Maximum Entropy Classifiers, Modeling Linguistic Patterns	CO4
С	Extracting Information from Text Information Extraction, Chunking, Developing and Evaluating Chunkers, Recursion in Linguistic Structure, Named Entity Recognition, Relation Extraction	CO4
Unit 5	Analysis of sentences	
A	Analyzing Sentence Structure Grammatical Dilemmas, What's the Use of Syntax?, Context-Free Grammar, Parsing with Context- Free Grammar, Dependencies and Dependency Grammar, Grammar Development	CO5



В	Analyzing the Meaning of Sentences Natural Language CO5											
	Understanding,Propo	ositional Log	gic,First-Order Logic,The									
	Semantics of English	n Sentences,	Discourse Semantics									
С	Managing Linguistic	DataCorpu	s Structure, The Life Cycle of a	CO5								
	Corpus, Acquiring D	ata,Working	g with XML,Working with									
	Toolbox Data,Descri	ibing Langu	age Resources Using OLAC									
	Metadata											
Mode of	Theory	Гheory										
examination												
Weightage	CA	ETE										
Distribution	25%											
Text book/s*	6. Speech and La	inguage pro	ocessing An introduction to Nati	ural Language								
	Processing, Co	omputation	al Linguistics and speech Recog	nition by								
	Daniel Jurafsk	y and Jame	es H. Martin (ISBN13: 978-013)	1873216)								
	7. Ruslan Mitkov	, The Oxfo	ord Handbook of Computational	Linguistics,								
	Oxford Univer	sity Press,	2005									
Other References	7. Charu C. Aggarwal and Cheng Xiang Zhai, Mining Text Data,											
	Springer, 2012											
	8. Hopcroft, J.E.	and Ullma	n, J.D., Introduction to Automat	a, Theory and								
	Languages, Addison-Wesley, 1979											

S. No.	Course Outcome	Program Outcomes (PO) &
		Program Specific
		Outcomes (PSO)
1.	<b>Define</b> Computational Linguistics phenomena and making decisions using it.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	Explain how to access Text Corpora and Lexical Resources.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	Apply processing of raw text using NLP programming concepts.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	Analyze tagging of words and Extracting Information from Text.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	<b>Discuss</b> analysis of sentences using CFG and Propositional Logic.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	<b>Design</b> NLP based applications for different business environment.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3



# **PO and PSO mapping with level of strength for Course Name** Natural Language Processing (**Course Code CSA041**)

<u> </u>	РО	PO1	PO1	PO1	PSO	PSO	PSO								
0	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO													2	3	1
1	3	3	3	3	3	1	1	1	1	3	1	3			
CO													3	3	2
2	3	3	3	3	3	1	1	1	1	3	1	3			
CO													3	3	1
3	3	3	3	3	3	2	1	1	1	3	1	3			
CO													3	3	3
4	3	3	3	3	3	1	2	1	1	3	1	3			
CO													3	3	3
5	3	3	3	3	3	2	2	1	2	3	1	3			
CO													3	3	3
6	3	3	3	3	3	3	3	1	3	3	2	3			

### Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PS O 3
CSA	Natural															
041	Language		3.0	3.0	3.0	3.0	1.6	1.6	1.0	1.5	3.0	0.0	3.0	2.8	3.0	2.1
041	Processing	3.00	0	0	0	0	7	7	0	0	0	0	0	3	0	7

#### Total- 34.83 Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



School: School of Engineering & Technology											
Dep	artment	Computer Science & Engineering									
Pro	gram:	B.Tech									
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	T								
		Applications									
1	Course Code	CSI011									
2	Course Title	Android with IoT									
3	Credits	2									
4	Contact	2-0-0									
	Hours										
	(L-T-P)										
	Course Status	Elective									
5	Course	This course aim to give an overview of Android with IoT, i	ts architecture,								
	Objective	challenges and applications in different context.									
6	Course	CO1: Define the basics of Android platform	CO1: Define the basics of Android platform								
	Outcomes	CO2: Outline the Components of Android									
		CO3: Identify IoT ecosystem and role of the Android Thi	ngs								
		CO4: Analyze Android Things with IoT cloud platforms									
		CO5: Evaluate Android Things in IoT projects									
		CO6: Develop an Android App with IoT									
7	Course	The course is intended to know fundamentals of And	roid Platform,								
	Description	Android application components; integration of Android	with IoT, The								
		main focus is on implementing IoT projects using Androi	d Things.								
8	Outline syllabu	18	СО								
			Mapping								
	Unit 1	Introduction to Android Platform									
	А	Features of Android, Architecture of Android	CO1								
	В	Configuration of android SDK	CO1								
	С	Android application structure, Generation of APK Files	CO1								
		for Android Projects									
	Unit 2	Components of Android									
	А	Components of Android architecture	CO1, CO2								
	В	Activity, Activity life cycle	CO1, CO2								
	С	Service, Service life cycle, Concept of Intent	CO1, CO2								
	Unit 3	Android and IoT									
	А	Internet of Things overview & its components	CO3								
	В	Android Things overview, Android Things board	CO3								
		compatibility									
	С	Installation of Android Things	CO3								
	Unit 4	Integrate Android Things with IoT Cloud Platforms									
	А	IoT cloud architecture & IoT cloud platform overview	CO3, CO4								
	В	IoT cloud architecture overview	CO3, CO4								
L	С	Android with Android Things	CO3, CO4								
	Unit 5	Android Things									
	A	Creating the first Android Things project	CO5, CO6								
	В	Streaming data to the IoT cloud platform	CO5, CO6								
	С	Developing an Android app to retrieves data from	CO5, CO6								
		Android Things									



Mode of	Theory/Jury/	Practical/Viva							
examination									
Weightage	CA	MSE	ESE						
Distribution	25%	25%	50%						
Text book/s*	1. Android	. Android Things Projects by Francesco Azzola							
	Publishe	Publisher: Packt Publishing							
	2. Anubhav	2. Anubhav Pradhan and Anil V. Deshpande,							
	Composi	ng Mobile App	os: Learn, Explore, Apply						
	Using A	Using Android, 1st Edition, Wiley India.							
Other									
References									

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Define the basics of Android platform	PO1, PO5, PO10, PO11, PO12
2.	CO2: Outline the Components of Android	PO1, PO5, PO11, PO12
3.	CO3: Identify IoT ecosystem and role of the	PO1, PO2, PO4, PO5, PO6, PO7,
	Android Things	PO9, PO10, PO11, PO12, PSO3
4.	CO4: Analyze Android Things with IoT cloud	PO1, PO2, PO4, PO5, PO9, PO10,
	platforms	PO11, PO12, PSO1, PSO2, PSO3
5.	CO5: Evaluate Android Things in IoT projects	PO1, PO2, PO3,PO4, PO5, PO6,
		PO7, PO8, PO9, PO10, PO11, PO12,
		PSO1, PSO2, PSO3
6.	CO6: Develop an Android App with IoT	PO1, PO2, PO3, PO4, PO5, PO6,
		PO7, PO8, PO9, PO10, PO11, PO12,
		PSO1, PSO2, PSO3

# PO and PSO mapping with level of strength for Course Name Android with IoT (Course Code CSI011)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	P O4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
	CO1	2	-	•	-	2	-	•	•	•	1	2	2	-	-	-
CSI011 _Andro id with IoT	CO2	2	-	•	-	2	-	•	•	•	•	2	2	-	-	1
	CO3	2	2	-	2	2	2	3	-	2	2	2	3	-	-	-
	CO4	2	2	-	2	2	-	-	-	2	2	2	3	1	1	3
	CO5	2	2	2	3	2	3	2	2	3	3	2	3	3	3	3
	CO6	2	3	3	3	2	3	2	2	3	3	2	3	3	3	3



#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	РО 2	PO 3	РО 4	P O 5	PO 6	Р О 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSI011	Android with IoT	2.0	2.3	2.5	2.5	2. 0	2.7	2.3	2.0	2.5	2.2	2.0	2.7	2.3	2.3	2.5

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



School: School of Engineering & Technology										
Dep	artment	Computer Science & Engineering								
Pro	gram:	B.Tech								
Bra	nch:	CSE with Specialization in Artificial Intelligence for	ІоТ							
		Applications								
1	Course Code	CIP011								
2	Course Title	Android with IoT Lab								
3	Credits	1								
4	Contact Hours	0-0-2								
	(L-T-P)									
	Course Status	Elective								
5	Course	This course aim to give an overview of Android	with IoT, its							
	Objective	architecture, challenges and applications in different con	text.							
6	Course	CO1: Demonstrate the basics of Android Things on Ras	oberry							
	Outcomes	CO2: Build the Android Things project								
		CO3: Construction of connecting control peripherals	with Android							
		Things								
		CO4: Experiment with GPIO pins and PIR sensors	using Android							
		Things								
		CO5: Develop a small Android App with IoT								
		CO6: Build IoT application using Android Things								
7	Course	The course is intended to know fundamentals of And	roid Platform,							
	Description	Android application components; integration of Android	l with IoT, The							
		main focus is on implementing IoT projects using Andro	oid Things.							
8	Outline syllabus	5	CO							
		1	Mapping							
	Unit 1	Introduction								
		Install Android Things on Raspberry	CO1, CO6							
		Testing the installation: Connect Raspberry Pi to a	CO1, CO6							
		video using the HDMI, Connect Raspberry Pi to your								
		network using the LAN connection, Connect								
		Raspberry Pi to your Mac/PC using a USB cable								
	Unit 2	Android Things Project								
		Creating the first Android Things project	CO2, CO6							
		Cloning the template project, Create the project	CO2, CO6							
		manually								
	Unit 3	Connecting Control peripherals with Android								
		Things								
		Study the Android Things and how it works	CO3, CO6							
	<b></b>	Create your first Android Things app	CO3, CO6							
	Unit 4	Android Things with 101-1								
		Creating an Alarm System Using Android	CO4, CO6							
		Things								
		Use GPIO pins and PIK sensors, handle events from a	CO4, CO6							
	TT. •4 F									
	Unit 5	Anarold Things with 101-11								
		Build an app that is independent of the board	CO5, CO6							



	Implementat	ion of notifyin	g events from Android	CO5, CO6						
	Things to Ar	I hings to Android								
Mode of	Jury/Practica	Jury/Practical/Viva								
examination	-									
Weightage	CA	CA CE (Viva) ESE								
Distribution	25%	25% 25% 50%								
Text book/s*	1. Andr	1. Android Things Projects by Francesco Azzola								
	Publi	sher: Packt Pu	blishing							
	2. Anut	hav Pradhan a	nd Anil V. Deshpande,							
	Com	posing Mobile	Apps: Learn, Explore,							
	Appl	Apply Using Android, 1st Edition, Wiley								
	India									
Other										
References										

# PO and PSO mapping with level of strength for Android with IoT Lab (Course Code CIP011)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	Р О4	РО 5	PO 6	PO 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
	CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
CIP011 _Andro id with IoT Lab	CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	РО	PO	PO	РО	РО	PO	РО	РО	PO	PO	PO	PO	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	O 1	2	0 3
CIP011	Android with IoT Lab	2.3	2.0	2.0	2.0	3.0	2.0	2.0	2.2	2.5	2.5	2.5	2.7	2.7	2.0	2.0

- 1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



School: School of Engineering & Technology										
Dep	artment	Computer Science & Engineering								
Pro	gram:	B.Tech								
Bra	nch:	CSE with Specialization in Artificial Intelligence for Io	T							
		Applications								
1	Course Code	CSI041								
2	Course Title	Fog Computing in IoT								
3	Credits	3								
4	Contact	3-0-0								
	Hours									
	(L-T-P)									
	Course Status	Elective								
5	Course	The objective of this course is to provide the fundamentals	s and followed							
	Objective	by the middleware and technological solutions to imple	ment fog and							
	5	edge-related applications.								
6	Course	CO1: Define the IoT paradigm along with CIoT limitations								
	Outcomes	CO2: Outline the integrated cloud-to-things system comp	ising cloud							
		computing, fog computing, and the IoT	C							
		CO3: Assess the optimization problems in Fog and Edge of	computing							
		architecture	1 0							
		CO4: Evaluate the conceptual architecture for the data ma	nagement in							
		fog computing environments								
		CO5: Explain the different IoT applications with fog computing								
		CO6: Discuss the foundations, middleware, data management and								
		applications of fog computing.								
7	Course	The course covers the state-of-the-art in fog and edge com	puting, their							
	Description	applications, architectures, and technologies.								
8	Outline syllabu	15	СО							
			Mapping							
	Unit 1	Introduction to Fog Computing								
	А	IoT and New Computing Paradigms: Fog and Edge								
		Computing Completing the Cloud, Advantages, Hierarchy of	CO1, CO6							
		Fog and Edge Computing								
	В	Business Models, Opportunities and Challenges	CO1, CO6							
	C	Addressing the Challenges in Federating Edge	CO1, CO6							
	TL	Resources: Networking and Management Challenge	,							
	Unit 2	Uptimization Problems in FEC	<u> </u>							
	A	Introduction and Case for Optimization in Fog Computing	02							
	В	Formal Modeling Framework for Fog Computing, Metrics:	CO2							
		Financial Cost	02							
	С	Quality Attributes Optimization Opportunities along the Fog								
	C	Architecture. Optimization Opportunities along the Service	CO2. CO6							
		Life Cycle	,							
	Unit 3	Middleware for Fog and Edge Computing								
	А	Need for Fog and Edge Computing Middleware, Design	CO3 CO4							
		Goals, State-of-the-Art Middleware Infrastructures	005,000							
	В	System Model: Embedded Sensors or Actuators, Personal								
		Devices, Fog Servers, Cloudlets, Cloud Servers, Proposed	CO3, CO6							
		Architecture: API Code, Security, Device Discovery								



С	Middleware: C Participating D Resource Man Management, J	Context Monitor Devices, Data As agement, Netwo Mobility Manag	ing and Prediction, Selection of nalytics, Scheduling and ork Management, Execution gement, Sensor/Actuators	CO3, CO6						
Unit 4	Data Manage	ment in Fog Co	omputing							
А	Introduction, F	og Data Manag	gement: Fog Data Life Cycle	CO4, CO6						
В	Data Character	Data Characteristics, Data Pre-Processing and Analytics								
С	Data Privacy, Architecture	Data Storage an	d Data Placement, Proposed	CO4, CO6						
Unit 5	Fog Comput									
А	Fog Applicati Vehicle Mana	Fog Applications: Healthcare and Well-being, Smart Vehicle Management								
В	Fog Applicati Management	Fog Applications: Smart City Applications, Smart Data Management								
С	Other Emergi	CO5, CO6								
Mode of	Theory/Jury/I									
examination										
Weightage	CA	MSE	ESE							
Distribution	25%	25%	50%							
Text book/s*	1. Fog and	Edge Computi	ng: Principles and Paradigms,							
	Editor Buy	ya, Srirama, Jo	hnWiley & Sons							
	2. Sensors, C	loud, and Fog:	The Enabling Technologies for							
	the Interne	et of Things, S	udip Misra, Subhadeep Sarkar,							
	Subarna C	Subarna Chatterjee, CRC Press								
Other	1. Fog Comp									
References	1st Edition									
	2. Dr. Guilla									
	Mounier,	Mounier, 'Technologies & Sensors for the Internet of								
	Things Bu	isinesses & Ma	urket Trends 2014 - 2024', Yole							
	Developm	ent Copyrights	,2014.							



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Define the IoT paradigm along with CIoT limitations	PO1, PO2, PO12
2.	CO2: Outline the integrated cloud-to-things system comprising cloud computing, fog computing, and the IoT	PO1, PO2, PO3, PO4, PO7, PO12
3.	CO3: Assess the different design aspects of middleware for Fog and Edge computing	PO1, PO2, PO3, PO4, PO5, PO7, PO9, PO10, PO11, PO12, PSO1, PSO2
4.	CO4: Evaluate the conceptual architecture for the data management in fog computing environments	PO1, PO2, PO3, PO4, PO7, PO9, PO10, PO11, PO12, PSO1, PSO2
5.	CO5: Discuss various case studies of fog computing	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
6.	CO6: Develop real-life IoT applications with fog computing	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3

# PO and PSO mapping with level of strength for Course Name Fog Computing in IoT (Course Code CSI041)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	P O4	РО 5	PO 6	PO 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
CSI041	CO1	2	2	-	-	-	-	-	-	-	-	-	2	-	-	-
	CO2	3	2	2	2	-	-	1	-	-	-	-	2	-	-	-
_Fog Compu	CO3	3	2	2	2	2	-	2	-	2	2	2	3	2	2	-
ting in IoT	CO4	3	2	2	2	-	-	2	-	2	2	2	3	2	2	-
	CO5	3	3	3	2	3	2	2	3	3	3	3	3	2	2	2
	CO6	3	3	3	2	3	3	2	3	3	3	3	3	2	2	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	РО 3	РО 4	P O 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSI041	Fog Computin g in IoT	2.8	2.3	2.4	2.0	2. 7	2.5	1.8	3.0	2.5	2.5	2.5	2.7	2.0	2.0	2.5

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Scho	ool:	School of Engineering & Technology									
Depa	artment	Computer Science & Engineering B Tech									
Prog	gram:	B.Tech									
Brai	nch:	CSE with Specialization in Artificial Intelligence for	[oT								
		Applications									
1	Course Code	CSI042									
2	Course Title	Industrial IoT 4.0									
3	Credits	3									
4	Contact	3-0-0									
	Hours										
	(L-T-P)										
	Course Status	Elective									
5	Course	This course is designed to offer students an introduction	to Industry 4.0								
	Objective	or the Industrial Internet), its applications in the business wo									
		Students will gain deep insights into how smartness is	being harnessed								
		from data and appreciate what needs to be done in orc	er to overcome								
6	0	some of the challenges.									
0	Course	201: Define the concept of industry 4.0									
	Outcomes CO2: Identify design principles under the industry 4.0 umbrella										
		Service System (DSS)									
		CO4: Analyze 5C Cyber Physical System architecture for	r Industry A O								
		CO5: Discuss the impact of digital transformation on tra	nsportation and								
		logistics	insportation and								
		CO6: DESErmine the opportunities, challenges bro	ught about by								
		Industry 4.0 to earn the benefits.	-8								
7	Course	Industry 4.0 refers to fourth generation of ind	ustrial activity								
	Description	characterized by smart systems and internet-ba	sed solutions.								
		Applicability of 4.0 in transportation, energy and i	nfrastructure is								
		explored, with effects on technology, organization and op	perations from a								
		systems perspective.									
8	Outline syllabu	IS	CO								
			Mapping								
	Unit 1	Fundamentals of IoT 4.0									
	А	Definition of Industry 4.0, Key Paradigm of Industry									
		4.0, Industry 4.0 Conception: Five Main Components of	CO1								
		Networked Production									
	В	Framework of Industry 4.0: Conception and									
		Technologies, Nine Pillars of Technological	COI								
		Advancement									
	C	Magaza Daran active of Later 40 M' D									
	С	Macro Perspective of Industry 4.0, Micro Perspective of	CO1								
1	C Unit 2	Macro Perspective of Industry 4.0, Micro Perspective of Industry 4.0, Industry 4.0 Components	CO1								
	C Unit 2	Macro Perspective of Industry 4.0, Micro Perspective of Industry 4.0, Industry 4.0 Components Industry 4.0: Design Principles	CO1								
	C Unit 2 A	Macro Perspective of Industry 4.0, Micro Perspective of Industry 4.0, Industry 4.0 Components <b>Industry 4.0: Design Principles</b> Interoperability, Virtualization, Decentralization, Real- Time Canability, Service Orientation, Modularity	CO1								
	C Unit 2 A	Macro Perspective of Industry 4.0, Micro Perspective of Industry 4.0, Industry 4.0 Components <b>Industry 4.0: Design Principles</b> Interoperability, Virtualization, Decentralization, Real- Time Capability, Service Orientation, Modularity, Impact of Industry 4.0	CO1 CO1, CO2								
	C Unit 2 A B	Macro Perspective of Industry 4.0, Micro Perspective of Industry 4.0, Industry 4.0 Components <b>Industry 4.0: Design Principles</b> Interoperability, Virtualization, Decentralization, Real- Time Capability, Service Orientation, Modularity, Impact of Industry 4.0 RAMI 4.0 (Reference Architecture Model Industry 4.0)	CO1 CO1, CO2								



	Vertical Axis	, Function of	Layers on the Horizontal Left	
	Axis, Hierarc	chical System	Architecture in Industry 4.0	
C	Industry 4.0 (	Component M	lodel: Specification of the	CO1 CO2
	Industry 4.0 (	Component M	lodel	001, 002
Unit 3	Servitization	and Produc	t Service-System (PSS)	
А	The concept	of Servitizatio	on, Drivers and Features of	CO1, CO2
	Servitization,	, Current State	e of Servitization and Impacts	CO3.CO6
	from Industry	$\frac{7}{4.0}$ , Industry	4.0 Services	
В	Product Serv	ice-System (P	SS), Definition, Features of a	CO1, CO2,
C	PSS: POPSS,	003, 006		
C	Pervasive Co	CO1, CO2,		
	(IoT)	CO3, CO6		
Unit 4	The Industry	y 4.0 Archite	cture and	
	Cyber-Physi	cal Systems		
А	Concept and	CO1, CO2,		
	CPS 5C Leve	el Architecture	2	CO4
В	Implementati	on of 5C CPS	Architecture in Factories,	CO1, CO2,
	Classification	n of CPS in Co	ontext of Industry 4.0	CO4, CO6
С	IT and OT Co	CO1, CO2		
	Principles: H	orizontal and	Vertical Integration, Basic	CO4. CO6
 <b>T</b> T <b>1</b> / <b>F</b>	Functions and	d Uses of CPS		,
Unit 5	Industry 4.0	across the Se		004 005
A	Introduction,	Transportatio	on 4.0: Multimodal	C04, C05,
D	Poil 4 0 Dig	ital Transform	ation of Dailways	$\frac{C06}{C04}$
D	Kall 4.0, Dig		lation of Kallways	CO4, CO3, CO6
С	Logistics 4.0			CO4. CO5.
	0			CO6
Mode of	Theory/Jury/	Practical/Viva	L	
examination				
Weightage	CA	MSE	ESE	
Distribution	25%	25%	50%	
Text book/s*	1. Hand	book of Indus	try 4.0 and SMART Systems	
	by Di	ego Galar Pas	cual, Pasquale Daponte,	
	Uday	Kumar, CRC	Press	
Other	1. Indus	try 4.0:	Managing The Digital	
References	Trans	formation, Du	c Truong Pham, University of	
	Birmi			
	2. The C			
	of Te	chnologies ar	d Applications in Production	
	Logie	tice Christop	h Ian Bartodziej Springer	
1	LU215	ues. Chiistopi		



S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Define the concept of Industry 4.0	PO1, PO6, PO7, PO8, P012
2.	CO2: Identify design principles under the	PO1, PO2, PO4, PO6, PO7, PO8,
	Industry 4.0 umbrella	PO9, PO12
3.	CO3: Explain the drivers and features of	PO1, PO2, PO4, PO5, PO6, PO7,
	Servitization and Product Service-System	PO8, PO9, PO10, PO11, PO12,
	(PSS).	PSO1, PSO2
4.	CO4: Analyze 5C Cyber Physical System	PO1, PO2, PO3, PO4, PO5, PO6,
	architecture for Industry 4.0	PO7, PO8, PO9, PO10, PO11, PO12,
		PSO1, PSO2
5.	CO5: Discuss the impact of digital	PO1, PO2, PO4, PO5, PO6, PO7,
	transformation on transportation and logistics.	PO8, PO9, PO10, PO11, PO12,
		PSO1, PSO2, PSO3
6.	CO6: DESErmine the opportunities,	PO1, PO2, PO3, PO4, PO5, PO6,
	challenges brought about by Industry 4.0 to	PO7, PO8, PO9, PO10, PO11, PO12,
	earn the benefits.	PSO1, PSO2, PSO3

# PO and PSO mapping with level of strength for Course Name Industrial IoT 4.0 (Course Code CSI042)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	PO4	РО 5	PO 6	PO 7	PO 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	1	-	-	-	-	1	2	2	-	-	-	2	-	-	-
	CO2	2	2	-	1	-	1	2	2	1	-	-	2	-	-	-
CSI042_Industrial	CO3	2	1	-	1	2	1	2	2	2	1	2	2	1	2	-
IoT 4.0	CO4	2	2	1	2	2	1	2	2	2	1	2	2	1	2	-
	CO5	2	2	-	2	2	1	2	2	2	2	2	2	2	3	2
	CO6	2	2	2	2	3	1	2	2	3	2	3	3	2	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	РО 2	РО 3	РО 4	P O 5	PO 6	P O 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PSO 3
CSI042	Industrial IoT 4.0	1.8	1.8	1.5	1.6	2. 3	1.0	2.0	2.0	2.0	1.5	2.3	2.2	1.5	2.5	2.0

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent 2.

2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



So	chool: SET	Batch: 2023-27									
Pı	rogram:	Current Academic Year: 2023-24									
B.	Tech.										
B	ranch: CSE	CSE with Specialization in Artificial Intelligence for Id	T								
		Applications									
		Semester: VII									
1	<b>Course Code</b>	CSA051 Course Name- RECOMENDER SYST	ГEMS								
2	<b>Course Title</b>	RECOMENDER SYSTEMS									
3	Credits	3									
4	Contact	3-0-0									
	Hours										
	(L-T-P)										
	Course Statu	s Specialization Elective									
5	Course	To develop state-of-the-art recommender systems that aut	omate a								
	Objective	variety of choice-making strategies with the goal of provid	ding								
		affordable, personal, and high-quality recommendations	1 /								
		4. To introduce fundamental techniques in recommen	ider systems.								
		5. To introduce the ideas of Non-personalized and pr	5. To introduce the ideas of Non-personalized and project-								
		association recommenders through content-based a	and								
		collaborative techniques.									
		6. To become familiar with to various approaches for	r building								
		recommender systems including collaborative, cor	ntent-based,								
		knowledge-based, and hybrid methods.									
6	Course	After Successful completion of this course the student wil	l be able to:								
	Outcomes	<b>CO1 :Define</b> the basics of Recommender Systems and its	types.								
		CO2: Explain the similarity measures used in	formation of								
		neighbourhood of samples of data.									
		CO3: Apply various techniques of content and know	owledge based								
		recommendation for real life applications.									
		<b>CO4: Analyse</b> and categorize the various recommendation	n techniques for								
		hybridization.									
		<b>CO5: Choose</b> the suitable type of Recommender system	ms for societal								
		problems									
		<b>CO6:Design</b> the recommender system to support all onli	ne applications								
		of folksonomies and Social Networking sites.									
7	Course	Recommender systems offer personalized access to online	e information								
	Description	in product catalogs, social media networks, and document	collections,								
		among other applications. It will introduce students to various									
		approaches for building recommender systems including collaborative, content-based, knowledge-based, and hybrid methods									
8	Outline svllah	coment-based, knowledge-based, and hybrid methods.									
-	Unit 1	Introduction									
			1								



А	Introduction to Recommender Systems, Neighbourhood-	CO1,
	based methods Recommendation, Applications of	
	recommender systems, Case study of movie lens, group	
	lens and amazon.com etc.	
В	Introduction to Information retrieval, Introduction to	CO1,
	collaborative filtering	
С	Knowledge sources, Neighbourhood-based methods.	CO1
Unit 2	Memory and Model-based Collaborative	
•	Recommendation	
A	Similarity measures used in Collaborative Filtering, Model-	CO2, CO6
	based Collaborative Recommendation Dimensionality	
	reduction.	
	Regression: Slope1 and SLIM models. Association rules and	
	Naïve Bayes models,	
В	Factorization Methods of Collaborative Recommendation,	CO2, CO6
	Latent factor models.	
С	Optimization techniques. Singular value decomposition,	CO2, CO6
	constrained matrix factorization.	
Unit 3	Content-based and Knowledge-based Recommendation	
А	High level architecture of content-based systems,	CO3, CO6
	Advantages and drawbacks of content based filtering,	
	Content-based Recommendation Feature representation,	
D	extraction, and selection.	CO3 CO6
Б	features of documents. Obtaining item features from tags	005,000
C	Rearded as head Decommondation Constraint head	
C	Rhowledge-based Recommendation Constraint-based	005,000
 Unit 4	Hybrid recommendation and Evaluation	CO3 CO6
	Hybrid Recommendation Complementarities between	CO3, CO6
<b>A</b>	recommendation techniques and knowledge sources.	005,000
В	Combining recommendation methods. Types of evaluation	CO3, CO6
	for recommender systems	
С	Evaluation design. Prediction metrics and ranking metrics.	CO3. CO6
-	A/B Testing	,
Unit 5	Context-aware recommendation	
А	Context effects in recommendation. Types and	CO5, CO6
	representations of context.	
В	Pre-filtering, post-filtering and contextual modelling,	CO5, CO6
	Temporal and location-sensitive models	
С	Recommender Systems and communities: Communities.	CO5. CO6
	collaboration and recommender systems in personalized web	,
	search. Social tagging recommender systems. Trust and	
	Recommendations Group recommender systems, reast and their	
	applications in solving societal problems	
	approvidents in solving societal problems.	1



Mode of	Theory			
examinatio				
n				
Weightage	CA	MTE	ETE	
Distributio	25%	25%	50%	
n				
Text	Aggarwal, C. C	C. Recommende	r Systems: The Textbook. Spri	nger 2019.
book/s*	ISBN 978-3-3	19-29657-9. Av	ailable through the DePaul libra	ary.
Other	http://www.de	itel.com/Resour	ceCenters/Web20/Recommend	erSystems/Rec
References	ommenderSyst	temsCourseSylla	abi/tabid/1321/Default.aspx	
Other	Francesco Ric	ci, LiorRokach	and BrachaShapira Recomr	nender
References	Systems			
	Handbook, 20	005		

S. No.	Course Outcome	Program Outcomes (PO) &
		Program Specific Outcomes (PSO)
1.	<b>Define</b> the basics of Recommender Systems and its types.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	<b>Explain</b> the similarity measures used in formation of neighbourhood of samples of data.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	<b>Apply</b> various techniques of content and knowledge based recommendation for real life applications.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	<b>Analyse</b> and categorize the various recommendation techniques for hybridization.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	<b>Choose</b> the suitable type of Recommender systems for societal problems	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	<b>Design</b> the recommender system to support all online applications of folksonomies and Social Networking sites.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3



PO and PSO mapping with level of strength for RECOMENDER SYSTEMS (Cou	irse
Code CSA051)	

Subje ct	Course Objecti ves	PO 1	P O 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO 12	PS O1	P S O 2	P S O 3
RECO	CO1	3	3	2	3	2	1	1	1	2	1	-	3	3	2	2
MEND FR	CO2	3	3	3	3	3	2	2	1	2	2	-	3	3	3	2
SYSTE	CO3	3	3	3	3	3	3	3	1	3	2	-	3	3	2	2
MS	CO4	3	3	3	3	3	2	2	1	3	2	-	3	3	3	2
CSA-	CO5	3	3	3	3	3	3	3	1	3	2	-	3	3	3	2
051	CO6	3	3	3	3	3	3	3	1	3	3	-	3	3	3	3

### Average of non-zeros entry in following table (should be auto calculated)

Cour se Code	Course Name	PO 1	P O2	P 0 3	P 0 4	P 0 5	P O 6	P 0 7	P 0 8	P 0 9	P 0 10	P 0 11	P 0 12	PS 0 1	PS O 2	PS 0 3
CSA -051	RECOME NDER SYSTEMS	3.00	3.0 0	2.8 3	3.0 0	2.8 3	2.3 3	2.3 3	1.0 0	2.6 7	2.0 0	0.0 0	3.0 0	3.0 0	2.6 7	2. 17

#### Total- 35.83

### Strength of Correlation

1. Addressed to Slight (Low=1) extent

2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology Computer Science & Engineering										
Dep	artment	Computer Science & Engineering										
Prog	gram:	B.Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	Т									
		Applications										
1	Course Code	CSI051										
2	Course Title	IoT in Healthcare										
3	Credits	3										
4	Contact	3-0-0										
	Hours											
	(L-T-P)											
	Course Status	Elective										
5	Course	The objective of this course is to give an overview of a r	eople-focused									
-	Objective	view on IoT by providing an outline of the component	s that may be									
		included in an IoT-based smart health ecosystem and intro	oduced a set of									
		dimensions to consider in smart health applications. Th	nensions to consider in smart health applications. This course also									
		discusses many challenges facing the wide spread adoptio	n of smart IoT									
		health care applications.										
6	Course	CO1: Outline the elements of IoT-based health care ecosy	stems.									
	Outcomes	CO2: Explain the different types of applications that utiliz	e IoT in									
		Healthcare										
		CO3: Discuss the IoT that enables the realization of smart	ambulance									
		D4: Assesses the adoption of this model for diagnosis and prognosis										
		of chronic obstructive pulmonary disease.										
		CO5: Elaborate security, privacy and ethical issues in sma	rt sensor									
		health and well-being application										
		CO6: Discuss the integration of the IoT in patient-focused	health									
		applications.										
7	Course	IoT can automate patient care workflow with the help healt	hcare mobility									
	Description	solution and other new technologies, and next-gen health	care facilities.									
		IoT in healthcare enables interoperability, machi	ne-to-machine									
		communication, information exchange, and data movement	ent that makes									
		healthcare service delivery effective.										
8	Outline syllabu	18	CO									
	<b>TT A A</b>		Mapping									
	Unit 1	IoT and People in Health Care										
	А	Introduction to Smart Health Care Ecosystem, The	COI									
	2	patient at the centre, Health care providers										
	B	Devices and sensors, Applications and Interfaces COI										
	C	Other Stakeholders: Social Support, Connecting the	COI									
	TT	components										
	Unit 2	Dimensions of 101 Applications in Health Care										
	A	Well-being-Illness, Physical, Temporary-Cure, Prevent-	CO1, CO2									
		Cure, Monitor-Manage, Internal-External Measures,										
	<b>D</b>	Health Care Provider-Individual Dimensions										
	В	Examples of IoT Related Health Care Applications and	CO1, CO2									
		Their Dimensions										



С	Challenges, I	Lack of Standa	rds,Data Issues, Changing	CO1, CO2
 TI :4 0	the Health Ca	re Provider-Pa	atient Roles	
Unit 3	Internet of 1	hings in Sma	rt Ambulance and	
	Emergency I	Vledicine		
A	IoT in Emerg	ency Medicine	e, Point-of-CareEnvironment	CO3, CO6
В	Biosensing N	etwork, Hiera	rchical Cloud Architecture,	CO3, CO6
	Weather Obs	ervation for Re	emote Rescue	
C	Integration ar	nd Compatibili	ty, Operational Consistency	CO3, CO6
	and Reliabilit	y Assurance, l	Electronic Patient Record	
	Retrieval in N	Aultihop Com	munication	
Unit 4	Case Study:	Chronic Obst	tructive Pulmonary Disease	
А	On-scene Dia	ignosis and Pro	ognosis, Data Acquisition	CO4, CO6
	and Analytics	5		
В	Decision and	Selection Proc	cess, Patient and the Ambient	CO4, CO6
	Environment	, Smart Ambul	ance Challenges, Reliability	
C	Standards, St	aff Training ar	nd Operating Procedures,	CO4, CO6
	Security and	Privacy		
Unit 5	Security, Pri			
А	Smart Health	CO5, CO6		
В	Cyber-Physic	al-Social Syst	ems, Machine Ethics,	CO5, CO6
	Physical Safe	ety		
С	Software Qua	ality, IT Securi	ty, Privacy, Risk of	CO5, CO6
	Technology N	Misuse		
Mode of	Theory/Jury/	Practical/Viva		
examination				
Weightage	CA	MSE	ESE	
Distribution	25%	25%	50%	
Text book/s*	1. Intern	et of Things A	to Z Technologies and	
	Appli	cations. Ousay	F. Hassan	
	2 Intelli	gent Data Sen	sing and Processing for	
	2. Intern	h and Wall ha	ng Applications Migual	
	Healt			
	Antor	110 W1ster Ova	indo, Pablo Pancardo Garcia,	
	Franc	isco Diego Ac	osta Escalante, Jose Adan	
	Herna	ndez Nolasco		
Other				
References				



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Outline the elements of IoT-based health care ecosystems.	PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2
2.	CO2: Explain the different types of applications that utilize IoT in Healthcare	PS01, PS02 PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2
3.	CO3: Discuss the IoT that enables the realization of smart ambulance	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2
4.	CO4: Assesses the adoption of this model for diagnosis and prognosis of chronic obstructive pulmonary disease.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2
5.	CO5: Elaborate security, privacy and ethical issues in smart sensor health and well-being application	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2
6.	CO6: Discuss the integration of the IoT in patient-focused health applications.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2

# PO and PSO mapping with level of strength for Course Name IoT in Healthcare (Course Code CSI051)

Course Code_ Course Name	CO's	PO 1	РО 2	PO 3	P O4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PS O2	PS O3
	CO1	3	2	2	-	2	3	3	2	2	2	2	3	2	2	-
	CO2	3	3	3	2	2	3	3	2	2	3	2	3	2	2	-
CSI051 _IoT in	CO3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	-
Healthc	CO4	3	3	3	3	2	3	3	2	3	3	3	3	3	3	-
	CO5	3	3	3	3	2	3	3	2	3	3	3	3	3	3	-
	CO6	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	РО 3	РО 4	P O 5	PO 6	P 0 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSI051	IoT in Healthcar e	3.0	2.8	2.8	2.8	2. 0	3.0	3.0	2.2	2.7	2.8	2.7	3.0	2.7	2.7	3.0

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sch	chool:     School of Engineering & Technology       Department     Computer Science & Engineering												
Dep	artment	Computer Science & Engineering											
Pro	gram:	B.Tech											
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	T										
		Applications											
1	Course Code	CSI052											
2	Course Title	Drones in IoT											
3	Credits	3											
4	Contact	3-0-0											
	Hours												
	(L-T-P)												
	Course Status	Elective											
5	Course	The objective of this course is to addresses major issues a	and challenges										
	Objective	in drone-based solutions proposed for IoT-enabled cell	lular/computer										
		networks, routing/communication protocols, surveillance	s applications,										
		secured data management, and positioning approaches.											
6	Course	CO1: Define the concepts of UAV (Unmanned Aerial Vel	nicle)										
	Outcomes	CO2: Explain the approaches of Drone path planning											
		CO3: Apply the internet of things enabled UAV											
		CO4: Categorize various data routing approaches in dynamical structure of the second structure of the	nic IoT										
		CO5: Elaborate the common attacks and security aspect ir	n UAV										
		CO6: Discuss the issues and challenges of IoT-enabled U.	AV										
7	Course	The Internet of Things (IoT) is a system of inter-conn	e Internet of Things (IoT) is a system of inter-connected devices,										
	Description	ects, and organisms. Among these devices, drones are gaining lots of											
		interest. Drones are expected to communicate with cellul	erest. Drones are expected to communicate with cellular networks in										
		the next generation networks (5G and beyond) which oper	ns the door for										
		another exciting research area.	~~										
8	Outline syllabi	18	CO										
	<b>T</b> T •/ 4		Mapping										
	Unit 1	Drones in the IoT Era	<b>CO1</b>										
	A	Intelligence in UAVs, Collaborative UAVs in Cloud	COI										
	B	Static Positioning of Drones	COl										
	C	Dynamic Positioning of Drones: Drones Repositioning	CO1										
	<b>T</b> T <b>1</b> / <b>A</b>	Schemes											
	Unit 2	Drones Path Planning	<b>GO1 GO2</b>										
	A	Static and Dynamic Approaches	<u>CO1, CO2</u>										
	В	System Models: FANET Model, Cost and	CO1, CO2										
	~	Communication Models and Power and Lifetime Model											
	C	Least Cost Path Finder (LCPF) Approach	CO1, CO2										
	Unit 3	IoT-enabled UAVs	<u> </u>										
	A	For Multimedia Delivery: System Model	CO3, CO6										
	B	PSO in IIoT	CO3, CO6										
	C	Performance Evaluation	CO3, CO6										
	Unit 4	Data Routing in Dynamic IoT											
	А	IoT System Model: IoT Model, IoT Node, Pricing and	CO4, CO6										
		Communication Model											
	В	Adaptive Routing Approach	CO4, CO6										
	C	Use Case and Theoretical Analysis	CO4, CO6										



Unit 5	Security in U											
А	PLS for UAV	V Systems: UA	V as a Mobile Relay and	CO5, CO6								
	Mobile Trans	mitter BS										
В	PLS for UAV	V Systems: Mo	bile Jammer, Flying UE	CO5, CO6								
С	Common Att	Common Attacks in UAV Systems										
Mode of	Theory/Jury/I	Theory/Jury/Practical/Viva										
examination												
Weightage	CA	MSE	ESE									
Distribution	25%	25%	50%									
Text book/s*	1. Drone	es in IoT-enabl	ed Spaces, Fadi Al-Turjman,									
	CRC	CRC Press, Taylor & Francis										
Other												
References												

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Define the concepts of UAV (Unmanned Aerial Vehicle)	PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO9, PO10, PO12, PSO1, PSO2
2.	CO2: Explain the approaches of Drone path planning	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO12, PSO1, PSO2
3.	CO3: Apply the internet of things enabled UAV	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
4.	CO4: Categorize various data routing approaches in dynamic IoT	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
5.	CO5: Elaborate the common attacks and security aspect in UAV	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2
6.	CO6: Discuss the issues and challenges of IoT-enabled UAV	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3



# PO and PSO mapping with level of strength for Course Name Drones in IoT (Course Code CSI052)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	P O4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PS O2	PS O3
	CO1	3	2	2	-	3	2	2	2	2	2	-	3	2	2	-
	CO2	3	3	3	2	3	3	3	2	2	3	-	3	2	2	-
CSI052	CO3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
s in IoT	CO4	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
	CO5	3	3	3	3	3	3	3	2	3	3	3	3	3	3	-
	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	РО 3	РО 4	P O 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSI052	Drones in IoT	3.0	2.8	2.8	2.8	3. 0	2.8	2.8	2.2	2.7	2.8	3.0	3.0	2.7	2.7	2.3

- 1. Addressed to Slight (Low=1) extent
  - 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent


Sch	ool: SET	Batch: 2023-27						
Pro	gram: B-TECH	Current Academic Year: 2023-24						
Bra	unch: CSE	CSE with Specialization in Artificial Intelligenc	e for IoT					
		Applications						
		Semester: VII						
1	Course Code	CSA061 Course Name: Robotics and Intel	ligent Systems					
2	<b>Course Title</b>	<b>Robotics and Intelligent Systems</b>						
3	Credits	3						
4	<b>Contact Hours</b>	3-0-0						
	(L-T-P)							
	<b>Course Status</b>	Specialization Elective						
5	Course Objective	Students will try to learn:						
		17. Fundamental principles of robot system desig	gn and operation.					
		18. How to apply concepts of translational and ro	otational motion,					
		and gears to robot construction.						
		19. To design and program simple autonomous re-	obots.					
		20. To implement algorithms that enables the use	e of sensors and					
		actuators to facilitate intelligent behavior, learning and						
		perception.						
6	Course	Students will be able to:						
	Outcomes	CO1:Define the concept and key compon	ents of robotics					
		technologies.						
		that enable a robot to analyze their environment	t reason and take					
		appropriate actions toward the given goal.	t, reason and take					
		CO3: Apply the learned knowledge and skills in	practical robotics					
		laboratories and experiments.						
		CO4: Analyze problems in spatial coordinate	representation and					
		spatial transformation, robot locomotion design,	kinematics, motion					
		<b>CO5:</b> Assess stochastic control and multi a	paul plaining.					
		development of a robotic system.	igent systems for					
		CO6:Adapt intelligent system methodology suitab	ble for a given type					
		of real world application problem.						
7	Course	Basic concepts of Robotics, Intelligent Systems an	nd transformational					
	Description	modeling. This course provides students with a wor	rking knowledge of					
		methods for design and analysis of robotic and i	ntelligent systems.					
		Particular attention is given to modeling dynamic s	systems, measuring					
		and controlling their behavior, and making deci	sions about future					
		courses of action						
0			<u> </u>					
8	Outline syllabus		CO Mapping					



	Unit 1	<b>Overview and Pre</b>	liminaries	5						
	А	Mobile Robots, Pos	sition, and	Orientation	CO1					
	В	Translational and R	Rotational I	Dynamics	CO1, CO2					
	С	Flying and Swimm	ing Robots	s, Articulated	CO1, CO2					
	Unit 2	Transformation.								
	A	Path Planning, and	Trajectorio	es	CO1, CO2					
	В	Time Response of I	Dynamic S	ystems	CO1, CO2					
	С	Dynamic Effects of	Feedback	Control, Control	CO1, CO2					
		Systems								
	Unit 3	Optimization								
	А	Sensors and Actuat	CO1, CO2, CO4							
	В	Numerical Optimiz	Numerical Optimization							
	С	Dynamic Optimal (	Control		CO1, CO2, CO4					
	Unit 4	Formal Logic, Alg	ormal Logic, Algorithms, and							
	A	Computers, Compu	ting, and S	Sets	CO3. CO5					
	B	Probability and Sta	Probability and Statistics							
	C	Machine Learning.	Neural Ne	etworks	CO3. CO5					
	Unit 5	Information. Sear	ch and Ex	pert Systems						
	A	State Estimation. S	tochastic C	Control	CO3, CO5, CO6					
	В	Parameter Estimation	on and Ad	aptive Control	CO3, CO5, CO6					
	С	Task Planning and	Multi-Age	nt Systems	CO3, CO5, CO6					
-	Mode of	Theory	0		, ,					
	examination									
	Weightage	СА	MTE	ETE						
	Distribution	25%	25%	50%						
	Text book/s*	8. http://www.pri	nceton.edu	u/~stengel/RISVirTe	xt.html.					
		9. J. J. Craig, Intr	oduction to	o Robotics, Addison	Wesley					
		Publishers, 200	)5,							
		10. Computational	by Gregory Dudek							
		and Michael Je	enkin, Seco	ond Edition						
	Other References	9. M. Negnevitsk	y, Artificia	al Intelligence – A gu	uide to intelligent					
		systems Addison-Wesley, 2005,								
		10. Bharati A., Sar	ngal R., Ch	aitanyaVNatural la	nguage processing:					
		a Paninian pers	spective, P	HI, 2000	_					



S. No.	Course Outcome	Program Outcomes (PO) & Program
		Specific Outcomes (PSO)
1.	CO-7. <b>Define</b> the concept and key components of robotics technologies.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
2.	CO-8. <b>Classify</b> various robot sensors and their perception principles that enable a robot to analyze their environment, reason and take appropriate actions toward the given goal.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
3.	CO-9. <b>Apply</b> the learned knowledge and skills in practical robotics laboratories and experiments.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
4.	CO-10. <b>Analyze</b> problems in spatial coordinate representation and spatial transformation, robot locomotion design, kinematics, motion control, localization and mapping, navigation and path planning.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
5.	CO-11. Assess stochastic control and multi agent systems for development of a robotic system.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3
6.	CO-12. Adapt intelligent system methodology suitable for a given type of real world application problem.	PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO8, PO9,PO10, PSO1,PSO2,PSO3

# PO and PSO mapping with level of strength for Course Name Robotics and Intelligent Systems (Course Code CSA061)

Course	PO	PO	РО	PO	РО	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
Objectives	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	3	3	3	3	3	1	1	1	1	2	3	2	3	3	1
CO2	3	3	3	3	3	1	2	1	2	2	3	2	3	3	2
CO3	3	3	3	3	3	2	1	1	2	2	3	3	3	3	3
CO4	3	3	3	3	3	1	1	1	2	2	3	2	3	3	3
CO5	3	3	3	3	3	1	1	1	2	2	3	2	3	3	3
CO6	3	3	3	3	3	2	2	2	3	3	2	2	3	3	3



Cours e Code	Course Name	PO 1	PO 2	PO 3	РО 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS 0 2	PS O 3
CSA06	Robotics and		2.0	2.0	2.0	2.0	1.2	1.2	11	2.0	2.1		2.1	2.0	2.0	25
1	Systems	3.00	3.0	3.0	3.0	3.0	1.5	1.5	1.1	2.0	2.1	0.0	2.1	3.0	3.0	2.5
	Systems	5.00	U	U	U	U	3	3	/	U	/	U	/	U	U	U

### Average of non-zeros entry in following table (should be auto calculated).

### Total- 33.83 Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Pro	gram:	B.Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	T									
		Applications										
1	Course Code	CSI061										
2	Course Title	Industrial IoT: Smart Manufacturing										
3	Credits	3										
4	Contact	3-0-0										
	Hours											
	(L-T-P)											
	Course Status	Elective										
5	Course	The objective of this course is to introduce numerous concepts related to										
	Objective	Industrial IoT, which is concerned with the use of the IoT	in an industrial									
	0	environment.										
6	Course	CO1: Define the concepts of IIoT process management an	d protocols.									
	Outcomes	CO2: Explain the adoption case studies of Industrial IoT a	and current									
		technologies.										
		CO3: Apply the Business Model Framework for IIoT										
		CO4: List out the concerns and related business models in smart										
		manufacturing.	manufacturing.									
		CO5: Elaborate the challenges and Inventory Consolidation for										
		industrial Logistics.										
		CO6: Discuss the different business operations such as ma	CO6: Discuss the different business operations such as manufacturing,									
	~	logistics for Industrial IoT smart manufacturing.										
7	Course	A number of adoptions of the loT concepts are visible in a	ll walks of life									
	Description	globally and the number is all set to increase to billions	s of connected									
		objects before the turn of the decade. This course presen	ts some of the									
		use cases of the 101 in different business facets and proce	esses, focusing									
		of Industrial LoT (HoT) as well	sunct coverage									
0	Outling gullaby		CO									
0	Outiline synabl	15	Manning									
	Unit 1	Industrial IoT Paradigm	wiapping									
		Industrial IoT IoT Challenges in Agile Manufacturing										
	Λ	Drivers for HoT Adoption	CO1									
	R	HoT for Process Management HoT Protocols	CO1									
	C	Product Development and IoT Industry 4.0 HoT and	001									
	C	Related Developments	CO1									
	Unit 2	Hot Adoption										
	A	Current Areas of Industrial IoT adoption Emerging										
		Areas of IoT Adoption CO1, CO2										
	В	IIoT Adoption Case Studies	CO1. CO2									
	С	Overview of Current Technologies	CO1. CO2									
	Unit 3	Business Models	,									
	A	Business Model Framework. The IoT Business Models	CO3. CO6									
	В	The IoT Business Model Based on IT: Freemium.										
		Digital Add-On Enhancements, Razor and Blade	CO3, CO6									



	Digital Lock-	In, Point of Sa	lles (POS), Direct Selling							
	<b>Business</b> Mo	del or Solution	Provider Model using							
	Intelligent Ob	jects Self-Ser	vice, Pay Per Use Business							
	Model	-	-							
С	Digitally Cha	rged Products	Business Model Data Sale,	CO2 $CO6$						
	Challenges	-		CO3, CO0						
Unit 4	Smart Manu	facturing								
А	Manufacturin	g Concerns		CO4, CO6						
В	Industry 4.0 a	ndustry 4.0 and Related Models								
С	Smart Manuf	acturing, Smar	rt Manufacturing: Indian	CO4, CO6						
	Case Study	_	-							
Unit 5	Logistics Op	timization								
А	Introduction,	Challenges in	Logistics, Logistics Costs,	CO5 CO6						
	Autonomous	Logistics		005,000						
В	The IoT-Enal	oled Activity-H	Based Costing, The IoT and							
	Inventory Co	nsolidation, Tl	ne IoT and Consigned	CO5, CO6						
	Inventory									
С	Case Study: I	ndustrial Logi	stics	CO5, CO6						
Mode of	Theory/Jury/I	Practical/Viva								
examination										
Weightage	CA	MSE	ESE							
Distribution	25%	25%	50%							
Text book/s*	1. Intern	1. Internet of Things, Approach and Applicability								
	in Ma	in Manufacturing, Ravi Ramakrishnan, Loveleen								
	Gaur,	Gaur, CRC Press								
 Other										
References										



r		
S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: Define the concepts of IIoT process management	PO1, PO2, PO3, PO4, PO6,
	and protocols.	PO7, PO10, PO12
2.	CO2: Explain the adoption case studies of Industrial	PO1, PO2, PO3, PO4, PO6,
	IoT and current technologies.	PO7, PO11, PO12
3.		PO1, PO2, PO3, PO4, PO5,
	CO3: Apply the Business Model Framework for IIoT	PO6, PO7, PO8, PO12,
		PSO3
4.	CO4: List out the concerns and related business models	PO1, PO2, PO3, PO4, PO6,
	cO4. List out the concerns and related business models	PO7, PO10, PO11, PO12,
	In smart manufacturing.	PSO3
5.	CO5: Elaborate the challenges and Inventory	PO1, PO2, PO3, PO4, PO6,
	Consolidation for Industrial Logistics.	PO7, PO9, PO10, PO12
6.	CO6: Discuss the different husiness operations such as	PO1, PO2, PO3, PO4, PO5,
	monufacturing logistics for Industrial IoT smort	PO6, PO7, PO8, PO9,
	manufacturing, logistics for industrial for smart	PO10, PO11, PO12, PSO1,
	manuracturing.	PSO2, PSO3

### PO and PSO mapping with level of strength for Course Name Industrial IoT: Smart Manufacturing (Course Code CSI061)

Course Code_ Course Name	CO's	PO 1	РО 2	PO 3	Р О4	РО 5	PO 6	PO 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
	C01	2	2	2	2	-	2	2	-	-	1	-	2	-	-	-
CSI061 _Indust	CO2	2	2	2	3	-	2	2	-	-	-	2	2	-	-	-
rial LaT:	CO3	3	2	2	3	3	2	2	2	-	-	-	2	-	-	2
IoT: Smart Manufa cturing	CO4	3	2	2	3	-	2	2	-	-	2	2	2	-	-	2
	CO5	3	2	3	3	-	2	2	-	2	2	-	2	-	-	-
	CO6	3	3	3	3	3	2	2	3	2	2	2	3	3	2	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	РО 2	PO 3	PO 4	P O 5	PO 6	P O 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PSO 3
CSI061	Industrial IoT: Smart Manufacturing	2.7	2.2	2.3	2.8	3. 0	2.0	2.0	2.5	2.0	1.8	2.0	2.2	3.0	2.0	2.0

### Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment	Computer Science & Engineering									
Pro	gram:	B.Tech									
Bra	nch:	CSE with Specialization in Artificial Intelligence for Io	T								
		Applications									
1	Course Code										
2	Course Title	Applications of AIoT									
3	Credits	1									
4	Contact	1-0-0									
	Hours										
	(L-T-P)										
	Course Status	Elective									
5	Course	he objective of this course to build AIoT projects. By building AIoT									
	Objective	projects, the students can understand the basic concepts ar	nd will be able								
		to innovate using the basics to create their own AI based Io	Γapplications.								
6	Course	CO1: Build a simple smart environment system with invol	lved plant								
	Outcomes	sensor devices.									
		CO2: Build a smart AIoT based Waste management system	m.								
		CO3: Build a simple smart AloT based e-commerce	1.1.5								
		CO4: Build a simple smart AloT-based water managemen	t and lol-								
		based smart irrigation system									
		CO5: Build a simple AloT in healthcare and Agriculture									
		CO6: Build the Artificial Intelligence of Things (Alo1) pr	ojects and								
7	Course	Artificial Intelligence of Things (AIoT) is a ground break	na ta abrala av								
/	Course	Artificial Intelligence of Things (AloT) is a ground-breaking that involves connecting numerous physical devices to the	a Internet and								
	Description	approximation of the second se	e internet and								
		converting it into something meaningful is currently dr	iving the next								
		level of IoT learning	iving the next								
8	Outline syllabi		CO								
0	outilité syfiuet	•	Mapping								
	Unit 1	AIoT for smart environments	P8								
	A	Introduction to AIoT for smart environments	CO1. CO6								
	В	Smart retail. Smart office buildings	CO1, CO6								
	С	AI implementation and business cases of AIoT.	CO1, CO6								
		Business case: Tesla's autopilot and Business case:									
		classroom monitoring systems									
	Unit 2	AIoT-based waste management systems									
	А	Introducing IoT-based waste management system	CO1, CO6								
	В	Main features of AIoT-based framework for waste CO1, CO6									
		management, Working of intelligent bin process									
	С	Intelligent bin control by using AI	CO1, CO6								
	Unit 3	AIoT-based e-commerce									
	А	Introducing IoT in e-commerce	CO3, CO6								
	В	Applications of IoT in e-commerce: Inventory	CO3, CO6								
		management									



С	Applications	of IoT in e-co	ommerce: Smart homes	CO3, CO6					
Unit 4	AIoT-based	water manag	gement and IoT-based smart						
	irrigation sy	stem							
А	Introduction	to Smart wate	r management	CO4, CO6					
В	Smart irrigati	on and Requi	red components	CO4, CO6					
С	Working of C	G-SM compon	ent and Working of RELAY	CO4, CO6					
Unit 5	AIoT in heal	lthcare and A	griculture						
А	IoT architect	ure, Challenge	es in IoT, AIoT, UAV	CO5, CO6					
В	Artificial inte	Artificial intelligent IoT in healthcare							
С	AI in agricult	AI in agriculture, Use of wireless and automation							
	systems in ag	systems in agriculture							
Mode of	Theory/Jury/	Practical/Viva	L						
examination									
Weightage	CA	MTE	ETE						
Distribution	25%	25%	50%						
Text book/s*	3. AIoT	Technologies	and Applications for Smart						
	Envir	onments, Mar	noun Alazab, Meenu Gupta,						
	Shake	el Ahmed							
	4. Intelli	igent IoT Proj	ects, Agus Kurniawan, Packt						
	Public	shing	,,,,,						
	5 Rasph	perry Pi IoT P	rojects John C. Shovic						
	J. Kaspt		rojects, joini C. Shovie,						
 0.1	Apres								
Other	1. Intern	et of Things (	IoT), Systems and						
References	Appli	cations, Jamil	Y. Khan and Mehmet R.						
	Yuce								
	2. Intern	et of Things (	IoT), Technologies,						
	Appli	Applications, Challenges, and Solutions, B.K.							
	Tripa	Tripathy and J. Anuradha							
Add-on	Connecting a	Connecting an IOT Device to a Cloud Server							
Projects	Using IOT fo	or RFID and M	10TT						
- J	Implement C	itySense Lite	for an Application Building a						
	Solar Powere	d IOT Weath	er Station, Data Gathering						



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Build a simple smart environment system with involved plant sensor devices.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
2.	CO2: Build a smart AIoT based Waste management system.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
3.	CO3: Build a simple smart AIoT based e- commerce	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
4.	CO4: Build a simple smart AIoT-based water management and IoT-based smart irrigation system	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
5.	CO5: Build a simple AIoT in healthcare and Agriculture	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
6.	CO6: Build the Artificial Intelligence of Things (AIoT) projects and bring a new degree of interconnectivity to the world.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3

# PO and PSO mapping with level of strength for Course Name Applications of AIoT (Course Code )

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	Р О4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
	CO1	3	3	2	3	3	3	3	2	3	3	3	3	3	2	2
	CO2	3	3	3	3	3	3	3	2	3	3	3	3	3	2	2
Applica	CO3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
AIoT	CO4	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
	CO5	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
	CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	РО 2	PO 3	РО 4	P O 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
	Applicati ons of AIoT	3.0	3.0	2.8	3.0	3. 0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.7	2.0

### Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology Computer Science & Engineering										
Dep	artment	Computer Science & Engineering										
Pro	pram:	B.Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for Io	Т									
		Applications	_									
1	Course Code											
2	Course Title	Applications of AIoT Lab										
3	Credits	2										
4	Contact	0-0-4										
	Hours											
	(L-T-P)											
	Course Status	Elective										
5	Course	The objective of this course to build AIoT projects. By	building AIoT									
	Objective	projects, the students can understand the basic concepts ar	nd will be able									
	Ū.	to innovate using the basics to create their own AI based Io	Γ applications.									
6	Course	CO1: Build a simple smart environment system with invol	lved plant									
	Outcomes	sensor devices.										
		CO2: Build a smart AIoT based Waste management system	m.									
		CO3: Build a simple smart AIoT based e-commerce										
		CO4: Build a simple smart AIoT-based water managemen	t and IoT-									
		ed smart irrigation system										
		CO5: Build a simple AIoT in healthcare and Agriculture										
		CO6: Build the Artificial Intelligence of Things (AIoT) pr	ojects and									
	~	bring a new degree of interconnectivity to the world.										
7	Course	Artificial Intelligence of Things (AloT) is a ground-breaki	ng technology									
	Description	that involves connecting numerous physical devices to the	e Internet and									
		Artificial Intelligence and converting it into comething	s devices and									
		currently driving the next level of IoT learning	meaningful is									
8	Outline syllabi		CO									
0	Outline synabl	15	Mapping									
	Unit 1	AIoT for smart environments	mapping									
	A	Introduction to AIoT for smart environments	CO1, CO6									
	B	Smart retail Smart office buildings	CO1, CO6									
	C	AI implementation and business cases of AIoT.	CO1, CO6									
	0	Business case: Tesla's autopilot and Business case:	001,000									
		classroom monitoring systems										
	Unit 2	AIoT-based waste management systems										
	А	Introducing IoT-based waste management system	CO1, CO6									
	В	Main features of AIoT-based framework for waste	CO1, CO6									
		management, Working of intelligent bin process										
	С	Intelligent bin control by using AI	CO1, CO6									
	Unit 3	AIoT-based e-commerce										
	А	Introducing IoT in e-commerce	CO3, CO6									
	В	Applications of IoT in e-commerce: Inventory	CO3, CO6									
		management										
	С	Applications of IoT in e-commerce: Smart homes	CO3, CO6									

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Unit 4	AIoT-based	gement and IoT-based smart								
	irrigation sy	stem								
Α	Introduction	to Smart wate	er management	CO4, CO6						
В	Smart irrigati	on and Requ	ired components	CO4, CO6						
С	Working of C	<b>J-SM compo</b>	nent and Working of RELAY	CO4, CO6						
Unit 5	AIoT in heal	thcare and A	Agriculture							
А	IoT architect	ure, Challeng	es in IoT, AIoT, UAV	CO5, CO6						
В	Artificial inte	lligent IoT ir	n healthcare	CO5, CO6						
С	AI in agricult	ure, Use of v	vireless and automation	CO5, CO6						
	systems in ag	riculture								
Mode of	Theory/Jury/	Theory/Jury/Practical/Viva								
examination										
Weightage	CA	MTE	ETE							
Distribution	3%									
Text book/s*	6. AIoT	Technologie	s and Applications for Smart							
	Envir	onments, Ma	moun Alazab, Meenu Gupta,							
	Shake	el Ahmed								
	7 Intelli	igent IoT Pro	iects Agus Kurniawan Packt							
	Publis	shing	jeets, rigus Kurmuwun, ruekt							
	8 Rasph	verry Pi IoT F	Projects John C Shovic							
 Others		·S	(L-T) Constance and							
Other	3. Intern	let of Things	(101), Systems and							
References	Appli	cations, Jami	I Y. Khan and Mehmet R.							
	Yuce									
	4. Intern	et of Things	(IoT), Technologies,							
	Appli	Applications, Challenges, and Solutions, B.K.								
	Tripat	Tripathy and J. Anuradha								
Add-on	Connecting a	Connecting an IOT Device to a Cloud Server								
Projects	Using IOT fo	Using IOT for RFID and MQTT								
5	Implement C	itySense Lite	for an Application Building a							
	Solar Powere	d IOT Weath	ner Station, Data Gathering							



# PO and PSO mapping with level of strength for Course Name Applications of AIoT Lab (Course Code )

Course Code_ Course Name	CO's	PO 1	РО 2	PO 3	P O4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PS O2	PS O3
	CO1	3	3	2	3	3	3	3	2	3	3	3	3	3	2	2
	CO2	3	3	3	3	3	3	3	2	3	3	3	3	3	2	2
Applica tions of	CO3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
AIoT Lab	CO4	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
Lab	CO5	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2
	CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	РО 2	РО 3	РО 4	P O 5	PO 6	P O 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PSO 3
	Applicati ons of AIoT Lab	3.0	3.0	2.8	3.0	3. 0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.7	2.0

### Strength of Correlation

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology           ent         Computer Science & Engineering										
Dep	artment	Computer Science & Engineering										
Pro	gram:	B.Tech										
Bra	nch:	CSE with Specialization in Artificial Intelligence for Id	T									
		Applications										
1	Course Code	CSI021										
2	Course Title	Sensor-Cloud for Internet of Things										
3	Credits	2										
4	Contact	2-0-0										
	Hours (L-T-											
	P)											
	Course Status	Elective										
5	Course	The objective of this course is to address the topic	c of resource									
	Objective	management, virtualization, and green computation within	cloud servers.									
	5	It also covers the emergence and evolution of sensor-clou	d directly that									
		facilitates the growth of IoT through its architecture, funct	tionalities, and									
		life cycle.										
6	Course	CO1: Recall the history and evolution of Cloud-Co	mputing with									
	Outcomes	different cloud deployment and service models.										
		CO2: Outline the challenges and constraints of sensor network	work									
		CO3: Explain architecture and virtualization concept for S	Sensor-Cloud									
		CO4: Analyze the data management concept for Sensor-C	Cloud									
		CO5: Assess various contributions that enable IoT through	Sensor-Cloud									
		D6: Design and develop small applications based on Sensor-Cloud										
7	Course	SensorCloud is an IoT cloud that provides the Platform	n as a Service									
	Description	(PasS) to gather, visualize, monitor, and analyze the inform	nation coming									
		into sensors connected by wire or wirelessly. The course	e describes the									
		different challenges in realizing IoT in practice and present	nts the sensor-									
		cloud paradigms.	Γ									
8	Outline syllabu	1S	CO									
			Mapping									
	Unit 1	Introduction										
	А	History and evolution of Cloud Computing,	CO1, CO6									
		Classification of Cloud Computing, Cloud Computing										
	-	Deployment Models, Cloud Computing Service Models										
	В	Computation in Cloud, Resource Management,	CO1, CO6									
	~	Virtualization, Green Computing										
	C	Cloud Applications	CO1, CO6									
	Unit 2	Sensor Networks and the Cloud										
	А	Background of Wireless Sensor Networks, Design of a	CO2, CO6									
	D	Sensor Node										
	В	Applications of Sensor Networks, Challenges and	CO2, CO6									
		Constraints										
	C	Unification of WSNs with Cloud, The Significance of	CO2									
	<b>T</b> I <b>1 0</b>	Cloud Computing, Challenges										
	Unit 3	Sensor-Cloud Paradigm										
	A	Sensor-Cloud, Architecture of the Sensor-Cloud	CO3									



	В	Sensor Virtu	alization: Conf	igurations and	CO3							
		Characteriza										
	С	Sensor-Cloue	d Applications		CO3							
	Unit 4	Data Flow in	n the Sensor-C	Cloud								
	А	Composition	of a Virtual Se	ensor	CO4							
	В	Data Manage	ement: Data Ca	aching	CO4							
	С	Data Manage	ement: Data Tr	ansmission	CO4							
	Unit 5	Sensor-Clou	d for Internet	t of Things								
	А	Scenario and	model for Price	cing, pH: Pricing Attributed	CO5,CO6							
		to Hardware	and Infrastruct	ture								
	В	Enabling IoT	nabling IoT through Sensor-Cloud, Contributions									
		through Arch	rough Architecture and Functionalities									
	С	Contribution	Contributions through the Life Cycle									
	Mode of	Theory/Jury/	Theory/Jury/Practical/Viva									
	examination		11001,7001,711001000 +170									
	Weightage	CA	MSE	ESE								
	Distribution	25%	25%	50%								
	Text book/s*	1. Sense	ors, Cloud, and	Fog: The Enabling								
		Tech	nologies for the	e Internet of Things, Sudip								
		Misra	a, Subhadeep S	arkar and Subarna								
		Chatt	erjee, CRC Pre	ess								
	Other	1. The I	1. The Internet of Things in the Cloud, A									
	References	Midd	Middleware Perspective, Honbo Zhou, CRC									
		Press										
		2. The C										
		Turin	nan CRC Pres	S								
1		i uijii		6	1							

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: Recall the history and evolution of Cloud-	PO1, PO2, PO4, PO6, PO9,
	Computing with different cloud deployment and	PO12, PSO2
	service models.	
2.	CO2: Outline the challenges and constraints of	PO1, PO2, PO4, PO6, PO9,
	sensor network	PO12, PSO2
3.	CO3: Explain architecture and virtualization	PO1, PO2, PO3, PO4, PO6, PO9,
	concept for Sensor-Cloud	PO10, PO12, PSO2
4.	CO4: Analyze the data management concept for	PO1, PO2, PO3, PO4, PO6, PO7,
	Sensor-Cloud	PO9, PO10, PO12, PSO2
5.	CO5: Assess various contributions that enable IoT	PO1, PO2, PO3, PO4, PO6, PO7,
	through Sensor-Cloud	PO9, PO10, PO11, PO12, PSO2
6.	CO6: Design and develop small applications	PO1, PO2, PO3, PO4, PO5, PO6,
	based on Sensor-Cloud	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3



### PO and PSO mapping with level of strength for Course Name Sensor-Cloud for Internet of Things (Course Code CSI021)

Course Code_ Course Name	CO's	PO 1	РО 2	PO 3	P O4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PS O2	PS O3
	CO1	2	2	-	2	-	1	-	-	1	-	-	2	-	1	-
CSI021 _Sensor	CO2	2	2	-	2	-	1	-	-	1	-	-	2	-	1	-
-Cloud	CO3	2	1	1	2	-	1	-	-	1	1	-	2	-	2	-
Interne	CO4	2	2	1	2	-	1	2	-	2	1	-	3	-	2	-
t of Things	CO5	2	2	2	2	-	1	2	-	2	1	2	3	2	2	-
0	CO6	3	3	3	2	3	2	2	2	2	2	2	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	P O 5	PO 6	Р О 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSI021	Sensor- Cloud for Internet of Things	2.2	2.0	1.8	2.0	3. 0	1.2	2.0	2.0	1.5	1.3	2.0	2.5	2.5	1.8	2.0

### Strength of Correlation

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



### B.Tech (CSE) with Specialization in Data Science & Analytics



Schoo	ol:	School of Engineering & Technology									
Depa	rtment	Computer Science & Engineering									
Progr	am	B.Tech.									
Bran	ch	CSE									
1	Course number	CSD102									
2	Course Title	Introduction to Data Science									
3	Credits	2									
4	Contact Hours	2 0 0									
5	Course Objective	To introduce a range of topics and concepts related to the data scient	nce process								
6	Course Outcomes	<ul> <li>Having successfully completed this module, you will be able to:</li> <li>CO1: Define key concepts in data science, including tools, approaches, and application scenarios</li> <li>CO2: Explain topics in data collection, sampling, quality assessment and repair</li> <li>CO3: Identify topics in statistical analysis and machine learning</li> <li>CO4: Analyze topics in data processing at scale</li> <li>CO5: Determine state-of-the-art tools to build data-science applications for differen types of data.</li> <li>CO6: Compile the basics of concept and tools in Data Science to apply on real work</li> </ul>									
7	Outline syllabus										
7.01	Unit 1	Introduction: What is Data Science?									
7.02	А	Big Data and Data Science hype; Datafication	CO1, CO2								
7.03	В	Current Landscape of different perspectives	CO1								
7.04	С	Relevant Case Study	CO1, CO2, CO4								
7.05	Unit 2	Exploratory Data Analysis and the Data Science Process									
7.06	А	Philosophy of EDA - The Data Science Process, Basic tools of EDA (plots, graphs and summary statistics etc.)	CO1, CO2, CO3								
7.07	В	Data Pre-processing, Data Cleaning, Data Integration, Data Transformation and Data Reduction	CO1, CO2, CO3, CO4								
7.08	С	Data Generalization and Summarization Based Characterization	CO2, CO3								
7.09	Unit 3	Data Warehousing and Data Mining									
7.10	А	Introduction to data warehousing, DW Lifecycle, Architecture, Evolution of decision support systems	CO1, CO2, CO3, CO4								
7.11	В	Introduction to Data mining, Relation to Statistics. Steps in Data Mining Process, Architecture of a Typical Data Mining System.	CO1, CO3, CO4, CO5								
7.12	С	Overview of few Data Mining Techniques, Applications and Social Impacts of Data Mining	CO3, CO4, CO5								
7.13	Unit 4	Classification and Prediction									
7.14	А	Linear Regression, k-Nearest Neighbors (k-NN), k-means	CO1, CO3, CO5								
7.15	В	Prediction, Cluster Analysis	CO1, CO3, CO5								
7.16	С	Hierarchical Methods	Hierarchical Methods     CO1, CO3, CO5								
7.17	Unit 5	Data Visualization									



7.18	А	Basic principles, ideas and tools for data visualization	CO1, CO4, CO5, CO6						
7.19	В	Examples of inspiring (industry) projects	CO1, CO4, CO5, CO6						
7.20	С	Exercise: create your own visualization of a complex dataset	CO1, CO2, CO4, CO5, CO6						
8.1	Text book*	1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.							
8.2	Further Readings	<ol> <li>W. H. Inmon, "Building the Data Warehouse", 3rd edition.</li> <li>Anahory and Murray. Data warehousing in the re Education/Addison Wesley.</li> <li>Margaret Dunham, Data Mining: Introductory and Advanced Prentice Hall.</li> <li>Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Kaufmann Publishers, 2002. (www.cs.sfu.ca/~han/DMbook.htt</li> <li>Alex Berson, Stephen J. Smith, "Data Warehousing, Data Min Mcgraw- Hill, 2004.</li> <li>George M Marakas, Modern Data Warehousing, Mining and V Education.</li> </ol>	eal world, Pearson Topics, Published by Techniques", Morgan nl). ning, & OLAP", Tata Visualization-, Peason						
8.3		Internet as the resource for reference							
		•							

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	<b>CO1:</b> Key concepts in data science, including tools, approaches, and application scenarios	PO1, PO2, PO3, PO5, PO7, PO12, PSO1
2.	<b>CO2:</b> Topics in data collection, sampling, quality assessment and repair	PO1, PO2, PO3, PO5, PO6, PO7, PO8, PO9, PO12, PSO1, PSO2
3.	<b>CO3:</b> Topics in statistical analysis and machine learning	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO12, PSO1, PSO2, PSO3
4.	CO4: Topics in data processing at scale	PO1, PO2, PO4, PO5, PO6, PO11, PO12, PSO1, PSO3
5.	<b>CO5:</b> State-of-the-art tools to build data-science applications for different types of data.	PO1, PO2, PO5, PO9, PO11, PO12, PSO3
6.	<b>CO6:</b> Compile the basics of concept and tools in Data Science to apply on real world data.	PO1, PO2, PO3, PO5, PO9, PO11, PO12, PSO3

### PO and PSO mapping with level of strength for Course Name Introduction to Data Science (Course Code CSD 102)

	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	CO1	3	2	3	2	2		1		1	1			3	1	1
	CO2	3	1	1	2	2			3	2	1	1	1	1	1	
CSE	CO3	2	1	3	2	2		1		1	1			3	2	2
	CO4	3	2	2	1	1			1	3	3	3	2	2	1	3
	CO5	3	2	1	-	2	-	-	-	2	-	3	3	-	-	3
	CO6	3	2	2	-	2	-	-	-	2	-	3	2	-	-	3



School:		School of Engineering & Technology									
Depa	rtment	Computer Science & Engineering									
Prog	ram	B.Tech.									
Bran	ch	CSE									
1	Course number	CSD201									
2	Course Title	Data Collection and Pre-	Data Collection and Pre-processing								
3	Credits	4									
<u>з</u> Л	Contact Hours	3									
5	Contact Hours	3									
6	Course Objective	To introduce the concept of c as a subject for students.	i o introduce the concept of data collection and pre-processing that remains less touched s a subject for students.								
7	Course Outcomes (CO)	<ul> <li>On successful completion of this module students will be able to: <ol> <li>Recall the motivation behind proper process of data collection and preprocessing.</li> </ol> </li> <li>Demonstrate the basic understanding of data behaviour using its statistical metrics.</li> <li>Apply the tools and techniques vital to pre-processing of datasets for analysis once collected.</li> <li>Analyse the various apparent and hidden attributes of acquired dataset and utilizing those attributes towards knowledge discovery.</li> <li>Assess the various methodologies of data pre-processing and preparation on basis of their algorithmic complexities and accuracy in the due process.</li> </ul>									
		outcomes on the legi	timacy of knowledge discover	ed from acquired o	lata.						
8	Outline syllabus										
	Unit 1	Data Preparation	·		001						
	A	Motivation behind Data Prep	aration, Need for preparing da	ta	COI						
	В	Raw and Processed Data, Co	mponents of Tidy Data		C01						
		Various sources of different	Data types		COI						
	Unit 2	Knowing your data			CO1						
	А	Data attributes, Discrete vs C	Continuous Data attributes		CO1, CO2						
	В	Statistical description of Data Data dispersion: Range, Quar	a- Central Tendency: Mean, M rtile, Variance, SD, Interquarti	edian, Mode; le Range	CO1, CO2						
	С	Data Similarity and Dissimilarity - Data Matrix versus Dissimilarity Matrix, Proximity Measures for Nominal & Binary Attributes, Dissimilarity of Numeric Data: Minkowski Distance; Proximity Measures for Ordinal Attributes, Dissimilarity for Attributes of Mixed Types, Cosine Similarity									
	Unit 3	Data Pre-processing - Cleaning and Integration									
	А	Data Pre-processing - Data Q Tasks in Data Pre-processing	Duality: Why Pre-process the D	Data? Major	CO1, CO2						
	В	Data Cleaning – Finding Missing values, Noisy data, Data cleaning process.									
	С	Data Integration - Entity Identification Problem, Redundancy andCO3,Correlation Analysis, Tuple Duplication, Data Value Conflict DetectionCO4,and ResolutionCO5									
	Unit 4	Data Reduction									
	А	Data Reduction Strategies, W	Vavelet Transforms, PCA		CO3, CO5						



В	Attribute subset selection, Regression and Log-Linear Models: Parametric Data Reduction							
С	Histograms, Clustering, Sam	Histograms, Clustering, Sampling, Data Cube Aggregation						
Unit 5	Data Transformation and	Data Discretization						
A	Data Transformation Strateg Normalization	Data Transformation Strategies Overview, Data Transformation by Normalization						
В	Discretization by Binning, Discretization by Histogram Analysis							
С	Discretization by Cluster, De Concept Hierarchy Generation	ecision Tree, and Correlation on for Nominal Data	n Analyses,	CO3, CO5, CO6				
Weightage								
Distribution	CA 25%	MTE 25%	ETE 50%					
Text book*	<ol> <li>Han Jiawei, Kamber &amp; Pei, Data Mining Concepts &amp; Techniques 3<sup>rd</sup> Edition, Morgan Kaufman</li> </ol>							
Further Readings	<ol> <li>M.H. Dunham, Data Mining Introductory and Advanced Topics, Pearson Education.</li> <li>Adriaans, Data Mining, Pearson Education</li> <li>Vikram Pudi; P. Radhakrishnan, "Data Mining", Oxford University Press</li> </ol>							

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Recall the motivation behind proper process of data collection and pre-processing.	PO1, PO2, PO4, PO6, PO8, PO10, PO11, PO12,
2.	Demonstrate the basic understanding of data behaviour using its statistical metrics.	PO1, PO2, PO3, PO4, PO5, PO10, PO12, PSO1
3.	Apply the tools and techniques vital to pre-processing of datasets for analysis once collected.	PO1, PO2, PO3, PO5, PSO12, PSO2,
4.	Analyse the various apparent and hidden attributes of acquired dataset and utilizing those attributes towards knowledge discovery.	PO3, PO4, PO5, PO9, PSO2, PSO3
5.	Assess the various methodologies of data pre-processing and preparation on basis of their algorithmic complexities and accuracy in the due process.	PO1, PO2, PO4, PO8, PSO1, PSO2, PSO3
6.	Compile various data pre-processing methodologies with their respective outcomes on the legitimacy of knowledge discovered from acquired data.	PO2, PO4, PO8, PO9, PO11, PO12, PSO2, PSO3



Course Code_ Course Name	CO 's	Р О 1	<b>PO</b> 2	P O 3	Р О4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	PO 11	PO 12	PS O1	PS O2	PS O3
CSD20 1_	CO 1	3	2	-	2	-	2	-	1	-	2	1	3	-	-	-
	CO 2	3	2	2	3	2	-	-	-	-	2	-	2	1	-	-
Data Collect	CO 3	2	3	3	2	3	-	-	-	-	-	-	2	-	-	2
and Pre-	CO 4	-	-	3	3	2	-	-	-		-	-	-	-	3	2
proces sing	CO 5	2	3	-	-	-	-	-	2	-	-	-	-	1	3	2
	CO 6	-	2	-	3	-	-	-	2	1	-	1	3	-	3	2

### PO and PSO mapping with level of strength for Course Name Data Collection & Pre0processing (Course Code CSD201)

Average of non-zeros entry in following table (should be auto calculated).

Cour se Code	Cour se Nam e	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSD 201		2.5	2.4	2.7	2.6	2.3	2	0	1.7	1	2	1	2.5	1	3	2

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent



School:		School of Engineering & Technology								
Depa	rtment	Computer Science & Engineering								
Prog	ram:	B.Tech.								
Bran	ch:	CSE								
1	Course number	CDP201								
2	Course Title	Data Collection and Pre-processing Lab								
3	Credits	1								
4	Contact Hours (L-T-P)	0 0 2								
5	Course Objective	To introduce the concept of data collection and pre-processing using tangible datasets. Students will gain the skills and project-based experience needed for pre-processing in data analysis careers.	To introduce the concept of data collection and pre-processing using tangible latasets. Students will gain the skills and project-based experience needed for data pre-processing in data analysis careers.							
6	Course Outcomes (CO)	<ul> <li>On successful completion of this module students will be able to:</li> <li>CO1: Recall the motivation behind proper process of data collection and preprocessing.</li> <li>CO2: Demonstrate the basic understanding of data behaviour using its statistical metrics.</li> <li>CO3: Apply the tools and techniques vital to pre-processing of datasets for analysis once collected.</li> <li>CO4: Analyse the various apparent and hidden attributes of acquired dataset and utilizing those attributes towards knowledge discovery.</li> <li>CO5: Assess the various methodologies of data pre-processing and preparation on basis of their algorithmic complexities and accuracy in the due process.</li> <li>CO6: Compile various data pre-processing methodologies with their respective</li> </ul>								
7	Outline syllabus									
		Experiment C	COs							
	1.	To determine the differences between raw and processed data with the help of test samples.	CO1							
	2.	To analyse statistical description of a given sample dataset using CentralCTendency estimation measuresC	CO1, CO2							
	3.	To analyse statistical description of a given sample dataset using DataCdispersion estimation measures.C	CO1, CO2							
	4.	To analyse the effect of a) outliers and b) noisy data in a dataset.	CO1, CO2							
	5.	Creating data matrices and dissimilarity matrices for a given sample C C dataset.	CO1, CO2, CO4							
	6.	To evaluate numeric data dissimilarity using minkowski distance.								
	7.	To evaluate dissimilarity for attributes of mixed types using Cosine CO2 Similarity. CO2								
	8.	To find and replace missing values in a given dataset on contextual basis. CO3, CO4								
	9.	To analyse entity identification problem, redundancy and correlation analysis on a given sample dataset.								
	10.	To implement wavelet transforms and PCA (principal componentCanalysis) for data reduction.C	CO3, CO5							



	11.	To implement parametric data reduction using Regression models and	CO3, CO5,			
		Log-linear models	CO6			
			CO3,			
	12.	To implement Clustering on a given dataset.	CO5,			
			CO6			
			CO3,			
	13.	To implement data transformation using normalization.				
			CO6			
			CO3,			
	14.	To implement data discretization by binning and histogram analysis	CO5,			
			CO6			
			CO3,			
	15.	Discretization by Cluster, Decision Tree, and Correlation Analyses	CO5,			
			CO6			
8.1	Text book*	2. Han Jiawei, Kamber & Pei, Data Mining Concepts & Techni	ques 3 <sup>rd</sup>			
		Edition, Morgan Kaufman				
		4. M.H. Dunham, Data Mining Introductory and Advanced				
	Further	Topics, Pearson Education.				
8.2	Readings	5. Adriaans, Data Mining, Pearson Education				
	iceaunigs	6. Vikram Pudi; P. Radhakrishnan, "Data Mining", Oxford				
		University Press				

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Recall the motivation behind proper process of data collection and pre-processing.	PO1, PO2, PO4, PO6, PO8, PO10, PO11, PO12,
2.	Demonstrate the basic understanding of data behaviour using its statistical metrics.	PO1, PO2, PO3, PO4, PO5, PO10, PO12, PSO1
3.	Apply the tools and techniques vital to pre-processing of datasets for analysis once collected.	PO1, PO2, PO3, PO5, PSO12, PSO2,
4.	Analyse the various apparent and hidden attributes of acquired dataset and utilizing those attributes towards knowledge discovery.	PO3, PO4, PO5, PO9, PSO2, PSO3
5.	Assess the various methodologies of data pre-processing and preparation on basis of their algorithmic complexities and accuracy in the due process.	PO1, PO2, PO4, PO8, PSO1, PSO2, PSO3
6.	Compile various data pre-processing methodologies with their respective outcomes on the legitimacy of knowledge discovered from acquired data.	PO2, PO4, PO8, PO9, PO11, PO12, PSO2, PSO3



Course Code_ Course Name	CO 's	P O 1	<b>PO</b> 2	P O 3	Р О4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	PO 11	PO 12	PS O1	PS O2	PS O3
CDD20	CO 1	3	2	-	2	-	2	-	1	-	2	1	3	-	-	-
1_ Data	CO 2	3	2	2	3	2	-	-	-	-	2	-	2	1	-	-
Collect ion	CO 3	2	3	3	2	3	-	-	-	-	-	-	2	-	-	2
and Pre-	CO 4	-	-	3	3	2	-	-	-		-	-	-	-	3	2
proces sing	CO 5	2	3	-	-	-	-	-	2	-	-	-	-	1	3	2
	CO 6	-	2	-	3	-	-	-	2	1	-	1	3	-	3	2

### PO and PSO mapping with level of strength for Course Name Data Collection & Pre0processing (Course Code CSD201)

Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment:	Computer Science &	Engineering								
Pro	gram:	Data Sciences									
Bra	nch:	Computer Science &	Engineering								
1	Course Code	CSD202									
2	Course Title	Data Warehouse									
3	Credits	3									
4	Contact										
	Hours	3	0		0						
	(L-T-P)										
	Course		4								
	Status	Core/Elective/Open Ele	ective								
5	Course Objective	<ul> <li>Make the studen warehouses in Provide student in and approa enterprises.</li> <li>Make students g of different data</li> <li>Provide the students studentsty studentstudents students students students students student</li></ul>	nts understand the utility general and in co s with an overview of the aches used to build gain insights into the cha a warehouse architecture idents with implementa s.	and impo ntext of he metho data wa illenges a s tion of a	ortance of data enterprises. dologies used rehouses for nd limitations lternatives of						
7	Course Outcomes (must be 6 COs, following verbs given in Bloom's Taxonomy) Course Description	<ul> <li>CO1: Recall the necession</li> <li>CO2: Explain the bassion and establish its utilico3: Apply the acquares of applicate</li> <li>CO3: Apply the acquares of applicate</li> <li>CO4: Identify the arcsion</li> <li>CO5: Apply the basice</li> <li>CO6: Integrating and effectiveness, efficient</li> <li>This course introduces encompassing the prince</li> <li>problems, and choose to the second secon</li></ul>	ssary prerequisites to un ics of warehouse archite lity. ired knowledge of wareh ion hitecture suitable for imp and advanced modellin interpreting the data set ency and quality for dat advanced aspects of dat ciples, to analyze the dat he relevant models and a	derstand cture and nouses to plementat g techniq s and imp <u>a analysis</u> a wareho a, identif	warehousing component various tion ues proving s. using y the as to apply.						
8	Outline syllabi	18			CO						
	Summe synable	4.0			Mapping						
	Unit 1	Introduction to Data	Warehousing		inapping						
	A	The Need for Data Warel	nousing; Increasing Demai	nd for	001						
		Strategic Information									
	В	Inability of Past Decision V/s Decision Support Sys	a Support Systems, Operations	ional	CO1						
	С	Role of Metadata, Classif	fication of Metadata		CO1						
	Unit 2	Data Warehouse Archit	ecture								
	A	Data warehouse lifecyc approach, Data Wareho OLTP	ele, Top down vs Botton ouse vs Data Marts, OLA	n Up AP vs	CO2						



В	Different Typ	es of Archited	cture, Centralized data						
	warehouse, In	ndependent da	ta marts, Federated, Hub	CO2					
	and spoke, D	ata Mart Bus							
С	Data Extracti	on, Transform	ation and Loading (ETL)	CO2					
Unit 3	Data Wareh	ouse Modelin	g						
А	Introduction to	data cube, dril	l down, roll up, slice and dice	CO3					
В	ER vs Dimens Schema	ional Modeling	, Dimension Modelling: Star	CO3					
С	Snowflake and	Snowflake and fact constellation schema, fact less tables.							
Unit 4	Dimensional	Dimensional Modeling Advance topics							
А	Slowly changi changes, Junk	Slowly changing dimensions: Type 1, Type 2, Type 3 hanges, Junk dimensions, large dimensions							
В	Modeling: Des	criptive attribu	tes, cross dimensional						
	attributes, con-	attributes, convergence, shared hierarchies, incomplete							
	hierarchies, red	cursive hierarch	nies						
С	Aggregation-a	dditive, non-ad	ditive, convergence,	CO4, CO5					
Unit 5	Index for da	ta warehouse							
А	B+ tree index,	Bitmap index,	Projection Index	CO5, CO6					
В	Join and Star i	ndex, spatial in	dex	CO5, CO6					
C	Optimizers, in elements	dex dimension	table, physical design	CO5, CO6					
Mode of	Theory/Jury/	Practical/Viva							
examination									
Weightage	CA								
Distribution	25%								
Text book/s*									
Other									
References									

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	Recall the necessary prerequisites to understand	PO1, PO2, PO4, PO6,
	worshousing	PO8, PO10, PO11,
	warehousing	PO12,
2.	Explain the basics of warehouse architecture and	PO1, PO2, PO3, PO4,
	component and establish its utility.	PO5, PO10, PO12, PSO1
3.	Apply the acquired knowledge of warehouses to various	PO1, PO2, PO3, PO5,
	avenues of application	PSO12, PSO2,
4.	Identify the architecture suitable for implementation	PO3, PO4, PO5, PO9,
	identify the architecture suitable for implementation	PSO2, PSO3
5.	Apply the basic and advanced modeling techniques	PO1, PO2, PO4, PO8,
	Apply the basic and advanced modering techniques	PSO1, PSO2, PSO3
6.	Integrating and interpreting the data sets and improving	PO2, PO4, PO8, PO9,
	affactiveness officiency and quality for data analysis	PO11, PO12, PSO2,
	effectiveness, efficiency and quality for data analysis.	PSO3



PO and PSO mapping with level of strength for Course Name Data Warehouse (Course Code CSD202)

Course Code_ Course Name	CO's	P 0 1	PO 2	P O 3	P 0 4	P O 5	P O 6	P 0 7	P O 8	P O 9	P O 10	P 0 11	P O 12	PS O 1	PS O2	PS 0 3
Dat	CO1	3	2	I	2	I	2	2	1	I	2	1	3	I	-	-
а	CO2	3	2	2	3	2	1	-	I	1	2	I	2	1	-	-
War	CO3	2	3	3	2	3	-	1	-	-	-	-	2	-	-	2
eho	CO4	-	-	3	3	2	-	-	-	2	-	-	-	-	3	2
use CS	CO5	2	3	-	-	-	-	1	2	-	-	-	-	1	3	2
D20 2	CO6	-	2	-	3	-	-	-	2	1	-	1	3	-	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	PO 3	РО 4	P 0 5	PO 6	P O 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PSO 3

Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment	Computer Science & Engineering									
Pro	gram:	B.Tech.									
Bra	nch:	CSE									
1	Course Code	CSD301									
2	Course Title	Data Mining									
3	Credits	3									
4	Contact										
	Hours	2 0	2								
	(L-T-P)										
	Course	Core /Elective/Open Elective	L								
	Status	r i i i i i i i i i i i i i i i i i i i									
5	Course	1. Provide students with an overview of the m	ethodolo	gies and							
_	Objective	approaches to data mining.		0							
	5	2. Gain insight into the challenges and limitat	ions of di	fferent data							
		mining techniques.									
		3. Provide the students with practice on apply	ing data r	nining							
		solutions.	C	C							
		4. Prepare students for research in the area of	data mini	ing and							
		related applications.		-							
6	Course	CO1: To Recall the basic data analysis process	flow and	l data pre-							
	Outcomes	processing techniques		-							
	(must be 6	CO2: To Explain the interpretation, integration	and prep	paration of							
	COs,	data sets towards improving effectiveness, effic	ciency and	d quality for							
	following	data analysis.									
	verbs given	<b>CO3:</b> To Apply the mining of datasets towards	knowled	lge discovery							
	in Bloom's	from real world tangible scenarios									
	Taxonomy)	<b>CO4:</b> To Analyse different data mining and kn	owledge	discovery							
		processes over a variety of real-word application	on areas								
		<b>CO5:</b> To Compare and contrast and determine	the data 1	mining							
		algorithms fit for an open variety of real-world	, tangible	data source							
		<b>CO6:</b> To Adapt the acquired data mining meth	odologies	stowards							
7	0	societal, scientific and financially relevant outc	omes.	• 1							
/	Course	This course introduces advanced aspects of dat	a wareho	using and							
	Description	data mining, encompassing the principles, to an	naryze tne	e dala,							
		to apply	models al	nd algorithms							
0	Outling gyllob			CO							
0		15		CO							
	Unit 1	Introduction to Data Mining									
		Evolution of the data mining process revision	of								
	4 <b>X</b>	introductory concepts Knowledge Discovery P	Process	CO1, CO2							
	В	Central Tendency Box Plots introduction to D	Data								
		Mining Techniques	uu	CO1							
	С	Introduction to outliers. Effect of outliers on an	alvsis								
	~	outcome, handling the outliers		CO1							
	Unit 2	Data Pre-processing									



	А	Descriptive I	Data Summariz	zation, Data Cleaning	CO1, CO2				
	В	Data Integrat	ion and Trans	formation	CO1, CO2				
	С	Data Reducti	on, Discretiza	tion and Concept Hierarchy	CO1 $CO2$				
		Generation.			001,002				
	Unit 3	<b>Frequent Pa</b>	ttern Mining						
	А	Efficient and	Scalable Freq	uent Itemset Mining	CO3, CO4,				
		Methods: A-J	oriori Algorith	m, Naïve Algorithm	CO5				
	В	FPGrowth, E	CLATS		CO3, CO5				
	C	Correlation A	analysis, regre	ssion analysis	CO3, CO4, CO5				
	Unit 4	Classification	n & Predictio	on					
	А	What is class	ification, requ	irements of classification,	CO3, CO4,				
		Decision Tree	e-ID3 Algorith	hm	CO5				
	В	Naive Bayes	Naive Bayes Classifier, Rule Based Classification,						
		Backpropaga	Backpropagation						
	С	Support Vect	or Machine fo	or linearly separable data.					
		Prediction: -	Linear Regres	sion, Model Evaluation	CO4, CO5				
		Techniques	echniques						
	Unit 5	Clustering &	z Data Mining	g Applications					
	А	Requirements	s of cluster and	alysis, Partitioning					
		methods-k-m	eans and k-me	ediods, Hierarchical	CO4 $CO5$				
		Methods-Agg	glomerative ar	nd divisive, Density based	004, 005				
		methods- DB	SCAN						
	В	Data Mining	for: Financial	Data Analysis, Intrusion					
		Detection and	l Prevention, l	Retail and	CO5 CO6				
		Telecommun	ication Indust	ries, Science &	005,000				
		Engineering,	Recommende	r Systems					
	C	DM for Priva	cy, Security, a	and Social Impacts of Data	CO5. CO6				
		Mining, Data	Mining Trend	ds	,				
	Mode of	Theory/Jury/	Practical/Viva						
	examination			DIDD					
	Weightage		MIE						
	Distribution	25%	25%						
	1 ext book/s*	1. J. Han, M							
	Other	and Lech							
	Other	1. M.H.							
	Keierences		ncea Topics, F	rearson Education.					
		2. Adria	ans, Data Min	ang, Pearson Education					
		J. VIKra	III FUUI & F. F	aunakrisnnan, "Data					
		IVIIIII	ig, Oxford U	inversity Press					



S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: To Recall the basic data analysis process flow and	PO1, PO2, PO4, PO6,
	data pre-processing techniques	PO8, PO10, PO11,
		PO12,
2.	CO2: To Explain the interpretation, integration and	PO1 PO2 PO3 PO4
	preparation of data sets towards improving effectiveness,	PO5 PO10 PO12 PS01
	efficiency and quality for data analysis.	103,1010,1012,1501
3.	CO3: To Apply the mining of datasets towards	PO1, PO2, PO3, PO5,
	knowledge discovery from real world tangible scenarios	PSO12, PSO2,
4.	CO4: To Analyse different data mining and knowledge	PO3 PO4 PO5 PO9
	discovery processes over a variety of real-word	PSO2 PSO3
	application areas	1502,1505
5.	CO5: To Compare and contrast and determine the data	PO1 PO2 PO4 PO8
	mining algorithms fit for an open variety of real-world,	PSO1 PSO2 PSO3
	tangible data source	1501, 1502, 1503
6.	CO6: To Adapt the acquired data mining methodologies	PO2, PO4, PO8, PO9,
	towards societal, scientific and financially relevant	PO11, PO12, PSO2,
	outcomes.	PSO3

### PO and PSO mapping with level of strength for Data Mining (CSD301)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	P O4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
	CO1	3	2	I	2	I	2	2	1	I	2	1	3	-	I	-
	CO2	3	2	2	3	2	1	I	I	1	2	I	2	1	I	-
Data	CO3	2	3	3	2	3	-	1	-	-	-	-	2	-	-	2
Mining	CO4	-	-	3	3	2	-	-	-	2	-	-	-	-	3	2
(CSD	CO5	2	3	-	-	-	-	1	2	-	-	-	-	1	3	2
301)	CO6	-	2	-	3	-	-	-	2	1	-	1	3	-	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	PO 3	РО 4	P 0 5	PO 6	Р О 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3

### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment	Computer Sci	ence &	Engineering							
Pro	gram:	B.Tech.		0 0							
Bra	nch:	CSE									
1	Course Code	CSD301									
2	Course Title	Data Mining I	AB								
3	Credits	1									
4	Contact	-									
	Hours	0		0	2						
	(L-T-P)	0		0	2						
	Course	Core /Elective/	Open E	lective							
	Status		open L								
5	Course	1 Provide stude	ents with	n an overview of the met	hodologi	es and					
C	Objective	approaches to c	lata mir	ing.							
		2. Gain insight	into the	challenges and limitation	ons of diff	ferent data					
		mining techniq	ues.	8							
		3. Provide the	students	with practice on applyir	ng data m	ining					
		solutions.		1 117	C	U					
		4. Prepare stud	ents for	research in the area of d	ata minin	g and related					
		applications.				0					
6	Course	CO1: To Reca	ll the ba	sic data analysis process	flow and	l data pre-					
	Outcomes	processing tech	niques	• •		L.					
	(must be 6	CO2: To Expla	ain the i	nterpretation, integration	and prep	paration of					
	COs,	data sets towar	ds impro	oving effectiveness, effic	ciency and	d quality for					
	following	data analysis.									
	verbs given	CO3: To Appl	y the mi	ning of datasets towards	knowled	lge discovery					
	in Bloom's	from real world	l tangib	le scenarios							
	Taxonomy)	CO4: To Analy	yse diffe	erent data mining and kn	owledge	discovery					
		processes over	a variet	y of real-word application	on areas						
		CO5: To Com	pare and	l contrast and determine	the data i	mining					
		algorithms fit f	or an op	en variety of real-world	, tangible	data source					
		CO6: To Adap	t the ac	quired data mining meth	odologies	s towards					
		societal, scienti	fic and	financially relevant outc	omes.						
7	Course	This course int	roduces	advanced aspects of dat	a wareho	using and					
	Description	data mining, er	compas	ssing the principles, to ar	halyze the	e data,					
		identify the pro	blems,	and choose the relevant	models a	nd algorithms					
		to apply.									
8	Outline syllabu	18									
	1	Analyzing stati	stical de	escription of given datas	et	CO1. CO2					
	_	central tendenc	y measu	ires.		, _ <b></b>					
	2	Analyzing stati	stical de	escription of given datas	et using	CO1, CO2					
		data dispersion	estimat	ion measures.		, <b></b>					
	3	Analyze the eff	ects of	outliers on the analysis		CO1. CO2					
		outcome. Diffe	rences i	n the outcomes.							
	4	Analyze the da	taset for	missing values, noisy d	ata	CO1. CO2					
		values in the gi	ven dat	aset.		, <b></b>					



5	Demonstrate Naïve algorit	CO3						
6	Demonstrate A-priori algo	frequent items rithm from ret	set pattern mining using the ail dataset.	CO3				
7	Demonstrate given dataset	frequent items using FP grov	CO3					
8	Demonstrate using the EC A-priori.	CO3, CO4						
9	Demonstrate for a bivariate	CO3, CO4						
10	Demonstrate given dataset	decision tree- using the ID3	based classification of a algorithm.	CO3, CO4				
11	Demonstrate given dataset	CO5						
12	Demonstrate dataset.	CO5						
13	Demonstrate a given datas	Demonstrate the prediction using Linear regression on a given dataset.						
14	Demonstrate methods usin	the use of den g DBSCAN.	sity based clustering	CO5				
15	Case Study: l data analysis	Retail and Tele for patterns a	ecommunication Industry nd relatable outcomes.	CO6				
Mode of examination	Theory/Jury/	Practical/Viva						
Weightage	CA	MTE	ETE					
Distribution	25%	25%	50%					
Text book/s*	2. J. Han, M and Tech							
Other	4. M.H.							
References	Adva							
	5. Adria							
	$\begin{array}{ccc} 6. & \mathbf{V}_{1}\mathbf{k}\mathbf{r}\mathbf{a} \\ \mathbf{V}_{1}^{*} & \mathbf{V}_{2}^{*} \end{array}$	m Pudi & P. F	Kadhakrishnan, "Data					
	Minir							



S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: To Recall the basic data analysis process flow and	PO1, PO2, PO4, PO6,
	data pre-processing techniques	PO8, PO10, PO11,
		PO12,
2.	CO2: To Explain the interpretation, integration and	PO1 PO2 PO3 PO4
	preparation of data sets towards improving effectiveness,	PO5 PO10 PO12 PS01
	efficiency and quality for data analysis.	F03, F010, F012, F301
3.	CO3: To Apply the mining of datasets towards	PO1, PO2, PO3, PO5,
	knowledge discovery from real world tangible scenarios	PSO12, PSO2,
4.	CO4: To Analyse different data mining and knowledge	
	discovery processes over a variety of real-word	PC03, PC04, PC03, PC09,
	application areas	PSO2, PSO3
5.	CO5: To Compare and contrast and determine the data	
	mining algorithms fit for an open variety of real-world,	PO1, PO2, PO4, PO8,
	tangible data source	PS01, PS02, PS03
6.	CO6: To Adapt the acquired data mining methodologies	PO2, PO4, PO8, PO9,
	towards societal, scientific and financially relevant	PO11, PO12, PSO2,
	outcomes.	PSO3

### PO and PSO mapping with level of strength for Data Mining (CSD301)

Course Code_ Course Name	CO's	PO 1	<b>PO</b> 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O2	PS O3
	CO1	3	2	-	2	-	2	2	1	-	2	1	3	-	-	-
	CO2	3	2	2	3	2	-	-	-	1	2	-	2	1	-	-
	CO3	2	3	3	2	3	-	1	-	-	-	-	2	-	-	2
Data	CO4	-	-	3	3	2	-	-	-	2	-	-	-	-	3	2
Mining LAB	CO5	2	3	-	-	-	-	1	2	-	-	-	-	1	3	2
(CDP 301)	CO6	-	2	-	3	-	-	-	2	1	-	1	3	-	3	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	PO 3	РО 4	Р О 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3

### Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent



School:		School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Program:		B.Tech. DS								
Bra	nch:	CSE								
1	Course Code									
2	Course Title	Data Explorat	ion and V	Visualization						
3	Credits	3								
4	Contact									
	Hours	2		0	2					
	(L-T-P)									
	Course	Core /Elective	Open El	ective						
	Status		-							
5	Course	• To und	erstand v	what is in a dataset and th	e characte	eristics of the				
	Objective	data								
	0	• To des	gn and c	reate data visualizations	based on a	data available				
		and tas	ks to be a	achieved.						
		• To eva	luate the	effectiveness of visualization	ation desig	gns, and think				
		critical	ly about	each design decision, suc	ch as choic	ce of color				
		and cho	oice of vi	sual encoding.						
		• Studen	ts will cr	eate their own data visua	lizations,	and learn to				
		use Op	en Sourc	e data visualization tools	, especiall	y D3.js.				
6	Course	CO1: Design a	n approa	ch to leverage data using	the steps	in the				
	Outcomes	machine learni	ng proce	ess.						
	(must be 6	CO2: Design a	nd create	e data visualizations.						
	COs,	CO3: Craft vis	ual prese	entations of data for effect	tive comn	nunication.				
	following	CO4: Design a	nd evalu	ate color palettes for visu	alization	based on				
	verbs given	principles of p	erception	1.						
	in Bloom's	CO5: Apply da	ata transf	ormations such as aggreg	gation and	filtering for				
	Taxonomy)	visualization.								
		CO6: Use JavaScript with D3.js to develop interactive visualizations								
		for the Web.								
7	Course	This course us	es ecolog	gical datasets to discuss d	ata explor	ation and				
	Description	visualization to	ools. It al	so explain how to visual	ize the res	ults of				
		statistical mod	els. The	course also includes the J	lavaScript	with D3.js				
		needed to cons	truct, vis	sualize, and explore the n	nain featui	res of the data				
		step by step.								
8	Outline syllabu	S				CO				
						Mapping				
	Unit 1	INTRODUCT	TION							
	А	Introduction to	data exp	oloration, Data Terminol	ogy,	CO1				
	В	Data Explorati	on throu	gh summary statistics, Ex	xploring	CO 2, CO3				
		data with KNI	ME plots	, Data Exploration in Sp	ark					
	С	Classification	Techniqu	es, Clustering Technique	es,	CO 1, CO2				
		Regression Me	ethods,							
	Unit 2	<b>OVERVIEW</b>	OF DA7	TA VISUALIZATION,						
		INTRODUCT	TION TO	) WEB TECHNOLOG	IES					



А	Why Visualiz	CO3		
	Introduction t			
	Making a Fac	e with D3.js		
В	Input for Visu	alization: Data	a and Tasks, Loading and	CO2. CO3,
	Parsing Data	with D3.js	-	CO4
С	Encoding Dat	CO3, CO4		
	Marks and Cl			
	to D3 Scales,			
Unit 3	DATA MAN	SSUES		
А	Integrity and	Quality of Dat	a - Data type issues,	CO1,
	Exploratory c	lata analysis, si	mple viz.	CO4,CO5
В	Handling mis	sing data, Han	dling outliers, Attribute	CO4, CO5
	creation, mod	lification conve	ersion: categorical –	
	numeric.			
С	Understandin	g and naming t	the attributes and files,	CO3, CO4
	Replicability			
Unit 4	VISUALIZA	TION OF SP	ATIAL DATA,	
	NETWORK	S, AND TREF	ES	
А	Reusable Dyn	namic Compon	ents using the General	CO2, CO3
	Update Patter	m:-Reusable So	catter Plot	
	Common Vis	ualization Idio	ms with D3.js:-	
	Bar Chart, Ve	ertical & Horiz	ontal, Pie Chart and	
	Coxcomb Plo	t, Line Chart, A	Area Chart	
B	Making Maps	s, Visualizing	Trees and Networks	CO3, CO4
C	Encoding Dat	ta using Color,	Encoding Data using Size,	CO4, CO5
	Stacked & Gi	ouped Bar Cha	art, Stacked Area Chart &	
TI	Streamgraph,	Line Chart wi	th Multiple Lines	
Unit 5	INTERACT.	ION IECHNI	directional Data Flow	CO1 CO2
A	Adding intera	iction with Uni	directional Data Flow,	CO1, CO2,
	Zooming on a	Globa Addin	a scatter plot, raining and	005,005
B	Small Multin	les Linked Hi	blighting with Brushing	CO4 CO5
D	Linked Navio	ation: Bird's F	ve Man	CO4, CO3, CO6
С	Case Study: (	Covid19 Dashb	oard by joining interactive	C04 $C05$
C	techniques an	d spatial data i	networks and trees	CO6
Mode of	teeninques un	a sputtar auta r		
examination				
Weightage	СА			
Distribution	25%			
Text book/s*	1. Advar	nced Methods	of Data Exploration and	
	Mode			
	2. Intera			
	Scott			
Other	1. Visua	lizing Data: Ex	ploring and Explaining Data	
References	with t	he Processing 1	Environment by Ben Fry	
	2. Visua	lization Analys	sis and Design by Tamara	
	Munz			


S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: Design an approach to leverage data using the steps	
	in the machine learning process.	FO 1, FO2
2.	CO2: Design and create data visualizations	PO1, PSO2, PSO3
3.	CO3: Craft visual presentations of data for effective	
	communication.	P01, P02, P03, P302
4.	CO4: Design and evaluate color palettes for visualization	
	based on principles of perception.	PO4, PO5, PO6
5.	CO5: Apply data transformations such as aggregation and	
	filtering for visualization.	PO1, PO2, PSO2,PSO5
6.	CO6: Use JavaScript with D3.js to develop interactive	PO2, PO3, PO5, PSO2,
	visualizations for the Web.	PSO3

#### PO and PSO mapping with level of strength for Data Exploration and Visualization

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Data Explora	CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	3	2
	CO3	3	2	3	-	-	-	-	-	-	-	-	-	-	3	
Visualiz ation	CO4	-	-	-	3	2	3	-	-	-	-	-	-	-	-	
	CO5	2	3	-	-	-	-	-	-	-	-	-	-	-	2	3
	CO6	-	2	3	-	3	-	-	-	-	-	-	-	-	3	2

#### Strength of Correlation

- 1. Addressed to *Slight* (*Low=1*) *extent* 2. Addressed to *N* 
  - 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Scho	ol:	School of Engineering & Technology										
Depa	rtment	Computer Science & Engineering										
Prog	ram:	B. Tech										
Bran	ch:	CSE with Specialization in DS										
1	Course Code	CSD303										
2	Course Title	Big Data Analytics										
3	Credits	3										
4	Contact Hours	$\frac{3}{2}$ 0 2										
-	Course Status											
5	Course	Students should be able to learn about analytics techniques to handle the high	data									
5	Objective	through Hadoon framework	uata									
6	Course Outcomes (CO) (Max of 4)	<ul> <li>On successful completion of this module students will be able to:</li> <li>1. Explore the fundamental concepts of Big Data analysis</li> <li>2. Identify and successfully apply appropriate techniques and tools to seactual Big Data problems (derive value from vast data sets)</li> <li>3. Examine the distributed and parallel computing and its application for data analysis</li> <li>4. Analyse how to deal with huge amount of data and propose scalable</li> <li>5. Evaluate statistical packages and deriving intelligence from unstructurinformation</li> <li>6. Compile and contrast among different big data analytics tools and how can help solving Industry challenges</li> </ul>	olve or big solutions ured ow they									
7	Duonoquisito	Knowledge of DDMS. Data Mining is assortial										
/ 8	Prerequisite	Course Contents										
0	Unit A	Introduction to Big Data										
	Unit A Topic 1	Introduction to Big Data, challenges of conventional systems	CO1									
	Unit A Topic 2	Evolution of analytic scalability	C01									
	Unit A Topic 3	Modern data analytic tools	CO1,									
	*		CO2									
	Unit B	Modelling techniques										
	Unit B Topic 1	Mining frequent itemsets, Apriori algorithm, Handling large data sets in main memory	CO1, CO2									
	Unit B Topic 2	Clustering techniques, clustering for parallelism	CO2									
	Unit B Topic 3	Classification and Prediction: Decision Tree induction, Developing models using Decision Tree Algorithms	CO2									
	Unit C	Frameworks	•									
	Unit C Topic 1	Overview of Hadoop, Hadoop Distributed File System, HDFS design and	CO2,									
		architecture	CO3									
	Unit C Topic 2	Hadoop Map reduce Framework, HBASE	CO2, CO3, CO4									
	Unit C Topic 3	Interacting HDFS using HIVE, sample programs in HIVE-PIG	CO2, CO3, CO4									
	Unit D	Data Analysis and mining data streams	·									
	Unit D Topic 1	Regression modelling, Rule Induction	CO5									
	Unit D Topic 2	Fuzzy decision trees and neural networks	CO5									
	Unit D Topic 3	Introduction to streams concepts, Real time analytics platform, case studies	CO4,									
			CO5,									
1			CO6									



	Unit E	Visua	lization								
	Unit E Topic 1	Visua	l data analysis techn	iques, Interaction techniques		CO5					
	Unit E Topic 2	Analy	tics using statistical	packages, association intelliger	nce from	CO4,					
		unstru	ctured information			CO5					
	Unit E Topic 3	Text a	Text analytics, industry challenges and application of analytics								
			C06								
9			Co	ourse Evaluation							
		Contin	uous Assessment	Mid-Term Examination	End-Term Exar	nination					
	Attendance		Mandatory	Mandatory	75%						
	Assignment		Yes								
	Quizzes		yes								
	Projects		Yes								
	Presentations		Yes								
	Exam			Yes	Yes						
	Total Marks		30	30	40						
10			R	eading Content							
	Text book*		1. Bill Franks, "T	aming the big data tidal wav	e: finding opportu	unities in					
			huge data strea	ms with advanced analytics"	', John Wiley & S	ons,2012					
	Other reference	es	1. Anand Raja	araman and Jeffrey David Ull	lman, "Mining of	Massive					
			Datasets", 0	Cambridge University Press,2	2012						
			2. Michael Be	rthold, David J. Hand, "Intel	ligent Data Analy	vsis".					
			Springer 20	007	C ,	2					
			3. Jiwaei Han	. Micheline Kamber. "Data N	Aining Concepts a	ind					
			Techniques	". Second Edition. Elsevier.	Reprinted 2008						



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Explore the fundamental concepts of Big Data analysis	PO1, PO6, PO7, PO9, PO10, PO12
2.	Identify and successfully apply appropriate techniques and tools to solve actual Big Data problems (derive value from vast data sets)	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO12, PSO2
3.	Examine the distributed and parallel computing and its application for big data analysis	PO3, PO4, PO5, PO8, PO9, PSO1, PSO2
4.	Analyse how to deal with huge amount of data and propose scalable solutions	PO2, PO3, PO4, PO5, PO6, PO7, PO10, PO11, PSO2, PSO3
5.	Evaluate statistical packages and deriving intelligence from unstructured information	PO3, PO4, PO5, PO11, PO12, PSO1, PSO2
6.	Compile and contrast among different big data analytics tools and how they can help solving Industry challenges	PO4, PO5, PO6, PO7, PO8, PO11, PO12, PSO1, PSO2

**PO and PSO mapping with level of strength for Course Name** Introduction to Artificial Intelligence & Machine Learning (**Course Code** CSD-303)

Course Code_ Course Name	CO' s	PO 1	PO 2	Р О 3	Р О 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	Р О 11	P O 12	P S O 1	P S O 2	P S O 3
	CO1	3	2	-	-	-	1	1	-	2	2	-	3	-	-	-
	CO2	2	2	3	3	2	2	-	2	-	-	-	2	-	3	-
CSD303_Big	CO3	-	-	3	3	2	-	-	2	3	-	-	-	2	3	-
Data Analytics	<b>CO4</b>	-	2	3	2	2	2	2	-	-	2	2	-	-	3	2
	CO5	-	-	3	2	2	-	-	-	-	-	2	2	2	3	-
	CO6	-	-	-	2	3	2	1	2	-	-	2	2	2	3	-

Average of non-zeros entry in following table (should be auto calculated).

Cours	Course Name	Р		Р	Р	Р		Р	Р	Р	Р	Р	Р		PS	
e		0	PO	0	0	0	PO	0	0	0	0	0	0	PS	Ο	PS
Code		1	2	3	4	5	6	7	8	9	10	11	12	01	2	03

Total 28

Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology												
Dep	artment	Computer Science & E	ngineering											
Pro	gram:	B.Tech.												
Bra	nch:	CSE												
1	Course Code	New												
		Code												
		(major changes)												
2	Course Title	Business Intelligence												
3	Credits	3												
4	Contact													
	Hours	3	0	0										
	(L-T-P)													
	Course	Core /Elective/Open Ele	ctive											
	Status													
5	Course	In this course, students a	are intended to have gair	ed an understanding of										
	Objective	how business profession	als can use analytics tech	iniques to formulate and										
		solve relevant problems a	and now we can use analy	ytics to support decision										
		making. we will learn	In support of these act	soping, reporting, and										
		tools and methods will h	analyzing business data. In support of these activities selected analysi											
6	Course	CO1 Define and rec	bols and methods will be utilized.											
0	Outcomes	introducing Intelligence in husiness strategies												
	(must be 6	CO2. Explain the process of data analytics and recognize the best												
	COs,	practices for data	practices for data mining and nitfalls of managing data analytics											
	following	projects. Show h	ow data can improve bu	siness performance and										
	verbs given	inform decisions	for managing business a	application areas.										
	in Bloom's	CO3. Identify the de	tailed account of and	discuss fundamental										
	Taxonomy)	concepts, theory	ies, methods and mo	dels within Business										
		Intelligence and	Data Warehousing											
		CO4. Analyzing busine	ess intelligence using dif	ferent categorization of										
		operations such a	as extraction, cleansing,	integrating, visualizing,										
		and reporting to	identify the functionaliti	es of BI Life Cycle										
		CO5. Evaluate the imp	bact of DM and DW and	identify the Issues and										
		challenges.in ma	anaging capabilities and	a cost in Business by										
		CO6 A dapt the basics	and learnings available t	o Build the relationship										
		of data in pro	and learnings available to	nal systems for data										
		Intelligence using	σ BI	iai systems for data										
7	Course	After finishing the co	urse the student will	be able describe and										
	Description	comprehend all the cond	cepts related with Busine	ess Intelligence, how to										
	1	manage the internal and	external information in	order to make the best										
		decisions for the purpos	se of giving the best serv	vice, and obtain a good										
		profitability.		-										
8	Outline syllabu	IS		CO										
				Mapping										
	Unit 1	Introduction to BI												



А	Introduction, Definition, History and Evolution, BI Segments Difference between Information and	
	Intelligence, Defining BI Value Chain, Factors of BI System Real time BI BI Applications	CO1
В	BI Essentials: Introduction, Creating BI Environment, BI	
	Landscape, Types of BI, BI Platform, Dynamic roles in	CO1
	BI, Roles of BI in Modern Business	
С	BI Types: Introduction, Multiplicity of BI Tools, Types	
	of BI Tools, Modern BI, the Enterprise BI, Information	CO1
 	Workers	
Unit 2	Data Mining (DM) Tools and Techniques	
А	Architecture of the Data: Introduction, Types of Data and	
	Models (Enterprise Data, Enterprise Subject Area,	CO2
	Enterprise Conceptual, Enterprise Conceptual Entity), Crepularity of data Reporting and Query Tools, Data	02
	Bartitioning Metadata TDOM	
B	Introduction to DM Definition Mining parameters How	
D	DM works? Types of relationships. Architecture of DM.	
	Functionalities of DM. Classification on DM System.	CO2. CO6
	Various risks in DM, Advantages and disadvantages of	,
	DM,	
С	DM Techniques, Statistical Perspective on DM,	
	Statistics-need, Similarity Measures, Decision Tree-	
	Illustrations, Neural Network, Neural Network versus	CO2, CO6
	Conventional Computers, Genetic Algorithms,	
 	Applications of Genetic Algorithm	
Unit 3	Data Warehouse (DW) and Knowledge Management (KM)	
А	Introduction to DW, Advantages and Disadvantages of	
	DW, Data Mart, Aspects of Data Mart, Online Analytical	
	Processing, Characteristics of OLAP, OLAP Data	CO3. CO6
	Modeling, Difference between OLAP and OLTP,	
	Multidimensional Data Model, Data Modeling using	
D	Different Ways of DW Types of Pusiness Models P2P	
D	BI Model and Its Types Electronic Data Interchange &	
	E-Commerce Models Advantages of E-Commerce for	CO3 CO6
	B2B. Systems for Improving B2B E-Commerce, B2C BI	005,000
	Model and its Need	
С	Introduction of KM, Characteristics, Knowledge Assets,	
	Generic KM Process, KM Technologies, Essentials of	CO3, CO6
	KM Process	
Unit 4	Data Extraction (DE) and BI Life Cycle (BILC)	
А	Introduction to DE, Role of ETL process, Importance of	
	Source Identification, Various DE techniques, Logical	CO4
P	and Physical extraction methods, Change data capture	
В	Introduction of BILC, Enterprise Performance Life Cycle	CO4, CO6
	I UCETA J FLAIDEWOLK FJEIDEDIS, LITE UVCIE PNASES, HIIMAN I	



	Factors in	BI Impleme	ntation, BI Strategy and										
	Objectives, B												
С	BI User Mod	el, Evolution	of BI, Content Management										
	System, End	User Segmen	tation, Basic Reporting and										
	Querying, Q	Online Analy	ytical Processing, OLAP	CO4, CO6									
	Techniques a	nd Applicatio	ns, Applying the OLAP to										
	Data Warehow	using, Future c	of Business Intelligence										
Unit 5	BI Issues and	l Challenges											
А	Critical Chall	Critical Challenges for BI success, Cross-Organization											
	Partnership,	artnership, Business Sponsors, Dedicated Business											
	Representatio	Representation, BI App Development methodology, Data Standardization, Business Profitability											
	Standardizatio												
В	BI Strategy	and Planning	to implement BI Solution,										
	Understand L	Jnderstand Limitations of BI, BI Usage, TCO, Managing											
	the TCO of th	e BI, Factors t	hat Affect TCO										
С	Implementati	on of BI, I	BI Platform, BI Platform										
	Capability M	atrix, BI Targ	et Databases, Data Mart, BI	CO5, CO6									
	Products and	Vendor, The E	Big Four BI vendors										
Mode of	Theory												
examination													
Weightage	CA	MTE	ETE										
Distribution	25%	25%	50%										
Text book/s*	1. Business	Intelligence:	A Managerial Approach										
	(2014)	Furban, Shard	a, Delen, King, Publisher:										
	Prentice	Hall, Edition:	2nd, ISBN: 13-978-0-136-										
	10066-9												
	2. Turban,	Efraim, Rames	h Sharda, and Dursun Delen.										
	Business	intelligence	and analytics: systems for										
	decision	support. Pears	on Higher Ed, 2014.										
	3. Jiawei F	fan, Michelin	e Kamber, Jian Pei, Data										
	Mining C	Concepts and I	echniques, Third Edition										
 Other	1 Turbon	Efraim Damas	h Sharda and Dursun Dalar										
Duller	T. Turban, T. "Decision	support and	business intelligence systems										
References	(required)	." Google Scho	lar (2010).										
	2. Chen, Hsi	inchun, Roger H	IL Chiang, and Veda C. Storey.										
	"Business	intelligence and	d analytics: From big data to big										
	impact." I	MIS quarterly 3	6.4 (2012).										
	3. Business	Intelligence (	Guidebook: From Data In										
	(Kindle E	dition)by Shern	han, Rick										
	4. Business	Intelligence Fo	r Dummies (Kindle Edition)by										
	Scheps, S	wain	004) Data Mining Tashniswas										
	J. Derry, M. For Mar	y LIIIOII, G. (2 Reting Sales	and Customer Relationship										
	Managem	ent. Indianapoli	is: Wiley Publishing Inc										
	intunugon	in in in in in in in the point											



S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	Define and recall the importance of data in business by	PO1, PO2, PO3, PO4,,
	introducing Intelligence in business strategies.	PO9, PO11, PSO2
2.	Learn and Explain the best practices for data mining and	PO1, PO2, PO3, PO4, PO5,
	pitfalls of managing data analytics projects. Show how	PO6, PO8, PO10, PO11,
	data can improve business performance.	PSO1, PSO2, PSO3
3.	Identify and Use the tools to develop, implement and	PO1, PO2, PO3, PO4, PO5,
	administrate wide range of BI artifacts	PO9, PO10, PSO1, PSO2,
		PSO3
4.	Analyze various modeling techniques and apply business	PO1, PO2, PO3, PO4, PO5,
	intelligence methods to various situations	PO6, PO11, PO12, PSO1,
		PSO2, PSO3
5.	Evaluate the impact of DM and DW and identify the issues	PO2, PO3, PO4, PO5, PO6,
	and challenges.in managing capabilities and cost in	PO7, PO9, PO10, PO11,
	Business by decision analysis and decision processes.	PSO2, PSO3
6.	Adapt the basics and learnings available to build the	PO1, PO2, PO3, PO4, PO5,
	relationship of data in production and operational systems	PO6, PO9, PO11, PO12,
	for data Intelligence using BI	PSO1, PSO2, PSO3

## PO and PSO mapping with level of strength for Course Name xxxx (Course Code yyyy)

	COs	P 0 1	P 0 2	P 0 3	P 0 4	P 0 5	P 0 6	P 0 7	P 0 8	P 0 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
CSD 401	CO1	3	2	2	1	1	1	1	1	1	1	1	1	2	3	2
	CO2	2	3	2	2	2	2	3	3	1	1	3	2	2	2	3
	CO3	2	3	3	2	3	3	3	1	2	2	2	1	3	2	3
	CO4	3	3	3	3	3	2	3	1	2	2	2	2	3	3	2
	CO5	2	2	2	3	2	3	3	2	1	3	2	1	2	2	3
	CO6	3	1	2	2	2	3	2	1	1	3	2	3	2	2	2



#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	PO 3	PO 4	Р О 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sch	ool	School of Engineering & Tech								
Pro	gram	B.Tech.								
Bra	nch	CSE DS								
1	Course Code	CSD021								
2	Course Title	Business Process Mana	agement							
3	Credits	3								
4	Contact Hours (L-T-P)	3	0	0						
	Status	UG								
5	Course Objective	Business Process Management course focuses on the essential skills business people require to analyze and redesign their processes								
6	Course Outcomes	After the successful comple CO1: Understand Pro CO2: Understand Pro CO3: Perform translar activities CO4: Design complex CO5: Create dashboar CO6: Compile the too business process se	tion of this course, students cess Designer and its ob cess Modeling and its re- tion of workflow steps i x process applications rds and reports ols on the basis of their p tup	will be able jectives elation to nto busin performan	to: BPM ess process ace in a said					
7	Course Description	Business Process Mana concerned with lifting a improvement, manager encapsulates methods, all stages of the process enactment and control.	agement (BPM) is a mar an organization's perform nent and control of busi techniques and software s lifecycle including ana	agement nance thr ness proc involved lysis, des	discipline ough esses. It hroughout ign,					
8	Outline syllab	ous CO Manning								
	Unit 1	Introduction to BPM								
	А	Business Process, Business Process Management, Themes of Business Process, Goals of Business Process, Principles of Business Process, Process Choreographies and its importance, Process Designer, Administration and stakeholders of business process, Classification of Business Processes, Organizational versus Operational.								



В	Intraorganizational Processes versus Process, Degree of Automation, Degree of Repetition, Degree of Structuring, Goals: Structure, and Organization, Business Process Modelling Foundation, Conceptual Model and Terminology, Abstraction Concepts, Horizontal Abstraction, Vertical Abstraction from Business Functions to Business Processes Business Analysis: Business Process Analysis, Object Oriented Analysis, Structure Analysis	CO1, CO2, CO4						
С	Process Models and Process instances, Process Models, Activity Models and Gateway Models, Activity Instances. Business Process Modeling Notations.	CO1, CO2, CO3						
Unit 2	BPM Life Cycle Methodology							
А	Business Process Management Activities: Modelling, Execution, Monitoring, Optimization, Components of BPM suites, BPM Technology Workflow, Managing end-to-end, Customer-facing Processes	CO2, CO3						
В	B Business Process Management Life Cycle , Programming Language for BPM, Establishing a common language for business-IT alignment, Cloud Computing BPM, Market, Benefits							
С	C Interaction between Business Process and Data, Business Process Management tools and simulation, Business Process Integration and reengineering							
Unit 3	Business Process Management Overview							
А	Overview of Business Process Management and Process Modelling, Process Designer, Overview of Business Process Management and Process Modelling. Artifacts in Business Process Designing, Process development with the Process Centre, Process applications: Overview, Process applications and business level applications.	CO3, CO4						
В	Various Notation used to create BPD, Creating BPD	CO3, CO4						
 С	C Building Services, Understanding service components, Business objects and variable, Modelling events, Business objects and variables, Modelling events, Modelling event gateways, Creating user interfaces, Designing process interactions for business users, Enabling processes for tracking and reporting, Running and debugging processes with the Inspector							
Unit 4	Creating User Interfaces							
А	CO1, CO3, CO4							



	content contro Advanced ite HTML	ols, Document ms for Coach	t List - Document Viewer. Views - Content box, Custom	
В	Boundary ever Coach View I applications - users, Config Developing f Integrating w integrations, Service Integ	ents. Binding y behavior. Arcl Designing pr uring a role-ba lexible and eff ith other syste Integration Se ration step in	views with data - Defining hitecting complex process ocess interactions for business ased business user interface. ficient process applications, ems, Creating outbound rvice implementations, Web an integration service.	CO1, CO3, CO4
С	Business Prod Understandin variable types Structured typ types, Passing	CO1, CO3, CO4		
Unit 5	Inferential S			
А	Solution for C Sphere Data Management Integration. D users	CO4, CO5, CO6		
В	BPEL proces interactions, l Developing f Enabling proc	s interactions, Defining report lexible and eff cesses for trac	Factors affecting BPEL process rts in process Designer, ficient process applications - king and reporting.	CO4, CO5, CO6
С	Case study or i.e. IBM BPN	n various Busi 1	ness Process Management tools	CO2, CO4, CO5, CO6
Mode of examination	Theory			
Weightage	CA	MTE	ETE	
Text book/s*	<ol> <li>25%</li> <li>Business</li> <li>Business</li> <li>Architect</li> <li>Deliver M Framework</li> </ol>	25% Process Mana Process Mana ures, Mathias Aodern UI for ork and Other		
Other References				



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Understand Process Designer and its objectives	PO1, PO3, PO6, PO8, PSO3
2.	CO2: Understand Process Modeling and its relation to BPM	PO1, PO2, PO3, PSO3
3.	CO3: Translation of workflow steps into business process activities	PO4, PO6, PO7, PO9, PSO3
4.	CO4: Architect complex process applications	PO1, PO3, PO4, PO5, PSO3
5.	CO5: Visibility through dashboards and reports	PO1, PO3, PO4, PO5, PSO3,
6.	CO6: Compile the tools on the basis of their performance in a said business process setup	PO1, PO3, PO4, PO5, PSO3

# PO and PSO mapping with level of strength for Course Name Business Process Management CSD021

	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	CO1	1	1	1	1	1	1	1	1	-	-	1	1	-	-	3
CSE	CO2	2	2	2	2	1	1	1	1	1	2	1	2	1	1	3
	CO3	3	2	3	3	3	2	1	2	3	3	1	3	1	3	3
	CO4	3	1	3	3	3	1	1	2	3	3	1	3	-	-	3
	CO5	1	2	2	2	2	2	1	2	1	2	1	2	-	2	3
	CO6	3	1	3	3	3	1	1	2	3	3	1	3	-	-	3



Scho	ol:	School of Engineering & Technology							
Depa	artment	Computer Science & Engineering							
Prog	gram:	B. Tech							
Brai	ich:	CSE with Specialization in DS							
1	Course Code	CSA102							
2	Course Title	Introduction to Machine Learning for Data Science							
3	Credits	3							
4	Contact Hours								
	(L-T-P)	2 0 2							
	Course Status	Core /Elective/Open Elective							
5	Course	The objective of the course is to introduce basic fundamental co	oncepts in						
	Objective	Machine Learning (ML) as well as to give a strong foundation	of ML						
	5	Techniques used in Data Science.							
6	Course	CO-1. Define the requirement of Machine Learning							
	Outcomes	CO-2. Classify the functionality and active environment Fe	or Machine						
		Learning.							
		CO-3. Apply the concepts of Propositional Logic for real-wor	ld AI based						
		problems.							
		CO-4. Analyse the various ML techniques and apply them t	o solve the						
		real-world problems.							
		CO-5. Explain the basic concepts of pythons to understand an	nd Evaluate						
		the Models and Applications.							
		CO-6. Discuss the applicability of Machine learning in Data Science							
7	Course	Machine Learning (ML) are increasingly necessary to translate t	oday's data into						
	Description	direct business value. This course introduces learners to the ba	sic concepts of						
		ML, and covers how learning algorithms work. It illustrates ho	w ML fit in the						
		data science ecosystem, and presents several real-world use	cases that show						
		how companies are implementing.							
8	Outline syllabus		CO Mapping						
	Unit 1	Introduction to Machine Learning							
	А	Introduction, Training, Rote Learning, Learning Concepts, A	CO1						
		Simple Learning Algorithm, Types of learning (Supervised,							
	D	Unsupervised, Reinforcement)							
	В	Introduction to Regression and types of regression, Objective	COI						
		Function/Cost Function, Gradient Descent Learning							
	0	Algorithm	<u>CO1</u>						
	C	Concepts of Over-fitting and under-fitting, Application of	COI						
		Linear Regression in various application domains through case							
	Unit 2	Study.							
		Types of Learning	CO2						
	A	Supervised Learning, Classification and Regression,	02						
		Model Complexity to Dataset Size) Uncertainty Estimates							
		from Classifiers (The Decision Function, Predicting							
		Probabilities Uncertainty in Multiclass Classification)							
	B	Supervised Machine Learning Algorithms (Some Sample	$CO^2$						
	0	Datasets k-Nearest Neighbors Linear Models Naive Raves							
		Classifiers Decision Trees Ensembles of Decision Trees							
		Kernelized Support Vector Machines Neural Networks)							
	С	Unsupervised Learning and Preprocessing Types of	CO2						
	$\sim$	Unsupervised Learning, Challenges in Unsupervised Learning							
	Unit 3	Preprocessing, Feature Extraction and Clustering							



	<b>D</b> .	10 11 (5)	22 XXI 1 2 D	<b>G Q Q</b>				
А	Preprocessing	and Scaling (Di	fferent Kinds of Preprocessing,	CO3				
	Applying Data	1 Transformatio	ons, Scaling Training and Test					
	Data the San	ne Way, The	Effect of Preprocessing on					
	Supervised Lea	arning)						
В	Dimensionality	Reduction, Fe	ature Extraction, and Manifold	CO3				
	Learning (Pri	ncipal Compo	nent Analysis (PCA), Non-					
	Negative Mat	ix Factorizatio	n (NMF) Manifold Learning					
	with t_SNF)		in (1000), Mainfold Dourning					
C	Clustering (1)	Maana Clustoni	na Agalomorativa Clustorina	CO2				
C	DRCAN Com	Clustering (k-Means Clustering, Agglomerative Clustering,						
<b>T</b> T <b>1</b> / 4	DBSCAN, COI	DBSCAN, Comparing and Evaluating Clustering Algorithms)						
Unit 4	Data Represei							
A	Representing	Data and Engi	ineering Features, Categorical	CO4				
	Variables (O							
	Categoricals,	Binning, Discre	etization, Linear Models, and					
	Trees	Trees						
В	Interactions	and Polynom	nials, Univariate Nonlinear	CO4				
	Transformation	ns. Automatic	Feature Selection. Univariate					
	Statistics Mod	lel-Based Featu	re Selection Iterative Feature					
	Selection Utili	zing Expert Kn	owledge					
C	Model Evoluet	ion and Improv	amont Cross Validation(Cross	CO4				
C	Volidation in		Demofite of Cross Validation	04				
	validation in	scikit-learn,	Benefits of Cross-vandation,					
	Stratified k-Fo	ld Cross-Valida	tion and Other Strategies)					
<b>T</b> T •4 <b>#</b>		·· · · · · ·						
Unit 5	Model Evalua	tion and Pipeli	nes					
Unit 5 A	<b>Model Evalua</b> Grid Search (S	tion and Pipeli Simple Grid Sea	nes rch, The Danger of Overfitting	CO5, CO6				
Unit 5 A	<b>Model Evalua</b> Grid Search (S the Parameters	tion and Pipeli Simple Grid Sea and the Validati	<b>nes</b> rch, The Danger of Overfitting ion Set, Grid Search with Cross-	CO5, CO6				
Unit 5 A	Model Evalua Grid Search (S the Parameters Validation)	tion and Pipeli Simple Grid Sea and the Validati	<b>nes</b> rch, The Danger of Overfitting ion Set, Grid Search with Cross-	CO5, CO6				
Unit 5 A B	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me	tion and Pipeli Simple Grid Sea and the Validati	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind,	CO5, CO6				
Unit 5 A B	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir	tion and Pipeli imple Grid Sea and the Validati trics and Scorin nary Classificati	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass	CO5, CO6 CO5, CO6				
Unit 5 A B	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification,	tion and Pipeli imple Grid Sea and the Validati trics and Scorin nary Classificati Regression Met	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics	CO5, CO6 CO5, CO6				
Unit 5 A B	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Selec	tion and Pipeli imple Grid Sea and the Validati trics and Scorin hary Classificati Regression Met ttion)	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics	CO5, CO6 CO5, CO6				
Unit 5 A B	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bin Classification, in Model Select Algorithm Cha	tion and Pipeli Simple Grid Sea and the Validati trics and Scorin hary Classificati Regression Met tion)	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics	CO5, CO6 CO5, CO6				
Unit 5 A B C	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Select Algorithm Cha Preprocessing	tion and Pipeli Simple Grid Sea and the Validati trics and Scorin nary Classificati Regression Met tion) ins and Pipeline Building Pipeli	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes. The General Pipeline	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B C	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Selec Algorithm Cha Preprocessing, Interface Grid	tion and Pipeli Simple Grid Sea and the Validati trics and Scorin nary Classificati Regression Met tion) ins and Pipeline Building Pipeli	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B C	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Select Algorithm Cha Preprocessing, Interface, Grid	tion and Pipeli imple Grid Sea and the Validati trics and Scorin nary Classificati Regression Met tion) ins and Pipeline Building Pipeli -Searching Prep	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B C	Model Evalua Grid Search (S the Parameters Validation) Evaluation Met Metrics for Bir Classification, in Model Select Algorithm Cha Preprocessing, Interface, Grid Parameters	tion and Pipeli imple Grid Sea and the Validati trics and Scorin nary Classificati Regression Met etion) ins and Pipeline Building Pipeli -Searching Prep	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B C Mode of	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Selec Algorithm Cha Preprocessing, Interface, Grid Parameters Theory	tion and Pipeli imple Grid Sea and the Validati trics and Scorin hary Classificati Regression Met tion) ins and Pipeline Building Pipeli -Searching Prep	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B C Mode of examination	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Selec Algorithm Cha Preprocessing, Interface, Grid Parameters Theory	tion and Pipeli imple Grid Sea and the Validati trics and Scorin hary Classificati Regression Met tion) ins and Pipeline Building Pipeli -Searching Prep	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B C Mode of examination Weightage	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Selec Algorithm Cha Preprocessing, Interface, Grid Parameters Theory	tion and Pipeli imple Grid Sea and the Validati trics and Scorin ary Classificati Regression Met tion) ins and Pipeline Building Pipeli -Searching Prep	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B B C Mode of examination Weightage Distribution	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Select Algorithm Cha Preprocessing, Interface, Grid Parameters Theory CA 25%	tion and Pipeli Simple Grid Sea and the Validati trics and Scorin hary Classificati Regression Met tion) ins and Pipeline Building Pipeli -Searching Prep MTE 25%	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model ETE 50%	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B B C Mode of examination Weightage Distribution Text book/s*	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Select Algorithm Cha Preprocessing, Interface, Grid Parameters Theory CA 25% Andreas C. Mit	tion and Pipeli imple Grid Sea and the Validati trics and Scorin nary Classificati Regression Met etion) ins and Pipeline Building Pipeli -Searching Prep <u>MTE</u> 25% iller and Sarah (	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model ETE 50% Guido, "Introduction to	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B C C Mode of examination Weightage Distribution Text book/s*	Model Evalua Grid Search (S the Parameters Validation) Evaluation Met Metrics for Bir Classification, in Model Select Algorithm Cha Preprocessing, Interface, Grid Parameters Theory CA 25% Andreas C. Mit Machine Learn	tion and Pipeli imple Grid Sea and the Validati trics and Scorin hary Classificati Regression Met tion) ins and Pipeline Building Pipeli -Searching Prep <u>MTE</u> 25% iller and Sarah G ing with Pythor	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model ETE 50% Guido, "Introduction to n A Guide for Data Scientists",	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B C C Mode of examination Weightage Distribution Text book/s*	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Select Algorithm Cha Preprocessing, Interface, Grid Parameters Theory CA 25% Andreas C. Mit Machine Learn O'Reilly Media	tion and Pipeli imple Grid Sea and the Validati trics and Scorin hary Classificati Regression Met tion) ins and Pipeline Building Pipeli -Searching Prep <u>MTE</u> 25% iller and Sarah G ing with Pythor a.	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model ETE 50% Guido, "Introduction to n A Guide for Data Scientists",	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B C C Mode of examination Weightage Distribution Text book/s*	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Selec Algorithm Cha Preprocessing, Interface, Grid Parameters Theory CA 25% Andreas C. Mit Machine Learn O'Reilly Media 1) Ethem Alt	tion and Pipeli imple Grid Sea and the Validati trics and Scorin ary Classificati Regression Met tion) ins and Pipeline Building Pipeli -Searching Prep <u>MTE</u> 25% iller and Sarah G ing with Pythor a. paydin, "Adapt	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model ETE 50% Guido, "Introduction to n A Guide for Data Scientists", ive computation and machine	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B B C C Mode of examination Weightage Distribution Text book/s* Other References	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Selec Algorithm Cha Preprocessing, Interface, Grid Parameters Theory CA 25% Andreas C. Mü Machine Learn O'Reilly Media 1) Ethem Alg learning, In	tion and Pipeli imple Grid Sea and the Validati trics and Scorin ary Classificati Regression Met trion) ins and Pipeline Building Pipeli -Searching Prep <u>MTE</u> 25% iller and Sarah Q ing with Python a. paydin, "Adapt	nes rch, The Danger of Overfitting ion Set, Grid Search with Cross- g (Keep the End Goal in Mind, on, Metrics for Multiclass trics, Using Evaluation Metrics es, Parameter Selection with nes, The General Pipeline processing Steps and Model ETE 50% Guido, "Introduction to n A Guide for Data Scientists", ive computation and machine nachine learning. MIT Press	CO5, CO6 CO5, CO6 CO5, CO6				
Unit 5 A B B C C Mode of examination Weightage Distribution Text book/s*	Model Evalua Grid Search (S the Parameters Validation) Evaluation Me Metrics for Bir Classification, in Model Select Algorithm Cha Preprocessing, Interface, Grid Parameters Theory CA 25% Andreas C. Mü Machine Learm O'Reilly Media 1) Ethem Alj learning, In 2)	tion and Pipeli Simple Grid Sea and the Validati trics and Scorin mary Classificati Regression Met tricn) ins and Pipeline Building Pipeli -Searching Prep MTE 25% aller and Sarah Q ing with Python a. paydin, "Adapt ntroduction to n	nes         rch, The Danger of Overfitting         ion Set, Grid Search with Cross-         g (Keep the End Goal in Mind,         on, Metrics for Multiclass         trics, Using Evaluation Metrics         es, Parameter Selection with         nes, The General Pipeline         processing Steps and Model         ETE         50%         Guido, "Introduction to         n A Guide for Data Scientists",         ive computation and machine         nachine learning, MIT Press	CO5, CO6 CO5, CO6 CO5, CO6				



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Define the requirement of Machine Learning	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
2.	Classify the functionality and active environment For Machine Learning.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
3.	Apply the concepts of Propositional Logic for real-world AI based problems.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
4.	Analyse the various ML techniques and apply them to solve the real-world problems.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
5.	Explain the basic concepts of pythons to understand and Evaluate the Models and Applications.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
6.	Discuss the applicability of Machine learning in Data Science	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3

**PO and PSO mapping with level of strength for Course Name** Introduction to Artificial Intelligence & Machine Learning (**Course Code** CSA-102)

Course Code_ Course Name	CO' s	PO 1	PO 2	Р О 3	Р О 4	P O 5	P O 6	P O 7	P O 8	Р О 9	PO 10	P O 11	P O 12	P S O 1	P S O 2	P S O 3
Introduction to	CO1	3	3	1	1	2	1	1	1	1	2	-	3	2	3	1
Artificial	CO2	3	3	1	1	2	1	1	1	1	2	-	3	2	3	1
Intelligence &	CO3	3	3	1	1	2	1	1	1	1	2	1	3	2	3	1
Machine	<b>CO4</b>	3	3	1	1	2	1	1	1	1	2	-	3	2	3	1
Learning	CO5	3	3	1	1	2	1	1	1	1	2	-	3	2	3	1
(CSA-102)	CO6	3	3	1	1	2	1	1	1	1	2	1	3	2	3	1

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course	Р		Р	Р	Р		Р	Р	Р	Р	Р	Р		PS	
		0	PO	0	0	0	PO	0	0	0	0	0	0	PS	Ο	PS
	Iname	1	2	3	4	5	6	7	8	9	10	11	12	01	2	03
		3	3	2	2	2	1	1	1	1	2	1	3	2	3	1

#### Total 28 Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Sche	ool:	School of Engineering & Technology								
Dep	artment	<b>Computer Science</b>	& 1	Engineering						
Prog	gram:	B. Tech								
Bra	nch:	CSE with Specializ	ati	on in Data Science						
1	Course Code	CSD 021								
2	Course Title	Neural Networks for	or I	Data Science						
3	Credits	3								
4	Contact Hours (L-T-P)	2		0	2					
	Course Status	Core								
5	Course Objective	<ol> <li>To introduce the human experienc</li> <li>To conceptualize</li> <li>To become fam available exampl for inference syst</li> <li>To provide the classification tech</li> <li>To provide the optimization and optimum in self-</li> </ol>	<ol> <li>To introduce the ideas of learning rule and implement them based on human experience.</li> <li>To conceptualize the working of human brain using ANN.</li> <li>To become familiar with neural networks that can learn from available examples and generalize to form appropriate learning rules for inference systems.</li> <li>To provide the mathematical background for Neural Network and classification techniques.</li> <li>To provide the mathematical background for carrying out the optimization and familiarizing genetic algorithm for seeking global</li> </ol>							
6	Course	On successful c	om	pletion of this module stud	dents wil	l be able to:				
	Outcomes	CO1: <b>Define</b> biolo components. CO2: <b>Classify</b> vari CO3: <b>Apply basic</b> forward neural CO4: <b>Analyze</b> and CO5: <b>Explain</b> data appropriate neu CO6: <b>Discuss</b> and life data mining	gic con net tra pr ural ada g ap	al significance of Neural N s learning paradigms based <b>ncepts to build</b> single and works. in radial-basis function an eparation for analysis and network model. pt appropriate neural netw plications.	Network a d on real l multi-la nd recurre decision vorks mo	and list ANN file problems yer feed- ent networks; using del for real				
7	Course Description	This course introduces the basic models, learning algorithms, and some applications of neural networks. After this course, we should be able to know how to use neural networks for solving different problems related to pattern recognition, function approximation, data visualization, and so on.								
8	<b>T</b> T •4 4	<b>T</b> ( <b>1</b> ( <b>1</b>								
	Unit I	Introduction								
	A	Introduction, Motiva Neuron-synapses, de	atio end	n and History, Componen rite, cell nucleus, axon	ts of a	CO1				
	В	Important Terminolo function, Activation Components of Arti	Neuron-synapses, dendrite, cell nucleus, axonImportant Terminologies of ANNs: Propagationfunction, Activation function, output function,Components of Artificial Neural Network: common							



	activation functions, network topologies- feed forward,	
	recurrent networks, completely linked networks	
С	Neuron Activation order: Synchronous activation,	
	asynchronous activation, Communication with the	CO1
	outside world: input and output of data in and from	COI
	neural networks	
Unit 2	Learning Paradigms	
А	Learning Paradigms and their real Applications,	
	Unsupervised learning and Supervised learning,	CO2 $CO6$
	Reinforcement learning, Offline and online learning and	002,000
	their applications based on real life problems.	
В	Training patterns and teaching inputs, use of training	
	samples, data set split into training, validation and testing	CO2 $CO6$
	data, Implication of splitting of data set, Learning curves	002,000
	and their importance in diagnostics	
С	Gradient optimization procedures, Hebbian learning rule	CO2
Unit 3	The Perceptron, Backpropagation and its variants	
А	Single layer Perceptron network, Perceptron Learning	
	Algorithm and convergence theorem, Delta rule as a	CO3
	gradient based learning strategy, Limitations of Single	605
	Layer Perceptron network	
В	Multilayer Perceptron Network, Backpropagation	CO3
	learning and its applications	
С	Analyzing effect of learning rate on learning process,	CO3
	Variants of Backpropagation algorithm	
Unit 4	Radial Basis Function Neural Networks & Decision	
	Support Systems	
А	Components & Structure of RBF networks, Information	
	processing of RBF networks (neuron level), analytical	
	thoughts prior to training, Equation system and gradient	CO4
	strategies for training, comparison of RBF Networks and	
	Multilayer Perceptron	
В	Data Pre-processing, Data Representations, Data	
	Representation impact on training time, Managing	CO4, CO5
	Training Datasets, Data Quantity/Quality	
C	Sensitivity Analysis, Visualization, Sifting through	CO4. CO5
	output using Domain Knowledge.	,
Unit 5	Neural Network based Data Analysis Applications:	
	Case Studies	
А	Real Estate Pricing Model: Data Selection, Data	CO5, CO6
	Representation, Model and Architecture Selection,	<i>,</i>



	Training and	Testing the N	leural Network, Maintai	ning							
	the Application	on, Related Ap	plications & Discussion								
В	Customer R	aking Model:	Problem Definition,	Data							
	Selection, L	Data Represer	ntation, Model/Archited	cture							
	selection, Tr	aining and Te	esting the Neural Netw	vork,	CO5, CO6						
	Sensitivity .	Analysis, Ma	intaining the Applica	tion,							
	Related Appl	ications & Dise	cussion								
С	Sales Forecas	Sales Forecasting: Data Selection, Data Representation,									
	Model/Archit	Model/Architecture selection, Training and Testing the									
	Neural Netw	leural Network, Maintaining the Application, Related									
	Applications	pplications & Discussion									
Mode of											
examination											
Weightage	CA	MTE	ETE								
Distribution	25%	25%	50%								
Distribution Text book/s*	25% 1. David	25% Kriesel, 2007,	50% "A Brief Introductio	n to							
 Distribution Text book/s*	25% 1. David Neural	25% Kriesel, 2007, Network	50% "A Brief Introductio ss", available	n to at							
Distribution Text book/s*	25% 1. David Neural http://w	25% Kriesel, 2007, Network ww.dkriesel.co	50% "A Brief Introductio cs", available	n to at							
Distribution Text book/s*	25% 1. David Neural <u>http://w</u> 2. Joseph	25% Kriesel, 2007, Network ww.dkriesel.co P. Bigus "	50% "A Brief Introductio cs", available om Data mining with ne	n to at eural							
Distribution Text book/s*	25% 1. David Neural <u>http://w</u> 2. Joseph <u>network</u>	25% Kriesel, 2007, Network <u>ww.dkriesel.cc</u> <u>P. Bigus</u> <u>cs", McGraw Hi</u>	50% "A Brief Introductio cs", available <u>om</u> <u>Data mining with no</u> <u>11</u>	n to at eural							
Distribution Text book/s*	25% 1. David 1 Neural <u>http://w</u> 2. Joseph <u>network</u> 3. Simon	25% Kriesel, 2007, Network <u>ww.dkriesel.co</u> <u>P. Bigus "</u> <u>cs", McGraw Hi</u> O. Haykin,	50% "A Brief Introductio cs", available <u>om</u> <u>Data mining with no</u> <u>11</u> "Neural Networks Because	n to at eural and							
Distribution Text book/s*	25% 1. David Neural <u>http://w</u> 2. Joseph <u>network</u> 3. Simon Learnin	25% Kriesel, 2007, Network <u>ww.dkriesel.co</u> <u>P. Bigus</u> <u>cs", McGraw Hi</u> O. Haykin, ng Machines",	50% "A Brief Introductio cs", available <u>om</u> <u>Data mining with no</u> <u>11</u> "Neural Networks , Pearson	n to at eural and							
 Distribution Text book/s*	25% 1. David 1 Neural <u>http://w</u> 2. Joseph network 3. Simon Learnin 1. ANDE	25% Kriesel, 2007, Network ww.dkriesel.co P. Bigus " Cs", McGraw Hi O. Haykin, ng Machines", RSON, JAME	50% "A Brief Introductio cs", available <u>Data mining with no</u> <u>11</u> "Neural Networks , Pearson S A., AN INTRODUCT	n to at eural and							
Distribution Text book/s* Other References	25% 1. David 1 Neural <u>http://w</u> 2. Joseph <u>network</u> 3. Simon Learnin 1. ANDE TO NE 2. Christe	25% Kriesel, 2007, Network <u>ww.dkriesel.co</u> <u>P. Bigus "</u> <u>cs", McGraw Hi</u> O. Haykin, ng Machines", RSON, JAME EURAL NETW	50% "A Brief Introductio (s", available <u>Data mining with no</u> <u>Il</u> "Neural Networks , Pearson S A., AN INTRODUCT ORKS, PHI Learning. on & Geoffrey Hinton	n to at eural and							
Distribution Text book/s* Other References	25% 1. David 1 Neural <u>http://w</u> 2. Joseph <u>network</u> 3. Simon Learnin 1. ANDE TO NE 2. Christo Neural	25% Kriesel, 2007, Network ww.dkriesel.co P. Bigus " C. Bigus " O. Haykin, ng Machines", RSON, JAME EURAL NETW opher M. Bisho Networks for	50% "A Brief Introductio cs", available <u>Data mining with ne 11</u> "Neural Networks , Pearson S A., AN INTRODUCT ORKS, PHI Learning. p & Geoffrey Hinton, Pattern Recognition Ox	n to at eural and ION							
Distribution Text book/s* Other References	25% 1. David 1 Neural <u>http://w</u> 2. Joseph network 3. Simon Learnin 1. ANDE TO NE 2. Christon Neural Univer	25% Kriesel, 2007, Network ww.dkriesel.co P. Bigus " Cs", McGraw Hi O. Haykin, ng Machines", RSON, JAME URAL NETW opher M. Bisho Networks for sity Press	50%"A Brief Introductiocs", availablepmData mining with ne11"Neural NetworksPearsonS A., AN INTRODUCTORKS, PHI Learning.op & Geoffrey Hinton,Pattern Recognition, Oxu	n to at eural and HON							



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	<b>Define</b> biological significance of Neural Network and list ANN components.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2, PSO3
2.	<b>Classify</b> various learning paradigms based on real life problems	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2, PSO3
3.	<b>Apply basic concepts to build</b> single and multi- layer feed-forward neural networks.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2, PSO3
4.	<b>Analyze</b> and train radial-basis function and recurrent networks;	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2, PSO3
5.	<b>Explain</b> data preparation for analysis and decision using appropriate neural network model.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2, PSO3
6.	<b>Discuss</b> and adapt appropriate neural networks model for real life data mining applications	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2, PSO3

# PO and PSO mapping with level of strength for Course Name: Neural networks (Course Code- CSD-021)

Course Code_ Course Name	CO's	РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS 0 1	PS O 2	PS O3
	CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
	CO2	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
(Course Code-	CO3	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
CSA-042)	CO4	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
	CO5	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
	CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3

#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSA-042	Neural networks	3.0 0	3.0 0	3.0 0	3.0 0	2.8 3	2.33	2.3 3	1.1 7	2.3 3	3.0 0	2.6 7	3.0 0	3.00	3.00	2.67

#### **Total 40.3**

#### **Strength of Correlation**

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment	<b>Computer Science</b>	& Engineering								
Prog	gram:	B.Tech.									
Bra	nch:	CSE DS									
1	Course Code	New									
		Subject									
2	Course Title	Business for Data d	riven companies								
3	Credits	3	•								
4	Contact										
	Hours	3	0 0								
	(L-T-P)										
	Course										
	Status	Core /Elective/Oper	Elective								
5	Course	Introduction to Data	Analytics and its role in bus	iness decisions.							
	Objective	Students will learn	why data is important and how	w it has evolved.							
	5	They will be introdu	iced to "Big Data" and how it	t is used. They w	rill						
		also be introduced t	o a framework for conducting	g Data Analysis a	nd						
		what tools and techn	iques are commonly used.	-							
6	Course	Having successfully	completed this module, the s	student will be ab	ole						
	Outcomes	to:	-								
	(must be 6	CO1: Recall the bas	CO1: Recall the basics of Data analytics, including requirements,								
	COs,	various aspects and framework in context of businesses and									
	following	enterprises.									
	verbs given	CO2: Explain the in	evitability of big data as the f	future of data driv	ven						
	in Bloom's	companies.									
	Taxonomy)	CO3: Apply data an	alytics tools and techniques f	or handling and							
		analyzing enterprise	data for meaningful informa	tion.							
		CO4: Analyze clear	ly the roles played by Busine	ss Analysts,							
		Business Data Anal	ysts, and Data Scientists in a	data driven							
		company.									
		CO5: Evaluate the e	xplorations performed by var	rious data analyti	c						
		techniques using vis	ualization.								
		CO6: Adapt the data	a analytic techniques for big o	lata surge in data	ι						
		driven companies.									
7	Course	This course has been	n designed for the students to	understand the b	best						
	Description	data analytics practi	ces data driven companies fo	llow to become							
		more competitive and more profitable in the market. They will be									
		able to recognize the	e most critical business metri	cs and distinguis	h						
		them from mere dat	a.								
0											
8	Outline syllabi	S									
	TT 94 1	Later de attende Dat	A 1	Mapping	5						
		Introduction: Data	Analytics	1.4							
	A	An overview of the	specialization, introduction to	CO1	l						
1		uriven decision mak	1116								

### **Business for Data Driven Companies**



	В	What is Data	olving common business							
		problems usin	ng DA. Busine	ess defining decisions using	CO1					
		DA								
	С	Requirement	of a DA fram	ework, Aspects of a DA	CO1					
		framework, T	Cools and tech	niques.	01					
	Unit 2	The emerger	nce of Big dat	a						
	А	What is Big I	Data? The mar	ketplace and emerging						
		trends in Big	Data analytics	s, Business impacts of	CO1, CO2					
		technology ad	dvancements a	and data trends						
	В	Companies' p	perspective on	Big Data (Sample						
		examples). D	ata and analyt	ics examples at various	CO2, CO3					
		companies.	companies.							
	С	Identification	, organization	and processing of various						
		kinds of Big	inds of Big data addressed by companies in decision							
		making (Strue	naking (Structures, Semi-Structures and							
		Unstructured	nstructured)							
	Unit 3	Data analyti	cs: Tool and	techniques						
	А	Variety of da	ta-based busir	ess problems - predictive						
		analysis, data	CO3, CO4							
		survey design								
	В	Cluster analy	CO3, CO4							
	~	analysis,								
	C	Regression A	nalysis (corre	lation, multivariate						
		analysis), Seg	gmentation and	alysis, sentiment analysis,	CO3, CO4					
	<b>*</b> * •/ 4	Time series a	nalysis							
	Unit 4	Data visualiz	zation							
	А	Analyzing tre	ends based on	data visualization (e.g.	CO3, CO5					
	6	stock market	trends, area w	rise sales data)						
	B	Visual data a	nalysis technic	ques, Interaction techniques	CO3, CO5					
	C	Analytics usi	ng statistical p	backages, association	CO3					
	TT •4 F	intelligence fi	rom unstructu	red information						
	Unit 5	Big Data's F	uture for Ind							
	А	Case Study -	How Compan	f Date	CO2, CO4,					
	D	have harnesse	ed the Power of	or Data	C00					
	B	Key trends de	efining big dat	a s inture	CO2, CO6					
	C	The numan e	lement in gene	eration and usage of big	CO6					
	Madaaf	data								
	Mode of	I neory/Jury/J								
	Waishtaga		MTE	ETE						
	Distribution	250/	1VIIE 250/	E1E 500/						
<u> </u>	Distribution	23%	23%	30%						
	1 ext DOOK/S*									
	Other									
1	References									



S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: Recall the basics of Data analytics, including	PO1, PO2, PO3, PO6,
	requirements, various aspects and framework in context	PO8, PO9, PO11, PO12,
	of businesses and enterprises.	PSO1
2.	CO2: Explain the inevitability of big data as the future of	PO2, PO3, PO5, PO6,
	data driven companies.	PO10, PO11, PSO1
3.	CO3: Apply data analytics tools and techniques for	PO1, PO2, PO3, PO4,
	handling and analyzing enterprise data for meaningful	PO5, PO11, PO12,
	information.	PSO2, PSO3
4.	CO4: Analyze clearly the roles played by Business	PO3 PO4 PO6 PO8
	Analysts, Business Data Analysts, and Data Scientists in	PO0 PO11
	a data driven company.	109,1011
5.	CO5: Evaluate the explorations performed by various	PO2, PO3, PO5, PO6,
	data analytic techniques using visualization.	PO10, PO11, PSO2
6.	CO6: Adapt the data analytic techniques for big data	PO1, PO2, PO3, PO5,
	surge in data driven companies.	PO6, PO10, PO11,
		PO12, PSO2

## PO and PSO mapping with level of strength for Course Name xxxx (Course Code yyyy)

Cour se Code - Cour se Nam e	C O' s	P 0 1	PO 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P 0 11	P O 12	PS 0 1	PS O 2	PS 0 3
	CO 1	3	2	2	-	-	1	-	1	2	-	2	3	1	-	-
	CO 2	-	3	2	-	3	2	-	-	-	2	2	-	2	-	-
	CO 3	2	3	3	3	3	-	-	-	-	-	1	2	-	2	1
Yy	CO 4	-	-	2	2	-	2	-	2	3	-	2	-	-	-	-
уу _х	CO 5	-	2	3	-	2	2	-	-	-	1	2	-	-	3	-
XX X	CO 6	2	2	3	-	2	1	-	-	-	2	2	2	-	3	-



#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	PO 3	PO 4	Р О 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Dep	partment	Computer Science & Engineering									
Pro	gram:	B.Tech. Data Science									
Bra	nch:	CSE									
1	Course Code	CSA-042									
2	Course Title	Introduction to Deep Leaning									
3	Credits	3									
4	Contact Hours (L-T-P)	2 0 2									
	Course Status	Elective (AI/ML Core)									
5	<b>Course Objective</b>	This course aims to present the mathematical	, statistical and								
		computational challenges of building stable represe	ntations for high-								
		dimensional data such as images text and data W	Ve will delve into								
		collected tenies of Deen Learning, discussing recent models from both									
		selected topics of Deep Learning, discussing fecent models from bour									
		supervised and unsupervised learning. Special emphasis will be on									
		convolutional architectures, invariance learning, unsupervised									
		learning and non-convex optimization. To understand and demonstrat									
		how to solve general learning from a large serie	es of data using								
		computer based deep learning algorithms									
-											
6	Course Outcomes	On successful completion of this module students will be able to:									
	$(\mathbf{COS})$	CO1: Recall Neural Networks and relate it with De	eep Learning								
		concepts.									
		CO2: Compare and classify Regularization approa	aches for Deep								
		Learning.									
		CO3: Build Convolutional Neural Networks mode	els for image								
		analysis.	1 1 1.								
		CO4: Examine the Sequence models and analyse	the relationships								
		among them.	agad on their								
		design processes	ased on them								
		CO6: Predict the behavior of Deep learning mode	le and annly								
		them	is and apply								
7	<b>Course Description</b>	This course starts with introduction to Deep Lear	ming and further								
	-	build, train, and deploy real world applications	such as object								
		recognition and Computer Vision, image and video	processing, text								
		analytics, Natural Language Processing, recommen	der systems, and								
		other types of classifiers.									
8	Syllabus Outline		CO Mapping								
	Unit 1	Deep Feed forward Networks									
	А	Recall Neural networks, Deep learning and its Practical									
		aspects, Introduction to Simple Deep Neural Networks,	CO1								
		Platform for Deep Learning, Deep Learning Software									
		Libraries									



В	Introduction to Deep Feed Forward Networks ,Learning XOR, Gradient-Based Learning, Activation Functions, ReLU, Softmax, Sigmoid, Error Functions	CO1
С	Architecture Design- Hidden Units Back-Propagation and Other Differentiation Algorithms	CO1
Unit 2	Regularization for Deep Learning	
A	Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under- Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multitask Learning, Early Stopping	CO2
В	Parameter Tying and Parameter Sharing, Bagging , Drop Out, Difficulty of training deep neural networks, Greedy layer wise training, Adversarial Training	CO2
C	How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms: Stochastic Gradient Descent, Momentum, Nesterov Momentum Parameter Initialization Strategies Algorithms with Adaptive Learning Rates, AdaGrad. RMSProp. Adam Choosing the Right Optimization Algorithm	CO2
Unit 3	Convolutional Neural Networks	
A	Why CNN?, Its role, significance, The Convolution Operation, Motivation, Pooling, The Neuroscientific Basis for Convolutional Networks	CO1, CO3
В	Prior probability distribution, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data types with different dimensionalities and number of channel	CO1, CO3
С	Efficient Convolution Algorithms, Random or Unsupervised Features of CNN, Normalization, Applications of CNN in Computer Vision – ImageNet, Sequence Modelling –VGGNet, LeNet	CO1, CO3
Unit 4	Sequence Modelling: Recurrent Neural Networks	
A	Sequence Learning Problems, Recurrent Neural Network and its significance in real world, RNN model, Backpropagation through time ,Bidirectional RNNs	CO4
В	Different types of RNNs, Gated Recurrent Unit (GRU) Recursive Neural Networks , The Challenge of Long- Term Dependencies	CO4
С	Introduction of Long Short Term Memory Neural Networks, Learning Algorithm of LSTM/ RNN Bidirectional LSTMs	CO4
Unit 5	Deep Networks and design process	
A	Introduction to Autoencoder, Undercomplete Autoencoder, Regularized Autoencoders,	CO5,CO6



	Repres Stocha	entational Po stic Encoders	ower, Laye and Deco	er Size and Depth. ders, Applications of	
	Encode	er Decoder mo	odels		
В	Introdu Genera Applic	action to Ge ative Adversa ations of Gene	enerative A arial Netwo erative Adve	dversarial Networks, orks – Architecture, ersarial Networks	CO5, CO6
C	Practic Perforr Determ Hyperp	al design proc nance Metric nining Whethe parameters, De	blearning techniques: It Baseline Models, More Data, Selecting rategies	CO5, CO6	
Mode of	Theory				
 examination	<u>C</u>		MUE	DUD	
Weightage	CA 250/		MIE	<b>ETE</b> 500/	
 Torrt Books	23%	Deen Leanni	23%	JU%	
Text Books	1.	Deep Learni	ng, by Good	ifellow I., Bengio Y. &	Courville A.
	2	(2016)	1 7 7 1		
	2.	Visualizing a	and Underst	anding Convolutional I	Networks, by Matt
	-	Zeiler, Rob I	Fergus		
	3.	TensorFlow:	a system fo	or large-scale machine l	earning, by Martín
		A., Paul B.,	Jianmin C.,	Zhifeng C., Andy D. et	al. (2019)
<b>Reference Books</b>	4.	Deep learnin	ig in neural	networks, by Juergen S	chmidhuber
		(2015)			
	5.	https://cs230	).stanford.ed	lu/syllabus/	
	6.	https://towar	dsdatascien	ce.com/september-editi	on-machine-
		learning-case	e-studies-a3	a61dc94f23	
	7.	Deep Learni	ng: A Practi	tioner's Approach by Jo	osh Patterson,
		O'reilly.			
<b>Online Materials</b>					

S. No.	Course Outcome (CO)	Program Outcomes (PO) & Program
		Specific Outcomes (PSO)
1	Recall Neural Networks relate it with Deep Learning concepts.	PO1, PO2, PO5, PO12, PSO1, PSO2
2	Compare and classify Regularization approaches for Deep	PO1, PO2, PO3, PO4, PO5, PO9, PO12, PSO1,
	Learning.	PSO2, PSO3
3	Build Convolutional Neural Networks models for image	PO1, PO2, PO3, PO4, PO5, PO12, PSO1, PSO2,
	analysis.	PSO3
4	Examine the Sequence models and analyse the relationships among them.	PO2, PO3, PO10, PO12, PSO1, PSO2, PSO3
5	Assess the different Deep learning models based on their design	PO2, PO3, PO4, PO5, PO6, PO10, PSO1, PSO2,
	processes.	PSO3
6	Duradict the holowing of Deep learning models and emply them	PO4, PO5, PO6, PO7, PO12, PSO1, PSO2,
	Predict the benavior of Deep learning models and apply them.	PSO3



PO and PSO mapping with level of strength for Course Name: Neural networks
(Course Code- CSA-042)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 0 1	PS O 2	PS O3
Introduction to	CO1	3	3	-	-	3	-	-	-	-	3	-	2	3	3	-
Deep Leaning	CO2	3	3	-	3	3	-	-	-	-	3	-	3	3	3	-
8	CO3	3	3	3	3	3	2	-	-	3	3	-	3	3	3	-
(Course Code-	CO4	3	3	3	3	3	2	-	-	3	3	-	3	3	3	-
<b>CSA302</b> )	CO5	3	3	3	3	3	2	3	-	3	3	-	2	3	3	-
	CO6	3	3	3	3	3	2	3	-	3	3	-	3	3	3	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	Р О 1	РО 2	P O 3	P 0 4	P 0 5	P 0 6	P 0 7	P 0 8	P O 9	P O 10	P 0 11	P 0 12	PS 0 1	PS 0 2	PS 0 3
CSA30 2	Introduction to Deep Leaning	3	3	3	1. 8	2	2	3	-	3	3	-	2. 6	3	3	-

#### Total 32.4

Strength of Correlation

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



#### WEB AND TEXT ANALYSIS

Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & F	Engineering									
Pro	gram:	B.Tech. Data Science										
Bra	nch:	CSE										
1	Course Code											
2	Course Title	Web and Text analysis										
3	Credits	3										
4	Contact											
	Hours	2	0	2								
	(L-T-P)											
	Course	Core /Elective/Open Elective	ore /Elective/Open Elective									
	Status											
5	Course	To understand the text a	and web data and used it	for the info	rmation							
	Objective	retrieval										
6	Course	The student should be a	ble to									
	Outcomes	CO1: Recall the basics of	of www and textual data	in web.								
	(must be 6	CO2: Explain the proce	ssing of textual data on/c	off web for p	prediction							
	COs,	of intent.		<i>.</i> ,.,	. 10							
	Iollowing	CO3: Apply relevant mo	odels for contextual infol	rmation retr	leval from							
	in Plaam's	CO4: A polyzo individu	exis towards socio-economic betterment.									
	Tayonomy)	methods	bethods									
	Taxonomy)	1000000 105: Explain the processes involved in information extraction from										
		web based social netwo	rks									
		CO6. Design process ba	used on prior information	for web us	age							
		analysis.			450							
7	Course	This course provides a u	unique opportunity for yo	ou to learn k	key							
	Description	components of text and	web analytics aided by the	he real worl	ld datasets							
		and the web search and	analysis methodologies.									
8	Outline syllabu	18		(	CO							
	<b>TT A ( A</b> )			1	Mapping							
	Unit I	Introduction	1 7		<b>a</b> a4							
	A	WWW, History of Web	and Internet, Web analy	S1S (								
	В	Text analysis, Types of	problems solved using te	ext (	COI							
		analysis, Document clas	ssification and information	on								
	C	retrieval			001							
	C	Clustering and organizin	ng documents, information	on (	01							
	TT:4 0	NL D haged Drediction at	id Evaluation									
		NLP based Prediction	I ammatization Vector		<u></u>							
	A	Generation and Bradict	on Roundary determined	ion								
		Deneration and Predicti Dhree Decognition Dec	on, boundary determinat	.1011,								
	B	Term Document Metric	sing, reature generation		$CO^{2}$							
	D	Problem specific noval	res (1 Divis) from the Cor	pus, C								
		Problem specific novel	patterns finding									



С	Keyword sear	rch, Nearest N	eighbor Methods, Similarity	CO2					
	measures, We	eb based docur	nent search, Document						
	matching,								
Unit 3	Text informa	ation retrieval							
А	Clustering me	ethods for simi	larity, Cluster Label Mean,	CO3					
	Patterns and I	Entities,							
В	Co-reference	Co-reference and relationship extraction, Template							
	Filling	Filling							
С	Applications:	Applications: Information retrieval, commercial							
	extraction sys	extraction systems, criminal justice, Intelligence							
Unit 4	Web Search	Web Search							
А	Meta search:	combining mu	ltiple ranking, combination	CO4					
	using similari	ity scores, Con	nbination using rank position						
В	Web Spammi	ing: content sp	amming, Link spamming,	CO4					
	Hiding techni	iques, Combati	ng spam.						
С	Social networ	rk analysis, co-	citations and bibliographic	CO4, CO5					
	coupling, Pag	ge rank, HITS,	Community Discovery						
Unit 5	Web usage a	nalysis							
А	Data collection	on and preproc	essing, data modelling for	CO5, CO6					
	web usage								
В	Discovery and	d analysis for v	web usage methods	CO6					
С	Recommende	ed system and o	collaborative filtering, Query	CO6					
	Log Mining								
Mode of	Theory/Jury/I	Practical/Viva							
examination		1							
Weightage	CA	MTE	ETE						
Distribution	25%	2%	50%						
Text book/s*	1. Michael V	W. Berry, Jaco	b Kogan - Text Mining:						
	Application	ons and Theory	<i>y</i>						
	2. Bing Liu	2. Bing Liu - Web Data Mining: Exploring Hyperlinks,							
	Contents,								
Other	1. Handbool								
References	Technolo	Technologies edited by Song, Min, Brook Wu, Yi-							
	Fang								

S. No	Course Outcome	Program Outcomes (PO) & Program Specific
110.		Outcomes (PSO)
1.	What is Web and Text analysis	PO1, PO2, PO3, PO4, PO5,
	•	PO6
2.	Explain the processing of text for prediction.	PO1, PO2, PO3, PO4, PO5,
		PO6
3.	Apply relevant models for text retrievals	PO1, PO2, PO3, PO4, PO5,
	11 4	PO6
4.	Analyze web search methods	PO1, PO2, PO3, PO4, PO5,
		PO6
5.	Explain the process of social networking	PO1, PO6, PSO1, PSO2
6.	Estimate the web usage	PO1, PO6, PSO1, PSO2



PO and PSO mapping with level of strength for Web and Text Analysis (Course Code yyyy)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	P O4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
**7	CO1	3	2	2	2	3	1	1	1	1	1	1	1	1	2	1
we	CO2	3	3	2	2	2	2	1	1	1	2	1	1	1	1	1
D and	CO3	2	3	3	3	2	2	1	1	2	1	1	1	1	1	1
Text	CO4	3	2	2	2	2	2	1	1	1	2	1	1	1	1	1
Ana	CO5	3	1	1	1	1	2	1	1	1	1	1	1	3	3	1
lysis	CO6	3	1	1	1	1	3	1	1	1	1	1	1	2	3	1

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	PO 3	РО 4	P 0 5	PO 6	Р О 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PSO 3

#### Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent
 Addressed to Substantial (High=3) extent



#### WEB AND TEXT ANALYSIS LAB

Sch	ool:	School of Engineering	g & Technology							
Dep	artment	<b>Computer Science &amp;</b>	Engineering							
Pro	gram:	<b>B.Tech</b>								
Bra	nch:	CSE								
1	Course Code									
2	Course Title	Web and Text analysis	LAB							
3	Credits	1								
4	Contact									
	Hours	0	0	2						
	(L-T-P)									
	Course	Core /Elective/Open E	lective							
	Status									
5	Course	To understand the text	and web data and used i	t for the info	rmation					
	Objective	retrieval								
6	Course	The student should be	able to							
	Outcomes	CO1: Recall the basics	of www and textual dat	a in web.						
	(must be 6	CO2: Explain the proc	essing of textual data on	/off web for	prediction					
	COs,	of intent.	-		-					
	following	CO3: Apply relevant n	nodels for contextual inf	ormation ret	rieval					
	verbs given	from texts towards soc	io-economic betterment.							
	in Bloom's	CO4: Analyze individu	al and combination of a	variety of w	eb search					
	Taxonomy)	methods								
		CO5: Explain the processes involved in information extraction from								
		web based social networks.								
		CO6: Design process b	ased on prior information	on for web us	sage					
		analysis.								
7	Course	This course provides a	unique opportunity for	you to learn l	key					
	Description	components of text and	l web analytics aided by	the real wor	ld datasets					
		and the web search and	l analysis methodologies	5.						
8	Outline syllabu	18			CO					
		1			Mapping					
	1	Demonstrate Web base	ed textual data acquisitio	n for a	CO1					
		generic social media ne	etwork		001					
	2	Demonstrate the use of	f the y-TextMiner packa	ge.	CO1,					
					CO2					
	3	Demonstrate textual da	ata pre-processing such a	IS	$CO^2$					
		normalization includin	g tokenization and lemm	natization.	002					
	4	Demonstrate Vector G	eneration and Prediction	, Boundary	$CO^2$					
		determination for a giv	en textual dataset.		002					
	5	Demonstrate keyword	search, web-based docu	ment						
		matching and similarity	y searches using nearest	neighbor	CO3					
		methods.								
	6	Demonstrate similarity	matching and pattern m	atching	CO3					
		between textual entitie	s using clustering metho	ds	205					
	7	Demonstrate the proce	ss of collection and orga	nization of	CO3,					
		domain specific unstru	ctured data for corpus.		CO4					



8	Create a Terri corpus	n-document m	atrix for the established	CO2					
9	Demonstrate for	the reduction	of Term by document matrix	CO2					
10	Demonstrate	a polarity ana	lysis on the incoming textual	CO5,					
	data based on	ata based on the relevant corpora.							
11	Demonstrate user transacti	emonstrate classification and prediction based on web ser transactions.							
12	The recomme Rules, Matric	he recommender system problem: K-NN, Association Jules, Matric Factorization.							
Mode of examination	Theory/Jury/	Practical/Viva							
Weightage	CA	MTE	ETE						
Distribution	25%	25%	50%						
Text book/s*	3. Michael V	W. Berry, Jaco	b Kogan - Text Mining:						
	Applicati	ons and Theor	y						
	4. Bing Liu	- Web Data M	lining: Exploring Hyperlinks,						
	Contents,	Contents, and Usage Data							
Other	2. Handbool	. Handbook of Research on Text and Web Mining							
References	Technolo	gies edited by	Song, Min, Brook Wu, Yi-						
	Fang								

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	What is Web and Text analysis	PO1,PO2,PO3,PO4, PO5,
		PO6
2.	Explain the processing of text for prediction.	PO1,PO2,PO3,PO4, PO5,
		PO6
3.	Apply relevant models for text retrievals	PO1,PO2,PO3,PO4, PO5,
		PO6
4.	Analyze web search methods	PO1,PO2,PO3,PO4, PO5,
		PO6
5.	Explain the process of social networking	PO1,PO6, PSO1,PSO2
6.	Estimate the web usage	PO1, PO6, PSO1,PSO2



School:		School of Engineering & Technology									
Department		Computer Science & Engineering									
Program:		B.Tech. Data Science									
Bı	ranch:	CSE									
1	Course Code										
2	Course Title	SOCIAL MEDIA ANALYTICS									
3	Credits	3									
4	Contact Hours	2 0 2									
4	(L-T-P)										
	Course Status										
5	Course Objective	The objective of this course is to teach students how to obtain evaluate digital traces from online social platforms. After finis students will be prepared to approach future industry and acad with an understanding of how social media data can help to acad	n, monitor, and hing the course lemic problems complish goals.								
6	Course Outcomes Course										
7	Course Description	This course provides a thorough introduction to social data analysis, including influence and centrality in social media, information diffusion on networks, topic modeling and sentiment analysis, identifying social bots, and predicting behavior.									
8	Outline syllabus		CO Mapping								
	Unit 1	Introduction to Social Media Analytics									
	А	Introduction, History of Social media Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations;	C01								
	В	B Types of social networks: friend, user-generated, content, affiliation, etc., Sociograms, Sociometric studies									
	С	Basics of Social Media and Business Models, Basics of Web Search Engines and Digital Advertising., Application of SMA in different areas	CO1, CO6								
	Unit 2	Graph and Matrices									
	А	The Adjacency Matrix, Paths and Connectivity, Distance and Breadth-First Search, Network Datasets: An Overview	CO1, CO2								
	В	Nodes, ties and influencers, Making connections: Link analysis. Paths	CO1,CO2								
	С	Random graphs and network evolution. telephone call graph, Weighted Networks, Hypergraphs	CO1, CO2								
	Unit 3	Network fundamentals									
	А	Network structures: equivalence, homophile, clustering, Snowball Sampling, Contact Tracing, And Random Walks,	CO1, CO2								
	В	Ego-centered network, dominance hierarchies, Third-Party Records, affiliation network,	CO1,CO2								
	С	Citation Networks, Peer-To-Peer Networks, Recommender Networks, Biological Networks, Genetic Regulatory Networks, Neural Networks	CO1, CO2								
	Unit 4	Social Network and Modeling									



А	A Social contexts: Affiliation and identity. social capital, structural holes, Structural balance, Predictive modeling, Descriptive modeling: community/anomaly detection								
В	Diffusion in networ influence, market ex mining, Privacy in a Ne with social media	CO3, CO4, CO5,CO6							
С	Facebook Analytic demographics. Analy Engagement analysis.	CO3, CO4, CO5,CO6							
Unit 5	Processing, Visualizat	tion and W	eb analytics						
А	nization, ations in nalysing	CO3, CO4, CO5,CO6							
В	Social network and v analysis, A/B testing, Indexing.	CO3, CO4, CO5,CO6							
С	C Natural Language Processing Techniques for Micro-text Analysis, Trend: social influences on judgments, opinion spread, sentiment.								
Mode of examination	Theory								
Weightage	CA	MTE	ETE						
Distribution	25%	25%	50%						
Text book/s*	• Network: An Intro	duction by	y MEJ Newman, C	Oxford Pre	SS				
Other References	<ul> <li>Networks, Crowds, and Markets: Reasoning About a Highly connected World By David Easley and Jon Kleinberg</li> </ul>								

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	Illustrate the basic concents of social network analysis	PO1, PO2, PO4, PO6, PO8, PO11,
	mustrate the basic concepts of social network analysis.	PO12, PSO1, PSO2, PSO3
2.		PO1, PO2, PO3, PO4, PO5, PO6,
	Formulate fundamentals of graphs and networking theory.	PO9, PO10, PO11, PO12, PSO1,
		PSO2, PSO3
3.	Analyse current approaches to social modio data and data	PO1, PO2, PO3, PO4, PO5, PO6,
	analytics	PO7, PO9, PO11, PO12, PSO1,
	anarytics.	PSO2, PSO3
4.		PO1, PO2, PO3, PO4, PO5, PO6,
	Apply social network analysis to real world problems.	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3
5	<i>Evaluate</i> explore and analyze the uses of common social	PO1, PO2, PO3, PO4, PO5, PO6,
	<i>Evaluate</i> , explore and analyse the uses of common social media analytics tools	PO7, PO8, PO10, PO11, PO12,
	media analytics tools.	PSO1, PSO2, PSO3
6	Examine research and analysis that responds to the core	PO1, PO2, PO3, PO4, PO5, PO6,
	ideas, uses tools and skill sets specific to social data	PO7, PO8, PO9, PO11, PO12,
	analytics.	PSO1, PSO2, PSO3



Course Code_ Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3
	CO1	2	1	-	1	-	1	-	2	-	-	1	3	1	2	1
Social	CO2	3	1	3	2	1	1	-	-	2	3	2	3	2	1	2
Modio	CO3	2	3	2	3	3	2	3	-	2	-	2	1	2	3	1
Apolyti	CO4	1	3	3	3	3	3	3	3	3	2	3	2	2	3	3
Anaryu	CO5	2	3	2	3	3	3	3	2	-	2	3	1	3	3	2
CS	CO6	2	2	1	3	3	3	3	3	2	-	2	3	2	3	3
		2.0	2.2	1.8	2.5	2.2	2.2	2.0	1.7	1.5	1.2	2.2	2.2	2.0	2.5	2.0

#### PO and PSO mapping with level of strength

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	РО 2	PO 3	РО 4	P 0 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 0 1	PS O 2	PSO 3

Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent
 Addressed to Substantial (High=3) extent


Sche	ool:	School of	Engineering	& Technology							
Dep	artment	Compute	r Science & I	Engineering							
Program:		B. Tech.									
Bra	nch:	CSE									
1	Course Code	New									
		Code									
2	Course Title	Healthcar	e and Analytic	CS							
3	Credits	3	•								
4	Contact										
	Hours		3 0 0								
	(L-T-P)										
	Course	Core /Ele	ctive/Open El	ective							
	Status		•								
5	Course	This cour	rse is an inti	roduction to healthcare	analysis concepts and						
	Objective	methods	for students	who have had little p	previous data analytics						
		experienc	e. Topics to b	e covered in this course i	nclude:						
		creation of	of datasets, th	e structure of datasets,	an introduction to data						
		warehous	ing, working	with large databases, an	i introduction to public						
		health and	l healthcare da	atasets, methods for descr	riptive analytics, and						
		an introdu	ction to predi	ctive analytics.							
		Students v	vill gain skills	in data manipulation for	program evaluation and						
		analysis. In this course, students will gain an understanding of d									
		analysis u	used in impro	ovement of the healthcar	re system and help the						
		profession	nal to use infor	rmation for analysis, form	ulate and solve relevant						
		issues to s	upport decisio	on making. We will learn	different tools, activities						
		and method	ods to underst	and the principles of dev	veloping, reporting, and						
		analyzing	for Improven	nent of Healthcare Organ	izations.						
6	Course	CO1. De	efine the role	e of data analytics in	healthcare quality and						
	Outcomes	pe	rformance im	provement efforts.							
		CO2. Ex	xplain the too	ols and techniques used	I for data analytics in						
		he	althcare orgar	nizations.							
		CO3. Id	entify techni	ques to communicate	insights gained from						
		he	althcare data a	analysis.							
		CO4. Ai	nalyse the pote	ential of, and challenges to	o, incorporating big data						
		an	alytics to imp	prove the development a	and testing of precision						
		m	edicine / nursi	ng interventions.							
		CO5. De	emonstrate an	id evaluate the knowled	lge of health data and						
		undergirding the tools of big data analysis in health rel									
		research.									
		CO6. A	lapt the basics	s and learnings available	to build the relationship						
		of healthcare and data analytics in production and operational									
_	G	sy	stems for data	intelligence.	1 11 1 11 1						
7	Course	After cor	npleting the	course the student will	be able describe and						
	Description	comprehe	nd all the con	cepts related with health	care, how to manage the						
		internal a	nd external int	formation in order to mal	the best decisions for						



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C	Using Analy Sustainability Chart Princi	tics to Evaluation y, Basic Station ples. Statistic	ate Outcomes and Maintain stical Methods and Control cal Methods for Detecting	CO4, CO5
	Changes in Q			
	for Detecting			
Unit 5	Visualization	n and Advanc	ed Analytics in Healthcare	
А	Presentation	and Visualiz	ation of Information, Data	CO5, CO6
	Visualization	, Quality and	Performance Improvement,	
	Agents and	Alerts, Prov	iding Accessibility to and	
	Ensuring Usa	ability of Analy	ytics Systems	
В	Overview o	f Advanced	Analytics, Applications of	CO5, CO6
	Advanced An	nalytics, Enabl	ers of Predictive Analytics in	
	Healthcare (N	Methods, Data	and System), Developing and	
	Testing Adv	anced Analyti	cs in Healthcare, Advanced	
	Analytics Mo	odeling and De	ployment Process	
C	Determine	the Requirer	ments of the Healthcare	CO6
	Organization	, Understand	and Prepare Health Data,	
	Overview	of Predictive	e Algorithms (Regression	
	Modeling, M	lachine Learni	ng and Pattern Recognition),	
	Analytical	Healthcare	Organizational Challenges,	
 Mada af	objectives an	d requirements	s, Effective Analytical Teams	
Mode of	Theory			
 Weightage	CA	МТЕ	ETE	
Distribution	250/	1VI1E 25%	E1E 50%	
Taxt book/s*	$\frac{23\%}{1}$ Troug	23%	(2013) Healthears Analytics	
TEAT DOOK/S	for O	uality and Per	formance Improvement John	
	Wiley	v & Sons Inc	formance improvement. John	
	2 Chan	dan K Reddy	v and Charu C Aggarwal	
	Healt	hcare Data An	alytics. CRC Press ©2015	
Other	1. Big	Data Analytic	s in Healthcare, edited by	
References	Anan			
	Singh			
	Zoma			
	2. Healt			
	Appro			
	A. W	ager, Frances V	W. Lee, John P. Glaser	
	3. Statis	tics & Data	Analytics for Health Data	
	Mana	gement - E-B	Book By Nadinia A. Davis,	
	Betsy	J. Shiland		



S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	Define the role of data analytics in healthcare quality and	PO2, PO3, PO4, PO5,
	performance improvement efforts.	PSO2
2.	Explain the tools and techniques used for data analytics in	PO1, PO3, PO5, PO7,
	healthcare organizations.	PO8, PSO2
3.	Identify techniques to communicate insights gained from	PO2, PO3, PO7, PO8,
	healthcare data analysis.	PSO2
4.	Analyse the potential of, and challenges to, incorporating big data analytics to improve the development and testing of precision medicine / nursing interventions.	PO2, PO4, PO5, PO8, PSO2
5.	Demonstrate and evaluate the knowledge of health data and undergirding the tools of big data analysis in health related research.	PO1, PO2, PO4, PSO2
6.	Adapt the basics and learnings available to build the relationship of healthcare and data analytics in production and operational systems for data intelligence.	PO1, PO2, PO3, PO4, PO5, PO8, PSO2

# **PO and PSO mapping with level of strength for Course Name** Healthcare and Analytics (**Course Code yyyy**)

Course Code_ Course Name	CO s	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
	CO 1	-	2	3	1	2	-	-	-	2	3	1	2	-	3	-
	CO 2	2	-	3		1	-	3	2	-	3		1	-	3	-
Care	CO 3	-			-	-	-					-	-	-	3	-
Analyti	CO 4	-	2	•	3	2	-	-	2	2	-	3	2	-	3	-
65	CO 5	2	2	-	3	-	-	-	-	2	-	3	-	-	3	-
	CO 6	2	2	3	2	3	-	-	2	2	3	2	3	-	3	-



#### Average of non-zeros entry in following table (should be auto calculated).

Cou rse Cod e	Cou rse Na me	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3

Strength of Correlation

1. Addressed to Slight (Low=1) extent

3. Addressed to Substantial (High=3) extent

2. Addressed to Moderate (Medium=2) extent



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Pro	gram:	B.Tech. Data Science										
Bra	nch:	CSE										
1	Course Code											
2	Course Title	Predictive Analytics										
3	Credits	3										
4	Contact Hours											
-	(L-T-P)	2 0 2										
	Course Status											
5	Course	This course focuses on enabling students to master a scientific a	pproach to solving									
	Objective	problems with data. This course is designed to provide a comprehe	ensive introduction									
	5	to build models for prediction and classification.										
6	Course	CO1: <i>Determine</i> the key concepts for predictive analytics										
	Outcomes	CO2: Apply specific statistical and regression analysis methods appl	icable to predictive									
		analytics										
		CO3: <i>Interpret</i> the data and selecting appropriate features.										
		CO4 : <i>Develop</i> and use various quantitative and classification predi	ictive models									
		CO5: <i>Identify</i> new trends and patterns, uncover relationships, creat	e forecasts, predict									
		likelihoods, and test predictive hypotheses.	. 11									
7	Carrier	CO6: <i>Compare</i> the performance of different prediction and classifi	cation models									
/	Course	This course explores foundational concepts in analytics, statistica	al computing, data									
	Description	pre-processing, variable selection, dimensionality reduction,	classification and									
		officery of predictive models, identify and implement a variety of p	redictive modeling									
		techniques Prerequisites of this course are: Algebra Descriptive St	atistics and Excel									
8	Outline syllabus	techniques. rerequisites of this course are. Argeora, Descriptive St	CO Mapping									
0	Unit 1	Introduction to Analytics										
	A	Descriptive, Predictive and Prescriptive Analytics, Analytics in	CO1									
		Decision Making. The Analytics Life Cycle. Introduction to	001									
		Predictive Analytics										
	В	Matrix Notation, Model, Method and Feature, Probability	CO1, CO2									
		Distribution,										
	С	Covariance, Correlation, Hypothesis Testing, Analysis of	CO1, CO2									
		Variance										
	Unit 2	Linear Regression										
	А	Review on Simple Linear Regression, Ordinary Least Squares	CO2,CO3									
		(OLS), Model Diagnostics										
	В	Dummy, Derived and Interaction Variables, Multiple Linear	CO2, CO3									
		Regression, Weighted Least Squares (WLS), Generalized Linear										
	q	Models (GLM)	G02 G02									
	C	Multivariate Regression, Estimation of Regression Parameters, CO2,CO3										
	TI	Multi-collinearity, Model Deployment										
		Data Pre-processing	C02									
	А	ransformations: Categorical to Dummy Variables Polynomials										
		Roy Cox Transformation										
	B	Log & Electicity Models, Logit Transformation, Count Date	CO3 CO4									
	U	Models Centering Standardization	003,004									
	С	Rank Transformations Lagging Data (Causal Models) basics of	CO3 CO4									
	÷	Data Reduction	203,007									
	Unit 4	Variable selection and Dimensionality reduction										



Δ	Variable Sele	ction Dimens	vionality Issues Multi-Collinearity	CO3 CO4 CO5						
Π	Variable Selec	tion Methods	Sten Methods	003,004,005						
D	Pagularization	Depolized or (	Step Wethous	CO2 CO4 CO5						
D	Regularization	005,004,005								
	LASSO	LASSO								
С	Dimension Re	duction Mode	ls, Principal Components Regression	CO3,CO4, CO5						
	(PCR), Linear	Discriminant	t Analysis, Quadratic Discriminant							
	Analysis, Parti	al Least Squar	es (PLS)							
Unit 5	Classification	and Forecast	ing							
А	Machine Learn	ning overview,	Bias vs. Variance Trade-off, Error	CO4,CO5,CO6						
	Measures, Cro	ss-Validation								
В	Binomial Logi	stic Regression	n, Multinomial Logistic Regression,	CO4,CO5,CO6						
С	Foreca	sting: Time	Series Analysis, Additive &	CO4,CO6						
	Multip	licative model	s, Exponential smoothing techniques,							
	Foreca	sting Accura	cv. Auto-regressive and Moving							
	averag	e models	,,							
Mode of	Theory									
examination										
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	<ul> <li>Applied P</li> </ul>	• Applied Predictive Modeling by Max Kuhn and Kjell Johnson								
Other	<ul> <li>Statistical</li> </ul>									
References	for Better									
	Second E									
	• Applied F	Applied Predictive Analytics: Principles and Techniques for								
	the Profes	sional Data A	nalvst by Dean Abbott							

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	Determine the key concepts for predictive analytics	PO1, PO2, PO4, PO11, PO12,
		PS01, PS02, PS03
2.	Apply specific statistical and regression analysis methods	PO1, PO2, PO3, PO4, PO5, PO6,
	applicable to predictive analytics	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3
3.	<i>Interpret</i> the data and selecting appropriate features.	PO1, PO2, PO3, PO4, PO5, PO6,
		PO7, PO8, PO9, PO11, PO12,
		PSO1, PSO2, PSO3
4.	Develop and use various quantitative and classification	PO1, PO2, PO3, PO4, PO5, PO6,
	predictive models	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3
5	Identify new trends and patterns, uncover relationships,	PO1, PO2, PO3, PO4, PO5, PO6,
	create forecasts, predict likelihoods, and test predictive	PO7, PO8, PO9, PO10, PO11,
	hypotheses.	PO12, PSO1, PSO2, PSO3
6	Compare the performance of different prediction and	PO1, PO2, PO3, PO4, PO5, PO6,
	classification models.	PO7, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3

#### PO and PSO mapping with level of strength

COs	РО	PS	PS	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	3



CO1	2	2	-	2	-	-	-	-	-	-	2	2	1	2	1
CO2	3	2	2	2	3	3	3	2	2	1	2	3	1	1	2
CO3	2	3	2	3	2	1	1	2	2	-	1	2	2	1	1
CO4	3	2	3	3	3	3	2	2	1	2	3	2	2	3	2
CO5	2	3	2	3	3	3	2	1	2	1	2	2	3	2	2
CO6	2	2	2	2	2	2	1	2	2	1	2	3	1	3	2
	2.3	2.3	1.8	2.5	2.2	2.0	1.5	1.5	1.5	0.8	2.0	2.3	1.7	2.0	1.7



### B.Tech (CSE) with Specialization in Cyber Security & Forensics in association with Microsoft



Sch	ool:	School of Engineering & Technology										
Dep	partment	Computer Science & Engineering										
Pro	gram:	B.tech										
Bra	nch:	Computer Science & Engineering with Specialization in Cyber										
		Security and Forensics	·									
1	Course Code	CSC102										
2	Course Title	Introduction to Cyber Security & Laws										
3	Credits											
4	Contact	2-0-0										
-	Hours											
	(L-T-P)											
	Course	CORE										
	Status											
5	Course Objective	e This course will provide students exposure to the key legal and policy issues related to cybersecurity, including the legal authorities and obligations of both the government and the private sector with respect to protecting computer systems and networks, as well as the national security aspects of the cyber domain including authorities related to offensive activities in cyberspace.										
6	Outcomes	<ul> <li>On successful completion of this module students with CO1: Illustrate why securing the Nation's computer system goal of multiple successive administrations and has broad support, has proven to be so difficult to achieve.</li> <li>CO2: Analyze attack methodology and combat hackers from suspicious attempts at connection to gain unauthorized a and its resources</li> <li>CO3: Adapt Protection of data and respond to threats Internet</li> <li>CO4: Construct and implement risk analysis, security prassessment</li> <li>CO5:Plan, implement and audit operating systems' security process for incident response, disaster recovery, and planning within information security</li> </ul>	Il be able to ms, which has been a bipartisan and public om intrusion or other access to a computer that occur over the policies, and damage writy in a networked, ministrative planning business continuity									
7	Course	This course introduces advanced aspects of Cyber Crime, enco	ompassing the Laws									
	Description	and its domains comprising many activities such as data breac	ches and all, and									
0	Outling gullab	cnoose the relevant countermeasures.	CO Monning									
8												
		Introduction	Introduction									
	А	Brief overview of Networking Concepts, Information CO1										
	В	Security Threats and Vulnerabilities CO1										
	D C	Basics of Cruptography / Engruption										
	Unit 2	Information and Network Security Cyber Law-										
		International Perspectives										
	А	Security Management Practices, Access Control and Intrusion Detection	CO2									
	В	Security for VPN and Next Generation Technologies	CO2									



С	Security Arch	itectures and N	CO2, CO6									
Unit 3	Cyber Law	Wireless Network and Security Cyber Law: Indian and International Perspectives Need for Cyber Law, Cyber Jurisprudence at International and Indian Level										
	Need for Cyb	ar Law Cuber	Iurisprudence at International									
A	and Indian Le	vel	Julispludence at international	CO3								
В	UN & Interna	tional Telecon	nmunication Union (ITU)	CO3								
	Initiatives, GI	DPR (General ]	Data Protection Regulation)	005								
С	Council of Eu	rope - Budape	st Convention on Cybercrime,									
	Asia-Pacific H	Economic Coop	peration (APEC), GDPR, The	CO3, CO6								
	Data Privacy	Act 1998-2018	3									
Unit 4	Constitution	Constitutional & Human Right Issues in CyberSpace,										
	Cyber Torts	Cyber Torts Errodom of Spaceh and Expression in Cyberspace, Bight to										
А	Freedom of S	Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace – Access to Internet Right to Privacy, Right to Data Protection Cyber Defamation, Different Types of Civil Wrongs under the IT Act 2000, Different offences under IT Act 2000										
D	Access Cyber											
В	Right to Priva											
C	the IT Act 200											
 IImit 5	CyberCrime	he IT Act 2000, Different offences under IT Act 2000 CyberCrime and Legal FrameWork										
	CyberCrime	CyberCrime and Legal FrameWork Cyber Crimes against Individuals, Institution and State Hacking, Digital Forgery, Cyber Stelking/Hargement										
A	Cyber Crimes											
В	Hacking, Digi Cyber Pornog	CO5										
С	Cyber terroris	m, Cyber Defa	amation	CO5, CO6								
Mode of	Theory			Theory								
examination	2											
Weightage	CA	MTE	ETE									
Distribution	25%	25%	50%									
Text book/s*	Chris	Reed & John	Angel, Computer Law, OUP.									
	New	York, (2007).	8.,									
	<ul> <li>Justic</li> </ul>	e Yatindra Sin	gh, Cyber Laws, Universal Law									
	Publis	shing Co, New	Delhi, (2012).									
	• Verm	a S K Mittal	Raman Legal Dimensions of									
	Cyber	Space Indian	Law Institute New Delhi									
	(2004	)										
	<ul> <li>Ionth</li> </ul>	, anRosenoer C	vber I aw Springer New York									
	(1997		yber Law, Springer, New Tork,									
	Sudhir Naih	). The Informatic	on Technology Act. 2005: A									
	Handbook O	UP New York										
 Other		Bhansali Info	rmation Technology Act 2000									
References	I. D. R. Unive	ersity Book Ho	use Pyt Ltd Jaipur (2003)									
1010101005	Vasu Deva C	vher Crimes a	nd Law Enforcement									
	Commonweal	th Publishers.	New Delhi, (2003).									



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Illustrate why securing the Nation's computer systems, which has been a goal of multiple successive administrations and has broad bipartisan and public support, has proven to be so difficult to achieve.	PO1,PO2, PO5, PO8,PO12,PSO3
2.	CO2: Analyze attack methodology and combat hackers from intrusion or other suspicious attempts at connection to gain unauthorized access to a computer and its resources	PO1, PO2, PO3, PSO3
3.	CO3: Adapt Protection of data and respond to threats that occur over the Internet	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: Construct and implement risk analysis, security policies, and damage assessment	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: Plan, implement and audit operating systems' security in a networked, multi-platform and cross platform environment	PO1, PO2, PO3,PO8,PO9,PSO2,
6.	CO6: Demonstrate contingency operations that include administrative planning process for incident response, disaster recovery, and business continuity planning within information security	PO1, PO2, PO4, PO5, PO6,PO7,PO10,PO11,PSO1

## PO and PSO mapping with level of strength for Course Name Introduction to cyber security and laws CSC 102

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	P O4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS 03
Intr	CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
odu	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
ctio	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
n to	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
cybe r	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
secu		3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
rity																
and																
laws																
CS																
C																
102	CO6															



Average of non-zeros e	entry in following	table (should be auto	calculated).
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Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	P 0 5	PO 6	P 0 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O1	PS O2	PSO 3
CSC10 2	Introduc tion to cyber security and laws	3	2.7	1.1	1	1. 5	1	.5	1.3	.8	.5	.5	.8	1	1	1

#### Strength of Correlation

- Addressed toSlight (Low=1)extent2. Addressed toModerate (Medium=2) extent
   Addressed toSubstantial (High=3) extent



Schoo	ol:	School of E	ngineering &	& Technology	
Depar	tment	Computer S	cience & En	igineering	
Progra	am:	B.Tech			
Branc	h:	Computer S Security and	cience & En l Forensics	igineering with Sp	ecialization in Cyber
1	Course Code	CSC201			
2	Course Title	Digital Fore			
3	Credits	3			
4	Contact Hours (L-T-P)	3-0-0			
	Course Status	CORE			
5	Course Objective	Provide the techniques a digital foren	e students and enhance isics.	with practice on their skills regard	applying digital forensics ling practical applications of



OutcomestoCO1:Demonstrate the principles of Digital Forensics and horesultant evidence can be applied within legal cases. CO2:Illustrate their competence in evidence recovering files forensics, password cracking CO3:Evaluate the effectiveness of available digital forensics use them in a way that optimizes the efficiency and quality of forensics investigations. CO4: Apply a solid foundational grounding in computer net operating systems, file systems, hardware, and mobile devicd digital investigations and to the protection of computer networks and emerging industry trends CO6: Adapt effectively the results of a computer, network, a forensic analysis verbally, in writing, and in presentations to technical and lay audiences.7CourseThis course introduces students to basics of Digital Forensic										
7	Course Description	This course introduces students to basics of Digital them apply appropriate skills and knowledge in sol forensics problems.	Forensics. Make ving computer							
8	Outline syllabu	15	CO Mapping							
	Unit 1	INTRODUCTION TO COMPUTER FORENSICS								
	А	History of Forensics – Computer Forensic Flaws and Risks	CO1							
	В	Rules of Computer Forensics – Legal issues – Digital Forensic Principles	C01							
	С	C01								
	Unit 2									



А	Understanding Computing Investigations-digital evidence	CO2
В	Seizure methodology factors limiting the whole sale seizure of hardware- Demystifying computer/ cyber crime	CO2
С	Digital Evidence Collection, Evidence Preservation	CO2, CO6
Unit 3	DATA FORENSICS	
А	Recovering deleted files and deleted partitions – deleted file recovery tools –	CO3
В	deleted partitioned recovery tools – data acquisition and duplication	CO3
С	data acquisition tools – hardware tools – backing up and duplicating data.	CO3, CO6
Unit 4	NETWORK FORENSICS	
А	Overview of Network Forensics and Investigating Logs –incident response techniques	CO4
В	Identify the footprint of an attack – Denial of Service Investigations	CO4
С	Challenges of network forensics vs. disk forensics	CO4,CO6
Unit 5	E-MAIL FORENSICS AND STEGANOGRAPHY	
А	E-mail Basic- Fake Emails - Spoofing	CO5,
В	Forensics Acquisition – Processing local mail archives	CO5,CO6



С	Steganography steganography forensics	– Steganalysi - Categories o	s- classification of f steganography in	CO5,CO6								
Mode of examination	Theory	Theory										
Weightage Distribution	СА											
	25%											
Text book/s*	• "Cy Syn • John Fore	<ul> <li>Anthony Reyes, Jack Wiles, "Cybercrime and Digital Forenscis", Syngress Publishers, Elsevier 2007.</li> <li>John Sammons, "The Basics of Digital Forensics", Elsevier 2012</li> </ul>										
Other References	• Lind "Co Wild	la Volonins, F mputer Foren ey Publishing	Reynalds Anzaldua, sics for dummies", 2008.									



CO and	PO Mapping	
S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Demonstrate the principles of Digital Forensics and how resultant evidence can be applied within legal cases.	PO1, PO2, PO5, PO8, PO12, PSO3
2.	CO2: Illustrate their competence in evidence recovering files, network forensics, password cracking	PO1, PO2, PO3, PSO3
3.	CO3: Evaluate the effectiveness of available digital forensics tools and use them in a way that optimizes the efficiency and quality of digital forensics investigations.	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: Apply a solid foundational grounding in computer networks, operating systems, file systems, hardware, and mobile devices to digital investigations and to the protection of computer network resources from unauthorized activity	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: Access and critically evaluate relevant technical and legal information and emerging industry trends	PO1, PO2, PO3, PO8, PO9, PSO2,
6.	CO6: Adapt effectively the results of a computer, network, and/or data forensic analysis verbally, in writing, and in presentations to both technical and lay audiences.	PO1, PO2, PO4, PO5, PO6, PO7, PO10, PO11, PSO1



Course Code_ Course Name	CO's															
		PO1	2 2	PO 3	PO4	РО 5	РО 6	РО 7	РО 8	РО 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
		3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	CO1															
		3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	CO2															
		3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	CO3															
		3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	CO4															
		3	2	3	-	-	-	-	3	3	-	-	-	-	3	_
Digital	CO5															
Forensics $(CSC201)$		3	3	-	3	3	3	3	-	-	3	3	-	3	_	_
(CDC201)	CO6															

PO and PSO mapping with level of strength for Course Name Digital Forensics (Course Code CSC201)

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	Р О 4	Р О 5	P O 6	Р О 7	P O 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	PSO 1	PSO 2	PSO 3
CSC20 1	Digital Forensic s	3	2.7	1. 1	1	1. 5	1	.5	1. 3	.8	.5	.5	.8	1	1	1

Strength of Correlation

- 1. Addressed toSlight (Low=1)extent 2. Addressed toModerate (Medium=2) extent
- 3. Addressed toSubstantial (High=3) extent



School:		School of Engineering & Technology					
Depa	rtment	Computer Science & Engineering					
Progr	am:	B.Tech					
Branch:		Computer Science & Engineering with Specialization in Cyber Security and Forensics					
1	Course Code	CCP201					
2	Course Title	Digital Forensics lab					
3	Credits	1					
4	Contact Hours (L-T-P)	0-0-2					
	Course Status	Compulsory/Elective					
5	Course Objective	• Provide the students with practice on applying digital forensics techniques and enhance their skills regarding practical applications of digital forensics.					



6	Course Outcomes	professional standards and are based on the investigative process: identification, preservation, examination, analysis, and reporting; CO2:Compare and adhere to the highest professional and ethical standards of conduct, including impartiality and the protection of personal privacy CO3: Evaluate collaboratively with clients, management, and/or law enforcement to advance digital investigations or protect the security of digital resources. CO4: List potential security breaches of computer data that suggest violations of legal, ethical, moral, policy, and/or societal standards CO5:Access and critically evaluate relevant technical and legal information and emerging industry trends; and CO6:Illustrate effectively the results of a computer, network, and/or data forensic analysis verbally, in writing, and in presentations to both technical and lay audiences.					
7	Course Description	This course introduces students to basics of Digita Make them apply appropriate skills and knowledg computer forensics problems.	al Forensics. ge in solving				
8	Outline syllabus		CO Mapping				
	Unit 1	Introduction to computer forensics					
	А	Study of Computer Forensics and different tools used for forensic investigation	CO1				
	В	Study to Recover Deleted Files using Forensics Tools	CO1,				
	Unit 2	An overview of digital forensics investigation					
	A	Study the steps for hiding and extract any text file behind an image file/ Audio file using Command Prompt.CO2					



В	View Last A	CO2, CO5,CO6		
Unit 3	Data forensi	cs		
А	Create the fo using EnCas	prensic image se Forensics.	of the hard drive	CO3
В	Restoring the Forensics	e Evidence Im	age using EnCase	CO3
Unit 4	Network for	ensics		
А	Perform exp language	eriment of but	ffer overflows using c	CO4
В	Live Forensi Autopsy	ics Case Inves	tigation using	CO4
С	Extracting B	rowser Artifa	cts	CO2, CO4,CO6
Unit 5	E-mail foren	isics and stega	nography	
А	Perform exp website	eriment of em	ail hacking using any	CO5,
В	Collect Ema	CO5,CO6		
Mode of examination	Jury/Practica			
Weightage Distribution	СА	MTE	ETE	
	25%	25%	50%	



Text book/s*	<ul> <li>Anthony Reyes, Jack Wiles, "Cybercrime and Digital Forenscis", Syngress Publishers, Elsevier 2007.</li> <li>John Sammons, "The Basics of Digital Forensics", Elsevier 2012</li> </ul>	
Other References	<ul> <li>Linda Volonins, Reynalds Anzaldua, "Computer Forensics for dummies", Wiley Publishing 2008.</li> </ul>	

<u> </u>	<u>rompping</u>	
S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Demonstrate digital investigations that conform to accepted professional standards and are based on the investigative process: identification, preservation, examination, analysis, and reporting;	PO1, PO2, PO5, PO8, PO12, PSO3
2.	CO2: Compare and adhere to the highest professional and ethical standards of conduct, including impartiality and the protection of personal privacy	PO1, PO2, PO3, PSO3
3.	CO3: Evaluate collaboratively with clients, management, and/or law enforcement to advance digital investigations or protect the security of digital resources;	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: List potential security breaches of computer data that suggest violations of legal, ethical, moral, policy, and/or societal standards	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: Access and critically evaluate relevant technical and legal information and emerging industry trends; and	PO1, PO2, PO3, PO8, PO9, PSO2,



6.	CO6: Illustrate effectively the results of a computer, network, and/or data forensic analysis verbally, in writing, and in presentations to both technical and lay
	audiences.

PO1, PO2, PO4, PO5, PO6, PO7, PO10, PO11, PSO1

PO and PSO mapping with level of strength for Course Name Digital Forensic Lab (Course Code CCP201)

Course Code_ Course Name	CO' s	P O 1	P O 2	P O 3	PO 4	P O 5	P O 6	Р О 7	P O 8	Р О 9	Р О 10	P O 11	P O 12	PS O 1	PSO 2	PSO 3
	CO1	3	3	-	-	2	-	I	3	-	-	-	3	-	-	3
	CO2	3	3	2	-	-	-	-	-	-	I	I	-	-	-	3
	CO3	3	3	2	-	2	-	_	-	2	-	_	2	3	-	-
Digital Forensics (CCP201	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	CO5	3	2	3	-	-	-	-	3	3	-	_	-	-	3	-
)	CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	P O 3	P O 4	Р О 5	P O 6	P O 7	P O 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	PS O 1	PS O 2	PS O 3
CCP2 01	Digital Forensi cs Lab	3	2.7	1. 1	1	1. 5	1	.5	1. 3	.8	.5	.5	.8	1	1	1

Addressed toModerate (Medium=2) extent 3. Addressed toSubstantial (High=3) extent



School:		School of Engineering & Technology						
Depart	ment	Computer Sc	cience & Engin	neering				
Program	m:	B.Tech						
Branch	.:	Computer So Forensics	vience & Engin	neering with Specializa	tion in C	yber Security and		
1	Course Code	CSC301						
2	Course Title	Ethical Hack	ing					
3	Credits	3						
4	Contact Hours (L-T-P)	2-0-2						
	Course Status	rse Status core						
5	Course Objective	To provide s ethical hacki	tudents about t ng in IT and W	the Ethical hacking Con Vorking structure of had	ncepts, ir cking	nportance of		
6	Course Outcomes	On successful completion of this module students will be able to: CO1: Define the description of ethical Hacking CO2: Illustrate Types of Ethical Hacking. CO3: Explain about web and network hacking CO4: Demonstrate report writing and Mitigation CO5: Formulate the use of safe techniques on the World Wide Web CO6: Analyze various digital forensic problems						
7	Course Description	This course introduces ethical hacking concept and application of ethical hacking in network security.						
8	Outline syllabus					Outline syllabus		
	Unit 1	Introduction	to Ethical Hac	king				
	А	Security Fun Cracker, Des	Security Fundamental, Security testing, Hacker and CO1 Cracker, Descriptions					



В	Test Plans-keeping It legal, Ethical and Legality	CO1, CO2
С	The Attacker's Process, The Ethical Hacker's Process, Security and the Stack	CO1, CO2,CO4
Unit 2	Footprinting and Scanning	
А	Information Gathering, Determining the Network Range, Identifying Active Machines	CO1, CO2
В	Finding Open Ports and Access Points, OS Fingerprinting Services, Mapping the Network Attack Surface	CO1, CO2
С	Enumeration, System Hacking	CO1, CO2,CO5,CO6
Unit 3	Malware Threats	
А	Viruses and Worms, Trojans, Covert Communication	CO1,CO2,CO3
В	Keystroke Logging and Spyware, Malware Counter measures	C01,C02,C03
С	Sniffers, Session Hijacking, Denial of Service and Distributed, Denial of Service	CO1,CO2,CO3
Unit 4	Web Server Hacking	
А	Web Server Hacking, Web Application Hacking	CO2,CO3,CO4
В	Database Hacking	CO3,CO4
С	Wireless Technologies, Mobile Device Operation and Security, Wireless LANs	CO2, CO4,CO5
Unit 5	IDS, Firewalls and Honeypots	



А	Intrusion Detection	CO2,CO5,		
В	Physical Security	, Social Engine	ering	CO3,CO5,CO6
С	Case Studies			CO4,CO5,CO6
Mode of examination	Theory			
Weightage Distribution	СА	MTE	ETE	
	25%	25%	50%	
Text book/s*	1.Ec-Counc Countermea Learning, 2 2. Michael Corley, "Ha Defense", C			
Other References	3. Patrick I and Penetr Penetration Second Re 4. Jon Eric Exploitation 2008.			



CO and	CO and PO Mapping							
S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)						
1.	CO1: Define the description of ethical Hacking	PO1,PO2, PO5, PO8,PO12,PSO3						
2.	CO2: Illustrate Types of Ethical Hacking.	PO1, PO2, PO3, PSO3						
3.	CO3: Explain about web and network hacking	PO1, PO2, PO3, PO5, PO9, PO12, PSO1						
4.	CO4: Demonstrate report writing and Mitigation	PO1, PO2, PO4, PO5, PO6, PO8, PSO2						
5.	CO5: Formulate the use of safe techniques on the World Wide Web	PO1, PO2, PO3,PO8,PO9,PSO2,						
6.	CO6: Analyze various digital forensic problems	PO1, PO2, PO4, PO5, PO6,PO7,PO10,PO11,PSO1						

PO and PSO mapping with level of strength for Course Name Ethical Hacking (Course Code CSC301)

Course Code_ Course Name	CO's	POI	PO 2	PO 2	POA	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO	PO	PSO	PSO2	PSO3
		101	2	3	104	105	100	107	100	10,7	10		12	1	1502	1505
	CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
Ethical Hacking (Course Code CSC301)	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	CO5	3	2	3	-	-	-	-	3	3	-	I	-	-	3	-
	CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-



Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	Р О 4	Р О 5	Р О 6	Р О 7	P O 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	PSO 1	PSO 2	PSO 3
CSC30 1	Ethical Hackin g	3	2.7	1. 1	1	1. 5	1	.5	1. 3	.8	.5	.5	.8	1	1	1

Strength of Correlation

- 1. Addressed toSlight (Low=1)extent 2. Addressed toModerate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Scho	ol:	School of Engineering & Technology						
Depa	rtment	Computer Science & Engineering						
Prog	ram:	B.Tech						
Branch:		Computer Science & Engineering with Specializa Security and Forensics	ation in Cyber					
1	Course Code	CCP301						
2	Course Title	Ethical Hacking Lab						
3	Credits	1						
4	Contact Hours (L-T-P)	0-0-2						
	Course Status	core						
5	Course Objective	To provide students about the Ethical hacking Concepts, importance of ethical hacking in IT and Working structure of hacking						
6	Course Outcomes	On successful completion of this module students will be able to: CO1: Define the description of ethical Hacking CO2: Illustrate Types of Ethical Hacking. CO3: Explain about web and network hacking CO4: Demonstrate report writing and Mitigation CO5: Formulate the use of safe techniques on the World Wide Web CO6: Analyze various digital forensic problems						
7	Course Description	This course introduces ethical hacking concept and application of ethical hacking in network security.						
8	Outline syllabus	·	CO Mapping					
	Unit 1							



	To learn abo	out hacking to	ols and skills.	CO1, CO2						
Unit 2	Footprinting	g and Scannin	g							
	To study ab Reconnaiss	To study about Footprinting and Reconnaissance								
	To study ab	CO1, CO2,CO3								
Unit 3	Malware Th									
	To study ab	CO1,CO2,CO3, CO5								
Unit 4	Web Server	Web Server Hacking								
	To study ab	out Wireless	Hacking	CO2,CO3,CO4						
Unit 5	IDS, Firewa	alls and Honey	/pots							
	To learn &	study about S	niffing & their tools.	CO2,CO5,CO6						
Mode of examination	Jury/Practic	al/Viva								
Weightage Distribution	СА	MTE	ETE							
	25%									
Text book/s*	1.Ec-C Count Cenga 2. Mi James Hacki Learn									



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Define the description of ethical Hacking	PO1,PO2, PO5, PO8,PO12,PSO3
2.	CO2: Illustrate Types of Ethical Hacking.	PO1, PO2, PO3, PSO3
3.	CO3: Explain about web and network hacking	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: Demonstrate report writing and Mitigation	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: Formulate the use of safe techniques on the World Wide Web	PO1, PO2, PO3,PO8,PO9,PSO2,
6.	CO6: Analyze various digital forensic problems	PO1, PO2, PO4, PO5, PO6,PO7,PO10,PO11,PSO1



Course Code_ Course Name	CO's															
		PO1	РО 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
CCP301 Ethica	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
1 Hacking Lab	CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

#### PO and PSO mapping with level of strength for Course Name Ethical Hacking Lab-CCP301

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	Р О 4	Р О 5	Р О 6	Р О 7	Р О 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	PSO 1	PSO 2	PSO 3
CCP30 1	Ethical Hackin g Lab	3	2.7	1. 1	1	1. 5	1	.5	1. 3	.8	.5	.5	.8	1	1	1

Strength of Correlation

1. Addressed toSlight (Low=1)extent 2. Addressed toModerate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



School:		School of Engineering & Technology								
Depart	ment	Computer Science & Engineering								
Progra	m:	B.Tech								
Branch	1:	Computer Science & Engineering with Specialization in Cyber Security and Forensics								
1	Course Code	CSC061								
2	Course Title	Security Threats Intelligence and Risk Management								
3	Credits	3								
4	Contact Hours (L-T-P)	3-0-0								
	Course Status	Elective								
5	Course Objective	The subject provides a foundational platform for Cyber Security Aspirants by providing Cyber Security Awareness and Training that heighten the chances of catching a scam or attack before it is fully enacted, minimizing damage to the resources and ensuring the protection of information technology assets.								
6	Course Outcomes	CO1: Analyze and evaluate the cyber security needs of an organization. CO2: Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation. CO3: Measure the performance and troubleshoot cyber security systems. CO4: Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools. CO5: Comprehend and execute risk management processes, risk treatment methods, and key risk and performance indicators. CO6: Design and develop a security architecture for an organization.								
	Course Description	Understand principles of web security and to guarantee a secure network by monitoring and analyzing the nature of attacks through cyber/computer forensics software/tools.								



8	Outline syllabus		CO Mapping				
	Unit 1	Introduction					
	А	Security threats - Sources of security threats- Motives	CO1				
	В	Target Assets and vulnerabilities – Consequences of threats- E-mail threats	CO1, CO2				
	С	Web-threats - Intruders and Hackers, Insider threats, Cyber-crimes.	CO1, CO2,CO4				
	Unit 2	Network Threats					
	А	Network Threats: Active/ Passive – Interference – Interception – Impersonation	CO1, CO2				
	В	Worms – Virus – Spam's – Ad ware - Spy ware – Trojans and covert channels – Backdoors – Bots	CO1, CO2				
	С	IP Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal treats- Environmental threats - Threats to Server security					
	Unit 3	Security Threat					
	А	Security Threat Management: Risk Assessment - Forensic Analysis - Security threat correlation	CO1,CO2,CO3				
	В	Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools -Threat identification - Threat Analysis - Threat Modeling - Model for Information Security Planning	CO1,CO2,CO3				
	С	Concepts of risk-based planning and risk management of computer and information systems.	CO1,CO2,CO3				



Unit 4	Security Element	IS					
А	Security Element types, policies an	s: Authorization d techniques	on and Authentication -	CO2,CO3,CO4			
В	Security certifica Auditing - Securi	tion - Security ity Requiremen	monitoring and its Specifications	CO3,CO4			
С	Security Policies Files, Honey Pots	and Procedure s	es, Firewalls, IDS, Log	CO2, CO4,CO5			
Unit 5	Access control &	: Human factor	s				
А	Access control, T security - Securit	CO2,CO5,					
В	Trusted Systems, and infrastructure awareness, trainin	CO3,CO5,CO6					
С	Risk and Threat	CO4,CO5,CO6					
Mode of examination	Theory						
Weightage Distribution	СА	MTE	ETE				
	25% 25% 50%						
Text book/s*	<ol> <li>Joseph M Kiz Springer Verlag,</li> <li>Swiderski, Fra Microsoft Press,</li> <li>William Stallin Security: Princip</li> </ol>						


Other References	<ul> <li>4.Brian Kahin and Charles Nesson, eds, "Borders in Cyberspace: Information Policy and the Global Information Infrastructure" Cambridge: MIT Press, 1997.</li> <li>5.Philip Agree and Marc Rotenberg, "Technology and Privacy: The New Landscape" Cambridge: MIT Press, 1998.</li> </ul>	
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S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Analyze and evaluate the cyber security needs of an organization.	PO1, PO2, PO5, PO8, PO12, PSO3
2.	CO2: Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.	PO1, PO2, PO3, PSO3
3.	CO3: Measure the performance and troubleshoot cyber security systems.	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: Comprehend and execute risk management processes, risk treatment methods, and key risk and performance indicators.	PO1, PO2, PO3, PO8, PO9, PSO2,
6.	CO6: Design and develop a security architecture for an organization.	PO1, PO2, PO4, PO5, PO6, PO7, PO10, PO11, PSO1

PO and PSO mapping with level of strength for Course NameSecurity Threats Intelligence and Risk Management (CSC061)

Name    1 2 3 4 5 6 7 8 9 0 1 2 1 02 03	Course Code_ Course Name	CO 's	Р О 1	PO 2	P O 3	PO 4	Р О 5	Р О б	Р О 7	P O 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	PS O 1	PS O2	PS O3
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	CO 1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	CO 2	3	3	2	-	-	-	-	-	I	-	-	-	-	-	3
	CO 3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
CSC061_Se curity	CO 4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	_
Threats Intelligence	CO 5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	_
Management	CO 6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	Р О 1	P O 2	P O 3	Р О 4	Р О 5	Р О б	Р О 7	P O 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	PS O 1	PS O 2	PS O 3
CSC0 61	Security Threats Intelligenc e and Risk Manageme nt	3	2. 7	2. 3	3	2. 2	3	3	2.	2. 5	3	3	2. 5	2	2	2

Strength of Correlation

## 1. Addressed toSlight (Low=1) extent

- 2. Addressed toModerate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent

ool:	School of Engineering & Technology								
partment	Computer Science & Engineering								
gram:	B. Tech								
nch:	Computer Science & Engineering with Specialization in Cyber								
	Security and Forensics								
Course	CSC302								
Code									
Course	Cryptography and Network Security								
Title									
Credits	3								
	ool: partment gram: nch: Course Code Course Title Credits								



4	Contact	3-0-0	
	Hours		
	(L-T-P)		
	Course	Core	
	Status		
5	Course	To provide students with an overview cryptography and relation	ated
	Objective	algorithm which is required during data communication in o	computer
		networks which are the basic building blocks of different or	ganizations
		throughout world with respect to security.	
	Course	After the successful completion of this course, students will	be able to :
	Outcomes	CO1: Analyze the conventional Network security technique	which are
		basically designed to maintain confidentiality.	
		CO2: Compare the techniques of algorithms developed in n	nodern
		cryptographic era.	a .
		CO3: Explain the tools and methodologies used to perform	Security
6		analysis.	l
		CO4: Summarize the working knowledge of the Crytograp	пу
		CO5 Examine security at application layer, transport layer	and natwork
		laver	
		CO6: Interpret use of cryptographic data integrity algorithm	is and user
		authentication protocols	is and user
	Course	This course introduces concepts of Crytography & all the technic	ues related to
7	Description	it. It also imparts the knowledge of digital signature & message a	uthentication
	I I I	for effective Network Security	
		Tor effective retwork becurry.	
8	Outline syllar	nus	СО
8	Outline syllab	pus	CO Mapping
8	Outline syllab	Introduction to Network Security & Ethics	CO Mapping
8	Outline syllab Unit 1	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,	CO Mapping
8	Outline syllab Unit 1 A	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network	CO Mapping CO1, CO2, CO3
8	Outline syllab Unit 1 A	Introduction to Network Security & Ethics Computer Security Concepts- OSI security Architecture, Security attacks, Services, mechanism, model of network security	CO Mapping CO1, CO2, CO3
8	Outline syllab Unit 1 A	Introduction to Network Security & Ethics Computer Security Concepts- OSI security Architecture, Security attacks, Services, mechanism, model of network security Classical encryption techniques- Substitution Cipher (Mono-	CO Mapping CO1, CO2, CO3 CO1, CO2,
8	Outline syllab Unit 1 A B	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Stagenography	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3
8	Outline syllab Unit 1 A B	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2
8	Outline syllab Unit 1 A B C	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography         Block Cipher- Encryption Principles, DES & strength of DES	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3
8	Outline syllab Unit 1 A B C Unit 2	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography         Block Cipher- Encryption Principles, DES & strength of DES         Mathematics of Cryptography	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3
8	Outline syllab Unit 1 A B C Unit 2 A	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography         Block Cipher- Encryption Principles, DES & strength of DES         Mathematics of Cryptography         Euclidean Extended Euclidean Algorithm Euler's Totient	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3
8	Outline syllab Unit 1 A B C Unit 2 A	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography         Block Cipher- Encryption Principles, DES & strength of DES         Mathematics of Cryptography         Euclidean, Extended Euclidean Algorithm, Euler's Totient         Function, Ferment little Theorem, Euler's Theorem	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3 CO3
8	Outline syllab Unit 1 A B C Unit 2 A B	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography         Block Cipher- Encryption Principles, DES & strength of DES         Mathematics of Cryptography         Euclidean, Extended Euclidean Algorithm, Euler's Totient         Function, Ferment little Theorem, Euler's Theorem         Primality Testing-Miller Rabin test, Chinese Remainder	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3 CO3 CO3 CO3
8	Outline syllab Unit 1 A B C Unit 2 A B	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography         Block Cipher- Encryption Principles, DES & strength of DES         Mathematics of Cryptography         Euclidean, Extended Euclidean Algorithm, Euler's Totient         Function, Ferment little Theorem, Euler's Theorem         Primality Testing-Miller Rabin test, Chinese Remainder         Theorem	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3 CO3 CO3 CO3
8	Outline syllab Unit 1 A B C Unit 2 A B C	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography         Block Cipher- Encryption Principles, DES & strength of DES         Mathematics of Cryptography         Euclidean, Extended Euclidean Algorithm, Euler's Totient         Function, Ferment little Theorem, Euler's Theorem         Primality Testing-Miller Rabin test, Chinese Remainder         Theorem         Exponential- square and multiply method, Discrete Logarithm	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3 CO3, CO4 CO3, CO4
8	Outline syllab Unit 1 A B C Unit 2 A B C Unit 3	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography         Block Cipher- Encryption Principles, DES & strength of DES         Mathematics of Cryptography         Euclidean, Extended Euclidean Algorithm, Euler's Totient         Function, Ferment little Theorem, Euler's Theorem         Primality Testing-Miller Rabin test, Chinese Remainder         Theorem         Exponential- square and multiply method, Discrete Logarithm	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3 CO3 CO3 CO3 CO3, CO4 CO3, CO4
8	Outline syllab Unit 1 A B C Unit 2 A B C Unit 2 A B C Unit 3 A	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture, Security attacks, Services, mechanism, model of network security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher, Steganography         Block Cipher- Encryption Principles, DES & strength of DES         Mathematics of Cryptography         Euclidean, Extended Euclidean Algorithm, Euler's Totient Function, Ferment little Theorem, Euler's Theorem         Primality Testing-Miller Rabin test, Chinese Remainder Theorem         Exponential- square and multiply method, Discrete Logarithm         Asymmetric Cryptography-RSA, Cryptanalysis of RSA	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3 CO3, CO4 CO3, CO4 CO3, CO4 CO2, CO3
8	Outline syllab Unit 1 A B C Unit 2 A B C Unit 3 A B	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography         Block Cipher- Encryption Principles, DES & strength of DES         Mathematics of Cryptography         Euclidean, Extended Euclidean Algorithm, Euler's Totient         Function, Ferment little Theorem, Euler's Theorem         Primality Testing-Miller Rabin test, Chinese Remainder         Theorem         Exponential- square and multiply method, Discrete Logarithm         Asymmetric Cryptography & Key Exchange         Public Key cryptography-RSA, Cryptanalysis of RSA         Key management & distribution: KDC	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3 CO3, CO4 CO3, CO4 CO3, CO4 CO2, CO3 CO2, CO3
8	Outline syllab Unit 1 A B C Unit 2 A B C Unit 3 A B C	Introduction to Network Security & Ethics         Computer Security Concepts- OSI security Architecture,         Security attacks, Services, mechanism, model of network         security         Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher,         Steganography         Block Cipher- Encryption Principles, DES & strength of DES         Mathematics of Cryptography         Euclidean, Extended Euclidean Algorithm, Euler's Totient         Function, Ferment little Theorem, Euler's Theorem         Primality Testing-Miller Rabin test, Chinese Remainder         Theorem         Exponential- square and multiply method, Discrete Logarithm         Asymmetric Cryptography & Key Exchange         Public Key cryptography-RSA, Cryptanalysis of RSA         Key management & distribution: KDC         Diffie Hellman key exchange	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3 CO3, CO4 CO3, CO4 CO3, CO4 CO2, CO3 CO2, CO3 CO3, CO4
8	Outline syllab Unit 1 A B C Unit 2 A B C Unit 3 A B C Unit 3 A B C Unit 4	Introduction to Network Security & Ethics Computer Security Concepts- OSI security Architecture, Security attacks, Services, mechanism, model of network security Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher, Steganography Block Cipher- Encryption Principles, DES & strength of DES Mathematics of Cryptography Euclidean, Extended Euclidean Algorithm, Euler's Totient Function, Ferment little Theorem, Euler's Theorem Primality Testing-Miller Rabin test, Chinese Remainder Theorem Exponential- square and multiply method, Discrete Logarithm Asymmetric Cryptography & Key Exchange Public Key cryptography-RSA, Cryptanalysis of RSA Key management & distribution: KDC Diffie Hellman key exchange Digital Signatures	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3 CO3, CO4 CO3, CO4 CO3, CO4 CO2, CO3 CO2, CO3 CO3, CO4
8	Outline syllab Unit 1 A B C Unit 2 A B C Unit 3 A B C Unit 3 A B C Unit 4 A	Introduction to Network Security & Ethics Computer Security Concepts- OSI security Architecture, Security attacks, Services, mechanism, model of network security Classical encryption techniques- Substitution Cipher (Mono- alphabetic, Poly-alphabetic), Transposition cipher, Steganography Block Cipher- Encryption Principles, DES & strength of DES Mathematics of Cryptography Euclidean, Extended Euclidean Algorithm, Euler's Totient Function, Ferment little Theorem, Euler's Theorem Primality Testing-Miller Rabin test, Chinese Remainder Theorem Exponential- square and multiply method, Discrete Logarithm Asymmetric Cryptography & Key Exchange Public Key cryptography-RSA, Cryptanalysis of RSA Key management & distribution: KDC Diffie Hellman key exchange User Authentication protocol- Kerberos, Digital Signature –	CO Mapping CO1, CO2, CO3 CO1, CO2, CO3 CO1, CO2, CO3 CO3, CO4 CO3, CO4 CO3, CO4 CO2, CO3 CO2, CO3 CO3, CO4 CO2, CO3



В	DSS, Data	integrity alg	orithms-Hash Functions	CO2, CO4								
С	MD5, SHA	-512		CO2, CO4								
Unit 5	Message A	uthenticatio	on & hash function									
А	Authentica	Authentication requirement & functions, Message										
	Authentica	Authentication Code										
В	Security of	Security of Hash function & MAC										
С	Secure HA	Secure HASH & MAC algorithm.										
Mode of	Theory/Ju	Theory/Jury/Practical/Viva										
examination												
Weightage	CA	MTE	ETE									
Distribution	25%	50%										
Text	1. Atul K	ahate , "Netv	work Security ", Wiley India Pvt Ltd,									
book/s*	2010.											
	2. Michae	el T. Simpson	n, "Hands-on Cryptography & Network									
	Securit	y & Networ	k Defense", Course Technology, 2010.									
	3. Rajat K	Khare, "Netw	ork Seuciryt and Cryptography &									
	Networ	rk Security "	, Luniver Press, 2006.									
Other	1. Bruce S	Schneier, "A	pplied Cryptography", John Wiley &									
References	Sons Ir	Sons Inc, 2001.										
	2. Behrou	z A. Forouz	an, "Cryptography And Network									
	Securit	y"- McGraw	' Hill									
	3. Interne	t as a resour	ce for reference.									

S.	Course Outcome	Program Outcomes (PO) &
No		Program Specific Outcomes
1101		(PSO)
1.	CO1: Analyze the conventional Network security technique which	PO1, PO2, PSO1
	are basically designed to maintain confidentiality.	
2.	CO2: Compare the techniques of algorithms developed in modern	PO1,PO2,PO3,PSO1,PSO2
	cryptographic era.	
3.	CO3: Explain the tools and methodologies used to perform	PO1, PO3, PO5, PSO1,
	Security analysis.	PSO2
4.	CO4: Summarize the working knowledge of the Crytography	PO1, PO4, PO6, PO7,
	application during Network Security to maintain security	PSO1,PSO2
5.	CO5. Examine security at application layer, transport layer and	PO5,PO7, PO8, PO9,
	network layer.	PSO1,PSO2
6.	CO6:Interpret use of cryptographic data integrity algorithms and	PO10,PO11,PO12,PSO1,PS
	user authentication protocols	O3



### PO and PSO mapping with level of strength for Course Name Cryptography and **Network Security**(Course Code CSC302)

Code_ Course Name	CO' s	P 0 1	PO2	P 0 3	PO 4	P O 5	P O 6	P 07	P O 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
	CO1	3	3	I	-	2	-	-	3	-	-	3	-	-	3	3
CSC302_ Cryptogr	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
aphy and Network Security	CO3	3	3	2	-	2	-	-	-	2	-	2	3	-	-	3
	CO4	3	3	-	3	2	3	-	2	-	-	-	-	3	-	3
	CO5	3	2	3	-	-	-	-	3	3	-	-	-	3	-	3
	CO6	3	3	-	3	3	3	3	-	-	3	-	3	-	-	3

### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	РО 5	P 0 6	P 0 7	PO 8	PO 9	PO 10	Р О 11	P 01 2	PS O1	PS 0 2	PS 0 3
CSE302	Cryptography and Network Security	3	2.9	2.3	3	2. 2	3	3	2. 6	2.5	3	2. 5	3	3	3	3

### Strength of Correlation

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Prog	gram:	B. Tech										
Bra	nch:	Computer Science & Engineering with Specialization in	Cyber									
		Security and Forensics										
1	Course Code	CCP302										
2	Course Title	Cryptography and Network Security Lab										
3	Credits	1										
4	Contact	0-0-2										
	Hours											
	(L-T-P)											
	Course	Core										
-	Status											
5	Course	To provide deeper understanding into cryptography, its appli	cation to									
	Objective	network security, threats/vulnerabilities to networks and	~									
		countermeasures. To explain various approaches to Encrypti-	orophy									
		Digital Signing Message Authentication Codes (MAC) Has	grapny,									
		gital Signing, Message Authentication Codes (MAC), Hashing										
6	Course	On successful completion of this module students will be abl	e to:									
U	Outcomes	CO1: Illustrate basic security attacks and services	0.00									
	CO2: Demonstrate the skill on symmetric and asymmetric key											
		algorithms for cryptography										
		CO3:Perform basic cryptanalysis on encryption algorithms										
		CO4: Analyze Digitally Sign documents or data										
		CO5: Apply various Authentication functions										
		CO6: Perform Hashing functions on data										
7	Course	This course gives practical exposure on basic security attacks	8,									
	Description	encryption algorithms, authentication techniques. Apart from	security									
		algorithms, firewall configuration is also introduced.										
0	Oratline could be		60									
8	Outline syllabl	15	CO									
	Unit 1	Symmetric Energy Substitution (Stream Cinbers)	Mapping									
	Unit I	Symmetric Encryption – Substitution (Stream Ciphers)										
	Α	Perform the following implementation	CO1									
	B	1. Encryption and Decryption with Ceaser cipher	CO1									
	C	2. Encryption and Decryption with Playfair cipher	CO1									
	C	3. Encryption and Decryption with Hill cipher	001									
		4. Encryption and Decryption with Vigenere cipher										
	Unit 2	Symmetric Encryption – Transposition Technique										
		Perform the following implementation	CO2,									
		1. Transposition using Rail Fence Cipher	CO6									
		2. Transposition using Columnar Transposition										
		3. Transposition using Route Cipher										
		4. Transposition using Scytale Cipher										



TI 14 2	C	··· ···· · · · · · · · · ·		1					
Unit 3	Symmetric E	ncryption – S	udstitution (Block Cipners)						
	Perform the f	ollowing imple	ementation	CO3					
	1. Encryption	and Decryptic	on with DES						
	2. Encryption	2. Encryption and Decryption with 3-DES							
	3. Encryption	and Decryptic	on with AES						
	4. Encryption	and Decryptic	on with IDEA						
Unit 4	Asymmetric	Encryption							
	Perform the f	Perform the following implementation							
	1. Encryption	1. Encryption and Decryption with RSA							
	2. Encryption	2. Encryption and Decryption with Diffie-Hellman							
	3. Encryption								
Unit 5	Digital Signa								
	Perform the f	Perform the following implementation							
	1. Digital sign	nature of data ı	using RSA	CO6					
	2. Digital sign	nature of data u	ising Diffie-Hellman						
	3. Hashing fu	nction – SHA-	1						
	4. Message A	uthentication (	Code (MAC)						
Mode of	Jury/Practical	/Viva							
examination	-								
Weightage	CA	MTE	ETE						
Distribution	25%	5% 25% 50%							
Text book/s*	1.Cryptograp								
	William St								
Other	1. Cryptograp								
References	McGraw-H								
	2. Internet as	a Resource for	Reference.						

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: Identify basic security attacks and services	PO1, PO2, PO3, PO4, PO5,
	for cryptography	PO6, PO7, PO8, PSO
2.	CO2: Use symmetric and asymmetric key algorithms	PO1, PO2, PO3, PO5, PSO
3.	CO3:Perform basic cryptanalysis on encryption	PO1, PO2,,PO3 PO5, PSO1
	algorithms	
4	CO4: Digitally Sign documents or data	PO1, PO2, PO3, PO4, PO5,
		PO6, PO7, PO8,
		PSO1,PSO2
5	CO5: Make use of Authentication functions	PO1, PO2, PO3,PO4, PO5,
		PSO1
6	CO6: Perform Hashing functions on data	PO1, PO2, PO4, PO5, PO6,
		PO7, PO8, PO9,PSO



# PO and PSO mapping with level of strength for Course Name Cryptography and Network Security Lab (CCP302)

Cour se Code Cour se Nam e	CO's	Р О 1	PO 2	P 0 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	P 0 1 1	P O 1 2	PS O 1	PS O2	P S O 3
ССР	CO1	3	3	-	-	2	-	-	3	-	-	3	-	-	3	3
302_ Cryp	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
togra	CO3	3	3	2	-	2	-	-	-	2	-	2	3	-	-	3
phy	CO4	3	3	-	3	2	3	-	2	-	-	-	-	3	-	3
and Netw	CO5	3	2	3	-	-	-	-	3	3	-	-	-	3	-	3
ork Secu rity Lab	CO6	3	3	-	3	3	3	3	-	-	3	-	3	-	-	3

Average of non-zeros entry in following table (should be auto calculated).

Cour se Code	Course Name	P 0 1	P O 2	P O 3	Р О 4	P O 5	P O 6	P O 7	P O 8	P O 9	P 0 1 0	P 0 1 1	P 0 1 2	PS O1	PS O2	PS O3
CCP 302	Cryptograph y and Network Security Lab	3	2. 9	2. 3	3	2. 2	3	3	2. 6	2. 5	3	2. 5	3	3	3	3

## Strength of Correlation

1. Addressed toSlight (Low=1) extent

2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment	Computer Science & Engineering									
Pro	gram:	B. Tech									
Bra	nch:	Computer Science & Engineering with Specialization i	n Cvber								
		Security and Forensics									
1	Course Code										
2	Course Title	Intrusion Detection and Prevention System									
2	Credite	2									
1	Contact	200									
4	Hours	3-0-0									
	(L-I-F)	Corra									
	Course	Core									
~	Status		. 1								
5	Course	The objective of this course is to provide an in depth i	ntroduction to								
	Objective	intrusion detection and prevention. The course covers n	nethodologies,								
		techniques, and tools for monitoring events in compu	ter system or								
		network, with the objective of preventing and detect	ing unwanted								
		process activity and recovering from malicious behavior.									
	G		11 /								
6	Course	On successful completion of this module students will be	able to:								
	Outcomes	COI: illustrate in-depth introduction to the Science and Art of Intrusion									
		Detection and Prevention									
		CO2: demonstrate the skill to learn Unauthorized Activity									
		CO3: demonstrate the skill to capture and analyze network	k packets and								
		detection methods									
		CO4: analyze and apply various architecture									
		CO5: analyze apply IDS, IPS Internals & Snort rules, output	its, and plug-								
		ins to detect unauthorized activity	•. • •								
		CO6: apply and analyze different tools related to traffic m	ionitoring and								
_	9	analysis, snort, architecture, IDS, IPS Internals									
	Course	This course introduces intrusion detection and prevention,	, which is one								
	Description	of the most essential concepts in looking at how threats ar	id attacks are								
	<u> </u>	detected and mitigated.									
8	Outline syllabu	18	CO								
	** * 4		Mapping								
	Unit 1	Introduction									
	Δ	Intrusion Detection basics of Intrusion Detection and	CO1								
	A	Intrusion Detection, basics of Intrusion Detection and Intrusion Provention, Intrusion Detection system (IDS) and	COI								
		its types Intrusion Prevention System (IDS) and									
		Importance									
	В	IDS and IPS Analysis Schemes: The Anatomy of Intrusion	CO1								
		Analysis, Misuse detection, anomaly detection, specification-									
		based detection, hybrid detection; Example IDS Rules;									
		IDS/IPS Pros and Cons; Myths									
	С	Attacks: DDos attacks, TCP reset attack, malformed DNS CO1									
		attack									
	Unit 2	Unauthorized Activity									



	А	Limitations of	IDS Network F	Protocol Abuses: ARP Abuses	CO2 CO6				
		IP Abuses, UD	P Abuses, TCP	Abuses, ICMP Abuses	002,000				
·	В	Pros and Cons	of Open Source	e, Types of Exploits	CO2, CO6				
·	С	Commonly Ex	ploited Program	as and Protocols, Viruses and	CO2, CO6				
		Worms							
	Unit 3	Traffic monit	oring & analysi	is					
	А	Tcpdump Com	mand Line, Tcp	odump Output Format,	CO3, CO6				
		Tepdump Expr	Ccpdump Expressions, Bulk Capture, Bytes Transferred in						
		Connection							
	В	Tepdump as In	trusion Detection	on, Tcpslice, Tcpflow, and	CO3, CO6				
		Tcpjoin, forma	its of tepdump fi	ilters, bit masking					
	0		· · · ·	1 1 1 1 1 01					
	C	Packet capturi	ng using wiresna	ark, wiresnark display filters,	003, 006				
	Unit 4	Architecture	backet capturing	, protocol analysis					
	0 IIII 4	Tioned Archite	ature of IDC on	IDS. Single Tiered					
	A	Architocture	Aulti Tiorod Ar	hitactura Paar to Paar	004,006				
		Architecture	Autor Alternation	lintecture, reer-to-reer					
	B	Sensors: Senso	r Functions Ne	twork-Based Sensors Host-	CO4 CO6				
	D	Based Sensors	Sensor Deploy	ment Considerations. Sensor	004,000				
		Security Consi	derations.						
·	С	Agents: Agent	Agents: Agent Functions, Agent Deployment Considerations.						
		Agent Security	Considerations	; Manager Component:	,				
		Manager Func	tions, Manager I	Deployment Considerations,					
		Manager Secur	rity Consideration	ons					
	Unit 5	IDS, IPS Inter	rnals & Snort						
	А	Information Fl	ow in IDS and I	PS, Detection of Exploits	CO5, CO6				
	В	Malicious Cod	e Detection, Ou	tput Routines, Defending	CO5, CO6				
		IDS/IPS							
	С	Snort: configur	ration of snort, f	low process of snort, Model of	CO5, CO6				
		operation sniff	er, logger, NIDS	S, Writing snort rules, writing a					
	Mada af	rule for vulner	$\frac{ability}{2}$						
	Mode of	I neory/Jury/I	Practical/ viva						
	examination			EME					
	Weightage	CA	MTE	EIE					
	Distribution	25%	25%	50%					
	Text book/s*	2.Intrusion D							
		Eugene Sc							
		Profession							
	Other	3. Metasploit							
	References	Kennedy, J							
		Aharoni							
		4. Internet as	a Resource for	Reference.					



<u>CO a</u>	nd PO Mapping	
S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: illustrate in-depth introduction to the Science and	PO1,PO2, PO5,
	Art of Intrusion Detection and Prevention	PO8,PO12,PSO3
2.	CO2: demonstrate the skill to learn Unauthorized Activity	PO1, PO2, PO3, PSO3
3.	CO3: demonstrate the skill to capture and analyze	PO1, PO2, PO3, PO5, PO9,
	network packets and detection methods	PO12, PSO1
4.	CO4: analyze and apply various architecture	PO1, PO2, PO4, PO5, PO6,
		PO8, PSO2
5.	CO5: analyze apply IDS, IPS Internals & Snort rules,	PO1, PO2,
	outputs, and plug-ins to detect unauthorized activity	PO3,PO8,PO9,PSO2,
6.	CO6: apply and analyze different tools related to traffic	PO1, PO2, PO4, PO5,
	monitoring and analysis, snort, architecture, IDS, IPS	PO6,PO7,PO10,PO11,PSO
	Internals	1

# PO and PSO mapping with level of strength for Course Name Intrusion detection and prevention system (CSC303)

Course Code	CO's	P O	PO 2	P O	PS O	PS O2	P S									
Course Name		1	-	3	4	5	6	7	8	9	1 0	1 1	1 2	1	02	0 3
CSC303_I	CO1	3	3	-	-	2	-	-	3	-	-	3	-	-	3	3
ntrusion	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
and	CO3	3	3	2	-	2	-	-	-	2	-	2	3	-	-	3
prevention	CO4	3	3	-	3	2	3	-	2	-	-	-	-	3	-	3
system	CO5	3	2	3	-	-	-	-	3	3	-	-	-	3	-	3
	CO6	3	3	-	3	3	3	3	-	-	3	-	3	-	-	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	Р О 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P 0 1 0	P 0 1 1	P O 1 2	PS O1	PS O2	PS O3
CSC30 3	Intrusion detection and prevention system	3	2. 7	1. 1	1	1. 5	1	.5	1. 3	.8	.5	.5	.8	1	1	1

### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Prog	gram:	B. Tech								
Bra	nch:	Computer Science & Engineering with Specialization i Security and Forensics	n Cyber							
1	Course Code									
2	Course Title	Intrusion Detection and Prevention System Lab								
3	Credits	1								
4	Contact	0-0-2								
	Hours									
	(L-T-P)									
	Course	Core								
	Status									
5 Course The objective of this course is to provide an in depth introduct										
	Objective intrusion detection and prevention. The course covers methodolo									
		techniques, and tools for monitoring events in compu	ter system or							
		network, with the objective of preventing and detect	ing unwanted							
	process activity and recovering from malicious behavior.									
6	Course	On suggestive completion of this module students will be	ablata							
0	Outcomos	TO1: illustrate and able to perform scenning using nman								
	Outcomes	CO1. musuale and able to perform scanning using ninap.								
		CO2: analyze packet and detection methods	x packets							
		CO4: analyze and apply Sport rules outputs and plug-ins	to detect							
		unauthorized activity	to detect							
		CO5: apply different protocol analyzers tools								
		CO6: apply different tools related to traffic monitoring, sn	ort, toolkits							
7	Course	This course introduces intrusion detection and prevention.	which is one							
	Description	of the most essential concepts in looking at how threats an	d attacks are							
		detected and mitigated.								
8	Outline syllabu	15	CO							
			Mapping							
	Unit 1	nmap								
	•	Defense an anne dia anti-	CO1							
	A	Periorina an experiment to demonstrate								
	B	1. Download and install nmap.	<u>COI</u>							
	C	2. Use innap with university options to scall open ports.	COI							
		of the port scan, etc. using pmgp								
		uup port scan, etc. using innap								
	Unit 2	Traffic monitoring								



	1. Performa a	CO2, CO6							
	perform bina	y packet captu	re, formats of tcpdump						
	filters, bit ma	sking using ter	odump						
	,		L						
	2. Performa a								
	for router traf								
	- Download	l and install wi	reshark network analyzer						
	- Download	aliyo notwork	doto						
	- Capturing	g live network	uala						
	- Open, sav	e and merge C	Lapture Files						
	- Working	with captured j	packets						
Unit 3	Packets Ana	lveis							
Chit 5	Performa an e	ysis experiment to (	lemonstrate	CO3					
	1 Exominatio	n of fields in 7	CDahaakauma normal and	003					
			CPChecksums, normal and						
	abnormal tcp	stimulus and r	esponse						
	2. Detection i	nethods for ap	plication protocols, pattern						
	matching, pro	otocol decode a	and anomaly detection 3.						
	Sample attack	ks http, malfor	med dns, DDos, tcp reset						
	attacks								
Unit 4	<b>Open source</b>								
	Performa an e	Performa an experiment to demonstrate							
	1. Installing S								
	2. Configurin	g and Starting	the Snort IDS.						
	3. Defines Sn	ort rules to det	ect the intrusions.						
	4 Write and	Add Snort Ru	le						
	5 Triggering	an Alert for th	e New Rule						
Unit 5	A polyet tool								
Unit 5	Derforme en	Mu An animant to a	lamonstrata	CO5 CO6					
				005,000					
	1.1CP/UDP		ising ngrep, tepnow, netcat.						
	2. Create, rea	id/write, alter a	and send packets using jpcap						
	3. launch arp	poisining, ans	poisioning attacks using						
	јрсар								
Mode of	Jury/Practical	/Viva							
 examination			1						
Weightage	CA	MTE	ETE						
Distribution	25%	25%	50%						
Text book/s*	3.Intrusion E								
	Eugene Sc								
	Profession								
Other	5. Metasploit								
References	Kennedv.								
	Aharoni								
	6 Internet as	Allalulli 6 Internet as a Resource for Reference							
	5. monther de	a 10000100 101		1					



CO ai	nd PO Mapping	
S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: illustrate and able to perform scanning using nmap.	PO1, PO2, PO3, PO4,
		PO5, PO6, PO7, PO8,
		PSO
2.	CO2: demonstrate the skill to capture and analyze	PO1, PO2, PO4, PO5,
	network packets	PSO
3.	CO3: analyze packet and detection methods	PO1, PO2, PO4, PO5,
		PSO
4.	CO4: analyze and apply Snort rules, outputs, and plug-	PO1, PO2, PO3, PO4,
	ins to detect unauthorized activity	PO5, PO6, PO7, PO8,
		PSO
5.	CO5: apply different protocol analyzers tools	PO1, PO2, PO4, PO5,
		PSO
6.	CO6: apply different tools related to traffic monitoring,	PO1, PO2, PO3, PO4,
	snort, toolkits	PO5, PO6, PO7, PO8,
		PSO

## PO and PSO mapping with level of strength for Course Name Intrusion detection and prevention System Lab (CCP303)

Course Code_ Course Name	CO's	P 0 1	PO 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	P 0 1	P O 1 2	PS O 1	PS O2	P S O 3
	CO1	3	3	-	-	2	-	-	3	-	-	3	-	-	3	3
CCP303 I	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
ntrusion	CO3	3	3	2	-	2	-	-	-	2	-	2	3	-	-	3
detection	CO4	3	3	-	3	2	3	-	2	-	-	-	-	3	-	3
and prevention Lab	CO5	3	2	3	-	-	-	-	3	3	-	-	-	3	-	3
	CO6	3	3	-	3	3	3	3	-	-	3	-	3	-	-	3

### Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	Р О 1	P O 2	P O 3	P 0 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	P 0 1 1	P O 1 2	PS O1	PS O2	PS O3
CCP3 03	Intrusion detection and prevention System Lab	3	2. 7	1. 1	1	1. 5	1	.5	1. 3	.8	.5	.5	.8	1	1	1

### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Schoo	ol:	School of Engineering & Technology							
Depar	tment	Computer S	Science & Er	ngineering					
Progra	am:	B.Tech							
Branc	h:	Computer Science & Engineering with Specialization in Cyber Security and Forensics							
1	Course Code	CSC401	2SC401						
2	Course Title	Introduction	ntroduction to IoT and Its Security						
3	Credits	3							
4	Contact Hours (L-T-P)	3-0-0							
	Course Status	CORE							
5	Course Objective	Provide the techniques digital fore	e students and enhance nsics.	with practice on their skills regardi	applyin ng prac	ng digital forensics stical applications of			
6	Course Outcomes	• On to:- CO1: Apply CO2: Identi CO3: Apply CO4: Exam CO5: Exam CO6: Analy	<ul> <li>On successful completion of this module students will be able to:-</li> <li>CO1: Apply the concepts of IOT</li> <li>CO2: Identify the different technology.</li> <li>CO3: Apply IOT to different applications.</li> <li>CO4: Examine and evaluate hardware aspect of security in IOT.</li> <li>CO5: Examine and evaluate software aspect of security in IOT</li> <li>CO6: Analysis and evaluate the data received through sensors in IOT</li> </ul>						
7	Course Description	This course introduces students to basics of Digital Forensics. Make them apply appropriate skills and knowledge in solving computer forensics problems.							
8	Outline syllabu	18				CO Mapping			



Unit 1	OVERVIEW	
A	IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	CO1
В	M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management,	CO1, CO2
С	Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management	CO1, CO2,CO4
Unit 2	REFERENCE ARCHITECTURE	
Α	IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model	CO1, CO2
В	IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	CO1, CO2
С	Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.	CO1, CO2,CO5,CO6
Unit 3	Conceptualizing the Secure Internet of Things	
А	The BadUSB Thumb Drive, Air-Gap Security, Stuxnet,	CO1,CO2,CO3
CRepresentationBM2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management,CBusiness processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge ManagementUnit 2REFERENCE ARCHITECTUREAIoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference ModelBIoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.CReal-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.Unit 3Conceptualizing the Secure Internet of ThingsAThe BadUSB Thumb Drive, Air-Gap Security, Stuxnet,BDesigning Safe and Secure Cyber-Physical Systems	CO1,CO2,CO3	



С	Constrained Co Trusted IoT Ne	omputing and tworks and th	Moore's Law, he Network Edge	CO1,CO2,CO3			
Unit 4	Base Platform S Blocks	Security Hard	ware Building				
А	Background ar	nd Terminolo	gy	CO2,CO3,CO4			
В	Identity Crisis, Protection,	Device Boot	Integrity, Data	CO3,CO4			
С	RunTime Prote	ction, Threat	Mitigated	CO2, CO4,CO5			
Unit 5	IOT Software S	Security Build	ling Blocks				
А	Operating Syste Virtualization	CO2,CO5,					
В	Software separa stack and secur Management	Software separation and containment, Network stack and security management, Device Management					
С	System Firmwa Services, Appli Message Orche	ure and Root of cation level la stration	of Trust Update anguage Framework,	CO4,CO5,CO6			
Mode of examination	Theory						
Weightage Distribution	СА	MTE	ETE				
	25%	25%	50%				
Text book/s*	Sunil Cheruvu, M. Wheeler "D Security"						
Other References	1. Maciej Things	<ol> <li>Maciej Kranz, Building the Internet of Things - Comprehensive, Business</li> </ol>					



2.	Focused, Well-articulated coverage of IoT, WILEY Brian Russell and Drew Van Duren, Practical Internet of Things Security, PACKT	
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S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Apply the concepts of IOT	PO1, PO2, PO5, PO8, PO12, PSO3
2.	CO2: Identify the different technology.	PO1, PO2, PO3, PSO3
3.	CO3: Apply IOT to different applications.	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: Examine and evaluate hardware aspect of security in IOT.	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: Examine and evaluate software aspect of security in IOT	PO1, PO2, PO3, PO8, PO9, PSO2,
6.	CO6: Analysis and evaluate the data received through sensors in IOT	PO1, PO2, PO4, PO5, PO6, PO7, PO10, PO11, PSO1



PO and PSO mapping with level of strength for Course Name Introduction to IoT and Its Security (CSC401)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
Introduction to IoT and its security (CSC401)	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
	CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	P O 3	Р О 4	P O 5	Р О 6	Р О 7	P O 8	Р О 9	Р О 10	Р О 11	P O 12	PS O 1	PSO 2	PS O 3
CSC40 1	Introductio n to IoT and its security	3	2.7	2. 3	3	2. 2	3	3	2. 6	2. 5	3	3	2. 5	2	2	2

Strength of Correlation

1. Addressed toSlight (Low=1) extent

- 2. Addressed toModerate (Medium=2) extent
- 3. Addressed toSubstantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & I	Engineering							
Pro	gram:	B. Tech								
Bra	nch:	<b>CSE</b> with Specialization	on in Cyber Security & Fo	orensics ir	association					
		with Microsoft								
1	Course Code	Machine Le	arning							
2	Course Title	Machine Learning								
3	Credits									
4	Contact	2	0	0						
	Hours									
	(L-T-P)									
	Course	Core								
	Status									
5	Course	Students are Expected to lear	rn and develop Comprehensive	e Understar	nding of the of					
	Objective	the following Concepts and	Techniques:							
	U	1. To introduce the ideas of learning rule and implement them based on human								
		2. To conceptualize the w	experience. 2 To concentualize the working of human brain using SVM DE and ANN							
		3. To become familiar wi	<ol> <li>To conceptualize the working of numari orall using S vin, KF and AINN.</li> <li>To become familiar with decision boundaries that can learn from available</li> </ol>							
		examples and generalize to form appropriate learning rules for inference								
		systems.								
		4. To provide the mathematical background for SVM, RF and Neural Network								
		5. To understand and demonstrate how to solve patterns learning from a large								
		series of data using computer based learning algorithms								
6	Course	A Successful completion of	this Course Ensures the follow	ving Outcon	nes					
	Outcomes	CO1 : Define basics of M	achine Learning and stochastic	c concepts.	. da					
		CO2 : Identify and Comp CO3 : Classify and Compa	are existing models to underst	and the app	licability in					
		solve real world societal pro	blems.							
		CO-4 : Identify develop an	d apply mathematical models	to find sust	tainable					
		solutions.	d		l					
		<b>CO-5</b> : Analyse and Apply	the unsupervised learning and	model eva	luation in real					
		<b>CO-6</b> :Discuss the applica	bility of Machine learning	Approaches	to develop					
		sustainable solutions using p	rofessional ethics.	11	Ĩ					
7	Course	This course introduces comp	putational learning paradigm f	for critical a	& implementable					
	Description	understanding for supervised	l and unsupervised learning ba	sed probler	n areas.					
8					CO Mapping					
	Unit 1	Core Concepts of Machine	Learning							
	А	What is Machine Learning?		. 0.771						
		MI Mindset Introduction	be tackled using machine learing	Problem	CO1					
		Framing(Common ML Prob	lems, ML Use Cases, Identify	ing Good	001					
		Problems for ML, Hard ML	Problems).	0						
	В	Machine Learning Appli	cations(Image Recognition,	Speech						
		Recognition, Medical Diag	nosis, Statistical Arbitrage,	Learning						
		Associations), Learning Stag	ges(Features, Labels, Hyperpa	vnothesis	CO1, CO2					
		Tests).	Samples, Loss Function, H	ypomesis						



C	Learning Scenarios( Supervised learning, Unsupervised learning, Semi-Supervised learning, Transductive inference, On-line learning, Reinforcement learning, Active learning), Generalization Supervised Learning, Unsupervised Learning, Reinforcement learning).	CO1, CO2
 Unit 2	Data Preprocessing	
A	Data Preparation and Feature Engineering in ML(Data and Features, Information, Knowledge, Data Types, Big Data), Data Preprocessing: An Overview(Data Quality: Why Preprocess the Data?, Major Tasks in Data Preprocessing), Data Cleaning(Missing Values, Noisy Data, Data Cleaning as a Process),	CO2, CO6
В	CO2, CO6	
C	Data Transformation and Data Discretization(Overview of Data Transformation Strategies, Data Transformation by Normalization, Discretization by Binning, Discretization by Histogram Analysis, Discretization by Cluster, Decision Tree, and Correlation Analyses, Concept Hierarchy Generation for Nominal Data).	CO2, CO6
Unit 3	Supervised Learning Algorithms - Part One	
A	How Supervised Learning Algorithms Work ? Steps (Bias-variance trade off, Function complexity and amount of training data, Dimensionality of the input space, Noise in the output values, Algorithms, Other factors to consider (Heterogeneity of the data, Redundancy in the data).	CO1, CO3, CO6
В	Linear Regression Model Representation, Linear Regression Learning the Model (Simple Linear Regression, Ordinary Least Squares, Gradient Descent), Regularization / Shrinkage Methods ( Bias-variance trade-off, Overfitting Issues, Lasso Regression, Ridge Regression), Making Predictions with Linear Regression(Cost Function, Feature Scaling, Normalization, Mean Normalization, Learning Rate, Automatic Convergence Test)	CO1, CO3, CO6
C	Logistic Regression, The Logistic Model (Latent variable interpretation, Logistic function, odds, odds ratio, and logit, Definition of the logistic function, Definition of the inverse of the logistic function, Interpretation of these terms, Definition of the odds, The odds ratio, Multiple explanatory variables), Model fitting ("Rule of ten", Iteratively reweighted least squares (IRLS), Evaluating goodness of fit, Limitations of Logistic Regression).	CO1, CO3, CO6
Unit 4	Supervised Learning Algorithms - Part Two	
A	Support Vector Machines, Linear SVM (Hard-margin, Soft-margin), Nonlinear Classification, Computing the SVM classifier(Primal, Dual, Kernel trick), Modern methods(Sub-gradient descent, Coordinate descent), Empirical risk minimization(Risk minimization, Regularization and stability, SVM and the hinge loss, Target functions), Properties(Parameter selection, Issues)	CO1,CO3,CO4 , CO6
В	Introduction to Artificial Neural Networks (Feed-forward Network Functions, Weight-space symmetries), Network Training ( Parameter optimization, Local quadratic approximation, Use of gradient information, Gradient descent optimization), Error Backpropagation(Evaluation of error-function derivatives, Simple examples, Efficiency of backpropagation)	CO1,CO3,CO4 , CO6
C	Decision Tree Learning (Decision tree representation, ID3 learning algorithm, Entropy, Information gain, Overfitting and Evaluation, Overfitting, Validation Methods, Avoiding Overfitting in Decision	CO1,CO3,CO4 , CO6



		Trees, Minimu Random Forests	m-Description L s Algorithm ( Pre	ength Methods, Noise in Data), eliminaries: decision tree learning,					
		Bagging, From	bagging to rando	m forests, Extra Trees, Properties,					
	Unit 5	Unsupervised I	earning & Mod	el Evaluation					
		Unsupervised	Learning & Wh	at is Unsupervised Learning?					
	A	Clustering Meth	Learning ( Will	at is Ulisupervised Learning?), ed on Euclidean Distance Method					
		Based on Proba	bilities Hierarch	ical Clustering Methods Method	CO5, CO6				
		Based on Euclid	lean Distance )	ieur erustering methous, methou					
	В	k-means Cluster	ing Algorithm ( S	tandard algorithm (naive k-means),	CO5, CO6				
		Initialization me	ethods), Applicat	ions (Vector quantization, Cluster					
		analysis, Feature	e learning).						
	C	Model Evaluation	on (ML Model V	alidation by Humans, Holdout Set	CO5, CO6				
		Validation Met	hod, Cross-Valid	ation Method for Models, Leave-					
		One-Out Cross-	and Test Method. Bootstrapping ML Validation Method. Running						
		AI Model Simu							
		Curve							
	Weightage	CA	MTE	ETE					
	Distribution	25%	25%	50%					
	Text book/s*	1. Bishop, C.	(2006). Pattern F	Recognition and Machine Learning.					
		Berlin: Sp	ringer-Verlag.						
		2. Foundation	ns of Machine Le	arning, Second Edition					
		By Mehry	arMohri, AfshinR	ostamizadeh and AmeetTalwalkar,					
		MIT Press	, Second Edition,	2018.					
		3. Introductio	The MIT	Broggmithroog mit adu hashe					
		introductio	n-machine-learni	i					
1	Other	1) Baldi.	P. and Brunak. S.	(2002). Bioinformatics: A					
	References	Machir	ne Learning Appr	oach. Cambridge, MA: MIT Press.					
	References	2) Russel,	S. and Norvig, P	. (2003). Artifiical Intelligence: A					
		Moder	n Approach. 2ndE	Edition. New York: Prentice-Hall.					
		3) Cohen,	P.R. (1995) <u>Emp</u>	birical Methods in Artificial					
		Intellig	ence. Cambridge	, MA: MIT Press.					
		4) https://	www.toptal.com/	machine-learning/ensemble-					

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1 : Define basics of Machine Learning and stochastic	PO1,PO2,PO3,PO4,
	concepts.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
2.	CO2 : Identify and Compare different type of preprocessing	PO1,PO2,PO3,PO4,
	methods	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
3.	CO 3 : Classify and Compare existing models to understand the	PO1,PO2,PO3,PO4,
	applicability in solve real world societal problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
4.	CO-4: Identify develop and apply mathematical models to find	PO1,PO2,PO3,PO4,
	sustainable solutions.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
5.	CO-5 : Analyse and Apply the unsupervised learning and feature	PO1,PO2,PO3,PO4,
	engineering in real life problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3



6.	<b>CO-6</b> :Discuss the applicability of Machine learning Approaches to	PO1,PO2,PO3,PO4,
	develop sustainable solutions using professional ethics.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3

## PO and PSO mapping with level of strength for Course Name Machine Learning (Course Code )

Subject	PO's / PSO's	P 0 1	P 0 2	P 0 3	P 0 4	P O 5	P 0 6	P 0 7	P 0 8	P 0 9	P 0 10	P 0 11	P 0 12	PS O 1	PS 0 2	PS 0 3
Machine Learning	CO1	3	3	3	3	3	3	2	1	1	3	1	3	2	2	1
(Course Code )	CO2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
,	CO3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
	CO4	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
	CO5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS 0 3
	Machine Learning	3.00	3.00	3.00	3.00	3.00	3.00	2.83	2.00	2.00	3.00	2.67	3.00	2.83	2.83	2.67

### *Total- 41.83 Strength of Correlation*

- 1. Addressed to *Slight (Low=1) extent* 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



Scho	ol: SET	Batch: 2022								
Prog	ram: B.Tech.	Current Academic Year: 2022-2022								
Brar	nch: CSE/IT	Semester: IV								
1	Course Code									
2	<b>Course Title</b>	Machine Learning Lab								
3	Credits	1								
4	<b>Contact Hours</b>	0-0-2								
	(L-T-P)									
	Course Status	Core								
5	Course	1. Learn the basic concepts of Machine Learning algorithm	s.							
	Objective	2. Make use of Data sets in implementing the machine learning	g algorithms.							
		3. Implement the machine learning concepts and algorithms	in any suitable							
		language of choice.								
6	Course	CO 1: Show the implementation of linear and logistic Regress	ion on real life							
	Outcomes	applications.								
		CO-2: Interpretation of existing models to understand the solutio	n environment.							
		CO-3: Application of existing mathematical solutions to test real	world problems.							
		CO-4 : Build the understanding of learning theory to glance the u	pcoming world							
		through it.								
		CO-5: Analyse the logical ability to apply clustering approach to	extract							
		CO 6. Approximation reaching in machine learning and application								
7	Course	CO-0. Appraise recent trends in machine learning and apprication	asl &							
/	Description	implementable understanding for supervised and unsupervised la	arning based							
	Description	problem areas	aming based							
8	Outline syllabus	problem areas.	CO Mapping							
0	Unit 1	Core Concents of Machine Learning	CO Mapping							
		Write a Program to load and view data set file	CO1							
		Write a program to implement simple linear regression using	CO1 CO2							
		housing price prediction problem.	001,002							
		Write a program to implement binary logistic regression using	CO1. CO2							
		cancer identification problem.	,							
	Unit 2	Data Preprocessing								
		Write a Program to perform data cleaning.	CO1, CO2,							
			CO6							
		Write a Program to perform Data Integration.	CO1, CO2,							
			CO6							
		Write a Program to perform Data Reduction.	CO1, CO2, ,							
			CO6							
		Write a Program to perform Data Transformation and Data	CO1, CO2,							
		Discretization.	CO6							
	Unit 3	Supervised Learning Algorithms - Part One	G01 G02 G0							
		Write a program to implement gradient descent method for	C01,C02,C0							
	<u> </u>	Write a program to implement recularized linear recursion	3, 000							
		write a program to implement regularized linear regression.	C01, C02, C0							
		Write a program to implement regularized logistic regression	3,000							
		write a program to implement regularized logistic regression. (COI)								
		Write a program to Normalize the data used in linear	CO1.CO2.CO							
		regression problem above before predicting prices, and then	3. CO6							
		predict the housing prices.	5,000							



Unit 4	Supervised Le									
	Write a prog	ram to implem	ent Support Vector Machine	CO2.CO3.CO						
	regression usir	g suitable datase	et.	4, CO6						
	Build an Artifi	cial Neural Netw	vork by implementing the Back-							
	propagation al	gorithm and test	the same using appropriate data	02,003,00						
	sets.	0		4, CO6						
	Write a program	e a program to demonstrate the working of the decision tree								
	based ID3 alg	orithm. Use an a	appropriate data set for building							
	the decision tr	ee and apply this	is knowledge to classify a new							
	sample.									
	Write a progra	am to demonstra	te the working of the Random							
	Forest algorith	m. Use an appro	opriate data set for classifying a							
	new sample.									
Unit 5	Unsupervised	Learning & Mo	odel Evaluation							
	Write a progra	m to implement of	data split into training and	CO2,CO5,CO						
	testing data.			6						
	Write a progra	am to implement	t K-Means clustering algorithm							
	using an appro	priate dataset.								
	Write a progra	am to implement	t K-Means clustering algorithm	CO3,CO5,CO						
	using an appro	priate dataset.		6						
	Write a progra	m to implement of	data cross validation	CO4,CO5,CO						
				6						
Mode of	Practical									
examination										
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	1. Bishop	p, C. (2006). Patt	ern Recognition and Machine							
	Learni	ng. Berlin: Sprin	ger-Verlag.							
	2. Found	ations of Machin	e Learning, Second Edition By							
	Mehry	ar Mohri, Afshin	Rostamizadeh and Ameet							
	Talwa	lkar, MIT Press,	Second Edition, 2018.							
	3. Introdu	uction to Machin	e Learning, Third Edition, By							
	Ethem	Alpaydin, The M	IIT Pressmitpress.mit.edu >							
	books									
Other	1) Baldi, P. and	1) Baldi, P. and Brunak, S. (2002). Bioinformatics: A Machine								
References	Learning Appr									
	2) Russel, S. a									
	Modern Appro									
	3) Cohen, P.R.	(1995) Empirica	al Methods in Artificial							
	Intelligence. C	ambridge, MA: N	MIT Press.							
	4) https://www	.toptal.com/mac	hine-learning/ensemble-							
	methods-mach	ine-learning.								

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO 1 : Show the implementation of linear and logistic	PO1,PO2,PO3,PO4,
	Regression on real life applications.	PO5,PO6,PO7,PO8,
		PO9,PO10,
		PSO1,PSO2,PSO3
2.	CO-2 : Interpretation of existing models to understand the	PO1,PO2,PO3,PO4,
	solution environment.	PO5,PO6,PO7,PO8,



		PO9,PO10,
		PSO1,PSO2,PSO3
3.	CO-3 : Application of existing mathematical solutions to test	PO1,PO2,PO3,PO4,
	real world problems.	PO5,PO6,PO7,PO8,
		PO9,PO10,
		PSO1,PSO2,PSO3
4.	CO-4 : Build the understanding of learning theory to glance the	PO1,PO2,PO3,PO4,
	upcoming world	PO5,PO6,PO7,PO8,
		PO9,PO10,
		PSO1,PSO2,PSO3
5.	CO-5 : Analyse the logical ability to apply clustering approach	PO1,PO2,PO3,PO4,
	to extract hierarchical patterns existing in real life problems.	PO5,PO6,PO7,PO8,
		PO9,PO10,
		PSO1,PSO2,PSO3
6.	CO-6: Appraise recent trends in machine learning and	PO1,PO2,PO3,PO4,
	applications	PO5,PO6,PO7,PO8,
		PO9,PO10,
		PSO1,PSO2,PSO3

PO and PSO mapping with level of strength for Course Name Machine Learning Lab (Course Code )

Subjec t	PO's / PSO' s	Р О 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	Р О 11	P O 12	PS O 1	PS O 2	PS O 3
Machin	CO1	3	3	3	3	3	3	2	1	1	3	1	3	2	2	1
e Learnin	CO2	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
g	CO3	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
(Cours	CO4	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
e Code	CO5	3	3	3	3	3	3	3	2	2	3	3	3	3	3	3
,	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Cour	Cours	Р		Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
se	e	0	PO	0	0	0	0	0	0	0	0	0	0	Ο	Ο	0
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
	Machi															
	ne															
	Learni	3.0	3.0	3.0	3.0	3.0	3.0	2.8	2.0	2.0	3.0	2.6	3.0	2.8	2.8	2.6
	ng	0	0	0	0	0	0	3	0	0	0	7	0	3	3	7

Total- 41.83 Strength of Correlation

1. Addressed to Slight (Low=1) extent
2. Addressed to Moderate (Medium=2) extent
3. Addressed to Substantial (High=3) extent



Scho	ool:	School of Eng	ineering & Teo	chnology		
Dep	artment	Computer Sci	ence & Engine	ering		
Prog	gram:	B.Tech	U			
Bran	ich:	Computer Sc	ience & Engi	neering with Speci	alization	in Cyber Security
		and Forensic	s			
1	Course Code	CSC	5			
2	Course Title	Open source 7	Cools for Cyber	· Security & Forensi	~c	
3	Credits	3		becunty & Forensi	65	
4	Contact Hours	2-0-2				
-	(I -T-P)	2-0-2				
	Course Status					
5	Course					
5	Objective	to explore the	needs and effe	ects of Open source t	tools cont	rols.
6	Course	CO1: Analyze	the emergence	e of Open source cor	ncept	
	Outcomes	CO2: Explain	various feature	es of open source nee	ed for cyb	per security.
		CO3: Illustrate	e restrictions th	hat arise due to licens	sing of so	ftware.
		CO4: Underst	and vital laws	related to open sourc	æ.	
		CO5: Demons	trate the skills	of licensing and pate	ents.	
		CO6: Identify	and use open s	source cyber tools fo	r security	and audits.
7	Course	The course wi	ll inculcate the	skills of Open Source	ce Tools	that makes cyber
	Description	security a viab	ole domain in i	ndustry.		
8	Outline syllabus	8				CO Mapping
	Unit 1	Introduction				
	А	Background o	f open source t	ool		CO1
	В	Need of Open	source tools			CO1, CO2
	С	Open source p	aradigm			CO1, CO2,CO4
	Unit 2	Open source p	latform for pro	ogramming		
	А	Introduction to	Open source	operating System		CO1, CO2
	В	Understanding	g architecture o	f LINUX		CO1, CO2
	С	Directories of	LINUX			CO1, CO2,CO5,CO6
	Unit 3	Licensing				
	А	Licensing, Ty	pes of licensing	5		C01,C02,C03
	В	Intellectual Pr	oprietary Righ	t		CO1,CO2,CO3
	С	Commercial L	icense versus	Open Source License	e	C01,C02,C03
	Unit 4	Open Source I	Licensing			
	Α	Contract, and	Copyright Law	-Basic Principles of	f	CO2 CO3 CO4
		Copyright Lav	V			02,003,004
	В	Contract and C	Copyright, Ope	en Source Software		CO3 CO4
		Licensing, Ty	pes of OSS lice	enses		005,004
	С	OSS licensing	strategies, Issu	ues with Copyrights	and	CO2 CO4 CO5
		Patents, Warra	inties			002, 004,005
	Unit 5	Open Source t	ools for Pre-m	ortem and Post-mort	em	
		Cyber operation	ons			
	А	Windows O.S	Supported Too	ols		CO2,CO5,
	В	Linux Support	ed Tools			CO3,CO5,CO6
	С	MAC Support	ed Tools			CO4,CO5,CO6
	Mode of	Theory				
	examination		1	I		
	Weightage	CA	MTE	ETE		
	Distribution	25%	25%	50%		
	Text book/s*	OccupyTheW	eb: Linux Basi	cs for Hackers		



Other	Tony Howlett : Open Source Security Tools: A Practical	
References	Guide to Security Applications	

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes
		(PSO)
1.	CO1: Analyze the emergence of Open source concept	PO1, PO2, PO5, PO8, PO12,
		PSO3
2.	CO2: Explain various features of open source need for cyber	PO1, PO2, PO3, PSO3
	security.	
3.	CO3: Illustrate restrictions that arises due to licensing of	PO1, PO2, PO3, PO5, PO9,
	software	PO12, PSO1
4.	CO4: Understand vital laws related to open source.	PO1, PO2, PO4, PO5, PO6,
		PO8, PSO2
5.	CO5 Demonstrate the skills of licensing and patents.	PO1, PO2, PO3, PO8, PO9,
		PSO2,
6.	CO6: Identify and use open source cyber tools for security	PO1, PO2, PO4, PO5, PO6,
	and audits.	PO7, PO10, PO11, PSO1

PO and PSO mapping with level of strength for Course Name Open source Tools for Cyber Security & Forensics

											Р	Р	Р			
Course Code_	CO'a	Р		Р	Р	Р	Р	Р	Р	Р	0	0	0	PS	PS	
Course Name	CO s	0	PO	0	0	0	0	0	0	0	1	1	1	0	0	
		1	2	3	4	5	6	7	8	9	0	1	2	1	2	PSO3
Open source		3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
Tools for Cyber	CO1															
Security &	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
Forensics	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	CO5	3	2	3	-	-	1	I	3	3	-	I	I	-	3	-
	CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

											Р	Р	Р			
Course	Course Name	Р	Р	Р	Р	Р	Р	Р	Р	Р	0	0	0	PS	PS	PS
Code	Course Maine	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CSC	Open source Tools for Cyber Security & Forensics	3	2. 7	2. 3	3	2 2	3	3	2. 6	2. 5	3	3	2. 5	2	2	2



Scho	ol:	School of Engineering & Technology								
Depa	rtment	Computer Science & Engineering								
Prog	ram:	B.Tech								
Bran	ch:	Computer Science & Engineering with Specializ Security and Forensics	ation in Cyber							
1	Course Code									
2	Course Title	Open source Tools for Cyber Security & Forensi	sics Lab							
3	Credits	1								
4	Contact Hours (L-T-P)	0-0-2								
	Course Status	core								
5	Course Objective	to explore the needs and effects of Open source tools controls.								
6	Course Outcomes	On successful completion of this module stu- to: CO1: Analyze the emergence of Open source con CO2: Explain various features of open source ne security. CO3: Illustrate the extent of PowerShell in winde CO4: Understand open source tool for wireless h CO5: Use concept of open source for preventive CO6: Identify and use open source cyber tools for audits	adents will be able ncept ed for cyber ows. acking. security measures. or security and							
7	Course Description	This course introduces ethical hacking concept a ethical hacking in network security.	nd application of							
8	Outline syllabus	•	CO Mapping							
	Unit 1	Introduction of Open-Source hacking platforms								
		Familiarizing to execution environment	CO1, CO2							



Unit 2	Linux Trave	ersing									
	Terminal Co interaction	ode execution	for repository		CO1, CO2						
	To study file terminal	es structure a	nd PowerShell		CO1, CO2,CO3						
Unit 3	Tools utility	Tools utility									
	PowerShell interaction i	CO1,CO2,CO3, CO5									
Unit 4	Pre-mortem	Pre-mortem									
	Perform wir platforms ar	CO2,CO3,CO4									
Unit 5	Post-Morter	n									
	Auditing for using open	r malware and source tools	l deleted file system	m	CO2,CO5,CO6						
Mode of examination	Jury/Practic	al/Viva									
Weightage Distribution	СА	MTE	ETE								
	25%										
Text book/s*	Occup Hacke										
Other References	Tony Tools Appl										



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Define the description of ethical Hacking	PO1,PO2, PO5, PO8,PO12,PSO3
2.	CO2: Illustrate Types of Ethical Hacking.	PO1, PO2, PO3, PSO3
3.	CO3: Explain about web and network hacking	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: Demonstrate report writing and Mitigation	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: Formulate the use of safe techniques on the World Wide Web	PO1, PO2, PO3,PO8,PO9,PSO2,
6.	CO6: Analyze various digital forensic problems	PO1, PO2, PO4, PO5, PO6,PO7,PO10,PO11,PSO1



Course Code_ Course Name	CO's															
		PO1	РО 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
		3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	CO1															
		3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	CO2															
		3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	CO3															
		3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	CO4															
		3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
	CO5															
Hacking Lab		3	3	_	3	3	3	3	_	-	3	3	-	3	-	-
	CO6															

PO and PSO mapping with level of strength for Course Name Open Source Tools for Cyber Security & Forensics Lab

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	Open source Tools for Cyber Security & Forensics Lab	3	2.7	1.1	1	1.5	1	.5	1.3	.8	.5	.5	.8	1	1	1

Strength of Correlation

- 1. Addressed toSlight (Low=1)extent 2. Addressed toModerate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



School	:	School of Engineering & Technology							
Depart	ment	Computer Science & Engineering							
Progra	m:	B. Tech							
Branch	1:	Computer Science & Engineering							
1	Course Code								
2	Course Title	Packet Analysis							
3	Credits	3							
4	Contact Hours (L-T-P)	3-0-0							
	Course Status	Elective							
5	Course Objective	To prepare student able to identify different applications of computer communications networks and understand the current state of the telecommunications industry while performing the packet and protocol analysis.							
6	Course Outcomes	On successful completion of this module students will be able to CO1: To understand security concepts, Ethics in Network Secur CO2: To comprehend and apply relevant protocol like SSL, SSI CO3: To identify network security threats. CO4: To be able to determine efforts to counter them. CO5: To solve real-word network problems using Wireshark. CO6: To understand Networks characteristics and components a analysis using tools i.e. pCap or TCP-Dump or Wireshark.	o: ity. H etc. and its						
7	Course DescriptionThis course is to provide students with an overview of the concepts and fundamentals of network security protocols and its analysis.								
8	Outline syllabus		CO Mapping						
	Unit 1	Introduction							



A	Network Forensics Investigative Methodology- Technical Fundamentals- Sources of Network-Based Evidence- On the Wire- In the Air- Switches - Routers- DHCP Servers- Name Servers- Authentication Servers.	CO1
В	Network Intrusion Detection /Prevention Systems- Firewalls- Web Proxies- Application Servers- Central Log Servers.	CO1
С	Evidence Acquisition: Physical Interception-Cables- Radio Frequency- Hubs- Switches- Traffic Acquisition Software- libpcap and WinPcap.	CO1
Unit 2	Packet Filtering	
A	The Berkeley Packet Filter (BPF) Language- tcpdump - Wireshark- tshark- dumpcap- Active Acquisition- Common Interfaces- Inspection Without Access- Strategy.	CO2
В	Traffic Analysis: Protocol Analysis- Protocol Analysis Tools- Protocol Analysis Techniques- Packet Analysis- Packet Analysis Tools- Packet Analysis Techniques- Flow Analysis- Flow Analysis Tools- Flow Analysis Techniques.	CO2, CO6
С	Higher-Layer Traffic Analysis- Common Higher-Layer Protocols- Higher-Layer Analysis Tools- Higher-Layer Analysis Technique with tools.	CO2, CO6
Unit 3	Packet Flow Analysis	
A	Statistical Flow Analysis- Process Overview- Sensors- Sensor Types- Sensor Software- Sensor Placement.	CO3
В	Flow Record Export Protocols- NetFlow- IPFIX- sFlow- Collection and Aggregation- Wireless Traffic Capture and Analysis- Spectrum Analysis.	CO3, CO6



С	Wireless Passive Evidence Acquisition- Common Attacks – Sniffing- Rogue Wireless Access Points- Evil Twin- WEP Cracking- Locating Wireless Devices	CO3, CO6
Unit 4	Network Based Packet Flow Analysis	
A	Network Devices- Intrusion Detection and Analysis: Typical NIDS/NIPS Functionality- Sniffing - Higher-Layer Protocol Awareness- Alerting on Suspicious Bits Modes of Detection.	CO4
В	Signature-Based Analysis- Protocol Awareness- Behavioral Analysis- Types of NIDS/NIPSs.	CO4
С	NIDS/NIPS Evidence Acquisition - Comprehensive Packet Logging - Event Log Aggregation- Correlation- and Analysis.	CO4
Unit 5	Packet Log Analysis	
A	Sources of Logs - Operating System Logs - Application Logs Physical Device Logs- Network Equipment Logs- Network Log Architecture- Three Types of Logging Architectures- Remote Logging: Common Pitfalls and Strategies.	CO5
В	Switches - Content-Addressable Memory Table- ARP- Switch Evidence- Routers-Types of Routers- Router Evidence- Firewalls -Types of Firewalls - Firewall Evidence.	CO5
C	Advanced Topics: Network Tunneling- Tunneling for Functionality- Inter-Switch Link (ISL) - Generic Routing Encapsulation (GRE). Tunneling for Confidentiality- Internet Protocol Security (IPsec) - Transport Layer Security (TLS) and Secure Socket Layer (SSL) - Covert Tunneling- Covert Tunneling Strategies - TCP Sequence Numbers - DNS Tunnels - ICMP Tunnels.	CO6
Mode of examination	Theory	



Weightage Distribution	СА	MTE		ETE					
	25%	25%		50%					
Text book/s*	1. Blachars Environ Wiresha Chris Sa	<ol> <li>Blacharski D., "Network Security in a Mixed Environment"Practical Packet Analysis: Using Wireshark to Solve Real-Word Network problems by Chris Sanders.</li> </ol>							
Other References	<ol> <li>"Charle Education.</li> <li>Stalling</li> <li>Garfink Security", O'</li> </ol>	<ol> <li>"Charles P. Pfleeger "Security in computing", Pearson Education.</li> <li>Stalling W., "Network Security Essentials", Pearson.</li> <li>Garfinkel S., Spafford G., "Practical Unix and Internet Security", O'Reilly.</li> </ol>							


S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)					
1.	CO1: To understand security concepts, Ethics in Network Security.	PO1,PO2, PO5, PO8,PO12,PSO3					
2.	CO2: To comprehend and apply relevant protocol like SSL, SSH etc.	PO1, PO2, PO3, PSO3					
3.	CO3: To identify network security threats.	PO1, PO2, PO3, PO5, PO9, PO12, PSO1					
4.	CO4: To be able to determine efforts to counter them.	PO1, PO2, PO4, PO5, PO6, PO8, PSO2					
5.	CO5: To solve real-word network problems using Wireshark.	PO1, PO2, PO3,PO8,PO9,PSO2,					
6.	CO6: To understand Networks characteristics and components and its analysis using tools i.e. pCap or TCP-Dump or Wireshark.	PO1, PO2, PO4, PO5, PO6,PO7,PO10,PO11,PSO1					

PO and PSO mapping with level of strength for Course Name -

Course Code_ Course Name	CO' s	PO 1	PO 2	P O 3	PO 4	P O 5	Р О 6	P O 7	P O 8	P O 9	Р О 10	P O 11	P O 12	PS O 1	PSO 2	PSO 3
	CO1	3	3	3	3	2	1	1	1	1	3	1	3	3	3	1
	CO2	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
	CO3	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
	CO4	3	3	3	3	3	2	2	1	2	3	3	3	3	3	3
Packet	CO5	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
Analysi s	CO6	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).



Course Code	Course Name	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	Packet Analysi s	3	2.7	2.3	3	2.2	3	3	2.6	2.5	3	3	2.5	2	2	2

Strength of Correlation 1. Addressed to Slight (Low=1) extent2. Addressed to Moderate(Medium=2) extent 3. Addressed to Substantial (High=3) extent2. Addressed to Moderate



School: SET		Batch: 2022					
Program: B.Tech.		Current Academic Year:					
Bra	nch: CSE	Semester:					
1	Course Code						
2	Course Title						
3	Credits						
4	Contact Hours (L-T-P)	0-0-2					
	Course Status	PE					
5	Course Objective	To prepare student able to identify different applications of computer communications networks and understand the current state of the telecommunications industry while performing the packet and protocol analysis.					
6	Course Outcomes	CO1: To understand security concepts, Ethics in Network S CO2: To comprehend and apply relevant protocol like SSL, CO3: To identify network security threats. CO4: To be able to determine efforts to counter them. CO5: To solve real-word network problems using Wireshar CO6: To understand Networks characteristics and compo analysis using tools i.e. pCap or TCP-Dump or Wireshark.	ecurity. SSH etc. k. nents and its				
7	Course Description	This course is to provide students with an overview of the fundamentals of network security protocols and its analysis	concepts and				
8	Outline syllab	pus	CO Mapping				



Unit 1	Introduction	
	Implement the following executing protocols of Internet in action using Wireshark Lab.	CO1
	Packet Capture and Observations using Packet Sniffer.	CO2
Unit 2	Packet Filtering	
	Explore various aspects of HTTP Protocol	CO2, CO3, CO4
	Tracing DNS with Wireshark.	
Unit 3	Packet Flow Analysis	
	Analysis and Obtain various parameters-Values for TCP Protocol in action	CO3, CO4
	Analysis and Obtain various parameters-Values for UDP Protocol in action	
Unit 4	Network Based Packet Flow Analysis	
	Analysis and Obtain various parameters-Values for IP Protocol in action. Analysis and Obtain various parameters-Values for NAT Protocol in action. Analysis and Obtain various parameters-Values for ICMP Protocol in action. Analysis and Obtain various parameters-Values for Ethernet and ARP Protocols in action. Analysis and Obtain various parameters-Values for DHCP Protocol in action.	CO3, CO4,CO5
Unit 5	Packet Log Analysis	



	Analysis and Obtain Wireless Network I Analysis and Obta Protocol in action. Network tool Inti Planner (Not for Ev	CO3, CO4,CO6							
Mode of examination	Practical								
Weightage Distribution	СА	MTE	ETE						
	25%	25%	50%						
Text book/s*	The Wireshark Pro Supplements: Wire net.cs.umass.edu/w	The Wireshark Problems with solution are available as Supplements: Wireshark Labs at : http://www- net.cs.umass.edu/wireshark-labs/							
Other References	Companion Manua Networking : A Top http://wps.pearsone 5463/14198700.cw BenchMark LAN T A. Gonsalves, Depa Engineering, IIT-M								

#### Course outline

This course introduces the features of Wireshark for Packet Analysis. To gain basic and core knowledge in Networking Software Development for OSI and TCP/IP Models with their corresponding Layers, Issues, Functionalities and Protocol Design.

Course Evaluation	
Attendance	None



Any other	CA judged on the practical conducted in the lab, weightage may be specified
References	
Text book	Companion Manual for the text book Computer Networking : A Top- Down Approach at : http://wps.pearsoned.com/ecs_kurose_compnetw_6/216/55463/1419870 0.cw/
Other References	The Wireshark Problems with solution are available as Supplements: Wireshark Labs at : http://www-net.cs.umass.edu/wireshark-labs/
Software	Windows, Unix / Any Unix family OS baased Wireshark, TCPDump.

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: To understand security concepts, Ethics in Network Security.	PO1,PO2,PO3,PO4,PSO1
2.	CO2: To comprehend and apply relevant protocol like SSL, SSH etc.	PO1, PO3, PO4, PSO2
3.	CO3: To identify network security threats.	PO1,PO2,PO3,PO4
4.	CO4: To be able to determine efforts to counter them.	PO9, PO10,PO11, PSO3
5.	CO5: To solve real-word network problems using Wireshark.	PO1,PO2,PO8,PO9,PO10,PSO1
6.	CO6: To understand Networks characteristics and components and its analysis using tools i.e. pCap or TCP-Dump or Wireshark.	PO1,PO2,PO10,PO11,PSO1,PSO2



PO and PSO mapping with level of strength for Course Name Packet Analysis Lab (Co	urse
Code - )	

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3				2	2	1	2	1	3	2	2
CO2	3	2	3	3				2	2	2	1	1	2	3	2
CO3	3	3	3	3				1	1	1	3	2	3	2	1
CO4	2	2	2	2	1			2	3	3	3	1	2	2	2
Co5	2	2	3	-	-	-	-	3	3	1	2	-	3	-	-
CO6	3	2	-	-	-	-	-	-	-	2	3	-	2	2	-



Scho	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Prog	gram:	B.Tech										
Bra	nch:	Computer Science & Engineering with Specialization in Cyber										
		Security and Forensics										
1	Course Code	CSC021	CSC021									
2	Course Title	Mobile and Wireless Security										
3	Credits	3	3									
4	Contact Hours	-0-0										
	(L-T-P)											
	Course Status	Elective										
5	Course	To learn about Systems, protocols and cryptographic	functions for realizing									
	Objective	security properties, such as authentication, key	distribution, integrity,									
	5	confidentiality, in wireless access networks.										
6	Course	On successful completion of this module students wil	l be able to:									
	Outcomes	I										
		CO1: acquire knowledge of information security technolog	gy and methods for									
		communication systems that provide services for mobile u	sers by wireless access									
		networks.										
		CO2: about some of the models, design principles, mechar	nisms and solutions									
		used in wireless network security to obtain authentication a	and key transport									
		protocols.										
		CO3: acquire practice and analytical skills in information s	security assessment of									
		technology										
		CO4: apply security mechanisms and protocols in wireless communication										
		networks.										
		CO5: illustrate network security to obtain authentication and	nd key transport									
		protocols										
		CO6: demonstrate security measures in wireless communi	cation for WPAN,									
		WLAN, mobile networks, and new emerging technology.										
7	Course	The course presents a selection of security functionalities employed in existing										
	Description	wireless communication for WPAN, WLAN, mobile networks, and new emerging										
		technology.										
8	Outline syllabus	3	CO Mapping									
	Unit 1	Wireless Network Basics										
	А	Distinction between wired and wireless networks from	CO1									
		information theory;	01									
	В	Effect of mobility on networks & systems - Mobile Ad										
		Hoc Networks - Wireless Sensor Networks - Location	CO1, CO2									
		Discovery										
	C	In-Network Processing - Routing - Energy Efficiency -										
		Clustering	CO1, CO2,CO4									
	Unit 2	Security in Wireless Networks										
	А	Issues of security in wireless; IP broadcast, Satellite										
		broadcast; issues of information capacity; issues of	CO1, CO2									
		802.11 protocols;										
	В	design of secure protocols; Secure routing - Secure										
		localization - Secure and resilient data aggregation - Key	CO1, CO2									
		pre-distribution and management										



	С	Encryption an communication up	CO1, CO2,CO5,CO6				
	Unit 3	Source authent	ication				
	А	Source authent repudiation;	ication of trans	smissions, and non-	C01,C02,C03		
	В	Power manage wireless netwo	ment and selfi orks;	shness issues, attacks in	CO1,CO2,CO3		
	С	DOS and DDC processing for	OS attacks, read sensor networl	ction to attacks, information ks.	C01,C02,C03		
	Unit 4	Socket	Programming				
	А	Introduction to Processing in C address conver	socket progra Client-Server S sion functions	mming- Concurrent oftware-Byte ordering and	CO2,CO3,CO4		
	В	Sockets sockets - Iterat protocol and M server program	Socket Interface - System calls used with sockets - Iterative server and concurrent server- Multi protocol and Multi service server- TCP/UDP Client server programs				
	С	Thread Creation using threads-	CO2, CO4,CO5				
	Unit 5	Nex	kt Generation I	nternet Protocol			
	А	Introduction to V6 header com	) IPv6 – IPv6 A parison	Advanced Features –V4 and	CO2,CO5,		
	В	V6 Address ty	pes – Stateless	auto configuration	CO3,CO5,CO6		
	C	IPv6 routing Translation Te	protocols – chniques.	IPV4- V6 Tunneling and	CO4,CO5,CO6		
	Mode of examination	Theory					
	Weightage	CA	MTE	ETE			
	Distribution	25%	25%	50%			
	Text book/s*	<ol> <li>Douglas E. Comer ,"Internetworking with TCP/IP, Principles, Protocols, and Architecture", Addison- Wesley, 5th edition, Vol 1. 2005.</li> <li>Douglas E. Comer, David L. Stevens ,"Internetworking with TCP/IP Vol. III, Client-Server Programming and Applications", Addison-Wesley, 2 nd edition, 2000.</li> <li>Wendell Odom, "CCNP Route 642-902, CCIE", Official Certification Guide, Pearson education, 2010.</li> </ol>					
	Other	1. Behrouz	A. Forouzan, '	'Data Communications and			
1	References	INCLWORKI	ig , Micoraw-I	m, Jui equilion, 2012.			



CO ar	nd PO Mapping	
S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	CO1: acquire knowledge of information security technology and methods for communication systems that provide services for mobile users by wireless access networks.	PO1, PO2, PO5, PO8, PO12, PSO3
2.	CO2: about some of the models, design principles, mechanisms and solutions used in wireless network security to obtain authentication and key transport protocols.	PO1, PO2, PO3, PSO3
3.	CO3: Acquire practice and analytical skills in information security assessment of technology	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: Apply security mechanisms and protocols in wireless communication networks.	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: illustrate network security to obtain authentication and key transport protocols	PO1, PO2, PO3, PO8, PO9, PSO2,
6.	CO6: demonstrate security measures in wireless communication for WPAN, WLAN, mobile networks, and new emerging technology.	PO1, PO2, PO4, PO5, PO6, PO7, PO10, PO11, PSO1

PO and PSO mapping with level of strength for Course NameMobile and Wireless Security (CSC021)

Course											Р	Р	Р			Р
Code_	CO'a	Р		Р	Р	Р	Р	Р	Р	Р	0	0	0	PS	PS	S
Course	CO s	0	PO	0	0	0	0	0	0	0	1	1	1	0	0	0
Name		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
	CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
CSC021_	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
Mobile	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
Wireless	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
Security	CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Cour se Code	Cours e Name	Р О 1	P O 2	Р О 3	Р О 4	Р О 5	Р О 6	Р О 7	P O 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	PS O 1	PS O 2	PS O 3
CSC 021	Mobil e and Wirele ss Securi ty	3	2. 7	2. 3	3	2 2	3	3	2. 6	2. 5	3	3	2. 5	2	2	2



School:		School of Engineering & Technology						
Department		Computer Science & Engineering						
Pro	ogram:	B.Tech						
Br	anch:	Computer Science & Engineering with Specialization in Cyber Security Forensics	<sup>7</sup> and					
1	Course Code	CSC 031						
2	Course Title	Exploit Writing						
3	Credits	3						
4	Contact Hours (L-T-P)	3-0-0						
	Course Status	Elective						
5	Course Objectiv e	to explore the needs and effects of leveraging modern exploit mitigatio	n controls.					
6	Course Outcome s	<ul> <li>CO1: Analyze fuzz testing to enhance your company's SDL process.</li> <li>CO2: Explain network devices and assess network application protocols.</li> <li>CO3: Illustrate restricted environments on Linux and Windows.</li> <li>CO4: Test cryptographic implementations.</li> <li>CO5: Model the techniques used by attackers to perform 0-day vulnerability discovery and exploit development.</li> <li>CO6: Develop more accurate quantitative and qualitative risk assessments through validation.</li> </ul>						
7	Course Descripti onThe course will describe how to use essential skills for advanced penetration tested and software security professionals.							
8	Outline sy	llabus	CO Mapping					
	Unit 1	Introduction						



А	Exploit Development Life Cycle	CO1
В	System Architecture	CO1, CO2
С	Memory Organisation	CO1, CO2,CO4
Unit 2	Programming languages	
А	Powershell Programming	CO1, CO2
В	Python Scripts to perform exploits	CO1, CO2
С	Assembly Language	CO1, CO2,CO5 ,CO6
Unit 3	Protection	
А	GDB usage -operating debugger, decompilers	CO1,CO2 ,CO3
В	Prevention and Bypassing Address Space Layout	CO1,CO2 ,CO3
С	Randomization & DEP protection mechanisms	CO1,CO2 ,CO3
Unit 4	Techniques	
А	Shell Code- Shell-Spawning, Port Binding, Connect-Back, Fuzzing with SPIKE	CO2,CO3 ,CO4
В	Challenges: KSTET and GMON, Bypassing Antivirus Software	CO3,CO4
С	Safe SEH Based Overflow, Egg Hunting, Exploiting Character Set Restrictions	CO2, CO4,CO5
Unit 5	Applications	



А	Windows Buffer Overflow Exploita Exploitation, Windows Kernel Driv	uffer Overflow	CO2,CO5 ,		
В	Kernel Pool Exploitation	CO3,CO5 ,CO6			
С	RCE on Windows and Linux				
Mode of examinat ion	Theory				
Weighta ge	СА	MTE	ETE		
Distribut ion	25%	25%	50%		
Text book/s*					
Other Referenc es	Enrico Perla and Massimiliano Oldar Attacking the Core	ni, A Guide to I	Kernel Exploitation:		



School	:	School of Engineering & Technology						
Depart	ment	Computer Science & Engineering						
Program	m:	B. Tech						
Branch	:	Computer Science & Engineering with Specialization in Cyber Security and Forensics						
1	Course Code	CSC032						
2	Course Title	Malware Analysis						
3	Credits	3						
4	Contact Hours (L-T-P)	3-0-0						
	Course Status	Elective						
5	Course Objective	The objective of this course is to provide an insight to fundamentals of malware analysis, detection and prevention such as different types of malware, static and dynamic analysis, functionality and detection technique of malware.						
6	Course Outcomes	On successful completion of this module students will be able to: CO1: illustrate the nature of malware, its capabilities, types and its analysis CO2: apply the tools and methodologies used to perform static analysis. CO3: apply the tools and methodologies used to perform dynamic analysis. CO4: explain executable formats, Windows internals and API, and analysis techniques. CO5: utilize the techniques of signature-based and non-signature based o malware detection. CO6: identify and apply the techniques for real world problems in the domain						



7	Course Description	This course is to provide students with an overview of the conce fundamentals of malware, static analysis, dynamic analysis, ma functionality, Covert malware launching, malware detection tec and Case Studies.	epts and lware hniques
8	Outline syllabus		CO Mapping
	Unit 1	Introduction	
	A	The Goals of Malware Analysis, Introduction to malware, OS security concepts, malware threats, evolution of malware, General Rules for Malware Analysis.	CO1
	В	Malware types, viruses, worms, rootkits, Trojans, bots, spyware, adware, logic bombs,	CO1
	С	Malware analysis, Malware Analysis Techniques: Basic Static Analysis, Basic Dynamic Analysis, Advanced Static Analysis, Advanced Dynamic Analysis	CO1
	Unit 2	Static Analysis	
	A	Antivirus Scanning: A Useful First Step, Hashing: A Fingerprint for Malware, Finding Strings, Packed and Obfuscated Malware, Portable Executable File Format, Linked Libraries and Functions	CO2
	В	Static Analysis in Practice, PotentialKeylogger.exe: An Unpacked Executable, PackedProgram.exe: A Dead End, The PE File Headers and Sections	CO2, CO6
	C	Malware analysis in virtual machines : The Structure of a Virtual Machine, Creating Your Malware Analysis Machine, Configuring VMware, Using Your Malware Analysis Machine	CO2, CO6
	Unit 3	Dynamic Analysis	



Α	Sandboxes: The Quick-and-Dirty Approach, using a Malware Sandbox, Sandbox Drawbacks, Running Malware, Monitoring with Process Monitor, The Procmon Display, Filtering in Procmon	CO3
В	Viewing Processes with Process Explorer: The Process Explorer Display, Using the Verify Option, Comparing Strings, Using Dependency Walker, Analyzing Malicious Documents. Comparing Registry Snapshots with Regshot, faking a Network: Using ApateDNS, Monitoring with Netcat	CO3, CO6
С	Packet Sniffing with Wireshark, Using INetSim, Basic Dynamic Tools in Practice	CO3, CO6
Unit 4	Malware Functionality	
А	Downloaders and Launchers, Backdoors, Credential Stealers	CO4
В	Persistence Mechanisms, Privilege Escalation, Covering Its Tracks—User-Mode Rootkits	CO4
С	Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection	CO4
Unit 5	Malware Detection Techniques	
А	Signature-based techniques: malware signatures, packed malware signature, metamorphic and polymorphic malware signature	CO5
В	Non-signature-based techniques: similarity-based techniques, machine-learning methods, invariant inferences	CO5
С	Case Studies – Plankton, DroidKungFu, AnserverBot, Smartphone (Apps) Security	CO6
Mode of examination	Theory	



Weightage Distribution	СА	MTE	ETE	
	25%	25%	50%	
Text book/s*	1. Michael Malware Dissectin Press,20	Sikorski and And Analysis : The H ng Malicious Soft 12.	lrew Honig, "Practical Iands-On Guide to ware", No Starch	
Other References	<ol> <li>Jamie Bu Subverti 2005.</li> <li>Dang, G Engineer</li> <li>Reverent and Evas Second I</li> <li>Monnap Explore and inve</li> </ol>	utler and Greg Ho ng the Windows I azet, Bachaalany, ring", Wiley, 2014 d Bill Blunden, " sion in the Dark C Edition, Jones & I pa K A, "Learnin the concepts, tool stigate Windows	oglund, "Rootkits: Kernel", Addison-Wesley, "Practical Reverse 4. The Rootkit Arsenal: Escape Corners of the System" Bartlett, 2012. g Malware Analysis: Is, and techniques to analyze malware"	

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: illustrate the nature of malware, its capabilities, types and its analysis	PO1,PO2, PO5, PO8,PO12,PSO3
2.	CO2: apply the tools and methodologies used to perform static analysis.	PO1, PO2, PO3, PSO3
3.	CO3: apply the tools and methodologies used to perform dynamic analysis.	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: explain executable formats, Windows internals and API, and detection and prevention techniques	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: utilize the techniques of signature-based and non-signature based of malware detection.	PO1, PO2, PO3,PO8,PO9,PSO2,



6.	CO6: identify and apply the techniques for real world problems in the domain	PO1, PO2, PO4, PO5, PO6,PO7,PO10,PO11,PSO1

### PO and PSO mapping with level of strength for Course Name Malware Analysis (CSC032)

Course Code_ Course Name	CO 's	PO 1	PO 2	Р О 3	PO 4	Р О 5	Р О 6	P O 7	P O 8	P O 9	P O 10	Р О 11	P O 12	PS O 1	PSO 2	PSO 3
	CO 1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	CO 2	3	3	2	-	I	-	-	I	-	I	I	I	-	-	3
	CO 3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	CO 4	3	3	-	3	2	3	-	2	-	I	I	1	-	3	-
	CO 5	3	2	3	-	I	I	-	3	3	I	I	I	I	3	-
CSC032_Mal ware Analysis	CO 6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CSC03 2	Malwar e Analysi s	3	2.7	2.3	3	2.2	3	3	2.6	2.5	3	3	2.5	2	2	2

Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Scho	ool:	School of Engineering & Technology							
Depa	artment	Computer Science & Engineering							
Prog	ram:	B. Tech							
Bran	ch:	Computer Science & Engineering with Specialization in Cyber Security and Forensics							
1	Course Code	CSC041							
2	Course Title	Cloud Security							
3	Credits	3							
4	Contact Hours (L-T-P)	3-0-0							
	Course Status	Elective							
5	Course Objective	<ol> <li>Provide students with an overview of the fundamental concepts of Cloud Computing.</li> <li>Gain insight into the challenges and limitations Models of cloud computing.</li> <li>To learn the various technologies of the cloud computing paradigm and learn about recent advances in Cloud Computing and enabling technologies.</li> <li>Prepare students for research in the area of cloud Computing risks and cloud security challenges.</li> <li>Enhance students' communication and problem solving skills</li> </ol>							
6	Course Outcomes	Students will be able to: CO1: To identify the cloud computing Concepts. CO2: Explain how and why this paradigm came about and the influence of several enabling technologies physical and logical infrastructure CO3: Examine cloud access control methods CO4: Analyze of Cloud monitoring, auditing and management CO5:Compare types and objectives of virus CO6: Evaluate the different type of intrusion detection and firewall design principles.							



7	Course Description	This course introduces advanced aspects of Cloud C encompassing the principles, to analyze the cloud, is problems, and choose the relevant models and algor	Computing, identify the rithms to apply.
8	Outline syllabus		CO Mapping
	Unit 1	Introduction Cloud Computing	
	А	Introduction to distributed systems, Defining Cloud Computing	CO1, CO2
	В	Understanding of Cloud Architecture: Composability, Infrastructure, Platform	CO1, CO2
	С	Virtual Appliances, Communication Protocols, Applications, Understanding Services: SaaS, PaaS, IaaS	CO1, CO2
	Unit 2	Secure Isolation of Physical & Logical Infrastructure	
	А	Isolation: Compute, Network and Storage	CO1, CO2, CO4
	В	Common attack vectors and threats, Secure Isolation Strategies, Multitenancy, Virtualization strategies	CO1, CO2, CO4
	С	Inter-tenant network segmentation strategies, Storage isolation strategies	CO1, CO2, CO4
	Unit 3	Data Protection for Cloud Infrastructure and Services	
	А	Understand the Cloud based Information Life Cycle, Data protection for Confidentiality and Integrity	CO1, CO2, CO3
	В	Common attack vectors and threats, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key Management, Assuring data deletion	CO1, CO2, CO3



C	Data retention, c for tenant data, I	leletion and archi Data Protection St	ving procedures rategies	CO1, CO2, CO3
Unit 4	Enforcing Acces Infrastructure ba			
А	Understand the a Cloud infrastruct	CO1, CO2, CO3		
В	Authentication a Access Control,	CO1, CO2, CO3		
С	Securing remote boot, Firewalls, 1	CO1, CO2, CO3		
Unit 5	Monitoring, Auc			
А	Proactive activity Monitoring for u traffic, abuse of detection, events	y monitoring, Inc inauthorized acces system privileges and alerts	ident Response, ss, malicious , intrusion	CO1, CO2, CO3
В	Auditing – Reco Management, Ta	rd generation, Re amper-proofing at	porting and adit logs	CO1, CO2, CO3
С	Quality of Servic management, Ide Information and	ces, Secure Manag entity managemer Event Manageme	gement, User nt, Security ent	CO1, CO2, CO3
Mode of examination	Theory			
Weightage Distribution	СА	MTE	ETE	
	25%	25%	50%	



Text book/s* Other References	<ol> <li>Barrie Sosinsky "Cloud Computing (Bible)", Wiley</li> <li>Anthony T.Velte, Toby J. Velte, Robert Elsenpeter"Cloud Computing: A Practical Approach" TATA McGRAW-HILL Edition.</li> <li>Ronald L. Krutz and Russell Dean Vines, "Cloud Security: A comprehensive Guide to</li> </ol>
	Secure Cloud Computing", WILEY.

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: To understand the cloud computing Concepts.	PO1, PO2, PO3, PO4, PSO1
2.	CO2: Explain how and why this paradigm came about and the influence of several enabling technologies physical and logical infrastructure	PO1, PO3, PO4, PSO2
3.	CO3: cloud access control methods	PO1, PO2, PO3, PO4,PO6
4.	CO4: Understanding of Cloud monitoring, auditing and management	PO9, PO10, PO11, PSO5,PO7
5.	CO5. Examine security at application layer, transport layer and network layer.	PO5,PO7, PO8, PO9, PSO1,PSO2
6.	CO6:Interpret use of cryptographic data integrity algorithms and user authentication protocols	PO10,PO11,PO12,PSO1,PSO3

# PO and PSO mapping with level of strength for Course Name Cloud Security (CSC041)

Course Code, Course Name	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2



Cloud Security (CSC041	CO1	3	3	2	2				2	2	1	2	1	3	2
)	CO2	2	2	3	3	1		1	2	2	2	1	1	2	3
	CO3	3	3	3	3	1	2	1	1	1	1	3	2	3	2
	CO4	2	2	2	2	2		-2	2	3	3	3	1	2	2
	CO5	-	-	-	-	2	-	2	2	2		-	-	2	-
	CO6	-	-	-	-	-	-	-	-	-	2	2	2	2	-

verage of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSC041	Cloud Securi ty	2.5	2.5	2.5	2	2	2	2	2	2	2	2	2	2	2	2

Strength of Correlation

- 1. Addressed toSlight (Low=1) extent
- 2. Addressed toModerate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



School	:	School of Engineering & Technology								
Depart	ment	Computer Science & Engineering								
Program	n:	B.Tech								
Branch	:	Computer Science & Engineering with Specialization in Cyber Security and Forensics								
1	Course Code	CSC042								
2	Course Title	Penetration Testing								
3	Credits	3								
4	Contact Hours (L-T-P)	3-0-0								
	Course Status	Elective								
5	Course Objective	<ol> <li>Students will learn fundamentals of penetration testing via lectures and assignments.</li> <li>Students will investigate various problem and regulation of penetration testing through projects and assignments.</li> </ol>								
6	Course Outcomes	Students will be able to: CO1: acquire knowledge on Penetration Testing CO2: acquire the ability to identify Legal and ethical consideration CO3: explain Social Engineering Attacks CO4: explain and analyze Performing Host Reconnaissance CO5: explain and analyze attacking the network CO6: acquire the knowledge to prevent threats in targeted attacks and real time systems.								
7	Course Description	This course aims to introduce students to the fundamental concepts and techniques in penetration testing, and giving students an overview of attack and securing methods								



8	Outline syllabus		CO Mapping
	Unit 1	Understanding Penetration Testing	
	А	Defining penetration testing, proliferation of Viruses and worm, Wireless LANs.	CO1, CO2, CO3
	В	Complexity of networks today, frequency of software updates, availability of hacking tools, the nature of open source	CO1, CO2, CO3
	С	Unmonitored mobile users and telecommuters, marketing demands, industry regulation, administrator trust, Hacktivism, Attack Stages	CO1, CO3
	Unit 2	Legal and ethical consideration	
	А	Ethics of penetration testing, Laws: US Law, Computer Fraud and abuse act (CFAA), State Laws	CO1, CO4, CO3
	В	Regulatory Laws: Health Insurance Portability and Accountability Act (HIPAA), Graham-Leach-Bliley (GLB)	CO1, CO2, CO3
	С	Federal Information Security Management Act (FISMA), Sarbanes-Oxley Act (SOX)	CO1, CO2, CO3
	Unit 3	Performing Social Engineering	
	A	Human Psychology: conformity persuasion, logic persuasion, need-based persuasion, authority based persuasion, reciprocation based social engineering, similarity based social engineering, information based social engineering	CO2, CO3
	В	First Impressions and the social engineer, tech support impersonation, third-party impersonation	CO2, CO3
	С	E-Mail impersonation, end user impersonation, customer impersonation, Reverse Social engineering	CO2, CO3



Unit 4	Performing Host	Reconnaissand	ce			
А	Passive host reco	CO1, CO2				
В	Port Scanning: T scan, ACK scan,	CO4				
С	NMap, Detecting Detection system	g a Scan: intrus a, misuse detec	ion detection, Anomaly tion system,	CO1, CO2,CO4		
Unit 5	Attacking the Ne	twork				
A	Bypassing Firew Systems, Testing HTTP service, Pa Tables	all, Evading In Routers for V assword Crack	truder Detection ulnerabilities: CDP, ing, Modifying Routing	CO2,CO5, CO6		
В	Testing Switches Spanning Tree A Attacks, VTP At	for Vulnerabi ttacks, MAC T tacks	lity: VLAN Hopping, Fable Flooding, ARP	CO3,CO5, CO6		
С	Securing the Net Routers, Securin	CO3,CO5, CO6				
Mode of examination	Theory					
Weightage DistributionCAMTEETE						
25% 25% 50%						



Text book/s*	<ol> <li>Penetration Testing and Network Defence, Andrew Whitaker, Daniel P. Newman</li> <li>David Kennedy, Jim O'Gorman, Devon Kearns, and Mati Aharoni, METASPLOIT The Penetration Tester's Guide, No Starch Press,2011.</li> <li>Wil Allsopp, Advanced Penetration Testing: Hacking theworlds most Secure Networks, 1st Edition, John Wiley &amp; Sons,2017</li> </ol>	
Other References	<ol> <li>Sean-Philip Oriyano, Penetration Testing Essentials, John Wiley &amp; Sons, 2017.</li> <li>Leebrotherston, Amanda Berlin, Defensive Security handbook, O'reilly, 2017</li> </ol>	

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: acquire knowledge on Penetration Testing	PO1, PO2, PO5, PO8, PO12, PSO3
2.	CO2: acquire the ability to identify Legal and ethical consideration	PO1, PO2, PO3, PSO3
3.	CO3: explain Social Engineering Attacks	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: explain and analyze Performing Host Reconnaissance	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: explain and analyze attacking the network	PO1, PO2, PO3, PO8, PO9, PSO2,
6.	CO6: acquire the knowledge to prevent threats in targeted attacks and real time systems.	PO1, PO2, PO4, PO5, PO6, PO7, PO10, PO11, PSO1

PO and PSO mapping with level of strength for Course Name Penetration Testing (Course Code CSC042)



CSC042_Penetr ation Testing	Co s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
	CO 1		3	3	-	-	2	-	-	3	-	-	-	3	-	-
	CO 2		3	3	2	-	-	-	-	-	-	-	-	-	-	-
	CO 3		3	3	2	-	2	-	-	-	2	-	-	2	3	-
	CO 4		3	3	-	3	2	3	-	2	-	-	-	-	-	3
	CO 5		3	2	3	-	-	-	-	3	3	-	-	-	-	3
	CO 6		3	3	-	3	3	3	3	-	-	3	3	-	3	-

Average of non-zeros entry in following table (should be auto calculated).

Cour se Cod e	Cours e Name	Р О 1	P O 2	P O 3	Р О 4	P O 5	P O 6	P O 7	P O 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	P S O 1	P S O 2	P S O 3
CSC 042	Penetr ation Testin g	3	2. 7	2 3	3	2 2	3	3	2 6	2 5	3	3	2 5	2	2	2

Strength of Correlation

1. Addressed toSlight (Low=1) extent 2. Addressed toModerate (Medium=2) extent 3. Addressed toSubstantial (High=3) extent



Scho	ool:	School of Engineering & Technology	
Depa	rtment	Computer Science & Engineering	
Progr	ram:	B.Tech	
Brand	ch:	Computer Science & Engineering with Specializa Security and Forensics	ation in Cyber
1	Course Code		
2	Course Title	Penetration Testing Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	core	
5	Course Objective	to explore the area of penetration testing which vulnerability in the target element.	deals with finding
6	Course Outcomes	On successful completion of this module student CO1: Analyze the need of penetration testing for CO2: Explain various tools and their installation CO3: Understand the need of reconnaissance. CO4: Understand and find weakness in privacy of system. CO5: Use concept to understand the need of salt data. CO6: understand various exploit that could be ex vulnerability on the system.	s will be able to: security process. of the target for high priority ecuted on existing
7	Course Description	This course introduces ethical hacking concept an ethical hacking in network security.	nd application of
8	Outline syllabus		CO Mapping



Unit 1	Introduction engagement									
	Penetration components	Penetration test report structure and components								
Unit 2	Reconnaissa	ance								
	DNS, web r	econnaissance	,	CO1, CO2						
	TCP, UDP,	connections		CO1, CO2,CO3						
Unit 3	Scanning									
	Scanning us Windows pa	ing nmap, End asswords, hasł	cryption essentials , nes	CO1,CO2,CO3, CO5						
Unit 4	Windows									
	Passwords, Salt	hash, Rainbov	v tables, hashes with	CO2,CO3,CO4						
Unit 5	Vulnerabilit	у								
	Searching L Databases, S	inux and Win SQL, SQL inje	dows file systems, ection	CO2,CO5,CO6						
Mode of examination	Jury/Practic	al/Viva								
Weightage Distribution	СА	MTE	ETE							
	25%	25%	50%							
Text book/s*	Georg Introd	ia Weidma uction to Hack	n: A Hands-On ting							



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Analyze the need of penetration testing for security	PO1,PO2, PO5, PO8,PO12,PSO3
2.	CO2: Explain various tools and their installation process.	PO1, PO2, PO3, PSO3
3.	CO3: Understand the need of reconnaissance.	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: Understand and find weakness in privacy of the target system.	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: Use concept to understand the need of salt for high priority data.	PO1, PO2, PO3,PO8,PO9,PSO2,
6.	CO6: understand various exploit that could be executed on existing vulnerability on the system.	PO1, PO2, PO4, PO5, PO6,PO7,PO10,PO11,PSO1



Course Code_ Course Name	CO's															
		PO1	PO 2	РО 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	02															
		3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	CO3															
		3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
	CO4															
		3	2	3	-	_	-	-	3	3	_	-	-	-	3	-
CCD201 Ethics	CO5															
l Hacking Lab		3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
_	CO6															

PO and PSO mapping with level of strength for Course Penetration Testing Lab

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	Р О 4	Р О 5	Р О 6	Р О 7	Р О 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	PSO 1	PSO 2	PSO 3
	Penetration Testing Lab	3	2.7	1. 1	1	1. 5	1	.5	1. 3	.8	.5	.5	.8	1	1	1

Strength of Correlation

- 1. Addressed toSlight (Low=1)extent 2. Addressed toModerate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Prog	gram:	B.Tech										
Brai	nch:	Computer Science & Engineering with Specialization	in Cyber Security									
		and Forensics										
1	Course Code	CSC062										
2	Course Title	Web Application Security										
3	Credits	3										
4	Contact	3-0-0										
	Hours											
	(L-T-P)											
	Course	Elective										
	Status											
5	Course	Provide the students with practice on applying digital	forensics techniquesin									
	Objective	Web Application and enhance their skills regarding pr	ractical applications of									
		Web security.										
6	Course	CO1: Enhance students communication and problem solvi	ng skills									
	Outcomes	CO2: Identify, explain and demonstrate the problems in in	nsecure coding practices									
		and methods to rectify the same in Web Application.	1									
		cO3: Provide students with an overview of the 11 intrastru	ucture on web									
		CO4: Gain insight into the challenges and limitations	of application security									
		techniques	or application security									
		CO5: Design with practice on applying data mining soluti	ons in Web Application									
		Security.	11									
		CO6:Examine security on Database and Web Specific	c Input issues									
7	Course	This course contains exploring of security problems t	hat are being									
	Description	successfully tackled with web application, describe in	nsecure coding									
		practices and methods	I									
8	Outline syllab	us	CO Mapping									
	Unit 1	INTRODUCTION										
	A	Need for secure systems-	CO1, CO2, CO3									
	В	Proactive security development process-	CO1, CO2, CO3									
	С	Security principles to live by and threat modeling.	CO1, CO2, CO3									
	Unit 2	SECURE CODING IN C										
	А	Character strings- String manipulation errors – String	CO1. CO2. CO3									
		Vulnerabilities and exploits										
	В	Mitigation strategies for strings- Pointers – Mitigation	CO1, CO2, CO3									
	C	C Buffer Overflow based vulnerabilities										
	Unit 2	SECURE CODING IN CLEAND LAVA	101, 102, 103									
	Unit 3	Dunamia momory management. Common attents in										
	А	dynamic memory management-	CO1, CO2, CO3									
	R	Memory managers- Double	CO1 CO6 CO3									
		free vulnerabilities _Integer security Mitigation										
	C	strategies.	CO1, CO2, CO3									
	Unit 4	DATABASE AND WEB SPECIFIC INPUT ISSUES										



А	Quoting the In	CO1, CO3, CO4									
В	CO1, CO2, CO4										
С	CO1, CO2, CO5										
Unit 5	Unit 5 SOFTWARE SECURITY ENGINEERING										
А	Requirements	r secure software	CO1, CO2, CO6								
В	Misuse and ab	CO1, CO4, CO5									
С	Software secur and design.	CO1, CO2, CO6									
Mode of examination	Theory										
Weightage	CA	MTE	ETE								
Distribution	25%	25%	50%								
Text book/s*	1. J.Han,J. <i>Technique</i>	1. J.Han,J. Pei "Web Security <i>Concepts and</i> <i>Techniques</i> ".Edition:3. Morgan Kaufmann									
Other	1. M.H. Du										
References	Advanced										
	2. Adriaans, A										
	3. Vikram Pu	udi & P. Radl	hakrishnan, "Data Mining",								
	Oxford Un	iversity Press									

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)				
1.	CO1: Enhance students communication and problem solving skills	PO1, PO2, PO5, PO8, PO12, PSO3				
2.	CO2: Identify, explain and demonstrate the problems in insecure coding practices and methods to rectify the same in Web Application.	PO1, PO2, PO3, PSO3				
3.	CO3: Provide students with an overview of the IT infrastructure on web application Security.	PO1, PO2, PO3, PO5, PO9, PO12, PSO1				
4.	CO4: Gain insight into the challenges and limitations of application security techniques .	PO1, PO2, PO4, PO5, PO6, PO8, PSO2				
5.	CO5: Design with practice on applying data mining solutions in Web Application Security.	PO1, PO2, PO3, PO8, PO9, PSO2,				
6.	CO6:Examine security on Database and Web Specific Input issues	PO1, PO2, PO4, PO5, PO6, PO7, PO10, PO11, PSO1				



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e_	CO'a															
Cou	CO s										Р	Р	Р		Р	Р
rse		Р	Р	Р	Р	Р	Р	Р	Р	Р	0	0	0	PS	S	S
Nam		0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
e		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CSC	CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
062	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
_We	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
b	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
App	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
ion		3	3	-	3	3	3	3	-	-	3	3	-	3	-	-
Secu																
rity	CO6															

PO and PSO mapping with level of strength for Course Name Web Application Security (CSC062)

Average of non-zeros entry in following table (should be auto calculated).

Cou rse Cod	Cours e	P O	PO	PO	P C	P O	PO	P O	P O	P O	Р О	PO	Р О 1	PS	PSO	
e	Name	1	2	3	4	5	6	7	8	9	10	11	2	O 1	2	PSO 3
CSC 062	Web Appli cation Securi ty	3	2.7	1.1	1	1 5	1	.5	1. 3	8	.5	.5	8	1	1	1

### Strength of Correlation

- 1. Addressed to Slight (Low=1) extent
  - 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



School:		School of Engineering & Technology									
Department		Computer Science & Engineering									
Progra	m:	B.Tech									
Branch:		Computer Science & Engineering with Specialization in Cyber Security and Forensics									
1	Course Code	CSC022									
2	Course Title	Disaster Recovery Management									
3	Credits	3	3								
4	Contact Hours (L-T-P)	3		0	0						
	Course Status	Elective									
5	Course Objective	Students wil assignments through proj	Students will learn fundamentals of Disaster Recovery via lectures a assignments and, investigate various problem and regulation of BCM through projects and assignments.								
6	Course Outcomes	Students will be able to: CO1: Explain Disaster and risk reduction CO2: Illustrate Disaster management cycle CO3: Adapt to the knowledge of Business continuity Management CO4: summarize the application of BCM development process CO5: Analyse and evaluate research work on the field of emergencies and disaster while demonstrating insight into the potential and limitations of science, its role in society and people's responsibility for how it is used. CO6: Demonstrate Capacity to manage the Public Health aspects of the disasters.									
7	Course Description	This course techniques in	This course aims to introduce students to the fundamental concepts and techniques in disaster recovery and business continuity management.								
8	Outline syllabus		CO Mapping								


Unit 1	Introduction to Disaster							
А	Concepts of Hazard, Vulnerability, Risks, Natural Disasters (earthquake, Cyclone, Floods, Volcanoes), and Man-Made Disaster (Armed conflicts and civil strip, Technological disasters, Human Settlement, Slow Disasters (famine, draught, epidemics) and Rapid Onset Disasters (Air Crash, tidal waves, Tsunami) Risks	CO1						
В	Difference between Accidents and Disasters, Simple and Complex Disasters, Refugee problems, Political, Social, Economic impacts of Disasters, Gender and Social issues during disasters, principles of psychosocial issues and recovery during emergency situations, Equity issues in disasters							
С	Relationship between Disasters and Development and vulnerabilities, different stake holders in Disaster Relief. Refugee operations during disasters, Human Resettlement and Rehabilitation issues during and after disasters, Inter- sectoral coordination during disasters, Models in Disasters							
Unit 2	Approaches to Disaster Risk Reduction							
А	Disaster Risk Reduction Strategies, Disaster Cycle, Phases of Disaster, Preparedness Plans, Action Plans and Procedures, Early warning Systems Models in disaster preparedness, Components of Disaster Relief-(Water, food, sanitation, shelter, Health and Waste Management), Community based DRR, Structural non-structural measures in DRR							
В	CO1, CO2							



С	Sustainable Management, Survey of Activities Before Disasters Strike, Survey of Activities During Disasters, DRR Master Planning for the Future, Capacity Building, Sphere Standards. Rehabilitation measures and long-term reconstruction. Psychosocial care provision during the different phases of disaster	CO1, CO2,CO5,CO6						
Unit 3	Disaster Management Cycle and Framework							
A	Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development	CO1,CO2,CO3						
В	Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment							
С	Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action							
Unit 4	Business Continuity Management							
А	Introduction, Definition and Scope of Business	CO2,CO3,CO4						
В	Business Continuity Management (BCM), Drivers of Business continuity management	CO3,CO4						
С	Roles and Responsibility of BCM	CO2, CO4,CO5						
Unit 5	Development of BCM							
A	Developing effective BCM Capabilities	CO2,CO5,						



В	Software applic	ation that s	uppor	t BCM		CO3,CO5,CO6							
С	BCM in Action	: Example	of "Go	ood" Practices		CO4,CO5,CO6							
Mode of examination	Theory												
Weightage Distribution	СА	MTE		ETE									
	25%	25%		50%									
Text book/s*	<ol> <li>Dr. M Wiley I</li> <li>Tusha Manage Ltd.</li> <li>Jagbir S Challen Ltd.</li> </ol>	<ol> <li>Dr. Mrinalini Pandey Disaster Management Wiley India Pvt. Ltd.</li> <li>Tushar Bhattacharya Disaster Science and Management McGraw Hill Education (India) Pvt. Ltd.</li> <li>Jagbir Singh Disaster Management : Future Challenges and Opportunities K W Publishers Pvt. Ltd.</li> </ol>											
Other References	<ol> <li>J. P. S. Publica</li> <li>Shaile Environ Publica</li> <li>C. K. R Atmosp Manma</li> </ol>	<ol> <li>J. P. Singhal Disaster Management Laxmi Publications.</li> <li>Shailesh Shukla, Shamna Hussain Biodiversity, Environment and Disaster Management Unique Publications</li> <li>C. K. Rajan, Navale Pandharinath Earth and Atmospheric Disaster Management : Nature and Manmade B S Publication</li> </ol>											



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Explain Disaster and risk reduction	PO1,PO2, PO5, PO8,PO12,PSO3
2.	CO2: Illustrate Disaster management cycle	PO1, PO2, PO3, PSO3
3.	CO3: Adapt to the knowledge of Business continuity Management	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: summarize the application of BCM development process	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: Analyse and evaluate research work on the field of emergencies and disaster while demonstrating insight into the potential and limitations of science, its role in society and people's responsibility for how it is used.	PO1, PO2, PO3,PO8,PO9,PSO2,
6.	CO6: Demonstrate Capacity to manage the Public Health aspects of the disasters.	PO1, PO2, PO4, PO5, PO6,PO7,PO10,PO11,PSO1



Course Code_ Course Name	CO's															
		PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	3	-	-	2	I	I	3	-	I	I	3	-	-	3
	CO2	3	3	2	-	I	I	I	I	-	I	I	I	I	-	3
	CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
	CO4	3	3	I	3	2	3	I	2	-	I	I	I	I	3	-
CSC022_Disaste r Recovery Management	CO5	3	2	3	-	I	I	I	3	3	I	I	I	-	3	-
	CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

PO and PSO mapping with level of strength for Course Disaster Recovery Management CSC022

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CSC-022	Disaster Recovery Management	3	2.7	2.3	3	2.2	3	3	2.6	2.5	3	3	2.5	2	2	2

Strength of Correlation

1. Addressed to *Slight* (*Low=1*) *extent* 2. Addressed to *Moderate* (*Medium=2*) *extent* 

3. Addressed to Substantial (High=3) extent



School	:	School of Engineering & Technology									
Depart	ment	Computer Science & Engineering									
Progra	m:	B. Tech									
Branch:		Computer Science & Engineering with Specialization in Cyber Security and Forensics									
1	Course Code	CSC052									
2	Course Title	Information Security and Audit Monitoring									
3	Credits	3									
4	Contact Hours (L-T-P)	3-0-0									
	Course Status	Elective									
5	Course Objective	Students will learn various information security & auditing concepts, and technologies via lectures and assignments. Students will investigate various information security and auditing related topics									
6	Course Outcomes	After the successful completion of this course, students will be able to : Students will be able to: CO1: Identify security weaknesses in information systems, and rectify them with appropriate security mechanisms CO2: Analyze the latest trend of computer security threats and defense CO3: Explain the security controls in the aspects of physical, logical and operational security control CO4: Examine the security of information systems CO5:Compare types and objectives of virus CO6: Evaluate the different type of intrusion detection and firewall design principles.									



7	Course Description	This course aims to introduce students to the fundamental conc techniques in computer and network security, and giving studen overview of information security and auditing, and to expose st latest trend of computer attack and defense. Other advanced top information security such as mobile computing security, security of cloud computing, as well as secure information system devel also be discussed.	epts and nts an udents to the bics on ty and privacy lopment will	
8	Outline syllabus		CO Mapping	
	Unit 1	Introduction to Information Security and IS Auditing		
	А	Objectives of IS audit and control,	CO1, CO3	
	В	The structure of an IS audit and audit reports,	CO1, CO3	
	С	CO1, CO3		
	Unit 2	Organization Security and Controls		
	А	Physical security controls: contingency plan, disaster recovery and reconstruction	CO1, CO2, CO3	
	В	Logical security controls: operating system security and access control, Operating controls: segregation of duties, monitoring and logging controls	CO1, CO2, CO3	
	С	Personnel security and management practices: user training and incident reporting, third-party access and outsourcing, Application software control: software development control, input, processing and output control	CO1, CO2, CO3	
	Unit 3	Basics of Cryptographic Technologies		
	А	Symmetric encryption, Asymmetric encryption	CO2, CO3	



В	Basics of me functions	ssage authenti	cation and cryptographic hash	CO2, CO3								
С	Digital signa Infrastructur	tures and digite & Web of Tr	tal certificates, Public-key rust	CO2, CO3								
Unit 4	Network Sec	curity & Netwo	ork Defense									
А	Network Sec Identity Man	Network Security: User Authentication, Access Control and Identity Management Network Security – Attack & Defense, Network Attacks: Host based attacks, Network attacks, Web based attacks										
В	Network Sec Host based a											
С	Network Det IPSec and D	CO2, CO5										
Unit 5	Information and Other Se	ity Auditing, Computer Forensic logies										
А	Security aud	iting and secu	rity standards	CO2,CO6								
В	Incident han	dling and com	puter forensic	CO3,CO6								
С	Other securit	y technologie	s including blockchain	CO4,CO6								
Mode of examination	Theory											
Weightage Distribution	СА	CA MTE ETE										
	25%	25%	50%									



Text book/s*	<ol> <li>William Stallings and Lawrie Brown, Computer Security Principles and Practice, (3rd Edition), Pearson, 2014</li> <li>Bruce Schneier, Applied Cryptography: Protocols, Algorithms and Source Code in C, Wiley, 2015</li> <li>Niels Ferguson, Bruce Schneier, and Tadayoshi Kohno, Cryptography Engineering: Design Principles and Practical Applications, John Wiley &amp; Sons, 2010.</li> <li>Julia H. Allen, Sean J. Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, Software Security Engineering: A Guide for Project Managers, Addison- Wesley, 2008.</li> </ol>	
Other References	<ol> <li>Julia H. Allen, Sean J. Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, Software Security Engineering: A Guide for Project Managers, Addison- Wesley, 2008.</li> <li>ISO/IEC 27001:2013</li> </ol>	

No.	Course Outcome	ogram Outcomes (PO) & Program pecific Outcomes (PSO)
	O1: Identify security weaknesses in information stems, and rectify them with appropriate security echanisms	PO1, PO2, PSO1,PSO2
	O2: Analyze the latest trend of computer security reats and defense	PO1,PO2,PO3,PSO1,PSO2
	O3: Explain the security controls in the aspects of nysical, logical and operational security control	PO1, PO3, PO5, PSO1, PSO2
	O4: Examine the security of information systems	PO1, PO4, PO6, PO7, PSO1,PSO2
	O5:Compare types and objectives of virus	PO5,PO7, PO8, PO9, PSO1,PSO2
	O6: Evaluate the different type of intrusion detection ad firewall design principles.	PO10,PO11,PO12,PSO1,PSO3



# PO and PSO mapping with level of strength for Course Name Information Security and Audit Monitoring (Course Code CSC052)

Code_ Cou	rse Name	CO,	s PC 1	PC	2 PC	03	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSC052 Security Monitor	2_Information y and Audit	CO	1 2	2			-	-	-	-	-	-	-	-	-	2	2	-
	ing	CO	2 2	2	2	2	-	-	-	-	-	-	-	-	-	2	2	-
		CO3	3 2	-	2	2	-	2	-	-	-	-	-	-	-	2	2	-
		CO4	4 2	-	-		2	-	2	2	-	-	-	-	-	2	2	
		CO	5 -	-	-		-	2	-	2	2	2		-	-	2	-	-
		CO	5 -	-	-		-	-	-	-	-	-	2	2	2	2	-	2
Average	e of non-zeros	entry	in fo	llow	ing	tab	le (si	houla	l be a	uto ce	alcule	ited).						
Cours	Course	PO	PO	Р	Р	PC	) P	O F	POF	o I	20	PO1	PO1	PO1	PS	O F	SO	PSO

Cours e Code	Course Name	PO 1	PO 2	Р О 3	Р О 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CSE0 52	Cryptograp hy & Network Sec.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Strength of Correlation

1. Addressed toSlight (Low=1) extent

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2. Addressed toModerate (Medium=2) extent
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3. Addressed toSubstantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Pro	gram:	B.Tech								
Bra	nch:	Computer Science & Engineering with Specialization in Cyber								
		Security and Forensics								
1	Course Code									
2	Course Title	Network & Cyber Forensics								
2	Credits	7								
3	Contact									
4	Lours	3-0-0								
	Hours									
	(L-I-P)									
	Course	Elective								
	Status									
5	Course	Provide the students with practice on applying digital for	prensics techniques and							
	Objective	enhance their skills regarding practical applications of dig	ital forensics.							
6	Course	On successful completion of this module study	ents will be able to							
	Outcomes	CO1:Demonstrate the principles of Network & Cyber For	ensics and how							
		resultant evidence can be applied within legal cases.								
		<b>CO2:</b> Illustrate their competence in recovering files, netwo	ork forensics, traffic							
		analysis								
		<b>CO3:</b> Evaluate the effectiveness of available network & cyber forensics tools and								
		use them in a way that optimizes the efficiency and quality of network & cyber								
		rorensics investigations.								
		systems file systems hardware and mobile devices to digital investigations and								
		systems, me systems, naroware, and mobile devices to digital investigations and to the protection of computer network resources from unauthorized activity								
		to the protection of computer network resources from unauthorized activity								
		email and emerging industry trends	legar miormationor							
		<b>CO6:</b> Adapteffectively the results of a computer network	and/or cyber forensic							
		analysis verbally in writing and in presentations to both to	echnical and lav							
		audiences.	commour and ray							
7	Course	This course introduces students to basics of Network & Cy	ber Forensics. Make							
, í	Description	them apply appropriate skills and knowledge in solving co	mputer forensics							
	Description	problems.	1							
8	Outline syllab	us	CO Mapping							
	Unit 1	INTRODUCTION								
	A	Introduction to Computer Forensics. Use of Computer								
		Forensics in Law Enforcement, Computer Forensics	001							
		Assistance to HumanResources/Employment	COI							
		Proceedings, Computer Forensics Services								
	В	Benefits of professional Forensics Methodology, Steps	CO1							
		taken by Computer Forensics Specialists.	COI							
	С	Network forensic overview, TCP/IP fundamentals, the								
		OSI model, TCP vs UDP, application protocols, IP	CO1, CO6							
		addressing, NAT, and an overview of proxy servers.								
	Unit 2	AN OVERVIEW OF NETWORK FORENSICS								
		INVESTIGATION								
	A	privacy, security, and legal issues oncomputer networks	CO2							
		and theinternet.								
	В	Procedures for network forensics.	CO2							



С	Understanding Scanning, Netv	Understanding Traffic Analysis Scanning –Port Scanning, Network Scanning, Vulnerability Scanning						
Unit 3	NETWORK I	NTRUSIONS	S AND CYBER CRIME					
А	Investigating N Network Forer	CO3						
В	network packe	t capture tools	– Wireshark	CO3				
С	Checking of L Sweep	CO3, CO6						
Unit 4	<b>CYBER FOR</b>	ENSICS						
А	Standards, Gui Digital Crime	CO4						
В	Digital Eviden Daubert guidel	CO4						
С	Cyber forensic	CO4, CO6						
Unit 5	E-MAIL FOR	E-MAIL FORENSICS						
А	Exploring the role of client a	CO5,						
В	Investigating E E-mail Messag mail headers, I	CO5,CO6						
С	Tracing an e-m Understanding	sing network E-mail logs, s.	CO5,CO6					
Mode of examination	Theory		_					
Weightage	CA	MTE	ETE					
Distribution	25%	25%	50%					
Text book/s*	<ul><li>Ric M</li><li>Dejey, Universida</li></ul>							
Other References	Gulsha     Gupta     of Res     Techn	<ul> <li>Gulshan Shrivastava, Prabhat Kumar, B. B.</li> <li>Gupta, Suman Bala, Nilanjan Dey, "Handbook of Research on Network Forensics and Analysis</li> </ul>						

S. No	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes
1.00		(PSO)
1.	<b>CO1:</b> Demonstrate the principles of network & cyber	PO1,PO2, PO5,
	forensics and how resultant evidence can be applied within legal cases.	PO8,PO12,PSO3
2.	<b>CO2:</b> Illustrate their competence in recovering files, network forensics, traffic analysis	PO1, PO2, PO3, PSO3
3.	<b>CO3:</b> Evaluate the effectiveness of available network & cyber forensics tools and use them in a way that optimizes the efficiency and quality of digital forensics investigations.	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	<b>CO4:</b> Apply a solid foundational grounding in computer networks, operating systems, file systems, hardware, and mobile devices to digital	PO1, PO2, PO4, PO5, PO6, PO8, PSO2



	investigations and to the protection of computer	
	network resources from unauthorized activity	
5.	CO5: Access and critically evaluate relevant	PO1, PO2,
	technical and legal information of email and	PO3,PO8,PO9,PSO2,
	emerging industry trends	
6.	<b>CO6:</b> Adapt effectively the results of a computer,	PO1, PO2, PO4, PO5,
	network, and/or cyber forensic analysis verbally,	PO6,PO7,PO10,PO11,PSO1
	in writing, and in presentations to both technical	
	and lay audiences.	

# PO and PSO mapping with level of strength for Course Name Digital Forensics (Course Code CSC201)

Course Code_ Course Name	CO's	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO 3
	CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
Netw	CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
	соз	3	3	2	-	2	-	-	-	2	-	-	2	3	-	-
ork &	CO4	3	3	-	3	2	3	-	2	-	-	-	-	-	3	-
<b>Cyber</b> Foren	CO5	3	2	3	-	-	-	-	3	3	-	-	-	-	3	-
sics	CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	P 0 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	Network & Cyber Forensics	3	2.7	1.1	1	1.5	1	.5	1.3	.8	.5	.5	.8	1	1	1

- 1. Addressed toSlight (Low=1)extent2. Addressed toModerate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



School:		School of Engineering & Technology							
Depart	ment	Computer Science & Engineering							
Program	m:	B.Tech							
Branch:		Computer Science & Engineering with Specialization in Cyber Security and Forensics							
1	Course Code								
2	Course Title	Data Privacy and Protection							
3	Credits	2							
4	Contact Hours (L-T-P)	3-0-0							
	Course Status	Elective							
5	Course Objective	This course will make students understand data privacy laws in India. It will inculcate the knowledge of laws and regulations concerning cross border flow of data protection and law enforcement perspectives and will help to gain insights on data localization and processing sensitive personal information. The students will get to know individual participation rights, regulation, and enforcement.							
6	Course Outcomes	On successful completion of this module students will be able to: CO1: Understand the concepts of privacy in today's environment CO2: Obtain the understanding of to apply fundamental principles of the data protection regime and information privacy. CO3: Obtain the knowledge of data protection issues arising in the specific Contexts CO4: understanding of how emerging issues are affecting society and business, with a concentration on how information security must shape corporate practices. CO5: utilize the techniques to resolve current challenges faced by data controllers, data subjects, policy makers and regulators. CO6: identify and apply the techniques for real world problems in the domain							



7	Course Description	This course is to provide students with an overview of the fundamentals of data privacy and its laws in India.	concepts and
8	Outline syllabus	<u> </u>	CO Mapping
	Unit 1	Introduction	
	A	A Digital India in a Digital World, Data Protection: Genesis and Rationale, Data Protection, and the Value of Privacy, and why it matters, Statistics, Data Privacy Attacks, Data linking and profiling.	CO1
	В	The Evolution of Privacy Principle, Comparative Approaches to Data Protection, Data Protection in India,	CO1
	С	Judicial Developments on Right to Privacy, Legislative Developments.	CO1
	Unit 2	Framework Data Privacy and Protection Law	
	A	Risk in Data Privacy, Data Privacy Law, Protecting Privacy, Privacy Threats	CO2
	В	CO2, CO6	
	С	Data Protection in Healthcare, Indian IT act 2000 and International Laws i.e. MIPSA, FACTA, UK GDPR	CO2, CO6
	Unit 3	Data Localization	
	А	Introduction, Issues, Role of data transfer in trade,	CO3
	В	Digitization of Product and Service Offerings,	CO3, CO6
	С	International Practices	CO3, CO6



Unit 4	Processing & IP			
А	Introduction, issu data,	CO4		
В	International pra	ctices		CO4
С	Individual Partic	CO4, CO6		
Unit 5	Regulation and H			
А	Enforcement Mo Process, Remedi	CO5		
В	Examination of J Wide Web,	CO5, CO6		
С	Protections provo or the requireme	CO6		
Mode of examination	Theory/Jury/Prac			
Weightage Distribution	СА	MTE	ETE	
	25%	25%	50%	
Text book/s*	1. L. Sween A Primer Compute			
Other References	1. White Pa Data Prot B.N. Srik	mittee Of Experts On A ork For India, Justice		



co una i o mapping
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S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Understand the concepts of privacy in today's environment	PO1, PO2, PO5, PO8, PO12, PSO3
2.	CO2: Obtain the understanding of to apply fundamental principles of the data protection regime and information privacy.	PO1, PO2, PO3, PSO3
3.	CO3: Obtain the knowledge of data protection issues arising in the specific Contexts	PO1, PO2, PO3, PO5, PO9, PO12, PSO1
4.	CO4: understanding of how emerging issues are affecting society and business, with a concentration on how information security must shape corporate practices.	PO1, PO2, PO4, PO5, PO6, PO8, PSO2
5.	CO5: utilize the techniques to resolve current challenges faced by data controllers, data subjects, policy makers and regulators.	PO1, PO2, PO3,PO8,PO9,PSO2,
6.	CO6: identify and apply the techniques for real world problems in the domain	PO1, PO2, PO4, PO5, PO6,PO7,PO10,PO11,PSO1



Course Code_ Course Name	CO's															
		PO1	PO 2	PO 3	PO4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	3	-	-	2	-	-	3	-	-	-	3	-	-	3
	CO2	3	3	2	-	-	I	I	-	I	I	I	-	-	-	3
	CO3	3	3	2	-	2	I	I	-	2	I	I	2	3	-	-
	CO4	3	3	I	3	2	3	-	2	-	I	-	-	-	3	-
Data Privacy	CO5	3	2	3	-	-	I	I	3	3	I	-	-	-	3	-
and Protection	CO6	3	3	-	3	3	3	3	-	-	3	3	-	3	-	-

# PO and PSO mapping with level of strength for Course Name Malware Analysis, Detection & Prevention (Course Code CSE641)

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	Р О 4	P O 5	P O 6	Р О 7	P O 8	Р О 9	P O 1 0	P O 1 1	P O 1 2	PSO 1	PSO 2	PSO 3
	Data Privacy and Protection	3	2.7	1. 1	1	1. 5	1	.5	1. 3	.8	.5	.5	.8	1	1	1

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



# B.Tech (CSE) with Specialization in Block chain Technology



# Introduction to Blockchain Technology

Sc	chool: Sharda Sharda School of Engineering & Technology											
De	epartment	Compu	ter Science & I	Engineering								
Pr	ogram:	<b>B.Tech</b>	1 - CSE									
Br	anch:	Blockcł	nain									
1	Course Code	BCC102	2 Semester- 2									
2	Course Title	Introdu	ction to Blockchain Technology									
3	Credits	2										
4	Contact											
	Hours		2 0 0									
	(L-T-P)											
	Course	Core										
	Status											
5	Course Objective	e	By the end of	the course, students will	be able to:							
			1. Understand how blockchain systems work,									
			2. To securely interact with them,									
			3. Design, build, and deploy smart contracts and distri									
			applications,									
			4. Integrate ideas from blockchain technology into									
own projects												
6 Course Outcomes 1. Explain Abstract model of blockchain and cor												
			pro	blem								
			2 Lis	t and describe difference	s between proof-of-work							
			2. Els	l proof_of_stake consensi								
				proof-or-stake consense	us. Formunto anombio bosico for							
			5. Sul	initiarizing the benefits of	cryptographic basics for							
			cry	ptocurrency in case of va	arious attacks							
			4. An	alyzing properties of Bit	coin and Ethereum							
			5. Lis	t Ethereum Virtual Ma	chine (EVM) and its							
			ben	nefits								
			6. Lis	t topics like SNARK	and zcash along with							
			var	ious applications of bloc	kcahin technology							
7	Course Descripti	ion	Decentraliz	zed blockchain-based sy	ystems, such as Bitcoin							
	1		and Ether	eum, are successful b	eyond all expectations.							
			Although s	still in their infancy, they	promise to revolutionize							
			how we	think of financial, i	nformation, and other							
			infrastructu	ures. This course covers	the technical aspects of							
			public c	listributed ledgers,	blockchain systems,							
			cryptocurre	encies, and smart contra	acts. Students will learn							
			how these	systems are built, how to	o interact with them, how							
			to design a	nd build secure distribut	ed applications.							
8	Outline syllabus				CO Mapping							

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Unit 1	Introduction							
A	The consensus problem - Asynchronous Byzantine Agreement and its analysis	CO1 , CO2						
В	Abstract Models for BLOCKCHAIN - GARAY Model - RLA Model	CO1 , CO2						
С	Proof of Work ( PoW) as random oracle -	CO1 , CO2						
	formal treatment of consistency, liveness and							
	fairness - Proof of Stake (PoS) based Chains -							
	Hybrid models (PoW + PoS)							
Unit 2	Cryptographic Basics For Cryptocurrency							
А	A Short Overview of Hashing	CO1, CO3						
В	Signature Schemes,	CO1, CO3						
С	Encryption Schemes	CO1, CO3						
Unit 3	Bitcoin - Wallet							
А	Merkley Tree - Hardness of Mining	CO3, CO4						
В	Transaction Verifiability - Anonymity - Forks CO3, CO - Double Spending							
С	Mathematical Analysis of Properties Of CO3, CO4 Bitcoin							
Unit 4	Ethereum							
A	Ethereum Virtual Machine (EVM) - Wallets CO4,CO5 for Ethereum							
В	Smart Contracts - some attacks on smart CO3,CO5 contracts							
 С	Vulnerability, Attacks, Sidechain	CO3,CO5						
Unit 5	Application and future of Blockchain							
Α	Zero Knowledge proofs and protocols in Blockchain	CO5, CO6						
В	Succinct non interactive argument for Knowledge (SNARK)	CO5, CO6						
С	Applications: Internet of Things, Medical	CO5, CO6						
	Record Management System, Domain Name							
	Service and future of Blockchain, Zcash							
Mode of examination	Theory							
Weightage Distribution	CA MTE ETE							
	25% 25% 50%							
Text book/s*	Arvind Narayanan, Joseph Bonneau, Edward	Felten, Andrew						
	Miller, and Steven Goldfeder. Bitcoin and cryptocurrency							
	technologies: a comprehensive introduct	ion. Princeton						
	University Press, 2016.							
Other References	1. Joseph Bonneau et al, SoK: Research p	erspectives and						
	challenges for Bitcoin and cryptocurrency, IEE	E Symposium on						
	security and Privacy, 2015 (article available for	r free download)						
	{ curtain raiser kind of generic article, writt	en by seasoned						
	2 I A Garay et al. The hitcoin backhone protocol - analysis and							
	applications EUROCRVPT 2015 I NCS VOIC	01 - analysis and 0057 (VOLTI)						
	applications LOROCKITI 2013 LINCS VOIS	0.57, (0.000 ),						



pp 281-310. (Also available at eprint.iacr.org/2016/1048). (
serious beginning of discussions related to formal models for
bitcoin protocols).
3. R.Pass et al, Analysis of Blockchain protocol in
Asynchronous networks, EUROCRYPT 2017, (
eprint.iacr.org/2016/454) . A significant progress and
consolidation of several principles).
4. R.Pass et al, Fruitchain, a fair blockchain, PODC 2017 (
eprint.iacr.org/2016/916).

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1	Explain Abstract model of blockchain and	PO1, PO2, PO3, PO4, PO5,
	consensus problem.	PO6,PO11,PSO1, PSO2,PSO3
2	List and describe differences between proof-of-	PO1,
	work and proof-of-stake consensus.	PO2,PO3,PO4,PO5,PO7,PO10,PO12
		PSO2,PSO3
3	Summarizing the benefits of cryptographic	PO1, PO2, PO3, PO4, PO5, PO8, PO9,
	basics for cryptocurrency in case of various	PSO1, PSO2,PSO3
	attacks	
1	Analyzing properties of Bitcoin and Etheroum	
4	Analyzing properties of Bicolii and Ethereum	$P \cap P \cap Q = P \cap Q = Q \cap Q \cap$
5		PO1 PO2 PO2 PO4 PO5
3	List Ethonorm Wintrol Mashing (EVM) and its	PO1, PO2, PO3, PO4, PO3, PO7, PO10, PSO1, PSO2, PSO2
	List Emereum virtual Machine (EVM) and its	PO7,PO10,PSO1, PSO2,PSO3
6	List topics like SNARK and zeash along with	PO1, PO2,PO3,PO4,PO5, PO6,
	various applications of blockcahin technology	PO11,PO12,PSO1, PSO2,PSO3

# PO and PSO mapping with level of strength

Course																
Code_		Р														
Course		0				PO	РО	РО	PO	PO	PO	PO	РО			
Name	CO's	1	PO2	PO3	PO4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
	CO1	3	2	2	2	2	1	-	-	-	-	1	-	1	3	1
BCC102_	CO2	3	3	2	2	2	-	1	-	-	1	-	1	-	3	2
Introductio n to	CO3	3	3	3	2	2	-	-	1	1	-	-	-	1	3	1
Blockchain	CO4	2	3	2	2	2	-	-	1	1	-	-	1	1	3	-
Technology	CO5	2	2	2	3	2	-	1	-	-	1	-	-	2	3	1
	CO6	2	3	2	2	3	1	-	-	-	-	1	1	1	3	1



#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	РО 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PS O 3
	Introducti															
	on to															
BCC10	Blockchai	2.	2.	2.	2.	2.	0.	0.	0.	0.	0.	0.	0.	1.	3.	1.
2	n	5	7	2	2	2	3	3	3	3	3	3	5	0	0	0
	Technolog															
	У															

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



<b>BITCOIN AND C</b>	RYPTOCURRENCIES
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Sch	ool:	Sharda School of Eng	ineering & Technology								
Dep	artment	Computer Science & I	Engineering								
Pro	gram:	B.Tech - CSE									
Bra	nch:	Blockchain									
1	Course Code	BCC201 Semester- 3									
2	Course Title	<b>BITCOIN AND CRY</b>	PTOCURRENCIES								
3	Credits	4									
4	Contact										
	Hours	3	3 1 0								
	(L-T-P)										
	Course	Core									
	Status										
5	Course	The objective of the c	ourse is to introduce basi	c funda	amental concepts in						
	Objective	Bitcoins and Cryptocur	rencies, with a practical	approa	ch in understanding						
		futuristic development.	scope of bitcoin and crypt	ocurrer	icles, and its role in						
6	Course	On successful completion	on of this module students v	will be a	able to						
	Outcomes	CO-1: Explain the work	ing of bitcoin and cryptocu	rrencie	s.						
		CO-2: Discover bitcoin	mechanism and network.								
		CO-3: Interpret differen	CO-3: Interpret different bitcoin blocks.								
		CO-4: Compare online	CO-4: Compare online wallets and exchanges.								
		CO-5: Design bitcoin and cryptocurrency based application.									
7	Course	The fundamental concer	CO-6: Discuss distributed systems and future of blockchain.								
/	Description	approach in understandi	ng them will be discussed.	untenen	es, with a practical						
8	Outline syllabu		ng meni win ee uiseusseu.		CO Manning						
0	Unit 1		TO CRYPTO								
	Chit I	CRYPTOCURREN	CIES								
	А	Introduction, Cryptogr	aphic Hash Functions,	Hash	CO1, CO2						
		Pointers and Data Struct	tures								
	В	Digital Signatures, Publ	ic Keys as Identities		CO1, CO2						
	С	A Simple Cryptocurrent	сy		CO1, CO2,CO3						
	Unit 2	BITCOIN BASICS									
	А	Bitcoin Protocol and	Consensus: A High	Level	CO1, CO2,CO3						
		Overview,			~~~~						
	B	Bitcoin and Blockchain	History,		CO2, CO3						
	С	Bitcoin Mechanics an	d Optimizations: A Tech Wallata Mining and Marg	hnical	CO1, CO2,CO3						
	Unit 2	MECHANICS OF BIT	wallets, Mining, and More								
		Bitcoin Transactions Bi	teoin Scripts		CO2CO3CO4						
	A D	Applications of Bitcoin	Serinte Biteoin Blocks		C02,C03,C04						
	D C	The Bitcoin Network I	imitations & Improvements	2	C02,C03,C04						
	Unit 1	STORE AND LICE RIT	recoins & improvements	3							
		How to Store and Use R	litcoins Hot and Cold Store	loe	CO4 CO5						
	R	Online Wallets and Evol	hanges Payment Services	150	C04, C05						
	C Transaction Fees Currency Exchange Markets CO3 CO4 CO										
	Unit 5				003,004,005						
1	UIII J	ALL LICATIONS AND			1						



А	Enabling a and Alternat	Decentralize	d Future, Distributed Systems	CO2,CO5,CO6						
В	How to Dest	How to Destroy Bitcoin, Crypto economics and Proof-of-								
С	State, Scaling Blo Enterprise Anonymity: Blockchains	Scaling Blockchain: Cryptocurrencies for the Masses, Enterprise Blockchain: Real-World Applications, Anonymity: Mixing and Altcoins, Conclusion: Future of Blockchains								
Mode of examination	Theory									
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	Ante Dig     Sate Electronic State									
Other References	Wat     Dr.     Dec     pap	tenhofer, The Gavin Woo entralized er.2014.	Science of the Blockchain d, "ETHEREUM: A Secure Fransaction Ledger,"Yellow							

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO-1: Explain the working of bitcoin and	PO1, PO2, PO3, PO4, PO5, PO7, PO11,
	cryptocurrencies.	PO12, PSO1, PSO2,PSO3
2.	CO-2: Discover bitcoin mechanism and network.	PO1, PO2, PO3, PO4, PO11, PO12, PSO1,
		PSO2, PSO3
3.	CO-3: Interpret different bitcoin blocks.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO11,
		PO12, PSO1, PSO2, PSO3
4.	CO-4: Compare online wallets and exchanges.	PO1, PO2, PO3, PO4, PO5, PO8, PO11,
		PO12, PSO1, PSO2, PSO3
5	CO-5: Design bitcoin and cryptocurrency based	PO1, PO2, PO3, PO5, PO6, PO11, PO12,
	application.	PSO1, PSO2, PSO3
6	CO-6: Discuss distributed systems and future of	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8,
	blockchain.	PO9, PO10, PO12, PSO1, PSO2, PSO3



			0			0									
COa	PO	PS	PS	PS											
COS	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	O3
CO1	2	1	3	1	2	-	1	-	-	-	1	2	1	2	1
CO2	1	3	3	2	-	-	-	-	-	-	2	3	1	2	2
CO3	3	1	2	1	1	1	1	-	-	-	2	1	2	2	1
CO4	2	2	1	3	1	-	-	2	-	-	1	1	2	3	1
CO5	2	2	1	-	2	2	-	-	-	-	2	1	1	2	2
CO6	1	3	2	2	3	2	2	2	2	2	-	2	1	3	1
	1.8	2.0	2.0	1.5	1.5	0.8	0.7	0.7	0.3	0.3	1.3	1.7	1.3	2.3	1.3

#### PO and PSO mapping with level of strength

Average of non-zeros entry in following table (should be auto calculated).

Cour se Code	Course Name	РО 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS 0 2	PS 0 3
B CC 201	BITCOIN AND CRYPTOC URRENCIE S	1.8	2	2	1.5	1.5	0. 8	0. 7	0. 7	0. 3	0. 3	1. 3	1. 7	1. 3	2. 3	1. 3

Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent

#### **Blockchain using Multichain**



Sch	ool:	Sharda School of Engineering & Technology										
Dep	oartment	Computer Science & Engineering										
Pro	gram:	B.Tech - CSE										
Bra	nch:	Blockchain										
1	Course	BCC202 Semester: 4										
	Code											
2	Course	Blockchain using Multichain										
	Title											
3	Credits	3										
4	Contact											
	Hours	3 0 0										
	(L-T-P)											
	Course	Core										
	Status											
5	Course	By the end of the course, students will be able to										
	Objective	1. Understand how multi chain systems Platform work										
	-	2. How securely interact with multichain										
	3. How to Create streams											
6	Course On completion of this course the student should be able to:											
	Outcomes 1. Synthesize the basic concepts and principles of block cha											
	multichain											
		2. Setup a Private blockchain Using Multichain										
		3. To learn the approaches followed in smart contracts										
		4. Understand the functioning of streams										
		5. To learn concept of Decentralized and Distributed Ledger	•									
		6. To maintain security, privacy, and efficiency of a give	en system.									
			-									
7	Course	Blockchain using Multichain										
	Description											
8	Outline sylla	bus	СО									
	5		Mapping									
	Unit 1	Introduction	¥									
	А	What is Block chain? Basic ideas behind blockchain, how it is	CO1									
		changing the landscape of digitalization, Uses of Blockchain.										
		Abstract Models for BLOCKCHAIN - GARAY model -	l									
		RLA Model										
	В	What is Multichain? Objective of Multichain, Features of	CO1									
		Multichain, Uses of Multichain, Process of mining in	l									
		Multichain technology										
	C	Analyse Multichain platform, why it is better than other open CO1										
	Linit 2	Privacy and Parmissions in Multichain										
		Privacy and Parmissions in Multichein, compare Multichein	CO1									
	A	Core and Bitcoin Core Hand-Shaking Process Private										
		blockchains Multichain										
			1									



В	Multiple config	gurable Blockc	hains using Multichain,	CO1,				
	Decentralized	exchange	-	CO6				
С	Wallets for Eth	nereum - Solidi	ty - Smart Contracts - some	CO1,				
	attacks on sma	rt contracts		CO3,				
				CO6				
Unit 3	DECENTRAI	LIZED APPLI	CATIONS (DAPPS)					
А	Characteristics	of Decentraliz	ed application, Setting up a Private	CO2,				
	Blockchain, M	ultiple configu	rable Blockchains using Multichain	CO5,				
				CO6				
В	Deployment s	scenarios of l	Multichain, Centralized currency	CO2,				
	settlement, Bor	nd issuance and	l peer-to-peer trading	CO5,				
		CO6						
С	Consumer-faci	CO2,						
		-		CO5,				
		CO6						
Unit 4	Introducing M	<b>Aultichain Fee</b>	ds					
А	Multichain fe	MultiChain Feeds for Database	CO4					
	Integration, fee							
	0							
В	Purpose of Mu	ultichain stream	ns, off chain data vs on chain data,	CO4				
	JSON and Unicode text, Streams required to implement database, Streams and the MultiChain roadmap,Three areas of high-level functionality, create the streams,							
С								
	publish the dat	ta into streams,	retrieve the data from the streams					
	using the key,	and give perm	ission to others to publish the data					
 TT:4 E	Smort control	streams.						
	Smart contrac	Et approaches	filter D2 Carls Transaction	CO4				
А	Hyperleager	Fabric, smart	filters, R3 Corda, Iransaction	CO4,				
	rules in Hyp	berledger Fab	ric, smart filters, R3 Corda,	005				
D	Multichain, E	Etherium, Con	thick transaction	004				
В	Hyperledger I Multichain To	radric vs MultiChair	Explore Multichain web domo	CO4,				
0		6 Martin ale a line l	Explore, Wuttenam web demo	C05				
C	Applications of Management	System Dome	vin Nama Sarvice and future of	COI				
	Blockchain	System, Dolla	an mame service and future of					
Mode of	Theory							
examination	111001 j							
Weightage	CA	MTE	ETE					
Distribution	25%	25%	50%					
 Text book/s*	1. Blocke	chain From (	Concept to Execution: BitCoin					
1 VAL 000K/ 5	Fthere		Ripple R3 Corda Hyperledger					
	Fabric	/SawTooth/Ind	v MultiChain IOTA CoCo					
	- Kindla	Edition by Do	bajani Mohanty (Author)					
	Kindle	Kindle Edition by Debajani Monanty (Author)						
	2 Beginner's Guide to Ontology: The Dublic Multi Choir							
	& D18	surbuted frust	Conaboration Flattorin: (crypto,					
	crypto	currency, tore	x, trading, bitcoin, invest, earn					



		money, invest, ethereum, blockchain) Kindle Edition by	
		Juan Jimenez (Author)	
	3.	Mastering Blockchain, Second Edition Paperback - 1	
		January 2018 by Imran Bashir (Author)	
Other	1.	https://www.multichain.com/	
References	2.	https://www.multichain.com/download/MultiChain-	
		White-Paper.pdf	

	Course Outcome	Program Outcomes (PO) &
S. No.		Program Specific Outcomes
		(PSO)
1	Synthesize the basic concepts and principles of block	PO1, PO2, PO3, PO4, PO5, PO6,
1	chain AND multichain	PO8, PSO2
2	Setup a Private blockchain Using Multichain	PO1, PO2, PO3, PO4, PO5, PO6,
2		PSO2
3	To learn the approaches followed in smart contracts	PO1, PO2, PO3, PO4, PO5, PO6,
5		PSO2
1	Understand the functioning of streams	PO1, PO2, PO3, PO4, PO5, PO6,
4		PO8, PSO2
	To learn concept of Decentralized and Distributed	PO1, PO2, PO3, PO4, PO5,
5	Ledger.	PO6, PO8,
		PO10,PSO1,PSO2,PSO3
6	To maintain security, privacy, and efficiency of a	PO1, PO2, PO3, PO4, PO5, PO6,
0	given system.	PO8, PSO2,PSO3

### PO and PSO mapping with level of strength

Course Code_ Course Name	CO's	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	CO1	2	3	1	1	2	2	-	2	-	-	-	-	-	2	-
PCC202	CO2	2	2	3	2	3	2	-	-	-	-	-	-	-	2	-
Blockchain using Multichain	CO3	2	2	3	2	3	2	-	-	-	-	-	-	-	2	-
	CO4	2	3	1	1	2	2	-	1	-	-	-	-	-	2	-
	CO5	3	3	3	1	1	1		1	-	1	-	-	1	2	2
	CO6	3	3	3	1	2	1	-	1	-	-	-	-	-	3	2



Course Code	Course Name	PO 1	PO 2	РО 3	PO 4	РО 5	PO 6	РО 7	РО 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS 0 2	PS O 3
	Blockchai															
BCC20	n using	2.	2.	2.	1.	2.	1.	0.	0.	0.	0.	0.	0.	0.	2.	0.
2	Multichai	3	7	3	3	2	7	0	8	0	2	0	0	2	2	7
	n															

Average of non-zeros entry in following table (should be auto calculated).

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sc	chool: SET	Batch : 2023-27									
Pr C	rogram: B.TECH- SE	Current Academic Year: 2023-24									
Bi Bi	ranch: LOCKCHAIN	Semester: 5									
1	Course Code	BCC301									
2	Course Title	Programming in GO									
3	Credits	3									
4	Contact Hours (L-T-P)	2-0-2									
	Course Status	CORE									
5	Course Objective	The objective of the course is a short, concise computer programming using the language Go	e introduction to								
6	<ul> <li>6 Course Outcomes</li> <li>6 Course Outcomes</li> <li>6 Students will be able to:</li> <li>CO1. Implement GO fundamentals in programming concepts by identifying classes, objects, members of a class and relationships among them needed for a specific problem.</li> <li>CO2. Write GO programs to solve problems of applications in the real world scenarios.</li> <li>CO3. The ability to handle Concurrency primitives via go routines and channels makes concurrent programming easy.</li> <li>CO4. Create their own Stand-alone command-line apps or scripts Network and Web server's software.</li> <li>CO5. Analyse and evaluate the code coverage by your tests, benchmarking tests and writing example code that is used in generating your code documentation.</li> <li>CO6: design and develop GO program.</li> </ul>										
7	Course Description	The course is about short, concise introduct programming using the language Go	ion to computer								
8	Outline syllabus		CO Mapping								
	Unit 1	Introduction									
	А	Introduction to GO programming, Advantages of GO, Concurrency	CO1, CO2								
	В	Installing Go, Workspaces & Packages, Go Tool	CO1, CO2								
	С	Variables, Variable Initialization	CO1, CO2								
	Unit 2	Data Types									
	А	Overview, Pointers, Variable Scope, Deallocating Memory, Garbage Collection	CO1								
	В	Comments, Printing, Integers, Ints, Floats, Strings, String Packages	CO1								
	С	Constants, Control Flow, Control Flow, Scan	CO1, CO2								



Unit 3	Functions in G							
А	Function Declar Parameters, res	ration, Fur ult parame	nction types, variadic	CO1, CO2				
В	Passing parame functions, Error	ter value, signalling	Higher order g and handling	CO1,CO2				
С	Deferring funct recovery	ion call, F	unction panic and	CO1,CO2				
Unit 4	Go Packages a	nd Progra	ams					
А	Understanding creating a work	the GO pa space, The	ackage, the workspace, e import path	CO1, CO2				
В	Declaring the p Naming Packag visibility	CO1,CO2,CO4, CO5						
С	Importing a pactor creating program	kage initialization, e packages.	CO1,CO2,CO4, CO5,CO6					
Unit 5	Concurrency							
А	Go routines, GO and channel typ closing a chann	Go routines, GO routines scheduling, Channels and channel type, channel length and capacity, closing a channel						
В	Writing concur streaming data from multiple c	rent progr , Generate hannels, c	ram, synchronization, or function, Selecting hannel time out	CO2,CO3,CO4				
С	The sync packa locks, synchron concurrency ba Detecting race	ge, synchr izing with rrier with s condition,	onizing with mutex composite values, sync.Waitgroup, parallelism in GO	CO2,CO3,CO4				
Mode of examination	Theory							
Weightage	CA	MTE	ETE					
 Distribution	30%	20%	50%					
Text book/s*	By Vladimir Vi							
Other References	<ol> <li>The Go Programming Language, Alan A. A. Donovan, Brian W. Kernighan</li> <li>Programming in Go: Creating Applications for the 21st Century, Mark Summerfield</li> </ol>							



S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	CO1. Implement GO fundamentals in	PO1, PO2, PO3, PO6, PO7, PO8,
	programming concepts by identifying classes,	PO11, PO12, PSO1, PSO2, PSO3
	objects, members of a class and relationships	
	among them needed for a specific problem.	
2.	CO2. Write GO programs to solve problems of	PO1, PO2, PO3, PO4, PO5, PO10,
	applications in the real world scenarios.	PO12, PSO1, PSO2, PSO3
3.	CO3.The ability to handle Concurrency	PO1, PO2, PO3, PO4, PO5, PO10,
	primitives via go routines and channels makes	PO12, PSO1, PSO2, PSO3
	concurrent programming easy.	
4.	CO4. Create their own Stand-alone command-	PO1, PO2, PO3, PO4, PO7, PO8,
	line apps or scripts Network and Web server's	PO9,PO10,PSO1, PSO2, PSO3
	software.	
5.	CO5. Analyse and evaluate the code coverage	PO1, PO2, PO3, PO9, PO10, PO11,
	by your tests, benchmarking tests and writing	PO12, PSO1, PSO2, PSO3
	example code that is used in generating your	
	code documentation.	
6.	CO6: design and develop GO program.	PO1, PO2, PO3, PO4, PO5, PO6,
		PO7, PO8, PO9, PO11, PSO1,
		PSO2, PSO3

# PO and PSO mapping with level of strength

COs	P O 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	1	2	-	-	3	3	2	-	_	3	1	1	2	1
CO2	2	3	1	2	2	-	-	-	-	2	-	2	1	3	-
CO3	1	2	3	3	2	-	1	2	-	2	-	2	1	2	1
CO4	2	1	2	2	-	-	2	2	1	1	-	-	1	3	2
CO5	3	2	2	-	-	-	-	-	2	2	1	2	1	3	1
CO6	2	3	2	1	2	2	1	1	2	-	2	-	1	2	1



Course Code	Course Name	РО 1	РО 2	РО 3	РО 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PS O 3
BCC3	Programmi	2.	2.	2.	2.	2.	2.	1.	1.	1.	1.	2.	1.	1.	2.	1.
01	ng in GO	0	0	0	0	0	5	8	8	7	8	0	8	0	5	2

Average of non-zeros entry in following table (should be auto calculated).

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



#### Programming in GO LAB

School: SET		Batch : 2023-27						
Program:B.TECH- CSE		Current Academic Year: 2023-24						
Branch: BLOCKCHAIN		Semester: 5						
1	Course Code	BCL301						
2	Course Title	Programming in GO LAB						
3	Credits	1						
4	Contact Hours (L-T-P)	2-0-2						
	Course Status	CORE						
5	Course Objective	The main objective is after undergoing this course it will be easier for achieving higher performance in digital devices that require multicore architectures which are different from machines level languages like C++ and Java.						
6	Course Outcomes	<ul> <li>Students will be able to:</li> <li>CO1. This course is also known as Go Language programming is a great language for writing concurrent programs that are statically typed like C++.</li> <li>CO2. Write GO programs to solve problems of applications in the real world scenarios.</li> <li>CO3. This course includes concepts for building large scale and complex software.</li> <li>CO4. Create their own Stand-alone command-line apps or scripts Network and Web server's software.</li> <li>CO5. In this course, you will also learn about methods, arrays, channels, collection functions, expressions, rate limiting, implementation of interfaces, atomic counter and mutex, string functions, etc.</li> <li>CO6: In this course, this section is very important because it covers almost all the basic and important topics to understand and easily</li> </ul>						
7	Course Description	Go is a procedural programming language. It was developed in 2007 by Robert Griesemer, Rob Pike, and Ken Thompson at Google but launched in 2009 as an open-source programming language. Programs are assembled by using packages, for efficient management of dependencies. This language also supports environment adopting patterns alike to dynamic languages.						
8	Outline syllabus		CO Mapping					
	Unit 1	IntroductionGo Programming						
	А	Introduction to GO programming, online IDEsGO, Go Playground, repl.it	CO1, CO2					
	В	Installing Go, Text editor and Compiler, Go Tool	CO1, CO2					
	С	Finding a Go Compiler	CO1, CO2					



Unit 2	<b>Developed</b> in G						
	Overview, How	CO1					
Α	Windows 10, H						
	World in Go						
B	Write backslash	CO1					
D	How to Convert						
С	Constants, Cont	CO1, CO2					
Unit 2	Loop Control S						
Unit 5	Sorting in GO						
	Functions in Go	CO1, CO2					
А	Continue,						
	Golang program						
	Sort, Golang pro						
	Radix Sort						
B	Golang program	CO1,CO2					
D	Common Sub-se						
С	Concurrently pr	CO1,CO2					
C	goroutines and a						
Unit 4	Arrays in Go						
А	Creating and ac	CO1, CO2					
	illustrate value t						
В	Multi-Dimensio	CO1,CO2,CO4,					
	length of the arr	CO5					
С	How to compare	CO1 CO2 CO4					
	How to Compare	C01, C02, C04, C05, C06					
	Golong?	005,000					
Unit 5	Outrin Co I						
Unit 5	How to implement	CO1 CO2 CO4					
А	Implement Queue	01,002,004					
	Implement Queue	CO2 CO3 CO4					
В		02,003,004					
0	Implement queue	CO2 CO2 CO4					
U Mode of examination	Theory	02,003,004					
Mode of examination	Theory	MTE	ETE				
Weightage Distribution	CA 25%	MIE	EIE 500/				
	25%	25%	Des Vila dimeir Viesian				
Text book/s*	Learning Go Programming By viadimir vivien						
	1. Golang or Go programming language was introduced first by						
Other References	Google in late 2007 and was released in 2009 by Robert Griesemer, Bob Bike, and Kan Thompson						
	KOU PIKE, and KEN HOOMPSON. 2. The Go Programming Language, written by Alan A. A. Donovan						
	2. The Go Flogramming Language, whileh by Alah A. A. Donovan and Brian W Kernighan in 2015						
	3. Go in Action, written by William Kennedy, Brian Ketelsen, and						
	Erik St. Martin and was published back in 2015.						
	Unit 2ABCUnit 3ABCUnit 4ABCUnit 5ABCUnit 5ABCUnit 5ABCUnit 5ABCUnit 5ABCUnit 5ABCMode of examinationWeightage DistributionText book/s*Other References	Unit 2Developed in G Overview, How Windows 10, H World in GoBWrite backslash How to ConvertCConstants, ContUnit 3Loop Control S Sorting in GOAFunctions in Go Continue, Golang program Sort, Golang program Common Sub-se CBGolang program Concurrently pr 	Unit 2Developed in Go LanguaAOverview, How to Install 4AWindows 10, How to WritWorld in GoWrite backslash in Golang How to Convert string to fBWrite backslash in Golang How to Convert string to fCConstants, Control Flow, OUnit 3Loop Control Statements Sorting in GOAGolang program for imple Sort, Golang program for imple Continue,BGolang program for imple Control Sub-sequenceCConcurrently printing arra goroutines and channelsUnit 4Arrays in GoACreating and accessing an illustrate value type array How to Calculate the Aver Golang?BHow to compare two array How to Calculate the Aver Golang?CImplement Queue Using Stite StiteBImplement Queue Using Stite StiteCImplement Queue Using Stite StiteCImplement Queue Using Stite StiteBCA StifeCImplement Queue Using Stite StiteBCA StifeCImplement Queue Using Stite StifeBCA StifeCImplement Queue Using Stite StifeBCA StifeCImplement Queue Using Stite StifeBCA StifeCImplement Queue Using Stite StifeBCongo Go programing Google in late 2007 and Rob Pike, and Ken Thon S. Go in Action, written Erik St. Martin and was S. Go in Action, written Erik St. Martin and was	Unit 2         Developed in Go Language           A         Overview, How to Install and Run Go on Windows 10, How to Write your First Hello World in Go           B         Write backslash in Golang string, How to Convert string to float type in Go?           C         Constants, Control Flow, Control Flow, Scan           Unit 3         Loop Control Statements in Go Language, Sorting in GO           Functions in Go Language,Break, Goto, Continue,         Functions in Go Language,Break, Goto, Continue,           A         Golang program for implementation of Insertion Sort, Golang program for implementation of Longest Common Sub-sequence           C         Concurrently printing array elements using goroutines and channels           Unit 4         Arrays in Go           A         Creating and accessing an Array, Go program to illustrate value type array           Multi-Dimensional Array, How to find the length of the array           B         Multi-Dimensional Array, How to find the length of the array           C         How to calculate the Average using Arrays in Golang?           Unit 5         Queue in Go Language? Implement Queue Using Slices in Go Language           B         Implement queue Using Structures in Go Language           C         Implement queue Using Structures in Go Language           B         Inplement queue Using Structures in Go Language           1         Golang or Go programmin			


#### **<u>CO</u>** and **PO** Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program
		Specific Outcomes (PSO)
1.	CO1. The demand for the programmer having	PO1, PO2, PO3, PO6, PO7, PO8, PO11,
	experience in the GO language is increasing	PO12,PSO1, PSO2, PSO3
	day by day. Just for your information, Amazon	
	has started to shift some of its modules from	
	Node. js to GO.	
2.	CO2. Write GO programs to solve problems of	PO1, PO2, PO3, PO4, PO5, PO10, PO12,
	applications in the real world scenarios.	PSO1, PSO2, PSO3
3.	CO3.This GoLang course will give you full	PO1, PO2, PO3, PO4, PO5, PO10, PO12,
	hands-on experience of working with GO	PSO1, PSO2, PSO3
	rather than theoretical knowledge.	
4.	CO4. Create their own Stand-alone	PO1, PO2, PO3, PO4, PO7, PO8,
	command-line apps or scripts Network and	PO9,PO10,PSO1, PSO2, PSO3
	Web server's software.	
5.	CO5. Analyse and evaluate the code coverage	PO1, PO2, PO3, PO9, PO10, PO11, PO12,
	by your tests, benchmarking tests and writing	PSO1, PSO2, PSO3
	example code that is used in generating your	
	code documentation.	
6.	CO6: In this course, this section is very	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	important because it covers almost all the	PO8, PO9, PO11, PSO1, PSO2, PSO3
	basic and important topics to understand and	
	easily code the Golang codes.	

# PO and PSO mapping with level of strength

COs	DO1	РО	PO	РО	PSO	PSO	PSO								
COs	POI	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	2	-	-	3	3	2	-	-	3	1	1	2	1
CO2	2	3	1	2	2	-	-	-	-	2	-	2	1	3	-
CO3	1	2	3	3	2	-	1	2	-	2	-	2	1	2	1
CO4	2	1	2	2	-	-	2	2	1	1	-	-	1	3	2
CO5	3	2	2	-	-	-	-	-	2	2	1	2	1	3	1
CO6	2	3	2	1	2	2	1	1	2	-	2	-	1	2	1

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	PO 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
BCL30	Programming	2.	2.	2.	2.	2.	2.	1.	1.	1.	1.	2.	1.	1.	2.	1.
1	in GO LAB	0	0	0	0	0	5	8	8	7	8	0	8	0	5	2

Strength of Correlation

1. Addressed toSlight (Low=1)extent2. Addressed toModerate (Medium=2) extent



Sc	chool:	Sharda S	chool of Eng	ineering & Technology						
D	epartment	Compute	er Science & I	Engineering						
Pr	ogram:	B.Tech -	CSE							
Bı	ranch:	Blockcha	in							
1	Course Code	BCC302	Semester- 6							
2	Course Title	SMART	CONTRACTS	SUSING ETHEREUM						
3	Credits	4								
4	Contact									
	Hours		3	1		0				
	(L-T-P)									
	Course	Core								
	Status									
5	Course Objective	The objective of the course is to introduce basic fundamental conc Smart Contracts using Ethereum with a practical approa understanding them. To visualize the scope of smart contract Ethereum its role in futuristic development.								
6	Course Outcomes	On CO CO CO CO CO CO	<ul> <li>CO-1: Develop smart contract, solidarity, ethereum based application.</li> <li>CO-2: Compare bitcoin, ethereum, hyperledger and various crpyocurrencies concept.</li> <li>CO-3: Discuss decentralization and crowfunding systems.</li> <li>CO-4: Explain smart contracts, their technical capabilities, practical applications, limitations and security constraints.</li> <li>CO-5: Discuss the most prominent smart contract platform and Ethereum.</li> </ul>							
7	Course Descriptio	n The pra	The fundamental concepts in Smart Contracts using Ethereum with a practical approach in understanding them have been discussed.							
8	Outline syllabus									
	Unit 1	IN	<b>TRODUCTIO</b>	N TO SMART CONTRA	CTS					
	А	Sm life	art Contract Ba cycle,	sics: Why Smart Contracts	? Contract	CO1, CO2				
	В	Sol	idity: Structure	, Basic Data Types & State	ments,	CO1, CO2				
	C	Con	ntract lifecycle,	distinction between a payr	nent	CO1, CO2				
		sys	tem and a decer	ntralized applications platfo	orm					
	Unit 2		HEREUM							
	А	Eth Eth	ereum – Introd ereum,	uction, Multitude of clients	5 1 <b>n</b>	CO1, CO2, CO3				
	В	Pro priv	duction and tes vate and develo	t networks in Ethereum , P pment deployments	ublic,	CO1, CO2, CO3				
	С	Cor pro	nparing Bitcoin tocols	n and Ethereum, Ethereum	sub-	CO1, CO2, CO3				
	Unit 3	SO	LIDITY							
	А	Der Sol life	nonstration of s idity, Solidity	smart contract, Introductio in depth, Building blocks,	n to Contract	CO1, CO2, CO3, CO4				
	В	Sol	idity for Contra Deploying My	ct Writing, Developing, Co Contract	ompiling	CO1, CO2, CO3, CO4				

#### SMART CONTRACTS USING ETHEREUM



С	Interacting with th	e Contract,	Limitations of Remix	CO1, CO2,				
Unit 4	DECENTRALIZ	ATION		005,004				
A A	Decentralized Aut Decentralized App	onomous C	Organization (DAO),	CO3, CO4, CO5				
В	A Central Bank or System	Your Own	Coin, A Crowdfunding	CO3, CO4, CO5				
С	State, Merkle Patr Objects of smart c	State, Merkle Patricia Tree, Client Applications, Objects of smart contracts						
Unit 5	USE AND APPL CONTRACTS	USE AND APPLICATION OF SMART CONTRACTS						
А	Examples of using developing smart of	nples of using smart contracts, Time Elements in eloping smart contracts						
В	Features of smart of Safety, Efficiency	contracts: A	CO4,CO5, CO6					
С	Other smart contra applications, Code prospects	mart contract platforms, Quality of decentralized tions, Code patterns, Discussion of future						
Mode of examination	Theory							
Weightage Distribution	CA 25%	MTE 25%	ETE 50%					
Text book/s*	<ul> <li>Bitcoin and Introduction A Goldfeder Prin</li> <li>Mastering Bit 2014 978-069</li> </ul>	Comprehensive A. Miller, S. illy Publishing						
Other References	<ul> <li>Ethereum Whit</li> <li>Ethereum docu</li> <li>Solidity docum ((https://soliditionality))</li> </ul>	ite Paper V umentation nentation ty.readthed	Paper Vitalik Buterin Online 2017 nentation ( <u>http://www.ethdocs.org/en/latest</u> ) ntation readthedocs io/en/develop))					

S. No.	Course Outcome	Program Outcomes (PO) & Program
		Specific Outcomes (PSO)
1.	CO-1: Develop smart contract, solidarity, ethereum	PO1, PO2, PO3, PO6, PO7, PO8, PO11,
	based application.	PO12,PSO1, PSO2, PSO3
2.	CO-2: Compare bitcoin, ethereum, hyperledger and	PO1, PO2, PO3, PO4, PO5, PO10, PO12,
	various crpyocurrencies concept.	PSO1, PSO2, PSO3
3.	CO-3: Discuss decentralization and crowfunding	PO1, PO2, PO3, PO4, PO5, PO7, PO8,
	systems.	PO10,PO12,PSO1, PSO2, PSO3
4.	CO-4: Explain smart contracts, their technical	PO1, PO2, PO3, PO4, PO7, PO8, PO9,
	capabilities, practical applications, limitations and	PO10, PSO1, PSO2, PSO3
	security constraints.	
5.	CO-5: Discuss the most prominent smart contract	PO1, PO2, PO3, PO9, PO10, PO11, PO12,
	platform and Ethereum.	PSO1, PSO2, PSO3
6.	CO-6: Improve other smart contract problems.	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
		PO8,PO9,PO11,PSO1,PSO2, PSO3



COs	DO1	PO	PO	PO	PO	PO	PO	РО	PO	PO	РО	РО	PS	PS	PSO
COs	POI	2	3	4	5	6	7	8	9	10	11	12	01	O2	3
CO1	2	1	2	-	-	3	1	1	-	-	1	1	1	2	1
CO2	2	3	1	2	2	-	-	-	-	1	-	2	1	2	2
CO3	1	2	3	3	2	-	1	1	-	1	-	2	1	2	1
CO4	2	1	2	2	-	-	1	1	1	1	-	-	1	3	2
CO5	3	2	3	-	-	-	-	-	2	1	1	2	1	2	1
CO6	2	3	2	1	2	2	1	1	1	-	1	-	1	2	1

#### PO and PSO mapping with level of strength

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	P 0 1	PO 2	PO 3	PO 4	Р О 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
BCC30 2	SMART CONTRACT S USING ETHEREUM	2	2	2. 2	1. 3	1	0. 8	0. 7	0. 7	0. 7	0. 7	0. 5	1. 2	1	2. 2	1. 3

## Strength of Correlation

1. Addressed to Slight (Low=1) extent

2. Addressed to Moderate (Medium=2) extent



Smart Contracts using Hyperledger Fabric

So	chool:	Sharda School	of Engineering &	Technology							
D	epartment	Computer Scie	ence & Engineering	g							
Pı	rogram:	<b>B.Tech -CSE</b>									
B	ranch:	Blockchain									
1	Course Code	BCC303	SEMESTER: 6								
2	Course Title	Smart Contrac	Smart Contracts using Hyperledger Fabric								
3	Credits	4	4								
4	Contact Hours (L-T-P)	3	3 1 0								
	Course Status	CORE	CORE								
5	Course Objective	This course is de in blockchain tec chaincode.	This course is designed for Developers and system programmers who are interested in blockchain technology but have little to no experience with blockchain and chaincode.								
6	Course Outcomes	CO1. Understan CO2. Understan CO3. Explore H CO4. Understan contracts CO5. Understan environment CO6. Develop S	<ul> <li>CO1. Understand the concept of smart contracts and chaincode in blockchain</li> <li>CO2. Understanding the key concepts of Hyperledger fabric</li> <li>CO3. Explore Block chain application using Hyperledger Fabric</li> <li>CO4. Understand the architecture and framework of hyperledger and smart contracts</li> <li>CO5. Understand Hyperledger Explorer fabric &amp; Hyperledger Composer environment</li> </ul>								
7	Course Descriptio n	Blockchain is an emerging technology pattern that can radically improve banking, supply-chain, and other transaction networks, creating new opportunities for innovation.Blockchain technology offers exciting possibilities to radically improve transactions networks, enabling innovations for asset transfer while reducing the cost and risk. Blockchain technology provides the basis for a dynamic shared ledger that can be applied to save time when recording transactions between parties, remove costs associated with intermediaries, and reduce risks of fraud and tampering. All industries can benefit from this technology, from manufacturing to finance and intellectual property.									
8 Outline syllabus CO g											



Unit 1	Blockchain and smart contracts	
А	Smart contracts: Introduction, Legal design of small contracts, Developing a smart contract,Communicating between smart codes	CO1, CO2
В	System chaincode, chain code API, valid transactions, channels and chaincode definitions	CO1, CO2
С	Blockchain network, MSP, Identity	CO1, CO2
Unit 2	Exploring Hyperledger Fabric	
 А	Hyperledger Fabric Model terminology, tools	CO2
В	Frameworks of hyperledger fabric, component design	CO2
С	Use cases for design philosophy	CO2, CO3
Unit 3	ARCHITECTURE OF HYPERLEDGER FABRIC V1.1	
A	Architecture of hyperledger Fabric : Reference and run time architecture, Transaction, Ledger	CO3,C O4
В	Nodes, peer, Endorser, Ordering nodes	CO3,C O4
С	Channels, certification authority, Transaction flow.	CO3
Unit 4	Hyperledger Explorer	
А	Hyperledger explorer, Definition, Structure, Components	CO5,C O6
В	Block code peer list, Chaincode list, Transaction details	CO5,C O6
С	Technical requirements: Installation and setting up environment, Configuring with fabric	CO5,C O6
Unit 5	Hyperledger Composer	
A	Hyperledger Composer, Definition and structure	CO5,C O6



	В	Benefits, Components of Hypo	erledger composer		CO5,C				
					06 CO5 C				
	С	Hyperledger composer solutio	n, Installation and con	figuration	06				
	Mode of examinati on	Theory/Jury/Practical/Viva							
	Weightag	CA	CA MTE ETE						
	e Distributi on	25%	25%	50%					
		"1. Mastering Hyperledger Fabric: Master The Art of							
		Hyperledger Fabric on Kubernetes							
		By Narendranath Reddy Thota"							
	Text	"2. Developing a Blockcha	ain Business Networ	k with					
	book/s*	Hyperledger Composer usir	ng the						
		By Vance Morris, Rohit Ad	ivi, Ratnakar Asara,	Matthew					
		Cousens, Nick Gupta, Nich	olas Lincoln, Barry I	Mosakowski,					
	Hong Wei Sun, IBM Redbooks"       Other								
	Reference	content/uploads/2018/08/HL_Whitepaper_IntroductiontoHyperle							
	s	dger.pdf	dger.pdf						
		https://www.hyperledger.or	g/projects/explorer						



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1	Understand the concept of smart contracts and chaincode in blockchain	PO1,PO2,PO3,PO5, PO7,PO8,PO12,PSO1,PSO2
2	Understanding the key concepts of Hyperledger fabric	PO1,PO3,PO5,PSO1,PSO2
3	Explore Block chain application using Hyperledger Fabric	PO1,PO2,PO3,PO5, PO8,PSO2,PSO3
4	Understand the architecture and framework of hyperledger and smart contracts	PO1,PO2,PO4,PO6, PSO1
5	Understand Hyperledger Explorer fabric and Hyperledger Composer environment	PO5,PO10,PSO2
6	Develop Solutions to business modules.	PO1,PO2,PO3,PO5, PO6,PO8,PO11,PSO1,PSO2

# PO and PSO mapping with level of strength for Course Name Smartcontracts using hyperledger fabric

Course Code_ Course Name	C Os	Р О 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	C 0 1	2	2	3	-	2	-	1	3	-	-	-	1	1	3	-
	C 0 2	2	-	1	-	1	I	I	-	-	-	-	-	1	1	-
BCC303_Smartco ntracts_for	C 0 3	3	3	2	-	2	I	I	3	-	-	-	-	-	2	1
hyperledger fabric	C O 4	2	2	-	1	-	1	-	-	-	-	-	-	2	-	-
	C O 5	-	-	-	-	2	-	-	-	-	1	-	-	-	1	-
	C O 6	2	2	3	-	3	2	-	3	-	-	1	-	2	3	-



## Average of non-zeros entry in following table (should be auto calculated).

Cou rse Cod e	Cours e Name	Р О 1	P O 2	P O 3	Р О 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
BCC 303	Smart Contrac ts using Hyperle dger Fabric	1. 8	1.5	1.5	0.1	1.6	0.5	0.1 5	0.1 5	1. 5	0	0.1 5	0.1 5	1	1.6	0.1 5

## Strength of Correlation

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sc	hool:	Sharda	School of Engineering & Technology										
De	epartment	Compu	ter Science & l	Engineering									
Pr	ogram:	<b>B.Tech</b>	- CSE										
Br	anch:	Blockc	nain										
1	Course Code	BCC40	1 Semester- 7										
2	Course Title	Cyber	Security in Bloc	kchain Technology									
3	Credits	3		I									
4	Contact												
	Hours		3	0		0							
	(L-T-P)												
	Course	Core											
	Status		1										
5	Course Objective	e	By the end of the course, students will be able to:										
			1. define cyber	r security challenges in b	lockchai	in technology							
			2. analyze public key cryptography in blockchain technology										
	<u> </u>		3. understand role of time stamping in blockchain technology										
6	Course Outcome	s	I. Classif	ying Attacks On Blockel	hain Tec	hnology							
			2. Explain	n Consensus Algorithms	To Prev	ent Attacks							
			3. Demor	strate Public Key Crypto	ography								
			4. Constr	uct Digital Signature Fro	m Block	chain Context							
			5. Demonstrate Time Stamping Algorithms										
			6. Explain	n Use Cases Of Blockcha	ain In Cy	ber Security							
7	Course Descripti	on	This course provides insight to Cyber Security in Blockchai										
	course 2 courpu		Technolog	V									
8	Outline syllabus			<del>v</del>		CO Mapping							
	Unit 1		Privacy, Secu	rity issues in Blockchai	n								
	А		Pseudo-anony	mity vs. anonymity, Zca	ash and	CO1 , CO2							
			Zk-SNARKS	for anonymity preservati	on								
	В		attacks on Blo	ckchains – such as Sybil	attacks,	CO1 , CO2							
			selfish mining	g, 51% attacksadv	vent of								
			algorand										
	С		Sharding bas	ed consensus algorith	ims to	CO1 , CO2							
			prevent these a	attacks									
	Unit 2		Cryptography	y									
	A		Public Key	Infrastructure (PKI)	) and	CO1, CO3							
			Cryptography										
	В		Conventional	Form of	CO1, CO3								
	9		Distributed PK	A , Blockchain vs PKI									
	C		Blockchain -	Public Key Cryptog	graphy,	CO1, CO3							
			Decentralized	Public Key Infrast	ructure								
	IImit 2		(DPKI)										
			Digital Signal	ure	tort	CO2 CO4							
	A		Digital Signati	ure from Blockchain con	lext	CO3, CO4							
	В		Undeniable sig	gnature		C03, C04							

# Cyber Security in Blockchain Technology

-



С	Diffie-Hellma	an, Digital	signature scheme for	CO3, CO4							
	information no	on-repudia	tion in blockchain								
Unit 4	Blockchain-b	ased time	stamping								
Α	Time stampin	g Metadata	a Using Blockchain	CO4,CO5							
В	Decentralized on Blockchair	Trusted T	Fime stamping Based	CO3,CO5							
С	Content Time	stamping		CO3,CO5							
Unit 5	Use Cases of	Blockchai	in In Cyber security								
Α	Decentralized	Storage	e Solutions, How	CO5, CO6							
	Guardtime uses blockchain technology to safeguard data										
В	IoT Security, Safer DNS, Using blockchains to CO5, CO6 prevent DDoS attacks										
С	Implementing	Security i	n Private Messaging	CO5, CO6							
Mode of examination	Theory										
Weightage Distribution	CA	MTE	ETE								
	25%	25%	50%								
Text book/s*	Blockchain Technology Basics: Blockchain cryptography and cybersecurity Kindle Edition by Raghava Shankar (Author), Srikanth RC Cherukupalli M Tech (Author)										
Other References	Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks Kindle Edition by Imran Bashir (Author) Format: Kindle Edition										

<b>S.</b>	Course Outcome	Program Outcomes (PO) & Program Specific
No.		Outcomes (PSO)
1	classifying attacks on blockchain	PO1, PO2, PO3, PO4, PO5, PSO1, PSO2, PSO3
	technology	
2	explain consensus algorithms to	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9,
	prevent attacks	PSO1, PSO2,PSO3
3	demonstrate public key cryptography	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9,
		PSO1, PSO2,PSO3
4	construct digital signature from	PO1, PO2, PO3, PO4, PO5,
	blockchain context	PO10,PO11,PO12,PSO1, PSO2,PSO3
5	demonstrate time stamping	PO1, PO2,PO3,PO4,PO5,
	algorithms	PO10,PO11,PO12,PSO1, PSO2,PSO3
6	explain Use Cases of Blockchain	PO1, PO2, PO3, PO4, PO5,
	In Cyber security	PO10,PO11,PO12,PSO1, PSO2,PSO3



С	PO	РО	РО	PO	PO	PS	PS	PS							
Os	1	2	3	4	5	6	7	8	9	10	11	12	01	O2	O3
C 01	2	2	2	2	2	-	-	-	-	-	-	-	2	2	2
C 02	3	2	3	2	2	1	1	1	1	-	-	-	2	1	2
C 03	2	2	3	2	2	1	1	1	1	-	-	-	1	2	2
C 04	2	1	3	1	2	-	-	-	-	2	2	2	2	2	1
C 05	2	2	2	2	2	-	-	-	-	2	1	2	1	1	1
C 06	2	1	1	1	1	-	-	-	-	1	1	1	1	1	1

#### PO and PSO mapping with level of strength

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO	PO 3	РО	PO	PO	PO	PO	PO	PO	РО	PO	PS	PS	PS
Code	Name	1	2		4	5	6	7	8	9	10	11	12	O 1	O 2	O 3
BCC40 1	Cyber Security in Blockchai n Technolog y	2. 1	1. 6	2. 3	1. 6	1. 8	0. 3	0. 3	0. 3	0. 3	0. 8	0. 6	0. 8	1. 5	1. 5	1. 5

## Strength of Correlation

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	Sharda School of Engineering & Technology									
Dep	artment	Computer Science & I	Engineering								
Pro	gram:	B.Tech-CSE									
Bra	nch:	Blockchain									
1	Course Code	BCC011 Semester: 4									
2	Course Title	<b>Blockchain for Busine</b>	SS								
3	Credits	3									
4	Contact Hours	3	0		0						
	Course Status	Program Elective									
5	Course Objective	It aims at eliminating the companies to quickly and to their roots. Because da — and validated before it	e middleman, or data gate easily trace products and the ta is shared on multiple sy 's recorded — it's more see	ekeeper, b ransaction stems in r cure.	blockchain allows is all the way back nultiple countries						
6	Course Outcomes	CO1. Define how the co CO2. Interpret various business models and ma CO 3. Apply Blockch financial and commodit CO 4. Discover Blockch CO 5. Recommend new CO 6. Imagine CO cur solutions.	oncept of money and related blockchain functionalises ake correct & fully infortain technology in variation ies hain from Big data persponses application for rrent issues of blockcha	ate in the ities to med deci ous busin pective or the Blo in and pr	concept of DLT extend existing sions. less domains of ockchain ropose potential						
7	Course Description	Blockchain will bring at nature of business itself. funded and managed, how functions like marketing blockchain technology wi will explore how blockch blockchain can be used to be able to identify the dif explain how these affect will be able to identify se to attract technology start	bout profound changes to This technology will d v they create value, and ev and accounting. In this ill penetrate into the struct ain will transform the role o manage and protect inte ferent layers of the block the governance of blockch ven qualities that a region ups and to build a vibrant b	business, lisrupt hov yen how the course you tures of on s of the C llectual pre- chain technological in the wo blockchain	and even to the w enterprises are ney perform basic ou will learn how rganizations. You -Suite, and how a roperty. You will nology stack, and ms. As well, you rld needs in order n ecosystem.						
8	Outline syllabu	18			CO Mapping						
	Unit 1	Introduction to Blocko applications	chain and business								
	A	Evolution of blockchair crypto currencies	n, creation, Growth, Rise	e of	CO2						
	В	Blockchain Principles, Qu platforms	alities , Popular blockcha	in	CO2						
	С	Brief history of money, Ir sector, internet	npact of blockchain: Finar	ncial	CO1,CO2						

**Blockchain for Business** 



Unit 2	Financial Serv	vices& Govern	ment Public Sectors							
А	Blockchain an government s world use cas	nd Smart Cont ervices, Land	racts, Transparency in Right Management, real	CO2,CO3						
В	Manufacturin chain, Logisti	g & Industrial cs, IOT	Blockchain for Supply	CO3						
С	Health Care a Pharmaceutic	nd Life Science als, Public hea	ces: Recordkeeping, llth	C03,CO2,CO5						
Unit 3	Data Manager	ment and cybe	r security							
А	Data managem based blockcha	ent: Blockchair ain	n for big data,CCT,Cloud	CO3,CO4						
В	Monetizing Big Challenges	Monetizing Big data, Blockchain and Big Data Analytics, Challenges								
С	Blockchain for	Blockchain for Gaming, Blockchain and cyber security								
Unit 4	Implementin	Implementing blockchain in Enterprises								
А	Identifying opp	portunities and t	hreats, People and partners	CO5,CO6						
В	Determining us model of imple	se cases and imperentiation	pact on processes, Conceptual	CO5,CO6						
С	New Business Digital Medici	applications of ne, M2M Trans	blockchain :Smart Cities, actions	CO5,CO6						
Unit 5	Current Issue the next level	s and Potentia	l solutions to blockchain to							
А	Issues faced, S	olutions for sca	lability issues	CO5,CO6						
В	On-chain solut solutions: Payr	CO5,CO6								
С	Next generatio exciting world	n blockchain pr of blockchain	ojects, A case study: The	CO5,CO6						
Mode of examination	Theory/Jury/I	Practical/Viva								
Weightage	CA	MTE	ETE							
Distribution	25%									



Text book/s*	" "1. Applications of Blockchain Technology in	
	Business: Challenges and Opportunities	
	By Mohsen Attaran, Angappa Gunasekaran"	
	"2. Blockchain for Business 2019: A user-friendly	
	introduction to blockchain	
	By Peter Lipovyanov"	
Other	1. Blockchain and Business: Applications and	
References	Implications	
	https://www.coursera.org/learn/blockchain-	
	business/home/welcome	
	2. Blockchain for Business Professional	
	https://www.edx.org/professional-	
	certificate/linuxfoundationx-blockchain-for-business	

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
CO1	Define how the concept of money and relate in the concept of DLT	PO1,PO2,PO3,PO8,PO11, PSO1,PSO3
CO2	Interpret various blockchain functionalities to extend existing business models and make correct & fully informed decisions.	PO1,PO3,PO5,PO8,PO11, PSO1,PSO2
CO3	Apply Blockchain technology in various business domains of financial and commodities	PO1,PO2,PO8,PSO2,PSO3
CO4	Discover Blockchain from Big data perspective	PO1,PO2,PO3,O4,PO7,PO8, PSO2
CO5	Recommend new Business application for the Blockchain	PO3,PO4,PO5,PO8,PSO2, PSO1
CO6	Imagine current issues of block chain and propose potential solutions.	PO1,PO2,,PO5,PO6,PO8,PO11,PSO1,PSO2



Course Code_ Course Name	C Os	Р О 1	P O 2	Р О З	Р О 4	Р О 5	P O 6	Р О 7	P O 8	Р О 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	C 0 1	2	2	1	-	-	-	-	3	-	-	1	-	1	-	1
	C 0 2	2	-	1	-	1	-	-	2	-	-	2	-	1	1	-
BCC011_Blo	C 0 3	1	2	-	-	-	-	-	3	-	-	-	-	-	1	1
Business	C 0 4	2	2	2	3	-	-	2	2	-	-	-	-	-	3	-
	C O 5	-	-	1	1	2	-	-	1	-	-	-	-	2	1	-
	C O 6	1	1	1	-	2	2	-	1	-	-	1	-	1	1	-

## PO and PSO mapping with level of strength for Course Name Blockchain for business

Average of non-zeros entry in following table (should be auto calculated).

Cou rse Cod e	Cours e Name	P O1	P O2	Р О3	P O4	P O5	P O6	P O7	Р 08	Р О9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
BCC 011	Blockc hain for Busines s	1. 3	1.1	1	0.6	0.8	0.3	0.3	2	0	0	0.6	0	0.8	1.1	0.3

## Strength of Correlation

1. Addressed to Slight (Low=1) extent

2. Addressed to Moderate (Medium=2) extent



Sc	hool:	Sharda School of Engineering & Technology									
De	epartment	Computer Science & Engineering									
Pr	ogram:	B.Tech - CSE									
Br	anch:	Blockchain									
1	Course Code	BCC021 Semester- 5									
2	Course Title	IMPLEMENTING BLOCK CHAIN ON CLOUD									
3	Credits	3									
4	Contact Hours (L-T-P)	3 0	0								
	Course Status	tive									
5	Course Objective	<ul> <li>The objective of the course is a short, concise intrimplementation of block chain techniques over cloud</li> <li>On successful completion of this module students wi</li> <li>1. synthesize the basic concepts and principles of</li> <li>2. analyze the concept of secure service contait</li> </ul>	oduction and l system. Il be able to of blockchain ner and IBM								
6	Course Outcome	<ul> <li>cloud private cluster.</li> <li>3. synthesize the planning and installation of service container</li> <li>4. develop and install the secure service containe</li> <li>5. identify the application client, Smart contract planguage, Endorsement policy, Ord configuration</li> <li>6. design and develop GO language program</li> </ul>	f the secure er architecture programming erer block								
7	Course Descripti	on The fundamental concepts in Smart Contracts using I a practical approach in understanding them have been	Eherium with n discussed.								
8	Outline syllabus		CO Mapping								
	Unit 1	INTRODUCTION									
	А	Why Blockchain?, IBM blockchain platform introduction, benefits and differentiators of deploying and using a blockchain environment of LinuxONE	CO1, CO2								
	В	LinuxONE, Kubernetes(K8s), IBM cloud private, Gluster FS, IBM secure service container, IBM blockchain platform,	CO1, CO2								
	С	Secure service container partition, IBM cloud private cluster.	CO1, CO2								
	Unit 2	PLANNING FOR INSTALLATION									
	A	Why secure service container? Persistant storage provider, setting up file storage system	CO1, CO2, CO3								

## IMPLEMENTING BLOCK CHAIN ON CLOUD



	IBM blockchai	n platfor	m console, Minimum	CO1, CO2,							
В	network , Pilo	t network	, Production network,	CO3							
	Component cont	ainers, Res	source reallocation								
0	Consideration fo	r specific u	ise cases	CO1, CO2,							
C		1		CO3							
Unit 2	SECURE	SERVIC	E CONTAINER								
Unit 5	INSTALLATIO	ON AND C	CONFIGURATION								
٨	Secure service	contain	er architecture, SSC	CO1, CO2,							
Λ	bootleader overv	view, down	load the image	CO3, CO4							
	Hardware requ	uirement	for SSC partition,	CO1, CO2,							
	Networking, Su	upported	operating system and	CO3, CO4							
В	platform, softwa										
	version, Suppor	version, Supported IBM Cloud Private Versions,									
	required ports,										
	Creating SSC	CO1, CO2,									
C	private cluster,	Deployin	g IBM cloud private,	CO3, CO4							
C	Uninstalling IC	CP and S	SSC, Updating cluster								
	resource dynami	cally									
Unit 4	IBM BLO										
	INSTALLATIO	DNS AND	CONFIGURATIONS								
	Loading Helm c	chart, settir	ng up role based access	CO3, CO4,							
A	control (RBAC)	control (RBAC) rules, scripted console installatio									
	manual console	installation									
ח	Creating peer org	ganization,	creating a peer, creating	CO3, CO4,							
В	the ordering serv	vice, Open	shift support	COS							
~	Troubleshooting	the installa	ation	CO3. CO4.							
C	8			CO5							
Unit 5	PERFORMAN	CE AND C	CONSIDERATIONS								
	Application clie	ent, Smart	contract programming	CO4,CO5,							
А	language, Endo	orsement	policy, Orderer block	CO6							
	configuration, Pe	eer contain	er resource allocation								
D	Hiper sockets, H	iper socket	t benefits	CO4,CO5,							
D	_	-		CO6							
C	Cryptography in	portance in	n block chain, CPACF's	CO4,CO5,							
t	role in accelerati	on and pro	tection	CO6							
Mode of examination	Theory										
Weightage	СА										
Distribution	25%	25%	50%								
	• 1. Serious C	Cryptograp	hy: A Practical Introduct	tion to Modern							
	Encryption E	By Jean-Phi	ilippe Aumasson								
Text book/s*	• 2. Handboo	k of Resea	rch on Blockchain Tech	nology by							
	Saravanan K	rishnan, Va	alentina Emilia Balas, Ju	lie Golden, Y.							
	Harold Robinson, S. Balaji, Raghvendra Kumar										



	-	
S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	synthesize the basic concepts and principles of blockchain	PO1, PO2, PO3,PO6, PO7, PO8, PO11, PO12,PSO1, PSO2, PSO3
2.	analyze the concept of secure service container and IBM cloud private cluster.	PO1, PO2, PO3, PO4, PO5, PO10, PO12, PSO1, PSO2, PSO3
3.	synthesize the planning and installation of the secure service container	PO1, PO2, PO3, PO4, PO5, PO7,PO8, PO10,PO12, PSO1, PSO2, PSO3
4.	develop and install the secure service container architecture	PO1, PO2, PO3, PO4, PO7, PO8, PO9, PO10, PSO1, PSO2, PSO3
5.	identify the application client, Smart contract programming language, Endorsement policy, Orderer block configuration	PO1, PO2, PO3, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
6.	design and develop GO language program	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO11,PSO1, PSO2, PSO3

#### PO and PSO mapping with level of strength

CO	PO	PO1	PO1	PO1	PSO	PSO	PSO								
S	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO 1	2	1	2	-	-	3	3	2	-	-	3	1	2	2	3
CO 2	2	2	1	2	2	-	-	-	-	2	-	2	1	2	2
CO 3	3	2	2	2	2	-	1	2	-	2	-	2	1	2	1
CO 4	2	1	2	2	-	-	2	2	1	1	-	-	1	3	2
CO 5	3	2	3	-	-	-	-	-	2	2	1	2	1	1	1
CO 6	2	3	2	1	2	2	1	1	2	-	2	-	2	1	2

#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	РО 10	РО 11	PO 12	PS O 1	PS O 2	PS O 3
BCC02 1	IMPLEMENTI NG BLOCK CHAIN ON CLOUD	2. 3	1. 8	2. 0	1. 2	1. 0	0. 8	1. 2	1. 2	0. 8	1. 2	1. 0	1. 2	1. 3	1. 8	1. 8

## Strength of Correlation

1. Addressed to Slight (Low=1) extent

2. Addressed to Moderate (Medium=2) extent



Sch	ool:	Shar	da School of Engineering & Technology										
Dep	artment	Com	outer Science & En	gineering									
Pro	gram:	B.Te	h - CSE	.98									
Bra	nch:	Block	chain										
1	Course Code	BCC	31 Semester- 6										
2	Course Title	Crvn	tocurrency with Eth	ereum									
3	Credits	3	tocurrency with Lth	cream									
<u>J</u>	Contact	5											
-	Hours		3	0		0							
	(I - T - P)		5	0		0							
	Course	Progr	gram Elective										
	Status	11051											
5	Course Obie	ctive											
5	Course Objec	euve	By the end of the cou	urse, students will be ab	le to								
			1. Understand	how blockchain systems	s (Ethereum) v	vork,							
			2. To securely	interact with them,									
			3. Design, bui	ld, and deploy smart	contracts ar	nd distributed							
			applications,	,									
			4. Integrate id	eas from blockchain	technology in	to their own							
			projects.										
-													
6	Course Outco	omes	es On completion of this course the student should be able to:										
			7. understanding of the realities of Cryptocurrency										
			8. Explain design principles of Ethereum										
			9. Design, build, and deploy smart contracts										
			10. The student	will be able to use crypt	ocurrency exc	hanges and							
			wallets safel	у									
			11. To learn con	cept of Decentralized a	nd Distributed	Ledger.							
			12. Evaluate sec	urity, privacy, and effic	iency of a give	en blockchain							
			system.										
7	Course		Cryptocurrency wit	th Ethereum									
	Description												
8	Outline sylla	bus				CO							
						Mapping							
	Unit 1		Introduction to cr	yptocurrency		<u> </u>							
	A		What is Cryptocurren	ncy? History of Cryptoc	currency	COI							
			Blockchain Technol	raditional Currency, U	nderstanding								
	B		nares the	CO1									
			potential benefits and problems of cryptocurrency to										
			other currencies. Virtual currency, Centralize and										
			decentralize currency										
	С		Where to store your	cryptocurrency - Wallet	s & Cold	CO1, CO4							
			Storage										
			Paper Wallets: Hardw	ware Wallets, How to B	uy								
			Cryptocurrency, Things to Consider Before Investing										
			in Cryptocurrency										

#### **Cryptocurrency with Ethereum**



Unit 2	Introduction to Ethereum	
А	What is Ethereum? Ethereum Virtual Machine (	CO2
	EVM), Mining in Ethereum, private and public	
	Blockchain, Platform Functions used in Ethereum,	
	Technologies that support Ethereum	
		<u> </u>
В	Introducing Smart Contracts Cryptocurrency in	CO2, CO3
	Ethereum, The Turing Completeness of Smart	
	Contract Languages and verification challenges,	
	Using smart contracts to enforce legal contracts,	
	comparing Bitcoin scripting vs. Ethereum Smart	
	Contracts	
С	Wallets for Ethereum - Solidity - Smart Contracts -	CO2, CO3
	some attacks on smart contracts	
Unit 3	DECENTRALIZED APPLICATIONS (DAPPS)	
А	Decentralized Application Types, Components for	CO2, CO4,
	development of Ethereum DApps, Ethereum	CO5
	Platform – Transactions in Ethereum – Ether	
	wallet, Ether Accounts, Ether Gas, Gas Price, Gas	
	Limit,	
В	Ether Tokens – ERC20 ethereum stands for	CO2, CO4,
	Tokens,	CO5
С	Hyperledger Platform – Hyperledger Fabric	CO2, CO4,
	Architecture, Hyperledger Fabric and Smart	CO5
	Contract – Chain Code and Go Language.	
	Hyperledger fabric, the plug and play platform and	
	mechanisms in permissioned blockchain	
Unit 4	Cryptocurrency Investing Mindset	~ ~ ~
А	Security: Privacy, Security issues in	CO6
	Blockchain, Pseudo-anonymity vs. anonymity,	
	Zcash and Zk-SNARKS for anonymity	
D	preservation,	<u></u>
В	Hash Codes, Digital Signature - ECDSA, Memory	CO6
0	Hard Algorithm, Zero Knowledge Proof.	001
C	<b>Planning:</b> Short term gain vs. Long term	00
Unit 5	Cryptogurrongy Pogulation	
	Stakeholders Roots of Bit coin Legal Aspects	CO4 CO6
Λ	Crypto currency Exchange Black Market and	004,000
	Global Economy Applications: Internet of Things	
	Medical Record Management System, Domain	
	Name Service and future of Blockchain	
B	Identify major research challenges and technical	CO4 CO6
	gaps existing between theory and practice in	
	cryptocurrency domain	



С	Application Management future of F	CO1								
Mode of examination	Theory	Theory								
Weightage	CA									
Distribution	25%									
Text book/s*	1. Arvind Andrew M Cryptocurr Introductio	1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).								
Other References	3. Ste Be Cry alto Pla	phen Satosh ginners Gui yptocurrency coins-CreateS ttform (2017)	i - Cryptocurrency_ Ultimate de to Making Money with like Bitcoin, Ethereum and pace Independent Publishing							
	4. Dra Sha Tea Ox									

<b>S.</b>	Course Outcome	Program Outcomes (PO) & Program Specific
No.		Outcomes (PSO)
1	understanding of the realities of	PO1,PO2,PO3,PO4,PO5,PO6,PO8, PSO1, PSO2
	Cryptocurrency	
2	Explain design principles of	PO1,PO2,PO3,PO4,PO5, PO6,PO8,PO12,,
	Ethereum	PSO1, PSO2,PSO3
3	Design, build, and deploy smart	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO11, PO12,
	contracts	PSO2
4	The student will be able to use	PO1, PO2, PO4, PO5, PO6, PO8, PO10, PO11,
	cryptocurrency exchanges and	PSO2,PSO3
	wallets safely	
5	To learn concept of Decentralized	PO1, PO2, PO3, PO6, PO8, PO10, PSO1,
	and Distributed Ledger.	PSO2,PSO3
6	Evaluate security, privacy, and	PO1, PO2, PO3, PO5, PO6, PO8, PSO2, PSO3
	efficiency of a given blockchain	
	system.	



S.No	Cos	PO1	Р	PO3	РО	PO5	Р	PO7	PO8	PO9	PO1	Р	PO1	PS	PSO2	PSO3
			O2		4		0				0	0	2	01		
							6					11				
1	CO1	1	3	1	1	2	2	-	2	-	-	-	-	-	2	-
2	CO2	1	3	1	1	2	2	-	2	-	-	-	1	1	2	1
3	CO3	2	2	3	2	3	2	-	-	1	-	1	1	-	2	-
4	CO4	1	1	-	3	3	3		2	-	1	1	-	-	3	1
5	CO5	3	3	3	-	-	3		2	-	2	-	-	3	2	2
6	CO6	3	3	3	-	2	3	-	3	-	-	-	-	-	3	2

# PO and PSO mapping with level of strength for Course Name Cryptocurrency and Ethereum

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	РО 10	РО 11	РО 12	PS O 1	PS O 2	PS O 3
BCC0 31	Cryptocurre ncy with Ethereum	1. 8	2. 5	1. 8	1. 2	2. 0	2. 5	0. 0	1. 8	0. 2	0. 5	0. 3	0. 3	0. 7	2. 3	1. 0

## Strength of Correlation

1. Addressed to Slight (Low=1) extent

2. Addressed to Moderate (Medium=2) extent



Sc	hool:	Sharda School of Engineering & Technology										
De	epartment	Computer Science & Engineering										
Pr	ogram:	B.Tech - CSE										
Bı	anch:	Blockchain										
1	Course Code	BCC041 Semester- 6										
2	Course Title	OPEN SOURCE FOR BLOCKCHAIN USING HYPERL	EDGER									
3	Credits	3										
4	Contact											
	Hours	3 0	0									
	(L-T-P)		-									
	Course	Program Elective										
	Status											
		The objective of the course is to introduce basic fundament	ntal concepts in									
_		Open source for blockchain using hyperledger, with a pra-	ctical approach									
С	Course Objective	in understanding them. To visualize the scope of b	lockchain and									
		hyperledger, and its role in futuristic development.										
		On successful completion of this module students will be	able to									
		CO1: Explain Hyperledger and blockchain technologies.										
		CO2: Discover bitcoin mechanism and network.										
6	<b>C</b>	CO3: Interpret hyperledger ecosystem and blockchain for	business.									
0	Course Outcomes	CO5: Design applications using hyperledger tools such	WOIKS.									
		Iroha etc.										
		CO6: Discuss Hyperledger leverages open standards and or										
		governance to support business solutions.										
		The fundamental concepts in Open source for blockchain using										
7	Course Descriptio	hyperledger, with a practical approach in understanding them have been										
		discussed.	1									
8	Outline syllabus		CO Mapping									
	Unit 1	Blockchain Technologies										
	А	Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism,	CO1,CO2									
	_	Distributed Consensus, Merkle Patricia Tree, Gas										
	В	Limit, Transactions and Fee, Anonymity, Reward,	CO1, CO2									
		Life of Pleakehein application. Soft & Hard Fork										
	С	Private and Public blockchain	CO1, CO2									
	Unit 2	Introduction to Hyperledger										
		What is Hyperledger? Why we need Hyperledger? How	G01 G02									
	A	Hyperledger Works? The Birth of Hyperledger	CO1, CO2									
	B	Different types of Hyperledger frameworks. Comparing	CO1, CO2,									
	U	Hyperledger with Bitcoin and Ethereum	CO3									
	С	Hyperledger Goals	CO2, CO3, CO4									
	Unit 3	Hyperledger Frameworks										
	Α	blockchain networks: public blockchains, consortiums,	CO1, CO2,									
	ź <b>k</b>	and private, Components of Hyperledger Frameworks	CO4									
	В	key elements of a typical Hyperledger network,	CO1,CO2, CO4									

## OPEN SOURCE FOR BLOCKCHAIN USING HYPERLEDGER



С	Hyperledger f Composer	abrio	e transaction	n flow, Hyp	erledger	CO1, CO2					
Unit 4	Hyperledger	Too	ls								
А	Open Standar Source and O	Open Standards, The Importance of Open Source, OpenOpenSource and Open GovernanceOpen									
В	Software Gov Unique Chara	Software Governance of the Hyperledger Projects, Unique Characteristics of Hyperledger Sawtooth Hyperledger Sawtooth v1.0, Hyperledger Iroha v0.95, Hyperledger Ecosystem									
С	Hyperledger S										
Unit 5	Hyperledger										
А	Interest of dev Hyperledger v	velop vs. A	pers in Oper pache	Source So	ftware?	CO2, CO3, CO6					
В	Blockchain fo Use Hyperled	Blockchain for Business, Why Businesses Choose to									
С	Hyperledger I Interoperabili	Modu ty be	ules, Hyper tween Hype	ledger Cello erledger Fra	o, ameworks	CO2, CO3, CO6					
Mode of examination	Theory	-	21	0							
Weightage Distribution	CA		MTE	ETE							
Weightage Distribution	25%		25%	50%							
Text book/s*	<ul> <li>Gaur Hype: Hype:</li> <li>Anotr Ether Media</li> </ul>	<ul> <li>Gaur Nitin et. al. (2018), Hands-On Bloc Hyperledger: Building decentralized applic Hyperledger Fabric and Composer, Packt Publishi</li> <li>Anotnopoulous AM. and Wood M.,(2018) Masteri Ethereum: Building Smart Contracts and DApps. (Media</li> </ul>									
Other References	Watte     Satos     System	enhoi hi Na m	fer, The Sci akamoto, B	ence of the itcoin: A Pe	Blockchain eer-to-Peer Elect	ronic Cash					

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Explain Hyperledger and blockchain	PO1, PO2, PO4, PO6, PO10, PO11,
	technologies.	PO12, PSO1, PSO2, PSO3
2.	CO2: Discover bitcoin mechanism and network.	PO1, PO2, PO3, PO4, PO5, PO7, PO8,
		PO11, PO12, PSO1, PSO2, PSO3
3.	CO3: Interpret hyperledger ecosystem and blockchain	PO1, PO2, PO3, PO4, PO5, PO6, PO8,
	for business.	PO11, PO12, PSO1, PSO2, PSO3
4.	CO4: Compare different hyperledger frameworks and	PO1, PO2, PO4, PO8, PO9, PO12,
	networks.	PSO1, PSO2
5	CO5: Design applications using hyperledger tools	PO1, PO2, PO3, PO5, PO9, PO11,
	such as sawtooth, Iroha etc.	PSO1, PSO2, PSO3
6	CO6: Discuss Hyperledger leverages open standards	PO1, PO2, PO3, PO4, PO5, PO6, PO7,
	and open governance to support business solutions.	PO8, PO10, PSO1, PSO2, PSO3

# PO and PSO mapping with level of strength

		_					-								
$CO_{\rm s}$	РО	PO	PO	PO	PO	PO	РО	PO	РО	РО	PO1	РО	PSO	PSO	PSO
COs	1	2	3	4	5	6	7	8	9	10	1	12	1	2	3



CO1	2	2	-	1	-	2	-	-		2	2	2	3	2	2
CO2	1	3	3	2	2	-	1	2	-	-	2	3	2	1	1
CO3	2	1	2	1	1	3	-	1	-	-	1	1	2	1	2
CO4	1	2	-	3	-	-	-	2	2	-	-	2	2	3	-
CO5	2	2	2	-	1	-	-	-	1	-	2	-	1	2	2
CO6	2	3	2	3	2	2	2	2	-	2	-	-	1	1	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	РО 2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	РО 10	РО 11	PO 12	PS O 1	PS 0 2	PS O 3
BCC04 1	OPEN SOURCE FOR BLOCKCHAIN USING HYPERLEDGE R	1. 7	2. 2	1. 5	1. 7	1. 0	1. 2	0. 5	1. 2	0. 6	0. 7	1. 2	1. 3	1. 8	1. 7	1. 5

## Strength of Correlation

1. Addressed to Slight (Low=1) extent

2. Addressed to Moderate (Medium=2) extent



Sch	ool:	Sharda School of Engineering & Technology												
Dep	artment	Computer Science & Engineering B Tech-CSE												
Pro	gram:	B.Tech-CSE Blockchain												
Bra	nch:	Blockchain	Blockchain											
1	Course Code	BCC051 Semester: 7												
2	Course Title	<b>Disaster Recovery Ma</b>	nagement using Block	chain Te	chnology									
3	Credits	3												
4	Contact													
	Hours	3	0		0									
	(L-T-P)													
	Course	ELECTIVE												
	Status													
5	Course Objective	It aims to explores the application of blockchain in disaster management to address the prevalant issues, and in turn, reduce the loss of time, money, and human life. Disaster management is a unique form of operations management in which emergency service providers and humanitarian agencies provide resources (e.g., medical services, logistical services, food, shelter, etc.) to support the public before, during,												
6	Course Outcomes	CO1. Explore the appli CO2. Interpret variou disaster solution model CO 3. Apply Blockchar CO 4. Highlight the r services CO 5. Recommend r Blockchain CO 6. Understand the c solutions to support em	cation of blockchain in c s blockchain functional s. in technology for human role of blockchain to su new disaster managem current issues of blockch ergency service provider	lisaster m lities to itarian ag upport pu ent appl ain and p rs	anagement extend existing encies ublic healthcare ication for the ropose potential									
7	Course Description	Blockchain can be used as an application during emergencies. Because, there is no integrated information system so far developed for disaster management and control for effective decision making, there is a need for development of conceptual model. It is necessary to address and collaborate the stakeholders to a common platform where the storing and information sharing is consistent and reliable. Unfolding of disaster management produces massive amount of data that can help in restoring and supporting the society. The adoption of blockchain in this regard mitigates corruption, accelerates partnerships between various relief agencies, and improves resource allocation. In this course you will learn how blockchain framework will be useful for disaster management and how it facilitates the governments, residents, medical service providers, shelter providers, food service providers, transporters, and non-												
8	Outline syllabu	15			CO Mapping									
	Unit 1	Introduction to Blockch	ain											

# Disaster Recovery Management using Blockchain Technology



	А	Evolution of	blockchain, Ty	pes: Public, Private,	CO2
		Consortium,	Decentralizatio	on, Consensus protocols	
	В	Working of B	Blockchain, Ha	shing, Blockchain	CO2
		disruption and	d Smart Contra	act, Cryptocurrencies	
	С	Brief history	of blockchain	in healthcare, supply chain	CO1,CO2
		management	and other disas	ster related services.	
	Unit 2	Integration of	Blockchain an	d Disaster Management	
	А	Hazard Moni	toring, Transci	iption and management on	CO2,CO3
		blockchain of	disaster relate	ed data.	
	В	Humanitarian	aid and emerg	gency relief; smart	CO3
		contracts for	the manageme	nt of aid requests and relief	
		deliveries			
	С	Blockchain g	overnance for	disaster management,	C03,CO2,CO5
		Integration of	blockchain ar	d IoT for hazard	
		surveillance a	and monitoring	·	
	Unit 3	<b>Operations m</b>	anagement		
	А	Emergency se	ervice provider	s and humanitarian	CO3,CO4
		agencies, Dis	aster response,	Disaster Recovery	
	В	Allocation of	vital resources	s, Operations management,	CO3,CO4
		Government	issues in block	chain based disaster	
		management.			
	С	Design stakel	nolders: Gover	nments, food service	CO3
		providers, tra	nsportation pro	oviders, residents,	
		government r	elief organizat	ions, telecommunication	
		providers.			
	Unit 4	Multiagent co	llaborative em	ergency management	
	٨	Emorgonou	anagamant av	stam Smart contract for	CO5 CO6
	A	management	of aid requests	and relief deliveries	005,000
	B	Connotation	and dilemma o	f Multiagent collaborative	CO5 CO6
	D	emergency m	anagement me	chanism	005,000
	С	Application of	f blockchain to	Multiagent collaborative	CO5 CO6
	C	emergency m	anagement me	chanism	005,000
	Unit 5	Current issue	s and challenge	S S	
	Chit 5		s und chunchg		
	А	Blockchain for	supply chain a	nd logistics leading to	CO5.CO6
		resilient infrast	tructure, Perceiv	ved trust in blockchain,	
		Perceived secu	rity issues in bl	ockchain	
	В	Preventing cy	ber risks and t	heir cascading impacts	CO5,CO6
		with blockcha	ain, Implement	ing blockchain inside a	
		Business Mod	dels to face a c	risis, Crisis management	
		and blockcha	in		
	С	War, guerrilla,	counter-insurge	ency, and blockchain, Applied	l CO5,CO6
		case studies, A	cceptance and a	doption of blockchain in a	
	M-1 C	turbulent conte	ext		
	Mode of	I heory/Jury/I	ractical/Viva		
	Waisht		MTE	ETE	
	weightage	CA 25%	MIE 250/	EIE 500/	
1	Distribution	23%	23%	50%	



Text book/s*	1. Blockchain Revolution: How the Technology
	Behind Bitcoin Is Changing Money, Business,
	and the World, Book by Alex Tapscott and Don
	Tapscott.
	2. Blockchain-EnabledResilience: An Integrated
	Approach for Disaster Supply Chain and
	Logistics Management. By Polinpapilinho F.
	Katina, Adrian V. Gheorghe, CRC Press, ISBN
	9781032371504, 2023.
	3. Disaster ManagementByR N Misra, ISBN:
	9789388854047,2019.
	https://g.co/kgs/HzDnXR
Other	1. Hunt, K., Zhuang, J. (2022). Blockchain for
References	Disaster Management. In: Emrouznejad, A., Charles, V.
	(eds) Big Data and Blockchain for Service Operations
	Cham https://doi.org/10.1007/078.2.020.87204.2.10
	Chann. https://doi.org/10.1007/978-5-050-87504-2_10 2 Babich V & Hilary G (2020) OM Forum
	Distributed ledgers and operations: What operations
	management researchers should know about blockchain
	technology. Manufacturing & Service Operations
	Management, 22(2), 223–240.

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
CO1	Explore the application of blockchain in disaster management	PO1,PO2,PO3,PO8,PO11, PSO1,PSO3
CO2	Interpret various blockchain functionalities to extend existing disaster solution models.	PO1,PO3,PO5,PO8,PO11, PSO1,PSO2
CO3	Apply Blockchain technology for humanitarian agencies	PO1,PO2,PO8,PSO2,PSO3



CO4	Highlight the role of blockchain to support public healthcare services	PO1,PO2,PO3,O4,PO7,PO8, PSO2
CO5	Recommend new disaster management application for the Blockchain	PO3,PO4,PO5,PO8,PSO2, PSO1
CO6	Understand the current issues of blockchain and propose potential solutions to support emergency service providers	PO1,PO2,,PO5,PO6,PO8,PO11,PSO1,PSO2

## PO and PSO mapping with level of strength for Course Name Disaster Recovery Management using Blockchain Technology

Course Code_ Course Name	C Os	Р О 1	P O 2	Р О З	Р О 4	Р О 5	Р О б	Р О 7	Р О 8	Р О 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Disaster	C 01	2	1	2	-	-	-	-	2	-	-	1	-	1	-	1
Recover y	C 02	2	-	1	-	1	-	-	2	-	-	2	-	1	1	-
Manage ment	C 03	1	2	_	-	-	-	_	3	_	-	-	-	-	1	1
using Blockch	C 04	2	2	2	3	-	-	2	2	_	-	-	-	-	3	-
ain Technol	C 05	-	-	1	1	2	-	-	1	_	-	-	-	2	1	-
ogy	C 06	1	1	1	-	2	2	-	1	-	-	1	-	1	1	-



Cou rse Cod e	Course Name	P 0 1	P O 2	P O 3	Р О 4	P O 5	P O 6	Р О 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	Disaster Recovery Manage ment using Blockcha in Technolo gy	1. 3	1. 1	1	0. 6	0. 8	0. 3	0. 3	2	0	0	0.6	0	0.8	1.1	0.3

Average of non-zeros entry in following table (should be auto calculated).

Strength of Correlation

1. Addressed toSlight (Low=1)extent2. Addressed toModerate (Medium=2) extent



# Blockchain Risk Management

Sc	hool:	Sharda School of Engineering & Technology										
De	epartment	Computer Science & Engineering										
Pr	ogram:	B.Tech - CSE										
Br	anch:	Blockchain										
1	Course Code	BCC06	BCC061 Semester-7									
2	Course Title	Blockc	hain Risk Mana	gement								
3	Credits	3										
4	Contact											
	Hours		3	0		0						
	(L-T-P)											
	Course	Core										
	Status											
5	Course Objective	e	By the end of	the course, students will	be able	to:						
			1 Unders	stand how blockchain sys	stems wo	ork,						
			2 To sec	urely interact with them,								
			3 Design	, build, and deploy	smart	contracts and						
			distrib	uted applications,								
			4 Integrate ideas from blockchain technology into their									
			own projects									
6	Course Outcome	s	1	Define the basic conce	ent of	blockchain risk						
0	Course Outcome	.5	1	types and prediction of	rick	bioekenam msk,						
			2 Control and opportunity risk									
			2 Control and opportunity fisk.									
			3	Summarizing the ben	efits of	t cryptographic						
			basics for cryptocurrency in case of various									
				attacks								
			4 Better understand blockchain risk assessment or									
				the risks of blockchain								
			5	Common blockchain bu	usiness 1	risks is business						
				continuity risk.								
			6	Explain use cases of blo	ckchain	in security						
7	Course Descripti	on	Blockchai	n essentially an encryr	nted dis	stributed ledger						
,	eouise Descripti		may funda	mentally change financi	al servi	ces. the internet.						
			internation	al development, the	sharing	economy and						
			everything	in between. It will enabl	le organ	isations to lower						
			costs, decr	ease interaction or settle	ment tin	nes and improve						
			transparen	cy. It will revolutionise t	he way	we interact with						
			companies and transform peer to peer transactions. Beyond									
			financial services, some analysts suggest blockchain will									
			become the foundational technology for the future of risk									
			manageme	ent.		T						
8	Outline syllabus					CO Mapping						
	Unit 1		Introduction									

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А	Blockchain Enterprise Risk Assessment and	CO1 , CO2							
	Management Framework								
В	Types of Blockchain and the risks, Privacy	CO1 , CO2							
	and chain management								
С	Smart Contracts and their role in risk, Mitigate	CO1 , CO2							
	risk								
Unit 2	Basics Risk Considerations								
А	Standard risk considerations, Smart contract	CO1, CO3							
	risk considerations								
В	Security Related Blockchain Risks, Risks with	CO1, CO3							
	Private and Public Key, Human-Related								
	Risks								
С	Value transfer risk considerations, Regulatory	CO1, CO3							
 	Risks, Vendor Risks								
Unit 3	Consensus Methods Risk								
A	Cryptographic Protocol, Data confidentiality	CO3, CO4							
_	risk								
В	Transaction Verifiability - Anonymity - Forks	CO3, CO4							
~	- Double Spending								
С	Faux Consensus, Consensus Decisions	CO3, CO4							
 <b>T</b> T <b>1</b> / 4	Appropriate								
Unit 4	Business/Regulatory Risks, Smart Contract								
	<b>Risk</b>	G04 G05							
A	Information security risks, Legal Risks	CO4,CO5							
В	Smart Contracts - some attacks on smart	CO3,CO5							
	contracts								
С	Vulnerability, Attacks, Sidechain	CO3.CO5							
Unit 5	Web Application Security Risks	,							
А	Improper Logging & Monitoring, Insecure	CO5, CO6							
	Deserialization	,							
В	Cross-Site Scripting(XSS), Injection	CO5, CO6							
С	Broken Access Control, Broken	CO5, CO6							
	Authentication								
Mode of examination	Theory								
Weightage Distribution	CA MTE ETE								
	25% 25% 50%								
Text book/s*	1. Ritesh Modi, "Solidity Programming	Essentials: A							
	Beginner's Guide to Build Smart Contracts f	or Ethereum and							
	Block Chain". Packt Publishing								
Other References	1 Imran Bashir "Mastering Block Ch	ain. Distributed							
	Ladgar Tashnology Decentrolization	and Smart							
	Contracts Frenh in 12 Destentialization and Smart								
	Contracts Explained", Packt Publishing								
	2 J.A.Garay et al, The bitcoin backbone p	rotocol - analysis							
	and applications EUROCRYPT 2015 L	NCS VOI 9057,							
	( VOLII ), pp 281-310. ( Also	o available at							
	eprint.iacr.org/2016/1048) . ( seriou	s beginning of							



		discussions	related	to	formal	models	for	bitcoin
		protocols).						
	3	Ritesh Mod	li, "Sol	idity	Progra	mming	Essen	tials: A
		Beginner's	Guide	to	Build	Smart (	Contra	cts for
		Ethereum ar	nd Block	Cha	in", Pac	kt Publis	hing	
	4	R.Pass et al,	Fruitcha	ain, a	a fair blo	ockchain,	POD	C 2017 (
		eprint.iacr.o	rg/2016/	916)	).			

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1	Explain Abstract model of blockchain and	PO1,
	consensus problem.	PO2,PO3,PO4,PO5,PO6,PO11,PSO1,
		PSO2,PSO3
2	List and describe differences between proof-of-	PO1,
	work and proof-of-stake consensus.	PO2,PO3,PO4,PO5,PO7,PO10,PO12
		PSO2,PSO3
3	Summarizing the benefits of cryptographic	PO1,
	basics for cryptocurrency in case of various	PO2,PO3,PO4,PO5,PO8,PO9,PSO1,
	attacks	PSO2,PSO3
4		PO1 PO2 PO2 PO4 PO5
4	Analyzing properties of Bitcoin and Ethereum	PO1, PO2, PO3, PO4, PO5,
		PO8,PO9,PO12,PSO1, PSO2
5		PO1, PO2, PO3, PO4, PO5,
	List Ethereum Virtual Machine (EVM) and its	PO7,PO10,PSO1, PSO2,PSO3
	benefits	
6	List topics like SNARK and zcash along with	PO1, PO2, PO3, PO4, PO5, PO6,
	various applications of blockcahin technology	PO11,PO12,PSO1, PSO2,PSO3



#### PO and PSO mapping with level of strength

1						,										
		Р				Р	Р	Р	Р	Р	Р	Р	Р			
Course Code_ Course	CO	0	PO	PO	PO	0	0	0	0	0	0	0	0	PSO	PSO	PSO
Name	<b>'s</b>	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
	СО															
	1	3	2	2	2	2	1	-	-	-	-	1	-	1	3	1
	СО															
	2	3	3	2	2	2	-	1	-	-	1	-	1	-	3	2
BCC061_Blockc	СО															
hain Dick	3	3	3	3	2	2	-	-	1	1	-	-	-	1	3	1
Halli KISK	СО															
Management	4	2	3	2	2	2	-	-	1	1	-	-	1	1	3	-
	СО															
	5	2	2	2	3	2	-	1	-	-	1	-	-	2	3	1
	CO															
	6	2	3	2	2	3	1	-	-	-	-	1	1	1	3	1

#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	РО 2	РО 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
	Blockchain															
BCC0	Risk	2.	2.	2.	2.	2.	0.	0.	0.	0.	0.	0.	0.	1.	3.	1.
61	Manageme	5	7	2	2	2	3	3	3	3	3	3	5	0	0	0
	nt															

Strength of Correlation

1. Addressed toSlight (Low=1)extent2. Addressed toModerate (Medium=2) extent



Sc	hool	Sharda	School of Eng	ineering & Technology								
De	epartment	Computer Science & Engineering										
Pr	ogram:	B.Tech	- CSE									
Br	anch:	Blockc	hain									
1	Course Code		Semester- 7									
2	Course Title	Blockc	hain Opportuni	ty Analysis								
3	Credits	3	••	• •								
4	Contact											
	Hours		3	0		0						
	(L-T-P)											
	Course	Core										
	Status				_							
5	Course Objective	e	In this course	we will study the bus	iness are	e of blockchain.						
			Students are	expected to be capable	e of un	derstanding the						
			implementatio	n blockchain in industr	y, their	advantages and						
			drawbacks, no	be overcome and what	the app	vork, now their						
			where they can	i be used	the app	incations are and						
6	Course Outcome	S	1	Students would be able	to analy	vses opportunity						
Ŭ	course outcome	5	in blockchain property									
			2 Students would be able to implement any									
			problem by writing their own business idea									
			2 By analyzing the logic of transaction students									
			5 By analyzing the logic of transaction, students									
			would be able to write efficient business proposal									
			in blockchain.									
			4 To become an efficient blockchain administrator.									
			5 To be aware with blockchain governance									
			6 To become a blockchain practitioner									
7	Course Descripti	on	This cour	se examines Blockcha	in Tran	sformations for						
			Every Ind	ustry. The Topics to l	be cover	red (tentatively)						
			include: I	ndustry Transformation	is, Intro	duction to the						
			Blockchair	n Case Commons, H	Problem	Solving with						
0			Blockchait	n, Decision Matrix, State	ment of	Benefit.						
8	Uutime syllabus		Introduction			CO Mapping						
			Introduction									
	Α		Blockchain	Transformations for	Every	CO1						
			Industry, Prac	Carter								
			CIO at FedEx									
	D		Case Common	1 . 0	001							
	В		Decentralizing	COI								
			ConsenSys,	a Firm Opportunity Sec	ia the							
	C		Opportunity	Contracting One	ICII	CO1						
	C		Coordination	Opportunity Building T	ntuillty	COI						
			Coordination, Opportunity, Building Trust									

# Blockchain Opportunity Analysis

-


Unit 2	Introduction	to the	Blockchain	Case	
	Commons				
А	Determining	Corporate	Boundaries, Ha	acking	CO2
	Your Futu	re: Bou	undary Dec	isions,	
	Decentralizing	g the Ent	erprise, Trans	action	
	Costs and the	Structure of	of the Firm		~ ~ ~
В	Industry Tran	sformation	s, Introduction	to the	CO2
	Blockchain (				
	Market Resea	rch			
C	Conducting	Preliminary	Market Res	search,	CO2
 	How to Perfor	m a Comp	etitive Analysis	8	
Unit 3	Problems The	at Blockch	ain Can and C	annot	
	Solve				
A	Intellectual P	roperty, Pa	ayments, Attrib	oution,	CO3
	and Licensing	, Distribute	ed Ownership		
В	APAC Busin	ess Devel	opment & St	rategic	CO3
	Relations, Us	e a Decisio	on Matrix, Pro	blems,	
	That Blockel	nain Can	and Cannot	Solve,	
	Blockchain O	pportunity	Brainstorm,		
С	Problem Solv	ing With 1	Blockchain, De	ecision	CO3
	Matrix, Stater	nent of Bei	nefit		
Unit 4	<b>Regulatory P</b>	rinciples			
A	Keyless Tech	nologies,	Strategic Posit	ioning	
	of Your Orga	nization, R	legulatory Prin	ciples,	CO4
	Regulation,				
В	Regulation v	s. Govern	ance, Regulati	on &	CO4
	Governance,	The Block	chain Stack, M	ultiple	
	Layers of Blo	ckchain Go	overnance,		
C	A New I	Framework	for Bloc	kchain	CO4
	Governance,	Practitione	r Perspective	- Rob	
	Carter: Gover	mance, Pro	ofile of a Block	kchain	
	Hotbed				
Unit 5	II. G	111 5		1 0 11	
A	How to Store	and Use B	itcoins, Hot and	d Cold	CO5, CO6
	Storage, Split	ting and S	haring Keys, (	Unline	
	Wallets and	Exchanges	, Payment Se	rvices,	
2	Transaction F	ees		.1	
В	Currency Exe	change M	arkets, Buildin	ig the	CO5, CO6
	Blockchain, Q				
0	Cases, Blockc	nain in Ga	ming	· 1	005 001
C	Investing in	BIOCKChai	n, Governmen	it and	005,006
	the New Error	tion of Eir	uvocacy1m, Ci	eating	
Mode of examination	Theory		ech.		
Weightege Distribution	CA	MTE	ETE		
weightage Distribution	CA	IVI I E	EIE		
	25%	25%	50%		



Text book/s*	Blockchain: Blueprint for a New Economy Kindle Edition,
	by Melanie Swan
Other References	1 The Internet of Money Kindle Edition, by Andreas M.
	Antonopoulos
	2 Bitcoin Billionaires: A True Story of Genius, Betrayal,
	and Redemption, by Ben Mezrich

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1	Students would be able to analyses opportunity	PO1,
	in blockchain properly.	PO2,PO3,PO4,PO5,PO6,PO11,PSO1,
		PSO2,PSO3
2	Students would be able to implement any	PO1,
	problem by writing their own business idea.	PO2,PO3,PO4,PO5,PO7,PO10,PO12
		PSO2,PSO3
3	By analyzing the logic of transaction, students	PO1,
	would be able to write efficient	PO2,PO3,PO4,PO5,PO8,PO9,PSO1,
	business proposal in blockchain.	PSO2,PSO3
4	To become an efficient blockchain	PO1, PO2, PO3, PO4, PO5,
	administrator.	PO8,PO9,PO12,PSO1, PSO2
5		PO1, PO2,PO3,PO4,PO5,
	To be aware with blockchain governance	PO7,PO10,PSO1, PSO2,PSO3
6	To become a blockchain practitioner	PO1, PO2, PO3, PO4, PO5, PO6,
		PO11,PO12,PSO1, PSO2,PSO3

# PO and PSO mapping with level of strength

		Р				Р	Р	Р	Р	Р	Р	Р	Р			
Course Code_ Course	CO'	0	РО	РО	РО	0	0	0	0	0	0	0	0	PSO	PSO	PSO
Name	S	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
	СО															
	1	3	2	2	2	2	1	-	-	-	-	1	-	1	3	1
	СО															
BLOCKCHAI	2	3	3	2	2	2	-	1	-	-	1	-	1	-	3	2
Ν	СО															
	3	3	3	3	2	2	-	-	1	1	-	-	-	1	3	1
OPPORTUNIT	СО															
Y ANALYSIS	4	2	3	2	2	2	-	-	1	1	-	-	1	1	3	-
	СО															
	5	2	2	2	3	2	-	1	-	-	1	-	-	2	3	1
	СО															
	6	2	3	2	2	3	1	-	-	-	-	1	1	1	3	1



		C 11 ·		/ 1 / 1 / 1	, <b>1 1</b> , <b>1</b>
Average of non-zeros e	entry in	following	table (	should be	<i>auto calculated</i> ).

Cour se Code	Course Name	PO 1	PO 2	РО 3	РО 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PS O 3
	BLOCKCHAI															
	Ν															
	OPPORTUNI	2.	2.	2.	2.	2.	0.	0.	0.	0.	0.	0.	0.	1.	3.	1.
	TY	5	7	2	2	2	3	3	3	3	3	3	5	0	0	0
	ANALYSIS															

Strength of Correlation

1. Addressed to Slight (Low=1)extent2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



# B.Tech. (CSE) with Specialization in Cloud Technology and Virtualization with AWS



Sch	ool:	School of Engineering & Technology											
Dep	artment	Computer Science & Engineering											
Pro	gram:	B. Tech											
Bra	nch:	CSE with Specialization in CTV											
1	Course												
	Code												
2	Course												
	Title	Fundamentals of Linux System and cloud											
3	Credits	1-0-0											
4	Contact	1 0 0											
	Hours												
	(L-T-P)												
	Course	Specialized Subject 1											
5	Course	Introduces the Linux operating system, including: task scheduling and management.											
Ũ	Objective	memory management, input/output processing, internal and external	al commands,										
	o o jeeu ve	shell configuration, and shell customization. Explores the use of op	erating system										
		utilities such as text editors, electronic mail, file management and s	cripting.										
6	Course	CO-1. Identify and use Linux utilities to create and manage sim	pie file										
	Outcomes	security and develop shall seriets to perform more con	appropriate										
		CO-2 Effectively use the Linux system to accomplish typical n	ersonal office										
	ersonal, office,												
		CO-3. Monitor system performance and network activities.	tor system performance and network activities.										
		Effectively use software development tools including lib	raries.										
		preprocessors, compilers, linkers, and make files.	,										
		CO-4. Comprehend technical documentation, prepare simple re	adable user										
		documentation and adhere to style guidelines.											
		CO-5. Analyze the use of cloud in different editors in Linux env	vironment.										
		CO-6. Introduce the domain of cloud.											
7	Course												
	Description												
8	<b>Outline syll</b>	abus	CO										
	· ·		Mapping										
	Unit 1	Introduction											
	А	Introduction to Unix, Unix architecture, Features of Unix, Internal	CO1										
		& External Commands, Basic unix commands:											
	Unit 2	Introduction to shell	<b>G G G</b>										
	В	Shell & types of shell( Bourne family & its derivatives, c shell &	CO2										
		characters, escaping & quoting.											
	Unit 3	Graphical Interface											
		•											
	А	Session Management, Basic Operations, Graphical	CO3, CO6										
		Desktop,	-										
	Unit 4	Filters											
	Α	Piping, Simple filters: pr, head, tail, cut, paste, sort, nl, tr	CO4, CO6										
	Unit 5	Introduction to Cloud											



А	Public ,private a cloud, Introduct	Public ,private and hybrid cloud, Access of private and public cloud, Introduction to EC2, Use of keys.								
Mode of examination	Theory									
Weightage	CA									
Distribution	25%									
Text book/s*	1. Unix and she Behrouz A. for	1. Unix and shell programming by Richard F. Gilberg and Behrouz A, forouzan								
Other References	<ol> <li>Unix Shell pr Wood</li> <li>Sumitabha D McGraw Hill.</li> <li>Internet as a r</li> </ol>	<ol> <li>Unix Shell programming by Stephen G. Kochan and Patric Wood</li> <li>Sumitabha Das, "Unix Concepts and Applications", Tata McGraw Hill.</li> <li>Internet as a resource for reference</li> </ol>								

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Identify and use Linux utilities to create and manage simple file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks.	PO1, PO2, PO4, PSO1, PSO3
2.	Effectively use the Linux system to accomplish typical personal, office, technical, and software development tasks.	PO1, PO3, PO5, PSO1, PSO3
3.	Monitor system performance and network activities. Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.	PO1,PO3,PO4,PSO1,PSO3
4.	Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines.	PO2,PO3,PO4,PSO1,PSO2
5.	Analyze the use of different editors in Linux environment.	PO1,PO2,PO4,PSO2,PSO3
6.	Introduce the domain of cloud.	PO1,PO3,PO5,PSO2,PSO3



#### PO and PSO mapping with level of strength for Course Name Introduction to Artificial Intelligence & Machine Learning (Course Code )

Course Code_ Course Name	CO 's	P 0 1	P 0 2	P O 3	P O4	P O 5	P O 6	P O 7	P O 8	P O 9	P 0 1 0	P 0 1	P O 1 2	PS O 1	PS O2	PS O3
	CO 1	2	3		3									3		2
	CO 2	3		1		2								3		2
Fundamentals of Linux System	CO 3		2	3	1									2		2
and cloud	CO 4		2	1	3									1	2	
	CO 5	2	1		2										2	1
	CO 6	2		2		1									2	3

#### Average of non-zeros entry in following table (should be auto calculated).

Cours		Р			Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
e	Course Name	0	PO	РО	0	0	0	0	0	0	0	0	0	0	0	0
Code		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
	Fundamentals of Linux System and cloud	1. 5	1.1	1. 1	1. 5	0. 5	-	•	-	-	•	-	-	1.5	1	1.7

#### *Total*—1.23

- 1. Addressed to *Slight* (*Low=1*) *extent* 2. Addressed to *Moderate* (*Medium=2*) *extent*
- 3. Addressed to Substantial (High=3) extent



Sche	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Prog	gram:	B. Tech										
Bra	nch:	CSE with Specialization in CTV										
1	Course											
	Code											
2	Course	Fundamentals of Linux System and cloud										
	Title											
3	Credits	0-0-2										
4	Contact	0 0 2										
	Hours											
	(L-T-P)											
	Course	Specialized Subject 1										
	Status											
5	Course	Introduces the Linux operating system, including: task scheduling	and management,									
	Objective	memory management, input/output processing, internal and external shell configuration, and shell customization. Explores the use of or	al commands,									
		utilities such as text editors, electronic mail, file management and s	scripting.									
6	Course	CO-1. Identify and use Linux utilities to create and manage simple file										
	Outcomes	processing operations, organize directory structures with appropriate										
		security, and develop shell scripts to perform more complex tasks.										
		CO-2. Effectively use the Linux system to accomplish typical personal, office,										
		technical, and software development tasks.										
		CO-3. Monitor system performance and network activities.										
		Effectively use software development tools including lib	raries,									
		CO-4 Comprehend technical documentation prepare simple re	adable user									
		documentation and adhere to style guidelines.	addole user									
		CO-5. Analyze the use of different editors in Linux environmer	ıt.									
		CO-6. Explore the application domain of Linux environment in	AWS cloud.									
7	Course											
	Description											
8	Outline svlla	abus	СО									
	0		Mapping									
	Unit 1	Introduction										
	А	Setup Linux Environment	CO1									
	В	Install Linux in System	CO1									
	Unit 2	Introduction to shell										
	А	Implement c shell & its derivative tcsh,	CO2									
	В	shell's interpretive cycle, wild cards, meta characters, escaping &	CO2									
	Unit 3	Granhical Interface										
	Olit 5	Gruphical Internace										
	А	Setup Session in Linux	CO3									
	В	Create Graphical Desktop in Linux	CO3									
	Unit 4	Filters										
	А	Implement Piping with Simple filters in commands such as pr, head, tail, cut, paste, sort, nl, tr	CO4									



В	Create condition	reate conditional statement in Linux shell.									
Unit 5	Linux in AWS	inux in AWS									
А	Setup Linux Ma	etup Linux Machine in EC2									
В	Deploy Linux b	ased editor in EC	2 environment.	CO5,CO6							
Mode of examination	Practical	Practical									
Weightage	CA	ETE	MTE								
Distribution	25%	25%	50%								
Text book/s*	1. Unix and she Behrouz A. for	ll programming t buzan	by Richard F. Gilberg and								
Other References	<ol> <li>Unix Shell pr Wood</li> <li>Sumitabha Da McGraw Hill.</li> <li>Internet as a r</li> </ol>	<ol> <li>Unix Shell programming by Stephen G. Kochan and Patric Wood</li> <li>Sumitabha Das, "Unix Concepts and Applications", Tata McGraw Hill.</li> <li>Internet as a resource for reference</li> </ol>									

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Identify and use Linux utilities to create and manage simple file	PO1,PO2,PO4,PSO1,PSO3
	security, and develop shell scripts to perform more complex tasks.	
2.	Effectively use the Linux system to accomplish typical personal, office, technical, and software development tasks.	PO1,PO3,PO5,PSO1,PSO3
3.	Monitor system performance and network activities. Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.	PO1,PO3,PO4,PSO1,PSO3
4.	Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines.	PO2,PO3,PO4,PSO1,PSO2,PSO3
5.	Analyze the use of different editors in Linux environment.	PO1,PO2,PO4,PSO2,PSO3
6.	Explore the application domain of Linux environment in AWS cloud.	PO1,PO3,PO5,PSO2,PSO3



# PO and PSO mapping with level of strength for Course Name Fundamentals of Linux System and cloud

											Р	Р	Р			
Course Code Course Name	СО	Р	Р	Р		Р	Р	Р	Р	Р	0	0	0	PS		
Course Code_ Course Name	's	0	0	0	Р	0	0	0	0	0	1	1	1	0	PS	PS
		1	2	3	04	5	6	7	8	9	0	1	2	1	02	03
	СО															
	1	2	3		3									3		2
	СО															
	2	3		1		2								3		2
	СО															
Fundamentals of Linux System	3		2	3	1									2		2
and cloud	СО															
	4		2	1	3									1	2	3
	СО															
	5	2	1		2										2	1
	СО															
	6	2		2		1									2	3

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	P 0 1	РО 2	PO 3	P 0 4	P O 5	P 0 6	P 0 7	P 0 8	P O 9	P O 10	P 0 11	P 0 12	PS O 1	PS O 2	PS 0 3
	Fundamentals of Linux System and cloud		1.1	1. 1	1. 5	0. 5	-	-	-	-	-	-	-	1.5	1	1.7

Total—1.23

- 1. Addressed to *Slight (Low=1) extent*
- 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



# B.Tech. (CSE) with Specialization in Augmented and Virtual Reality



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Pro	gram:	B.Tech CSE (Specialization in Augmented and Virtu	al Reality)							
Bra	nch:	CSE	• •							
1	Course Code									
2	Course Title	The Mathematics and Science of Virtual Reality								
3	Credits	2								
4	Contact	2-0-0								
	Hours									
	(L-T-P)									
	Course									
	Status									
5	Course	To understand the fundamentals of virtual reality syste	ms, including							
	Objective	geometric modeling, transformations, graphical rendering	ng, optics, the							
		human vision, auditory, and vestibular systems, inte	erface design,							
		human factors, developer recommendations, and technol	logical issues.							
6	Course	after studying this course student will be able to:								
	Outcomes	omes CO1: <i>Describe</i> the components of VR and differentiate between V								
		AR, MR.								
		CO2: Explain current trends in VR systems and Geo	ometry of VR							
		World								
		CO3: Apply the concept of geometry of virtual worlds	and effect of							
		light & camera.								
		CO4: Compare and understand the perception of cold	or, depth, and							
		motion in Virtual Reality.								
		CO5: Assess different VR techniques to create motion a	nd tracking in							
		the real and virtual world.								
		CO6: Plan future challenge and opportunity of virtual re-	eality.							
7	Course	In this course, students will learn the fundamentals of	virtual reality							
	Description	technology and its components.								
8	Outline syllabi	15	СО							
			Mapping							
	Unit 1	Introduction to Immersive Technologies:								
	А	A Brief History of Virtual Reality, The Five Classic	CO1							
		Components of a VR System, Modern VR Experiences. VR,								
		AR, MR, XR: similarities and differences								
	В	Current trends and state of the art in immersive technologies,	CO2							
		developing platforms and consumer devices, The future of	developing platforms and consumer devices. The future of							
	TT '' 2	human experience.								
	Unit 2	Bird's-Eye View: Math's and Physics of VR								

The Mathematics and Science of Virtual Reality



А	Hardware, So	ftware, Human	Physiology and Perception.	CO2							
	The Geometry	y of Virtual	Worlds: Geometric Models,								
	Changing Posi	tion and Orient	ation,								
В	Axis-Angle	Representation	s of Rotation, Viewing	CO2							
	Transformatio	ns, Chaining th	e Transformations.								
Unit 3	Light and Op	tics:									
А	Basic Behavio	our of Light, Le	nses, Optical Aberrations, the	CO3							
	Human Eye, C	Human Eye, Cameras, and Displays.									
В	The Physiolog	gy of Human	Vision: From the Cornea to	CO3							
	Photoreceptors	s, From Photore	eceptors to the Visual Cortex,								
	Eye Movemen										
Unit 4	Visual Percep	otion:									
А	Perception of	Depth: Monoc	ular depth cues, Stereo depth	CO4, CO5							
	cues, Implicati	ions for VR. Pe	rception of Motion: Detection								
	mechanisms, s	stroboscopic ap	parent motion, Perception of								
	color, combini	ng sources of in	nformation.								
В	Visual Rende	ering: Ray Tra	acing and Shading Models,	CO4, CO5							
	Rasterization,	Correcting Op	otical Distortions, Improving								
	Latency and F	rame Rates, Im	mersive Photos and Videos.								
Unit 5	Motion in rea	l and virtual w	vorlds:								
А	Velocities and	Accelerations,	the Vestibular System, physics	CO5, CO6							
	in the virtual v	vorld, mismatch	ned motion and Vection.								
В	Tracking: Tra	cking in 2D a	nd 3D Orientation. Tracking	CO5, CO6							
	position and	orientation. Tr	cacking attached bodies. 3D								
	Scanning of th	e Environment.									
Mode of	Theory/Jury/P	ractical/Viva									
examination											
Weightage	CA	MTE	ETE								
Distribution	25%	25% 25% 50%									
Textbook/s*	Virtual reality	, Steven M. L	avelle. Cambridge University								
	Press.										
	K.S. Hale an	nd K. M. Star	nney, Handbook on Virtual								
	Environments,	, 2nd edition, C	RC Press, 2015.								
Other	Virtual Real	ity, IIT Mad	ras, Prof Steven LaValle								
References	https://nptel.a	ac.in/courses/1	06106138								

S.	Course Outcome	Program Outcomes
No.		(PO) & Program
		Specific Outcomes
		(PSO)
1.	CO1: Describe the components of VR and differentiate	PO1, PO3, PO5,
	between VR, AR, MR.	PO12, PSO2, PSO3



-		
2.	CO2: <i>Explain</i> current trends in VR systems and Geometry of	PO1, PO2, PO3, PO5,
	VR World	PO12, PSO1, PSO2,
		PSO3
3.	CO3: Apply the concept of geometry of virtual worlds and	PO1, PO3, PO5,
	effect of light & camera.	PO12, PSO1, PSO2,
		PSO3
4.	CO4: <i>Compare</i> and understand the perception of color, depth,	PO1, PO5, PO12,
	and motion in Virtual Reality.	PSO1, PSO2, PSO3
5.	CO5: Assess different VR techniques to create motion and	PO1, PO5, PO12,
	tracking in the real and virtual world.	PSO1, PSO2
6.	CO6: <i>Plan</i> future challenge and opportunity of virtual reality.	PO1, PO2, PO3, PO4,
		PO5, PO9, PO12,
		PSO1, PSO2, PSO3

#### PO and PSO mapping with level of strength

CO's	PO 1	PO 2	РО 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	-	2	-	-	-	-	-	-	-	-	2	3	-	3	-
CO2	2	-	2	2	3	-	-	-	-	-	2	3		3	-
CO3	3	2	-	2	-	2	-	-	-	-	-	-	2	-	2
CO4	-	2	2	-	-	-	-	-	-	-	-	-	-	2	2
CO5	2	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO6	2	-	-	2	-	-	-	2	-	-	2	-	-	2	-

Course Code/Nam e	PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2	PS O3
The Mathematics and Science of Virtual Reality	1.5	1.3 3	1	1.3 3	0.5	0.3 3	-	0.3 3	-	-	1	1	0.3 3	2	0.6 7

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Pro	gramming in C#	using Unity	
Sch	ool:	School of Engineering & Technology	
Dep	artment	Computer Science & Engineering	
Pro	gram:	B.Tech CSE (Specialization in Augmented and Vir	tual Reality)
Bra	nch:	CSE	
1	Course Code		
2	Course Title	Programming in C# using Unity	
3	Credits	2	
4	Contact Hours	2-0-0	
	(L-T-P)		
	Course Status		
5	Course	The objective of this course is to equip stude	nts with C#
	Objective	programming concepts.	
6	Course	After studying this course student will be able to:	
	Outcomes	CO1: Describe the basic concepts of C# progr	amming and
		implement knowledge of object-oriented concepts.	C
		CO2: Explain the concepts of code development using	g C#.
		CO3: Apply the concept of C# to implement object-orie	ented concepts
		such as inheritance.	1
		CO4: Compare different tools and techniques	in product
		development using Unity.	-
		CO5: Assess different features of C# & tools of Unit	v for product
		development	ly for produce
		CO6: <i>Plan</i> the opportunities of product developmen	t using Unity
		and C#.	e using only
7	Course	To understand the basic concepts of C# programming a	nd implement
	Description	knowledge of object-oriented concepts like classes,	methods, and
		accessors, instantiate objects and understand the basi	c components
		of Game development using unity.	-
8	Outline syllabus		CO
Ŭ			Mapping
	Unit 1	Introduction to Unity Environment	B
	A	Unity IDE, Different windows: Hierarchy, Project, Scene	CO1
		Game, Inspector, Console.	
		Primitive Shapes, Game Object, Different Asset, and	CO1
	В	Layout of Unity.	
	Unit 2	Programming with C#	
	А	Tokens, Variables, Statement and Expression, Keywords,	CO2
		Classes, Type Casting.	
		Creating classes, functions, scope, this, logical Operators,	CO2
	В	Loops	
	Unit 3	Inheritance	
	A	Inheritance, Instancing, Static, Jump Statement	<u>CO3</u>
	B	Arrays, Array List, Strings.	CO3
	Unit 4		
	Α	Constructor, Enum, Switch, Structs	CO4
	B	Vectors, Boxing and Unboxing and Operator overloading	CO4



Unit 5											
А	Delegates, I	Delegates, Interfaces, Exception, Destructor									
В	Source Vers	Source Version Control, Setting up Repository.									
Mode of	Theory/Jury	Theory/Jury/Practical/Viva									
examination											
Weightage	CA	MTE	ETE								
Distribution	25%	25%	50%								
Text book/s*	• Learning CRC Pres	C# Programmir s.	ng with Unity 3D, Alex Okita,								
	• C# Game	Programming (	Cookbook for Unity 3D, Jeff								
	W. Murra	W. Murray, CRC Press.									
Other											
References											

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes
		(PSO)
1.	CO1: Describe the basic concepts of C# programming and implement knowledge of object-oriented concepts.	PO1, PO3,PO5, PO11,PO12,PSO1,PS O23
2.	CO2: Explain the concepts of code development using C#.	PO1,PO3,PO4,PO5,P 011PO12,PSO2
3.	CO3: Apply the concept of C# to implement object-oriented concepts such as inheritance.	PO1,PO2,PO4,PO11, PO12, PSO1, PSO2, PSO3
4.	CO4: Compare different tools and techniques in product development using Unity.	PO1, PO2, PO4, PO5, PO12, PSO2,PSO3
5.	CO5: Assess different features of C# & tools of Unity for product development.	PO1, PO2,PO3, PO4, PO12, PSO1, PSO2
6.	CO6: Plan the opportunities of product development using Unity and C#.	PO1, PO2, PO4,PO8 PO11, PSO2



Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12	PSO 1	PSO2	PSO3
CO1	3	-	3	-	2	-	-	-	-	-	-	2	2	-	2
CO2	2	-	2	2	2	-	-	-	-	-	2	2	-	3	-
CO3	2	3	-	2	-	-	-	-	-	-	2	2	2	3	3
CO4	2	-	2	3	3	-	-	-	-	-	-	2	-	2	3
CO5	2	2	2	2	-	-	-	-	-	-	-	2	3	2	-
CO6	2	2	-	3	-	-	-	-	2	-	2	2	-	2	-

#### PO and PSO mapping with level of strength

Cours e Code	Cours e Name	PO 1	PO 2	PO 3	P 0 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P 0 11	P 0 12	PS O 1	PSO 2	PS O 3
		2.2	2.33	2.2 5	2.4	-	-	-	-	2	-	2	2	2.33	2.4	2.6

- 1. Addressed to *Slight* (*Low=1*) *extent*
- 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



Scho	ool:	School of Engineering & Technology	
Dep	artment	Computer Science & Engineering	
Prog	gram:	BTech.	
Bra	nch:	CSE	
1	Course Code		
2	Course Title	Programming in C# using Unity Lab	
3	Credits	2	
4	Contact Hours	0-0-4	
	(L-T-P)		
	Course Status		
5	Course	The objective of this course is to equip students with C# prog	ramming
	Objective	concepts.	
6	Course	After studying this course student will be able to:	
	Outcomes	CO1: Describe the basic concepts of C# programming a	and implement
		knowledge of object-oriented concepts.	
		CO2: <i>Explain</i> the concepts of code development using C#.	_
		CO3: Apply the concept of C# to implement object-oriented c	oncepts such as
		inheritance.	1
		Unity	elopment using
		CO5: Assess different features of $C^{\text{H}}$ is tools of Unit	y for product
		development	y for product
		CO6: <i>Plan</i> the opportunities of product development us	ing Unity and
		Coo. <i>Fian</i> the opportunities of product development us C#.	ing Onity and
7	Course	To understand the basic concepts of C# programming and im	plement
	Description	knowledge of object-oriented concepts like classes, methods,	and accessors,
		instantiate objects and understand the basic components of G	ame
		development using unity	
0	Outline gullebus		CO Monning
0	Unit 1	Introduction to Unity and C#	CO Mapping
		Introduction to Unity IDE installation and sotting up the	CO1
	1	environment	COI
	2	In C# suppose you're making a RPG (Role Playing Game).	CO1
	-	Now in this RPG, your Player Character will have Stats, like	001
		Name, Strength, Endurance, Mana, Charm etc that will be	
		used by you to display and calculate various things in your	
		game. Create that player character's data using data types	
			CO2
	Unit 2	Conditional and looping	
	3	Write a program in C# utilizing logical operators and	CO2
		conditional statements. In the ongoing RPG project, limit the	
		time for the player to enter the shop after 11 am and before	
		7pm	

#### **Programming in C# using Unity Lab**



4	Create C# pr	ogram to mod	el a restaurant menu where	CO2					
	players can ch	oose a food of t	he day from the menu						
Unit 3	Arrays and M								
5	Create a scena	Create a scenario for a team game, which stores the data of							
	all different pl	ayers using arra	iys						
6	Write a progr	am in C# to d	esign a player bag. Create a	CO3					
	system to m	nanage the in	ventory of the bag using						
	looping funda	amentals							
Unit 4	Advanced C#	techniques							
7	Write a progra	am in C# to de	monstrate difference between	CO4, CO5					
	Boxing and U	nboxing							
8	Write a progra	um in C# to der	nonstrate vector3 and vector2	CO4, CO5					
	and use it to cr	reate a game en	vironment and interaction						
Unit 5									
9	Write a prog	ram in C# to	demonstrate interfaces and	CO5, CO6					
	delegates								
10	Write a progra	am in C# using	g inheritance to emulate RPG	CO5, CO6					
	(Role Playing	Game) that ha	as a lot of different types of						
	weapons like	Swords, Spea	ars, Guns, Axes, Bows and						
	Arrows. Now	all these weapo	ns will have stats like Piercing						
	Damage, Slash	ning Damage, B	leeding Damage, Weapon HP.						
Mode of	Lab/ Practical								
examination									
Weightage	CA	CE(VIVA)	ETE						
Distribution	25%	25%	50%						
 Text book/s*	• Learning C#								
	CRC Press.								
	• C# Game Pr								
 0.1	Murray, CR								
Other									
References				1					

S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific
		Outcomes (PSO)
1.	CO1: Describe the basic concepts of C# programming	PO1, PO2, PO5, PO8,
	and implement knowledge of object-oriented concepts.	PSO1, POS2
2.	CO2: Explain the concepts of code development using	PO1, PO2, PO3, PO4, PO8,
	C#.	PSO1, PSO2
3.	CO3: Apply the concept of C# to implement object-	PO1, PO3, PO4, PO6, PO7,
	oriented concepts such as inheritance.	PO8, PO9, PO10, PSO1,
		PSO2



4.	CO4: Compare different tools and techniques in product	PO1, PO3, PO4, PO5, PO6,
	development using Unity.	PO7, PO8, PO9, PSO1,
		PSO2
5.	CO5: Assess different features of C# & tools of Unity for	PO1, PO2, PO3, PO4, PO5,
	product development.	PO6, PO10, PSO1, PSO2
6.	CO6: Plan the opportunities of product development using	PO1,PO2, PO3, PO4, PO5,
	Unity and C#.	PO6, PO7, PO8, PO9,
		PO10, PSO1, PSO2

#### PO and PSO mapping with level of strength

Course Code_ Course Name	CO's	Р О 1	РО 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Р О 11	P 01 2	PSO 1	PSO 2	PSO 3
	CO1	3	3	2	2						3	3	3	3	3	3
	CO2	3	3	2	2						3	3	3	3	3	3
Programming	CO3	3	3	3	3	3					2	3	3	3	3	3
Unity Lab	CO4	3	3	2	2	2					2	3	3	2	2	2
	CO5	3	2	2	2	2					2	3	3	2	2	2
	CO6	3	3	2	2	2					2	3	3	2	2	2

Co urs e Co de	Course Name	РО 1	PO 2	РО 3	PO 4	РО 5	PO 6	PO 7	РО 8	PO 9	РО 10	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
	Programmin g in C# using Unity Lab	3. 00	2. 83	2. 17	2. 17	2. 25	-	-	-	-	2. 33	3.0 0	3.0 0	2.5 0	2.5 0	2.5 0

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology			
Den	artment	Computer Science & Engineering			
Pro	gram:	B.Tech CSE (Specialization in Augmented and Virtu	al Reality)		
Bra	nch:	CSE	ur recurrey)		
1	Course Code				
2	Course Title	3D Modeling Using Blender			
3	Credits	2			
<u>л</u>	Contact Hour	2-0-0			
	(L-T-P)	200			
	Course				
	Status				
5	Course	The objective of this course is to develop the skill & know	wledge in 3D		
	Objective	Modeling & Animation.	8		
6	Course	After studying this course student will be able to:			
	Outcomes	CO1: <i>Describe</i> the basic concepts of blender for 3D mod	deling.		
	outcomes	CO2: <i>Utilize</i> materials and textures for creating 3D gam	e assets.		
		CO3: <i>Apply</i> the principles of animation.			
		CO4: <i>Create</i> and animate 3D Text using blender.			
		CO5: <i>Develop</i> character rigging object armatures.			
		CO6: Design 3D game environments using blender.			
7	Course	This course introduces the concept of 3D Modeling & A	Animation and		
	Description	blender with its usage in 3 D game development.	Students will		
		understand multimedia and the animation industry, vide	o studios, edit		
		set-up.			
8	Outline syllabu	15	СО		
			Mapping		
	Unit 1	Introduction			
	А	Definition of Computer-based Animation, Basic Types of	CO1		
		Animation, Definition of Modeling, Application using 3D			
		skills. Blender Editor panels, The 3D View Editor, the			
		Outliner Editor, the Properties Editor, and the Timeline			
		Editor			
	-	Meshes, Mesh types, Scaling and Rotating Objects,	CO1		
	В	Precision Manipulation, Transformation, Vertex Editing,			
		Center Points, Shading, Edge Loop Selection, Knife and			
	Linit 2	Sculpt 1001. Materials and Textures			
		Introduction to materials Button Colors Shaders	$CO^{2}$		
	A	Transparency Vertex Painting Application of Materials	02		
		Texture Mapping & Displacement Mapping IV Texture	CO2		
	В	Mapping, Unwrapping with seams. Texture Paint.			
	Unit 3	Animation			
	A Lighting and Camera. Rendering and Ray tracing.				
		Animation Basics: Introduction, Moving, Rotating and	CO3		
	В	Scaling, Types of curves, Automatic key framing.			
	Unit 4	3D character			

**3D Modeling Using Blender** 



А	3D Text: Crea	3D Text: Creating 3D Text, Create Text on Curve, Convert								
	text to mesh ol	oject, curve, and	l NURBS & Meta shapes.							
В	Modifiers and	Modifiers and Particles system, Armatures.								
Unit 5	Rigging									
А	Basic Riggin	g and Anima	tion: Keyframing with the	e CO5, CO6						
	Timeline, The	Dopesheet, Par	enting, Graph Editor							
В	Pivot Point: T	he Center of R	otation, Basic Tracking: Eyes	CO5, CO6						
	That Follow,	Rigging with	Bones, Rigging a Simple	•						
	Character									
Mode of	Theory/Jury/P	ractical/Viva								
examination										
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Textbook/s*	• John M. Bla	n, The Comple	te Guide to Blender Graphics	5						
	Computer Mod	leling and Anin	nation, CRC Press							
Other	Gordon Fish	er, Blender 3D	Basics, 2nd Edition_ A quick	C C						
References	and easy-to-us	e guide to creat	e 3D modeling and animation	1						
	using Blender,									
	• Michael G.	i								
	Publishing.									
	• Lance Flav	ell. Beginning	Blender: Open-Source 3D							
	Modeling Ani	mation and Ga	me Design Apress							

S.	Course Outcome	Program Outcomes
No.		(PO) & Program
		Specific Outcomes
		(PSO)
1.	CO1: Describe the basic concepts of blender for 3D	PO1,PO2,PO3,PO4,PO
	modeling.	5,PO11,PO12,PSO2,
2.	CO2: Utilize materials and textures for creating 3D game	PO1,PO2,PO3,PO4,PO
	assets.	5,PO11,PO12,PSO2
3.	CO3: <i>Apply</i> the principles of animation.	PO1,PO2,PO3,PO5,
		PO9,PO11,PO12
4.	CO4: <i>Create</i> and animate 3D Text using blender.	PO1,PO2,PO3,PO4,PO
		5,PO09,PO10,PO11,PO
		12,PSO3
5.	CO5: <i>Develop</i> character rigging object armatures.	PO1,PO2,PO3,PO4,PO
		5,PO10,PO11,PO12,PS
		O1,PSO2,PSO3
6.	CO6: Design 3D game environments using blender	PO1,PO2,PO3,PO4,PO
		5,PO10,PO11,PO12,PS
		O1,PSO2,PSO3



Course Code_ Course Name	CO's	Р О 1	PO 2	PO 3	РО 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PSO 2	PSO 3
3D Modeling Using Blender	CO1	3	3	2	-	2	-	-	-	-	-	2	2	-	3	-
	CO2	3	3	2	2	2	-	-	-	-	-	2	2	-	3	-
	CO3	3	3	3	3	-	-	-	-	3	-	2	3	-	-	-
	CO4	3	3	3	3	-	-	-	-	3	2	2	3	-	-	3
	CO5	3	3	3	2	2	-	-	-	-	2	2	3	3	3	3
	CO6	3	3	2	2	2	-	-	-	-	2	2	2	3	3	3

#### PO and PSO mapping with level of strength

Course Code	Course Name	PO 1	PO 2	РО 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
	3D Modelin g Using Blender	3	3	2.33	2.4	2	-	-	-	3	2	2	2.33	3	3	3

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Soh	ool.	School of Fr	School of Engineering & Technology									
Don	001: ontmont	School of El	gineering &	l echnology								
Dep		D Task CSE	Cience & Eng		(							
Pro	gram:	B. I ech CSE	(Specializatio	on in Augmented and v	irtual Reality)							
	ncn:	CSE										
1	Course Code		·	<b>T</b> 1								
2	Course Title	3D Modeling	using Blende	Lab								
3	Credits	1										
4	Contact	0-0-2										
	Hours											
	(L-T-P)											
	Course											
	Status											
5	Course	The objective	e of this cours	e is to impart practical	knowledge in 3D							
	Objective	modelling &	Animation.									
6	Course	After studyin	g this course s	tudent will be able to:								
_	Outcomes	CO1: Descril	<i>be</i> the basic co	ncepts of blender for 3D	modeling.							
		CO2: <i>Utilize</i>	materials and	textures for creating 3D	game assets.							
		CO3: Apply t	he principles of	of animation.	0							
		CO4: <i>Create</i>	CO4: <i>Create</i> and animate 3D Text using blender.									
		CO5: Develo	CO5: <i>Develop</i> character rigging object armatures.									
		CO6: Design	3D game env	ronments using blender.								
7	Course	This course in	ntroduces the	concept of 3D Modeling	& Animation and							
	Description	blender with	its usage in 3	D game development.								
0	Outling gullaby											
0	Outime synabl	18			CO							
	Unit 1	Introduction			Mapping							
		Learn Blender	from Absolute	Basics Add Materials To	3D CO1							
	1	Models Learn	Modifiers in B	lender								
	2	Design poly re	cks trees mou	ntains to create jungle scer	e CO1							
	L Init 2	Materials and	Textures	intuitis to create juligie see								
	3	Design the dot	ut with a glass	containing water	CO2							
	3	Design the Ter	dy Beer and pl	ace it on chair								
	4 Unit 2	Animation	idy Dear and pr		02							
	5	Create animati	on of interior d	esign of a cinema hall	CO3							
	5	Create animati	of of a corr	unning on road	CO3							
	U Umit 4	2D character		unning on toau	0.05							
		Crosta a 2D 7	Fort Croata Ta	yt on Currie Convert tor	to CO4							
	/	Create a SD I	d ourvo	xt on Curve, Convert lex	10 004							
	0	Create a 2D al		ulating frature	<u> </u>							
	8 TL 4 7	Create a 5D cr	laracter using so		04							
		Rigging										
	9	Create the cartoon character and render it as a movie file. CO5,										
	10	Create a Castle/City in blender CO										
	Mode of	Theory/Jury/P										
	examination	nination										
	Weightage	CA	CE(VIVA)	ETE								
	Distribution	25%	25%	50%								

3D Modelin sing Rlender I ah



Text book/s*	• John M. Blain, The Complete Guide to Blender	
	Graphics Computer Modeling and Animation, CRC	
	Press.	
Other	• Gordon Fisher, Blender 3D Basics, 2nd Edition_ A	
References	quick and easy-to-use guide to create 3D modeling and	
	animation using Blender, PACKT Publishing.	
	Michael G. Strintzis, 3D Modeling and Animation, Igi	
	Publishing.	
	• Lance Flavell, Beginning Blender: Open-Source 3D	
	Modeling, Animation, and Game Design, Apress.	

C	Course Outcome	Drogram Outcomes
<i>З</i> .	Course Outcome	
No.		(PO) & Program
		Specific Outcomes
		(PSO)
1.	CO1: <i>Describe</i> the basic concepts of blender for 3D	PO1,PO2,PO3,PO4,
	modeling.	PO5,PO11,PO12,PS
		O2,
2.	CO2: Utilize materials and textures for creating 3D game	PO1,PO2,PO3,PO4,
	assets.	PO5,PO11,PO12,PS
		O2
3.	CO3: <i>Apply</i> the principles of animation.	PO1,PO2,PO3,PO5,
		PO9,PO11,PO12
4.	CO4: Create and animate 3D Text using blender.	PO1,PO2,PO3,PO4,
		PO5,PO09,PO10,P
		O11,PO12,PSO3
5.	CO5: <i>Develop</i> character rigging object armatures.	PO1,PO2,PO3,PO4,
		PO5,PO10,PO11,P
		O12,PSO1,PSO2,PS
		03
6.	CO6: <i>Design</i> 3D game environments using blender.	PO1,PO2,PO3,PO4,
		PO5,PO10,PO11,P
		O12,PSO1,PSO2,PS
		O3

# PO and PSO mapping with level of strength

Course Code_ Course Name	CO's	P 0 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS 0 1	PSO 2	PSO 3
	CO1	3	3	2	-	2	-	-	-	-	-	2	2	-	3	-
3D	CO2	3	3	2	2	2	-	-	-	-	-	2	2	-	3	-
Modeling	CO3	3	3	3	3	-	-	-	-	3	-	2	3	-	-	-
Using	CO4	3	3	3	3	-	-	-	-	3	2	2	3	-	-	3
Blender	CO5	3	3	3	2	2	-	-	-	-	2	2	3	3	3	3
	CO6	3	3	2	2	2	-	-	-	-	2	2	2	3	3	3



Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
ת נ ן	3D Modelin g Using Blender	3	3	2.33	2.4	2	-	-	-	3	2	2	2.33	3	3	3

- 1. Addressed to *Slight (Low=1) extent* 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



2D and 3D Game Development in Unity	2D	and 3D	Game	Develo	pment in	Unity
-------------------------------------	----	--------	------	--------	----------	-------

Scho	ool:	School of Engineering & Technology
Dep	artment	Computer Science & Engineering
Prog	gram:	BTech.
Bra	nch:	CSE
1	Course Code	
2	Course Title	2D and 3D Game Development in Unity
3	Credits	2
4	Contact Hours	2-0-0
	(L-T-P)	
	Course Status	
5	Course Objective	This course introduces game development using Unity, a powerful game engine widely used in the industry. Students will learn how to create 2D and 3D games using Unity's scripting language, C#. By the end of the course, students will have developed a solid foundation in game development that they can use to create their own games.
6	Course Outcomes	<ul> <li>after studying this course student will be able to:</li> <li>CO1: <i>Recall</i> fundamental game development concepts and terminology.</li> <li>CO2: <i>Explain</i> the components and stages of game development.</li> <li>CO3: <i>Develop</i> 2D and 3D games in Unity using pre-built assets and game mechanics and modify existing scripts.</li> <li>CO4: <i>Analyze</i> and troubleshoot code and game design problems.</li> <li>CO5: <i>Evaluate</i> game design choices and their impact on gameplay experience.</li> <li>CO6: <i>Create</i> original game mechanics, player controls, user interfaces, and graphics using Unity and C# programming.</li> </ul>
7	Course Description	This course explores basic and advanced techniques for developing 2D and 3D games using Unity. Students will learn about fundamental concepts in game development, including the history and evolution of games, game types and genres, and game design principles. Additionally, they will gain hands-on experience creating game mechanics, player controls, graphics, sound effects, and user interfaces using Unity's features and C# scripting language.



8	Outline syllabus	3	CO Mapping						
	Unit 1								
	A	Overview of game development process and stages. Technological advancements and their impact on video games. Overview of different types of games.	CO1						
	В	Elements of game design, level design, storytelling, and player experience.	CO2						
	Unit 2	Hands on to Unity							
	A	Sprites: Introduction to Scripting, C# Language Concepts, Game Loops and Functions, Simple and Input Movement, Simple Rotation and Scaling.	CO2, CO4						
	В	2D and 3D Physics Concepts: Rigid body Components, Unity Colliders, Physics Materials, Scripting Collision Events.							
	Unit 3	Game Development Fundamentals							
	A	Techniques for importing and exporting game assets in Unity, Introduction to physics engines. Overview of graphics and animation and their applications in game development, Animation techniques, Optimization techniques.	CO3						
	В	Implementation of core gameplay mechanics, Creation of gameplay systems, Techniques for balancing gameplay systems.	CO3						
	Unit 4	Advanced Game Development Techniques							
	A	Developing complex game systems, Multiplayer game development: Client-server architecture, Network synchronization. Procedural generation of game content: Perlin noise, Cellular automata, L-systems,	CO5						
	В	Generating terrain, levels, and enemies Shader programming for advanced graphics. Optimization techniques for improving game performance: Reducing draw calls, Asset size and loading optimization, Object pooling, Unity's built- in profiling tools	CO4, CO5						
	Unit 5	Game Development Project							
	A	Applying the principles and techniques learned in previous units to develop a complete game project using Unity.	CO6						



В	Developing and user in	Developing the game mechanics, graphics, sound effects, and user interface elements. Game performance.							
Mode of examination	Theory	Theory							
Weightage Distribution	CA	MTE	ETE						
	25%								
Text book/s*	• <u>Ur</u> <u>Ev</u> Ma • <u>Ur</u>	<ul> <li><u>Unity Game Development Cookbook: Essentials for</u> <u>Every Game</u>, by Paris Buttfield-Addison, Jon Manning, and Tim Nugent.</li> <li><u>Unity in Action</u> by Joe Hocking.</li> </ul>							
Other References	• <u>Le</u> Ha • <u>Int</u> De	arning C# by De arrison Ferrone. aroduction to G avelopment by Je	eveloping Games with Unity by ame Design, Prototyping, and remy Gibson Bond.						



C	Course Outcome	$\mathbf{D}_{\mathbf{r}}$
5.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific
		Outcomes (PSO)
1.	CO1: <i>Recall</i> fundamental game development concepts and	PO1, PO2, PO12
	terminology.	
2.	CO2: <i>Explain</i> the components and stages of game	PO2, PO3, PO5, PO6
	development.	
3.	CO3: Develop 2D and 3D games in Unity using pre-built	PO3, PO5, PO9, PO10
	assets and game mechanics and modify existing scripts.	
4.	CO4: Analyze and troubleshoot code and game design	PO2, PO4, PO6, PO9,
	problems.	PO10
5.	CO5: Evaluate game design choices and their impact on	PO2, PO3, PO4, PO5, PO6,
	gameplay experience.	PO7, PO9, PO10
		, ,
6.	CO6: Create original game mechanics, player controls, user	PO3, PO5, PO9, PO10
	interfaces, and graphics using Unity and C# programming.	
	internetes, and graphies using emity and en programming.	
1		1

# PO and PSO mapping with level of strength

Course Code_ Course Name	CO's	Р О 1	P 0 2	РО 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P O 10	P 0 1 1	P 0 1 2	PS O 1	PS O2	PS O3
	CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
2D and 3D	CO2	-	3	3	-	2	-	-	-	-	-	-	3	-	-	-
Game	CO3	-	-	3	-	2	-	-	-	3	3	-	3	-	-	-
Developmen t in Unity	CO4	-	3	-	3	-	-	-	-	3	-	-	3	2	-	2
	CO5	-	3	3	3	-	-	-	-	3	3	-	3	2	2	2
	CO6	-	-	3	-	-	-	-	-	3	3	-	3	-	2	2



Course Name	Р О 1	P O2	P O 3	P 0 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	PO 11	PO 12	PS O1	PS O 2	PS O3
2D and 3D Game Developme nt in Unity	1. 5	3	3	3	2	-	-	-	3	3	-	3	2	2	2

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology							
Dep	artment	Computer Science & Engineering							
Pro	gram:	BTech.							
Bra	nch:	CSE							
1	Course Code								
2	Course Title	2D and 3D Game Development in Unity							
3	Credits	1							
4	Contact	0-0-2							
	Hours								
	(L-T-P)								
	Course								
	Status								
5	Course	This course introduces game development using Unit	y, a powerful						
	Objective	game engine widely used in the industry. Students will	l learn how to						
		create 2D and 3D games using Unity's scripting language	ge, C#. By the						
		end of the course, students will have developed a solid	foundation in						
		game development that they can use to create their own	games.						
6	Course	after studying this course student will be able to:	-						
	Outcomes	CO1: <i>Recall</i> fundamental game development c	concepts and						
		terminology.	1						
		CO2: <i>Explain</i> the components and stages of game devel	opment.						
		CO3: <i>Develop</i> 2D and 3D games in Unity using pre-bu	uilt assets and						
		game mechanics and modify existing scripts.							
		CO4: <i>Analyze</i> and troubleshoot code and game design p	roblems.						
		CO5: Evaluate game design choices and their impact	on gameplay						
		experience.							
		CO6: <i>Create</i> original game mechanics, player controls, u	ser interfaces,						
		and graphics using Unity and C# programming.	,						
7	Course	This course explores basic and advanced techniques for c	leveloping 2D						
	Description	and 3D games using Unity. Students will learn about	t fundamental						
	_	concepts in game development, including the history an	d evolution of						
		games, game types and genres, and game desig	n principles.						
		Additionally, they will gain hands-on experience c	reating game						
		mechanics, player controls, graphics, sound effects, and user interfaces							
		using Unity's features and C# scripting language.							
8	Outline syllabu	15	СО						
			Mapping						
	Unit 1								

# 2D and 3D Game Development in Unity Lab



A	Create a new project through Unity Hub, Navigate 3D space and the Unity Editor comfortably, Add and manipulate objects in the scene to position, Position a camera in an ideal spot for your game. Create C# scripts and apply them to objects. Utilize fundamental C# methods and classes like transform.Translate and Vector3, Add Rigidbody and Collider components to allow objects to collide realistically	CO1
Unit 2		
A	Create an if-then statement to implement basic logic in your project, including the use of greater than (>) and less than (<) operators. Get user input with GetKey and KeyCode to test for specific keyboard presses. Apply components to multiple objects at once to work as efficiently as possible. Detect collisions and destroy objects that collide with each other	CO2, CO4
Unit 3		
A	Influence physics of game objects with ForceMode.Impulse. Tweak the gravity of your project with Physics.gravity. Utilize new operators and variables like &&. Constrain the RigidBody component to halt movement on certain axe. Use script communication to access the methods and variables of other scripts. Stop and play particle effects to correspond with character animation states. Work with Audio Sources and Listeners to play background music.Add sound effects to add polish to your project	CO3
Unit 4		
A	Apply Texture wraps to objects. Attach a camera to its focal point using parent-child relationships. Transform objects based on local XYZ values. Write informative debug messages with Concatenation and variables. Repeat functions with the power of IEnumerator and Coroutines. Use SetActive to make game objects appear and disappear from the scene	CO5
Unit 5		
A	Add torque to the force of an object. Create a Game Manager object that controls game states as well as spawning. Create a List of objects and return their length with Count.	CO6



	Use OnMou	Use OnMouseDown to enable the player to click o										
	things. Cre	things. Create UI Elements in the Canvas. Lock										
	elements an	elements and objects into place with Anchors										
Mode of	Theory	Theory										
examination												
Weightage	CA	CE(VIVA)	ETE									
Distribution	25%	25%	50%									
Textbook/s*	Unity	Game Develop	ment Cookbook: Essentials for									
	Every	Game, by Paris	Buttfield-Addison, Jon Manning,									
	and T	im Nugent.										
	• Unity	in Action by Joe	Hocking.									
Other	• Learn	ing C# by Dev	eloping Games with Unity by									
References	Harri	Harrison Ferrone.										
	• Intro	luction to Gan	ne Design, Prototyping, and									
	Deve	lopment by Jerem	y Gibson Bond.									

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: Recall fundamental game development concepts	PO1, PO2, PO12
	and terminology.	
2.	CO2: Explain the components and stages of game	PO2, PO3, PO5, PO6
	development.	
3.	CO3: Develop 2D and 3D games in Unity using pre-	PO3, PO5, PO9, PO10
	built assets and game mechanics and modify existing	
	scripts.	
4.	CO4: Analyze and troubleshoot code and game design	PO2, PO4, PO6, PO9,
	problems.	PO10
5.	CO5: Evaluate game design choices and their impact on	PO2, PO3, PO4, PO5,
	gameplay experience.	PO6, PO7, PO9, PO10
6.	CO6: Create original game mechanics, player controls,	PO3, PO5, PO9, PO10
	user interfaces, and graphics using Unity and C#	
	programming.	



Course Code_ Course Name	CO's	Р О 1	PO 2	РО 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Р О 11	P 01 2	PSO 1	PSO 2	PSO 3
	CO1	3	3	-	-	-	-	-	-	-	-	-	3	-	-	-
2D and 3D	CO2	-	3	3	-	2	-	-	-	-	-	-	3	-	-	-
Game	СОЗ	-	-	3	-	2	-	-	-	3	3	-	3	-	-	-
Development	CO4	-	3	-	3	-	-	-	-	3	-	-	3	2	-	2
in Unity	CO5	-	3	3	3	-	-	-	-	3	3	-	3	2	2	2
	CO6	-	-	3	-	-	-	-	-	3	3	-	3	-	2	2

#### PO and PSO mapping with level of strength

Course Name	PO 1	PO2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO 2	PSO3
2D and 3D															
Game	3	3	3	3	2	_	_	-	3	3	_	3	2	2	2
Development	5	5 5	5	5	2	_	-	-	5	5	-	5	2	2	2
in Unity															

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Pro	gram:	BTech.								
Bra	nch:	CSE								
1	Course Code									
2	Course Title	Augmented Reality Application Developmen	t							
3	Credits	2								
4	Contact	2-0-0								
	Hours									
	(L-T-P)									
	Course									
	Status									
5	Course	The objective of this course is to provide a foundation to	o the fast-							
	Objective	growing field of AR and make the students aware of the	e various AR							
		devices								
6	Course	after studying this course student will be able to:								
	Outcomes	CO1: Describe the basic concepts and different applications of								
		Augmented Reality.								
		CO2: <i>Explain</i> how AR systems work and list the applications of AR.								
		CO3: Apply the concept of AR in unity game engine to	develop							
		various applications.								
		CO4: <i>Compare</i> and understand the working of various s	state of the art							
		AR devices.								
		CO5: Assess different AR techniques for application de	velopment.							
		CO6: <i>Plan</i> for future challenge and opportunity of augn	nented reality.							
			2							
7	Course	This Course introduces the concept of augmented r	eality and its							
	Description	utilization to develop various applications using unit	y engine. The							
	Ĩ	future utilization of this course will be to merge with co	mputer vision.							
			r I CO							
8	Outline syllabi	18	CO							
	<b>T</b> T <b>1</b> / 4		Mapping							
	Unit I	Augmented Reality: Introduction								
	A	What is Augmented Reality, Applications of Augmented	COI							
		AR								
	B	Concept of Displays and Tracking (Tracking Calibration	$CO^2$							
		and Registration). AR architecture								
	С	How Does Augmented Reality Work. Trends in	CO2							
	Augmented Reality. Mobile Augmented Reality									
	Unit 2 Augmented Reality Hardware									

# **Augmented Reality Application Development**


А	Augmented Re	eality Hardware	– Displays – Audio	CO2, CO4						
	Displays, Hap	ic Displays, Vi	sual Displays							
В	Visual Percept	ion, Requireme	nts and Characteristics,	CO2, CO4						
	Spatial Display	y Model.								
С	Tracking & Se	Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology,								
	Registration, C									
	Stationary Tra	cking Systems,	Mobile Sensors, Optical							
	Tracking									
Unit 3	Augmented R	eality in Unity								
А	Game Loops a	and Functions, S	Simple Movement, and Input:	CO3						
	Simple Moven	nent, Simple Ro	tation and Scaling, Easy Input							
	Handling in U									
В	2D and 3D Physics Concepts: Rigidbody Components,									
	Unity Collide	rs, Physics M	laterials, Scripting Collision							
	Events,									
С	Organizing G	ame Objects, H	Parent-Child Objects, Sorting	CO3						
	Layers, Taggir	ng Game Object	ts, Collision Layers							
Unit 4	AR Techniqu	es- Marker bas	sed & Marker less tracking							
А	Marker-based	approach- In	troduction to marker-based	CO5						
	tracking, type	es of markers,	, marker camera pose and							
	identification,	visual tracking								
В	mathematical r	representation o	f matrix multiplication Marker	CO4, CO5						
	types- Temp	olate markers	, 2D barcode markers,							
	imperceptible	markers.								
С	Marker-less a	pproach- Loca	lization based augmentation,	CO5						
	real world ex	amples Trackir	ng methods- Visual tracking,							
	feature based t	racking, hybrid	tracking, and initialization and							
	recovery									
Unit 5	Augmented R	eality Challen	ges and Future							
А	Human Factor	Consideration	in AR – What are Human	CO6						
	Factors, Physic	cal Side Effects	, Visual Side Effects,							
В	Legal and	Social Consid	erations in AR – Legal	CO6						
	Considerations	s, Moral and Etl	nical Considerations,							
С	Today's challe	enges for AR,	Current State of Augmented	CO6						
	Reality, Future									
Mode of	Theory/Jury/P									
examination										
Weightage	СА	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	Augmented F	Reality for Dev	velopers by Jonathan							
	Linowes, Kry									
	Publisher(s):	Packt Publishi	ing,ISBN: 9781787286436							
	· · · ·			1						



C R	Other References	•	Augmented Reality with Unity AR Foundation: A practical guide to cross-platform AR development with Unity 2020 and later versions, by Jonathan Linowes Complete Virtual Reality and Augmented Reality	
			Development with Unity: Leverage the power of Unity and become a pro at creating mixed reality applications	
			by Jesse Glover, Jonathan Linowes	

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: Describe the basic concepts and different	PO1, PO2, PO5, PO8,
	applications of Augmented Reality.	PSO1, POS2
2.	CO2: Explain how AR systems work and list the	PO1, PO2, PO3, PO4,
	applications of AR.	PO8, PSO1, PSO2
3.	CO3: Apply the concept of AR in unity game engine to	PO1, PO3, PO4, PO6,
	develop various applications.	PO7, PO8, PO9, PO10,
		PO11, PO12, PSO1,
		PSO2
4.	CO4: Compare and understand the working of various	PO1, PO3, PO4, PO5,
	state of the art AR devices.	PO6, PO7, PO8, PO9,
		PSO1, PSO2,PSO3
5.	CO5: Assess different AR techniques for application	PO1, PO2, PO3, PO4,
	development.	PO5, PO6, PO10,
		PO11,PO12, PSO1,
		PSO2,PSO3
6.	CO6: Plan for future challenge and opportunity of	PO1,PO2, PO3, PO4,
	augmented reality.	PO5, PO6, PO7, PO8,
		PO9, PO10, PO11,PO12,
		PSO1, PSO2,PSO3



Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	РО 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
	CO1	3	3			2			2					3	3	3
Augmented	CO2	3	3	2	2				2					3	3	3
Reality Application	CO3	3		3	3		2	2	2		2	2	2	3	3	3
Developme	CO4	2		2	2	1	1	1	2	2				2	2	2
nt	CO5	2	2	2	2	1	1				2	2	2	2	2	2
	CO6	3	3	2	2	2	2	1	1	1	1	1	2	2	2	2

#### PO and PSO mapping with level of strength

Course Name	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO 2	PSO3
Augmente															
d Reality															
Applicatio	2.6	2.7	2.2	2.2	1.5	1.5	1.3	1.8	1.5	1.6	1.9	1.0	2 50	2 50	2 50
n	7	5	0	0	0	0	3	0	0	7	1.0	1.9	2.30	2.30	2.30
Developm															
ent															

- 1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Pro	gram:	B.Tech.								
Bra	nch:	CSE								
1	Course Code									
2	Course Title	Augmented Reality Application Development Lab								
3	Credits	2								
4	Contact	0-0-4								
	Hours									
	(L-T-P)									
	Course									
	Status									
5	Course	The objective of this course is to provide a foundation to	o the fast-							
	Objective	growing field of AR and make the students aware of the	various AR							
		devices								
6	Course	after studying this course student will be able to:								
	Outcomes	CO1: <i>Describe</i> the basic concepts and different applications of								
		Augmented Reality.								
		CO2: <i>Explain</i> how AR systems work and list the applications of AR.								
		CO3: Apply the concept of AR in unity game engine to	develop							
		various applications.								
		CO4: Compare and understand the working of various s	state of the art							
		AR devices.								
		CO5: Assess different AR techniques for application de	velopment.							
		CO6: <i>Plan</i> for future challenge and opportunity of augmented reality.								
7	Course	This Course introduce the concept of augmented reality	and its							
	Description	utilization to develop various applications using unity en	ngine. The							
		future utilization of this course will be to merge with co	mputer							
		vision.								
8	Outline syllabi	18	СО							
			Mapping							
	Unit 1	Augmented Reality: Hardware								
	А	Introduction to Augmented Reality Hardware – Displays –	CO1							
		Audio Displays, Haptic Displays, Visual Displays, Other								
		sensory displays								
	В	Hands-on experience with HMDs (e.g. Microsoft	CO2							
		HoloLens, Oculus Rift)								
	C	Hands-on experience with mobile devices and smart CO2								
		glasses (e.g. Google Glass, Vuzix Blade)								
1	Unit 2	Introduction to AK and AKCore								

#### **Augmented Reality Application Development Lab**



А	CO2, CO4							
В	Creating a bas	ic AR application	on to display a 3D object in	CO2, CO4				
	the real world.							
С	Enhancing the	AR application	to display a virtual object	CO2, CO4				
	based on the re	eal-world location	on.					
Unit 3	Introduction	to Unity and A	R					
А	Introduction to	Unity and its A	AR features.	CO3				
В	Creating an Al	R application us	ing Unity and ARCore to	CO3				
	real world.							
С	CO3							
Unit 4	AR Techniqu	es- Marker bas	sed & Marker less tracking					
А	Marker-based Tracking Experiment: Create a simple 3D							
	model using U	nity. Print out a	marker and place it on a table.					
	Develop an A	AR application	that detects the marker and					
	overlays the 3	D model on top	of it. Add interactivity to the					
	application by	allowing the	user to interact with the 3D					
	model through	touch or gestur	res.					
В	Markerless Tra	acking Experim	ent: Create a simple 3D model	CO4				
	using Unity. I	Develop an AR	application that uses image					
	recognition to	detect and track	a real-world object.					
	time Add int	model on top (	of the real-world object in real-					
	user to interact	with the 3D m	del through touch or gestures					
C	Hybrid Tracki	ng Experiment	· Create a simple 3D model	<u> </u>				
C	using Unity	Print out a mai	rker and place it on a table	04				
	Develop an Al	R application th	at uses marker-based tracking					
	to detect the m	arker and displa	av the 3D model on top of it.					
	Use markerles	s tracking to c	letect and track a real-world					
	object that is n	ot related to the	marker. Overlay the 3D model					
	on top of the re	al-world object	in real-time. Add interactivity					
	to the applicat	ion by allowing	g the user to interact with the					
	3D model thro	ugh touch or ge	stures.					
Unit 5	AR and Com	puter Vision						
А	Introduction to	o computer visio	on and its applications in AR.	CO6				
В	CO6							
	objects and ov	erlays virtual in	formation on them.					
С	Developing an	AR application	that tracks facial expressions	CO6				
	and displays v	irtual objects ba	sed on them.					
Mode of	Practical/Viva							
examination								
Weightage	СА	CE(VIVA)	ETE					
Distribution         25%         25%         50%								



Text book/s*	<ul> <li>Augmented Reality for Developers by Jonathan Linowes, Krystian Babilinski, Released October 2017, Publisher(s): Packt Publishing ISBN: 9781787286436</li> </ul>	
Other References	<ul> <li>Augmented Reality with Unity AR Foundation: A practical guide to cross-platform AR development with Unity 2020 and later versions by Jonathan Linowes</li> <li>Complete Virtual Reality and Augmented Reality Development with Unity: Leverage the power of Unity and become a pro at creating mixed reality applications by Jesse Glover, Jonathan Linowes</li> </ul>	

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: Describe the basic concepts and different	PO1, PO2, PO5, PO8,
	applications of Augmented Reality.	PSO1, POS2
2.	CO2: Explain how AR systems work and list the	PO1, PO2, PO3, PO4,
	applications of AR.	PO8, PSO1, PSO2
3.	CO3: Apply the concept of AR in unity game engine to	PO1, PO3, PO4, PO6,
	develop various applications.	PO7, PO8, PO9, PO10,
		PO11, PO12, PSO1,
		PSO2
4.	CO4: Compare and understand the working of various	PO1, PO3, PO4, PO5,
	state of the art AR devices.	PO6, PO7, PO8, PO9,
		PSO1, PSO2,PSO3
5.	CO5: Assess different AR techniques for application	PO1, PO2, PO3, PO4,
	development.	PO5, PO6, PO10,
		PO11,PO12, PSO1,
		PSO2,PSO3
6.	CO6: Plan for future challenge and opportunity of	PO1,PO2, PO3, PO4,
	augmented reality.	PO5, PO6, PO7, PO8,
		PO9, PO10, PO11,PO12,
		PSO1, PSO2,PSO3



Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
1,44110			-	5				107	100	107	10			-	-	
Augme	CO1	3	3			2			2					3	3	3
nted	CO2	3	3	2	2				2					3	3	3
Reality	CO3	3		3	3		2	2	2		2	2	2	3	3	3
Applic	C04	2	1	2	2	1	1	1	2	2				2	2	2
ation	04	2		4	4	1	1	1	4	4		2	2	2	4	2
Develo	CO5	2	2	2	2	1	1				2	-	-	2	2	2
pment	CO6	3	3	2	2	2	2	1	1	1	1	1	2	2	2	2
												Р	012	PSO1		PSO3

#### PO and PSO mapping with level of strength

												PO12	PSO1		PSO3
Course Name															
Course Maine	РО				РО					РО				PSO	
	1	PO2	PO 3	PO 4	5	PO 6	PO 7	PO 8	PO 9	10	PO11			2	
Augmented												1.9	2.50		2.50
Reality															
Application	26	27	22	22	1	15	13	18	15	16					
Developmen	2.0	2.7	2.2	2.2	1.	1.5	1.5	1.0	1.5	1.0					
t	7	5	0	0	50	0	3	0	0	7	1.8			2.50	

2. Addressed to *Moderate* (*Medium=2*) *extent* 

- 1. Addressed to *Slight* (*Low=1*) *extent*
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Pro	gram:	B.Tech CSE (Specialization in Augmented and Virtu	al Reality)									
Bra	nch:	CSE										
1	Course Code											
2	Course Title	Virtual Reality Application Development										
3	Credits	2										
4	Contact	2-0-0										
	Hours											
	(L-T-P)											
	Course											
	Status											
5	Course	The objective of this course is to introduce the princip	les of Virtual									
	Objective	Reality and learn the concepts of Development of A	Application in									
		Virtual Reality.										
6	Course	After studying this course student will be able to:										
	Outcomes	CO1: Describe the basic concepts of virtual reality and learn about the										
		technology and psychology of VR and differentiate between VR and										
		AR systems.										
		CO2: <i>Explain</i> the concepts of content creation, interaction, and										
		iterative design.										
		CO3: Apply the concept of 3D scenes with Unity and experiment with										
		various user interface (UI) techniques that are used in VF	R applications.									
		CO4: Analyze the different event and its correspondi	ng actions of									
		virtual reality objects.										
		CO5: Assess the effect of VR systems on the health of in	ndividuals.									
		CO6: <i>Plan</i> the opportunities of virtual reality application	n creation.									
7	Course	This course will help students learn the basic princip	bles of virtual									
	Description	reality applications and get them to know how game	es differ from									
		desktop apps. It will help students build various	types of VR									
0		experiences and use Unity to develop VR applications.	60									
8	Outline syllabi	18										
	TI	Introduction to vintual poolity	Mapping									
		Introduction to virtual reality	CO1									
	А	what is virtual reality? Types of head-mounted	COI									
		displays, the difference between virtual oreanty and										
		augmented reality,	CO1									
	D	Applications versus games, how virtual reality really	COI									
	В	works, Types of VR experiences, technical skills that										
		are important to VK										

#### Virtual Reality Application Development



Unit 2	Virtual Realit								
	High-Level C	oncepts of Con	tent Creation, Environmental	CO2					
А	Design, Affec	ting Behavior,	Transitioning to VR Content						
	Creation, Cont	tent Creation: D	Design Guidelines						
	Human-Center	red Interaction	, VR Interaction Concepts,	CO2					
В	Input Device								
	Interaction: De	Interaction: Design Guidelines							
Unit 3	Iterative Desi	gn and Game	Development						
	Philosophy of	Philosophy of Iterative Design, The Define Stage, The Make							
А	Stage, The Lea	Stage, The Learn Stage, Iterative Design: Design Guidelines							
	Overview, Bu	ilding Your Pi	roject and Character, Getting	CO3					
В	Animated, Th	e Town View	, Working with Unity's UI						
	System, NPC	Cs and Intera	actions, The World Map,						
	Encountering	Encountering Enemies and Running Away.							
Unit 4	Game Develo	Game Development in Unity - Part II							
	Getting Ready	to Fight, The	Battle Begins, Shopping for	CO4					
А	Items, Sound	Items, Sound and Music, Putting a Bow on It, Deployment							
	and Beyond								
	Keyboard Inp	Keyboard Input as Action, Controller Button Inputs as							
В	Actions, Creat								
Unit 5	Adverse Heal								
	Motion Sickn	ess, Eye Strair	n, Seizures, and Aftereffects,	CO5,CO6					
А	Hardware Cha	llenges, Latenc	y, Measuring Sickness,						
	Summary of I	Factors That C	ontribute to Adverse Effects,	CO5,CO6					
В	Examples of	Reducing Adv	erse Effects, Adverse Health						
	Effects: Desig	n Guidelines							
Mode of	Theory/Jury/P	ractical/Viva							
examination									
Weightage	CA	MTE	ETE						
Distribution	25%	25%	50%						
Text book/s*	<ul> <li>Jason J</li> </ul>	erald- The VR B	ook: Human- Centered Design for						
	Virtual	Reality, Associ	ation for Computing Machinery						
	and Mo BOLIV								
	<ul> <li>Jonsth</li> </ul>								
	Explor	e the world of vir	tual reality by building immersive						
	and fu	n VR projects u	using Unity 3D Paperback <sup>II</sup> , 1st						
	Editior	n, Packt Publ 38556	ications, 2015, ISBN 978-						
Other	• Tony	Parsi, Learning	g Virtual Reality Developing						
References	Immer	sive Experiences	and Applications for Desktop,						
1.010101005	Web a								
	Kakesh     Immer	i вaruan, virtua sive VR Experi	I Keality with VKIK4 _ Create ences Leveraging Unity3D and						
	Virtual	Reality Toolkit,	2020, Apress						



S.	Course Outcome	Program Outcomes
No.		(PO) & Program
		Specific Outcomes
		(PSO)
1.	CO1: Describe the basic concepts of virtual reality and learn	PO1,PO3,PO5,PO1
	about the technology and psychology of VR and	2, PSO1,PSO3
	differentiate between VR and AR systems.	
2.	CO2: Explain the concepts of content creation, interaction,	PO1,PO5,PO12,
	and iterative design.	PSO1,PSO2,PSO3
3.	CO3: Apply the concept of 3D scenes with Unity and	PO1, PO3, PO5,
	experiment with various user interface (UI) techniques that	PO12,
	are used in VR applications.	PSO1,PSO2,PSO3
4.	CO4: Analyze the different event and its corresponding	PO1, PO5, PO12,
	actions of virtual reality objects.	PSO1, PSO2,PSO3
5.	CO5: Assess the effect of VR systems on the health of	PO1, PO5, PO12,
	individuals.	PSO1, PSO2
6.	CO6: Plan the opportunities of virtual reality application	PO1, PO2, PO3,
	creation.	PO5, PO9, PO12,
		PSO1, PSO2, PSO3



Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	РО 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
	CO1	3	-	3	-	2	-	-	-	-	-	-	2	2	-	2
Virtual	CO2	2	-	-	-	2	-	-	-	-	-	-	2	2	3	3
Reality Application	CO3	2	-	3	-	2	-	-	-	-	-	-	2	2	3	3
Developme	CO4	2	-	-	-	3	1	-	-	-	-	-	2	3	2	3
nt	CO5	2	-	-	-	2	-	-	-	-	-	-	2	3	2	-
	CO6	2	2	3	-	3	-	-	-	2	-	-	2	3	2	2

#### PO and PSO mapping with level of strength

Course Name	РО 1	PO2	РО 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	P011	PO12	PSO1	PSO 2	PSO3
Virtual Reality Application Development	2.1	2	3	-	2.3	-	-	-	2	-	-	2	2.5	2.4	2.6

- 1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology							
Dep	artment	Computer Science & Engineering							
Pro	gram:	B.Tech CSE (Specialization in Augmented and Virtu	al Reality)						
Bra	nch:	CSE	• •						
1	Course Code								
2	Course Title	Virtual Reality Application Development Lab							
3	Credits	2							
4	Contact	0-0-4							
	Hours								
	(L-T-P)								
	Course								
	Status								
5	Course	The objective of this course is to learn and develop the	e different VR						
	Objective	applications based on different concepts of Virtual Reality.							
6	Course								
	Outcomes CO1: <i>Describe</i> the basic concepts of virtual reality and learn abo								
	technology and psychology of VR and differentiate between V								
		AR systems.							
		CO2: Explain the concepts of content creation, int	eraction, and						
		iterative design.							
		CO3: Apply the concept of 3D scenes with Unity and ex	periment with						
		various user interface (UI) techniques that are used in VF	R applications.						
		CO4: Analyze the different event and its correspondi	ng actions of						
		virtual reality objects.							
		CO5: Assess the effect of VR systems on the health of in	ndividuals.						
		CO6: Plan the opportunities of virtual reality application	n creation.						
7	Course	This course will help students learn the basic princip	oles of virtual						
	Description	reality applications and get them to know how game	es differ from						
		desktop apps. It will help students build various	types of VR						
		experiences and use Unity to develop VR applications.							
8	Outline syllabi	15	CO						
			Mapping						
	Unit 1								
		Develop a VR Ball Game. The scene should contain a	CO1						
		play area surrounded by four walls and a ball that acts							
		as a player. The objective of the game is to keep the ball rolling without colliding with the walls. If it							
		collides with either of the walls, the wall color should							
		change, and a text should display on the screen							
		indicating the collision.							
	Unit 2								

#### Virtual Reality Application Development Lab



	Develop a V	CO2							
	play area (go	olf course), w	hich consists of a series of						
	cups/holes ea	cups/holes each having different scores. Display the							
	score card.	score card.							
Unit 3									
	Develop a V	R game in U	nity such that on each gun	CO3					
	trigger click,	destroy the cu	ibes placed on the plane and						
	gain a score	point. Make a	score UI and display it on						
	the screen								
Unit 4									
	Develop a VR	Basketball Gar	ne. The scene should contain a	CO4					
	basketball cou	basketball court. The developed game should be a single							
	player game.	The objective of	of the game is to let the player						
	put the ball in t	the basket maxi	mum number of times. Display						
<b>T</b> T <b>1</b> / <b>F</b>	the score card.								
Unit 5			1.1 · · · · · · · · · · · · · · · · · ·						
	Develop an VI	Develop an VR bowling game with one image target. The							
	Write a c# pr	Write a c# program to develop score point system for							
	bowling game	. Build an apk. (	Note: Vuforia plugin should						
	be installed in	unity.)	~	~~~ .					
	Develop a VR	environment fo	or flying helicopter/moving car	CO5 and					
	simulation.			CO6					
Mode of	Theory/Jury/P	ractical/Viva							
examination									
Weightage	CA	CE(VIVA)	ETE						
Distribution	25%	25%	50%						
Text book/s*	Jonathan Lir								
	Explore the								
	immersive a								
	Paperback <sup>II</sup> ,	1st Edition,	Packt Publications, 2015,						
	ISBN 978-17	83988556							
Other	Rakesh Baru	Rakesh Baruah, Virtual Reality with VRTK4 _ Create							
References	Immersive V	mmersive VR Experiences Leveraging Unity3D and							
	Virtual Reali	ty Toolkit, 202	20, Apress						



S	Course Outcome	Program Outcomes
D.	Course Outcome	
NO.		(PO) & Program
		Specific Outcomes
		(PSO)
1.	CO1: Describe the basic concepts of virtual reality and learn	PO1, PO3, PO5, PO12,
	about the technology and psychology of VR and	PSO1, PSO3
	differentiate between VR and AR systems.	
2.	CO2: Explain the concepts of content creation, interaction,	PO1, PO5, PO12,
	and iterative design.	PSO1, PSO2, PSO3
3.	CO3: Apply the concept of 3D scenes with Unity and	PO1, PO3, PO5, PO12,
	experiment with various user interface (UI) techniques that	PSO1, PSO2, PSO3
	are used in VR applications.	
4.	CO4: Analyze the different event and its corresponding	PO1, PO5, PO12,
	actions of virtual reality objects.	PSO1, PSO2, PSO3
5.	CO5: Assess the effect of VR systems on the health of	PO1, PO5, PO12,
	individuals.	PSO1, PSO2
6.	CO6: <i>Plan</i> the opportunities of virtual reality application	PO1, PO2, PO3, PO5,
	creation.	PO9, PO12, PSO1,
		PSO2, PSO3

#### PO and PSO mapping with level of strength

Course Code_ Course Name	CO's	РО 1	РО 2	PO 3	PO4	РО 5	PO 6	PO 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	CO1	3	-	3	-	2	-	-	-	-	-	-	2	2	-	2
	CO2	2	-	-	-	2	-	-	-	-	-	-	2	2	3	3
Virtual Reality	CO3	2	-	3	-	2	-	-	-	-	-	-	2	2	3	3
Application Development Lab	CO4	2	-	-	-	3	-	-	-	-	-	-	2	3	2	3
Ĩ	CO5	2	-	-	-	2	-	-	-	-	-	-	2	3	2	-
	CO6	2	2	3	-	3	-	-	-	2	-	-	2	3	2	2

Course Name	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO 2	PSO3
Virtual Reality Applicatio n Developm ent	2.1	2	3	-	2.3	-	-	-	2	-	-	2	2.5	2.4	2.6

#### Strength of Correlation

1. Addressed to *Slight (Low=1) extent* 2. Addressed to *Moderate (Medium=2) extent* 

3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology							
Dep	artment	Computer Science & Engineering							
Pro	gram:	B.tech CSE (Specialization in Augmented and Virtua	l Reality)						
Bra	nch:	CSE							
1	Course Code								
2	Course Title	Game Development using Unreal Engine							
2	Credits	1							
<u>з</u>	Contact								
4	Lours	0-1-0							
	HOUIS								
	(L-1-P)								
	Course								
_	Status								
5	Course	Io learn different concepts of Unreal Engine.							
	Objective								
6	Course	after studying this course student will be able to:							
	Outcomes	<b>CO1:</b> <i>Describe</i> the basics of game development in Unre	al Engine						
		CO2: Explain the knowledge of models, terrains, environment effect							
		etc.							
		<b>CO3:</b> <i>Apply</i> the concept of code development in Unreal	Engine						
		<b>CO4:</b> <i>Compare</i> User interface principles in game develo	opment.						
		CO5: Assess different techniques and tools of Unreal eng	gine for Game						
		Development							
		CO6: Plan the opportunities of game development	using Unreal						
		Engine							
7	Course	This course basically deals with the theoretical concepts	of unreal						
	Description	engine for game development.							
8	Outline syllabu	15	СО						
			Mapping						
	Unit 1	Introduction to Unreal:	11 0						
	Α	Introduction to Ureal: Installing, Getting to Know the	CO1						
		Unreal, Project Type Selection and Start-Up, Exploring the							
		Unreal Launcher, Choosing a Project Type and Location.							
	В	An Overview of the Unreal Engine 4's User Interface, A	CO2						
		Look at the Tab System, An Overview of the Level Design							
		Process, The Conceptual Design of Levels.							
	Unit 2	Blocking:							
	А	Blocking: Blocking Your First Level, Introduction,	CO2						
		Exploring the Modes Panel Focusing on BSPs, Using BSPs							
		to Build the Foundation, Continuing to Block Out Your							
		Level, Play-Testing the Level, Using Geometry Editing							
		Mode, Finishing the Blocking.							

Game Development using Unreal Engine



В	Importing Ass	CO2								
	Blueprint, Exp	oloring the Swap	oping Process, Creating Your							
	Initial Materia	Initial Materials, Adding Your First Point Light,								
Unit 3	Exploring Blu	eprints:								
А	Exploring Blu	eprints: Introdu	uction, Creating the Hallway	CO3						
	Blueprints, Ad	lding Hallway l	Blueprints to the Level, Using							
	Layers to Grou	up Objects								
В	Correcting Co	llisions, Materia	als: Introduction, Textures	CO3						
	versus Materia	als, Material Ty	pes, Input Types, Adding							
	Textures.									
Unit 4	Lighting Con	cepts:								
А	Lighting Con	ncepts: Introd	uction, Common Lighting	CO4, CO5						
	Techniques.									
В	Blueprint An	imation: Introd	luction, Creating Automatic	CO4, CO5						
	Doors, Matine	e, Populating Y	our Level: Introduction, Time-							
	Based Materia	als, Adding A	ctors, Adding Physics to an							
	Actor.									
Unit 5	Particle Syste	ems:								
А	Particle Syste	ems: Introduct	ion, Overview of Cascade,	CO5, CO6						
	Emitters, Cur	ve Editor, Adv	anced Blueprint Techniques:							
	Introduction, U	<b>Using Blueprint</b>	S.							
В	Working with	Landscapes: In	troduction, Creating and	CO5, CO6						
	Working with	Landscapes								
Mode of	Theory/Jury/P	ractical/Viva								
examination										
Weightage	СА									
Distribution	25%	25%	50%							
Text book/s*	1. "Unreal E									
	Aram Coo									
	2. "Mastering	g Unreal Engin	ne 4.X" by Simon Manning,							
	Matt Edn	nonds, and Za	ak Parrish, Publisher: Packt							
	3 "Learning	; C++ by Crea	ating Games with UF4" by							
	William S	William Sherif, Publisher: Packt Publishing								
Other	"An Introduct									
References	Publisher: CR	S Press, Taylor	& Francis Group							
	B Unit 3 A B Unit 4 A B B Unit 5 A B Unit 5 A B B Mode of examination Weightage Distribution Text book/s*	BImporting Ass Blueprint, Exp Initial MateriaUnit 3Exploring Blueprint Blueprints, Add Layers to Grout BBCorrecting Conversus Materia Textures.Unit 4Lighting Conversus Materia Textures.BBlueprint An Doors, Matine Based Materia Actor.Unit 5Particle System Emitters, Curr Introduction, UBWorking with Working with Working with Mode of ExaminationMode of ExaminationCA Ca SistributionBWorking with Mode of Ca DistributionText book/s*1. "Unreal E Aram Coo SistributionOther References"An Introduct Publishing Siner: CR	B       Importing Assets into Unreal, Blueprint, Exploring the Swap Initial Materials, Adding You         Unit 3       Exploring Blueprints: Introde Blueprints, Adding Hallway I Layers to Group Objects         B       Correcting Collisions, Material versus Materials, Material Type Textures.         Unit 4       Lighting Concepts: Naterials, Material Type Textures.         A       Lighting Concepts: Introde Techniques.         B       Blueprint Animation: Introde Doors, Matinee, Populating Y Based Materials, Adding Addered Actor.         Unit 5       Particle Systems: Naterials, Adding Addered Actor.         Imite 5       Particle Systems: Introduct Emitters, Curve Editor, Adven Introduction, Using Blueprint         B       Working with Landscapes: In Working with Landscapes         Mode of examination       CA       MTE         Distribution       25%       25%         Text book/s*       1. "Unreal Engine 4 Game I Aram Cookson, Publisher       2. "Mastering Unreal Engine Matt Edmonds, and Za Publishing         0. "Learning C++ by Creation William Sherif, Publisher       3. "Learning C++ by Creation William Sherif, Publisher	B       Importing Assets into Unreal, Creating Your First         Blueprint, Exploring the Swapping Process, Creating Your       Initial Materials, Adding Your First Point Light,         Unit 3       Exploring Blueprints:         A       Exploring Blueprints: Introduction, Creating the Hallway Blueprints, Adding Hallway Blueprints to the Level, Using Layers to Group Objects         B       Correcting Collisions, Materials: Introduction, Textures versus Materials, Material Types, Input Types, Adding Textures.         Unit 4       Lighting Concepts:         A       Lighting Concepts: Introduction, Common Lighting Techniques.         B       Blueprint Animation: Introduction, Creating Automatic Doors, Matinee, Populating Your Level: Introduction, Time- Based Materials, Adding Actors, Adding Physics to an Actor.         Unit 5       Particle Systems:         A       Particle Systems: Introduction, Overview of Cascade, Emitters, Curve Editor, Advanced Blueprint Techniques: Introduction, Using Blueprints.         B       Working with Landscapes: Introduction, Creating and Working with Landscapes         Mode of examination       CA       MTE       ETE         Distribution       25%       25%       50%         Text book/s*       1. "Unreal Engine 4 Game Development in 24 Hours" by Aram Cookson, Publisher: Sams Publishing       Yeublisher: Packt Publishing       Succenters         Cher       "An Introduction to Unreal Engine 4." by Andrew Sanders						

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	<b>CO1:</b> <i>Describe</i> the basics of game development in Unreal Engine.	PO1, PO5, PO8, PO12



-		
2.	<b>CO2</b> : <i>Explain</i> the knowledge of models, terrains, environment effects, etc.	PO1, PO2, PO3, PO4, PO5,
		PO6, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3
3.	<b>CO3</b> : Apply the concept of code development in Unreal Engine	PO1, PO2, PO3, PO4, PO5,
		PO6, PO8, PO9, PO10, PO12,
		PSO1, PSO2
4.	CO4: Compare User interface principles in game development.	PO1, PO2, PO3, PO4, PO5,
		PO9, PO10, PO12, PSO1,
		PSO2, PSO3
5.	<b>CO5:</b> Assess different techniques and tools of Unreal engine for Game	PO1, PO2, PO3, PO4, PO5,
	Development	PO6, PO8, PO9, PO10, PO12,
		PSO1, PSO2, PSO3
6.	CO6: Plan the opportunities of game development using Unreal Engine	PO1, PO2, PO3, PO4, PO5,
		PO6, PO8, PO9, PO10, PO11,
		PO12, PSO1, PSO2, PSO3

#### PO and PSO mapping with level of strength

CO's	PO 1	PO 2	PO 3	PO4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	-	-	2	-	-	-	3	-	2	-
CO2	3	2	2	2	3	2	-	-	2	2	2	3	2	2	3
CO3	3	2	2	2	3	2	-	2	2	2	-	3	-	2	-
CO4	3	3	3	3	3	-	-	-	2	2	-	3	-	2	3
CO5	3	3	3	3	3	3	-	2	2	2	2	3	-	3	3
CO6	3	3	3	3	3	3	3	2	3	3	-	3	3	3	3

Co urs e Co de	Course Name	PO 1	PO 2	P O 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
	Game Develo pment using Unreal Engine	3.0	2.6	2. 6	2.6	2.8	2.5	3.0	2.0	2.2	2.2	2	3	2.5	2.3	3

- 1. Addressed to *Slight (Low=1) extent* 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



Scho	ool:	School of Engineering & Technology	
Dep	artment	Computer Science & Engineering	
Prog	pram:	B.tech CSE (Specialization in Augmented and Virtua	l Reality)
Brai	nch:	CSE	( include ( )
1	Course Code		
2	Course Title	Game Development using Unreal Engine Lab	
3	Credits	2	
4	Contact Hours (L-T-P)	0-0-4	
	Course Status	Compulsory/Elective	
5	Course	The objective of this course is to inculcate among stud	lents' different
	Objective	concepts of Unreal Engine and development of game in	unreal engine
6	Course	after studying this course student will be able to:	
	Outcomes	<b>CO1:</b> <i>Describe</i> the basics of game development in Unre	al Engine
		CO2: Explain the knowledge of models, terrains, enviro	onment effects,
		etc.	
		<b>CO3:</b> <i>Apply</i> the concept of code development in Unreal	Engine
		CO4: Compare User interface principles in game develo	opment.
		CO5: Assess different techniques and tools of Unreal en	gine for Game
		Development	
		CO6: Plan the opportunities of game development	using Unreal
		Engine.	
7	Course	The course basically deals with the concepts of unreal er	igine for the
	Description	game development	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction to Unreal Engine, Getting Started	
		with Unreal Engine	
		1.1 Overview of Unreal Engine	CO1, CO2,
		1.2 Installing Unreal Engine	CO3
		1.3 Introduction to Blueprint Visual Scripting	
		1.4 Creating a New Project	
		1.5 Unreal Engine Editor Interface	
		1.6 Asset Management and Content Browser	
		1.7 Working with Levels and Actors	
	Unit 2	Building Game Environments, Creating Player	
		Characters and NPCs	
		2.1 Creating Landscapes and Terrain	CO1, CO2,
		2.2 Adding Static Meshes and Props	CO4
		2.3 Working with Materials and Textures	
		2.4 Lighting and Post-Processing Effects	
		2.5 Introduction to Characters and Pawns	
		2.6 Implementing Player Input	
		2.7 Creating Non-Player Characters (NPCs)	
		2.8 AI Behavior and Navigation	

Game Development using Unreal Engine Lab



Unit 3	Implementi and HUD	ng Gameplay	Mechanic	es, User Interface		
	3.1 Physics	and Collision I	Detection		CO1,	CO2,
	3.2 Impleme	enting Characte	r Moveme	ent	CO5	,
	3.3 Interacta	ble Objects and	d Triggers			
	3.4 Game M	odes and Gam	e Rules			
	3 5 Creating					
	3.6 Health B	ars and Status	 Indicators			
	3.7 Inventor	v and Item Ma	nagement			
	3.8 Monu Si	y and Rein Ma	r Input			
 Unit 4	Sound D	stems and Use	Musio	Dolishing and		
Unit 4	Sound De	esigni anu	wiusic,	ronsning anu		
	Optimizatio	on				~~~
	4.1 Adding	Sound Effects			CO1,	CO2,
	4.2 Impleme	enting Backgro	und Music	;	CO6	
	4.3 Spatial A	Audio and Atter	nuation			
	4.4 Dynamic	c Audio and Tr	iggered Ev	vents		
	4.5 Performa	ance Optimizat	ion Techn	iques		
	4.6 Debuggi	ng and Testing				
	4.7 Playtesti	ng and Feedba	ck Iteratio	n		
	4.8 Finalizin	g and Packagi	ng the Gar	ne		
Unit 5	Additional	Resources and	Next Ste	DS		
	5.1 Unreal F	Engine Docume	entation an	d Tutorials	CO1.	CO2.
	5.2 Commu	nity Resources	and Forun	18	CO6	,
	5 3 Further I	earning and G	ame Deve	lopment Tips		
 Mode of	Jury/Practice	al/Viva				
examination	Jul y/1 factice					
Weightage	CA	CE(viva)	ESE			
Distribution	25%	25%	50%			
Text book/s*	• "Unr	eal Engine 4	Game De	evelopment in 24		
	Hour	s" by Aram	Cookson.	Publisher: Sams		
	Publ	ishing	,			
	• "Mas	stering Unreal	Engine	4 X" by Simon		
	Man	ning Matt E	dmonds	and <b>Zak Parrish</b>		
	Dubl					
	by w					
 Other		Intro des stis	to IImm	1 Engine 4" 1		
Defener	• An	introduction	io Unrea	a Engine 4" by		
Keterences	And	rew Sanders, P	ublisher: (	CRS Press, Taylor		
	& F1	rancis Group				



S.	Course Outcome	Program Outcomes (PO) &
No.		Program Specific Outcomes (PSO)
1.	<i>Describe</i> the basics of game development in Unreal	PO1,PO2,PO3,PO10
	Engine	
2.	<i>Explain</i> the knowledge of models, terrains, environment effects, etc.	PO1, PO5, PO8, PO12
3.	Apply the concept of code development in Unreal	PO1, PO2, PO3, PO4, PO5, PO6,
	Engine	PO9, PO10, PO11, PO12, PSO1,
		PSO2, PSO3
4.	Compare User interface principles in game	PO1, PO2, PO3, PO4, PO5, PO6,
	development.	PO8, PO9, PO10, PO12, PSO1,
		PSO2
5.	Assess different techniques and tools of Unreal engine	PO1, PO2, PO3, PO4, PO5, PO9,
	for Game Development	PO10, PO12, PSO1, PSO2, PSO3
6.	Plan the opportunities of game development using	PO1, PO2, PO3, PO4, PO5, PO6,
	Unreal Engine.	PO8, PO9, PO10, PO12, PSO1,
		PSO2, PSO3

# PO and PSO mapping with level of strength

CO's		PO	РО		PO	PO	PO	PO	PO		PO11	PO12			PSO3
cos	PO 1	2	3	PO4	5	6	7	8	9	PO 10			PSO1	PSO2	
CO1	3	-	-	-	2	-	-	2	-	-	-	3	-	2	-
CO2	3	2	2	2	3	2	-	-	2	2	2	3	2	2	3
CO3	3	2	2	2	3	2	-	2	2	2	-	3	-	2	-
CO4	3	3	3	3	3	-	-	-	2	2	-	3	-	2	3
CO5	3	3	3	3	3	3	-	2	2	2	2	3	-	3	3
CO6	3	3	3	3	3	3	3	2	3	3	-	3	3	3	3

Co urs e Co de	Course Name	PO 1	PO 2	P O 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
	Game Develo pment using Unreal Engine	3.0	2.6	2. 6	2.6	2.8	2.5	3.0	2.0	2.2	2.2	2	3	2.5	2.3	3

## Strength of Correlation

1. Addressed to *Slight (Low=1) extent* 

2. Addressed to *Moderate* (*Medium=2*) *extent* 

3. Addressed to Substantial (High=3) extent



School: School of Engineering & Technology										
Dep	artment	Computer Science & Engineering								
Pro	gram:	B. Tech								
Bra	nch:	CSE								
1	Course	CSA10								
	Code	2								
2	Course	Introduction to Artificial Intelligence & Machine Learning								
	Title									
3	Credits	2								
4	Contact	2 0	0							
	Hours									
	(L-T-P)									
	Course	Core								
Status										
5	Course	The objective of the course is to	introduce basic fundame	ental concepts						
	Objective	in Artificial Intelligence (AI) an	d Machine Learning (MI	L) as well as to						
		give a strong foundation od AI Techniques.								
6	Course	CO-1. Define the requirement of Artificial Intelligence								
	Outcomes	CO-2. Classify the functionality of agents along with acting								
		environment of Intelligence in Artificial Intelligence.								
		CO-3. Apply the concepts of Propositional Logic for real-world AI								
		$CO_{-4}$ Analyse the various MI	techniques and apply th	em to solve						
		the real world societal p	roblems.							
		CO-5. Explain the Use Cases	s of AIML in real wo	rld societal						
		problems.								
		CO-6. Discuss the applicabil	ity of Artificial Intelli	gence and						
		Machine learning Ap	proaches to develop	sustainable						
7	0	solutions using profession	onal ethics.	1						
/	Course	Artificial Intelligence (AI) and	Machine Learning (ML)							
	Description	necessary to translate today's da	ta into direct business val	ue. This course						
		introduces learners to the basic	concepts of AI and ML,	and covers now						
		learning algorithms work. It ill	ustrates how AI and ML	fit in the data						
		science ecosystem, and present	s several real-world use	cases that show						
how companies are implementing.										
8	Outline syll		CO							
		Mapping								
	Unit I	Introduction of Artificial Inte								
	A	Introduction to Artificial Intelligen	ce, Foundation of Artificial	COI						
		Intelligence: Acting humanly: If	ie Turing Test approach,							
1	1	Ininking humanly: The cognit	ve modeling approach,	1						

# Introduction to Artificial Intelligence & Machine Learning



	Thinking rationally: The laws of thought approach, Acting	
	rationally: The rational agent approach	
В	History of Artificial Intelligence, Applications of AI in Pattern	CO1, CO6
	Recognition, Autonomous planning and scheduling, Game	
	playing, Spam filtering, Logistics planning, and Machine	
	Translation.	
С	Case Study on AI Solutions Vs. Conventional Solutions,	CO1, CO6
	Google Duplex, Do you think AI is good or evil?	
Unit 2	Introduction to Intelligent Agents	
А	Introduction to Intelligent Agents, How Agents Should	CO2
	Act, The ideal mapping from percept sequences to actions,	
	Properties of Agents: Intelligence, Autonomy, Ability to	
	Learn, Cooperation.	
В	Classification of Agents: Reactive Agents, Collaborative	CO2
	Agents, Interface Agents, Mobile Agents, Information	
	gathering Agents	
С	The nature of Environments: Specifying the task environment,	CO2
	Properties of task environments, Applications of Intelligent	
	agents: Robotic vehicles, driver less cars	
Unit 3	Introduction to Propositional Logic	
А	Introduction, What Is Logic? Why Logic is used in Artificial	CO3
	Intelligence, Logical Operators, Translating between English	
	and Logic Notation, Truth Tables.	
В	Complex Truth Tables, Tautology, Equivalence	CO3
С	Propositional Logic, Syntax, Semantics, Deduction, The	CO3
	Deduction Theorem	
Unit 4	Introduction to Machine Learning	
А	Introduction, Training, Rote Learning, Learning Concepts, A	CO4, CO6
	Simple Learning Algorithm, Supervised Learning,	
	Unsupervised Learning, Reinforcement Learning	
В	Introduction to Linear Regression, Application of Linear	CO4, CO6
	Regression in various application domains through case study.	
С	Introduction, Neurons, Artificial Neurons, Perceptron, Neural	CO4, CO6
	Networks Architecture, Feed forward Neural Networks,	
	Applications of Neural Networks	
Unit 5	Applications of AIML	
А	Case Study on applications of AI ML in Human	CO5, CO6
	Resource: Screening Tons Of Resumes, Attracting	
	Talent, Schedule Management	
	Case Study on applications of AI ML in Health Care:	
	Virtual assistance in healthcare, Diagnostics assistance	
	and medical imaging	



	В	Use Cases on	applications o	f AI ML in Banking, Use	CO5, CO6							
		Cases on app	lications of Al	ML in insurance,								
	С	Use Cases on	applications o	f AI ML in cyber security	CO5, CO6							
		Use Cases on	Jse Cases on applications of AI ML in weather									
		forecasting	orecasting									
	Mode of	Theory	Theory									
	examination											
	Weightage	СА	MTE	ETE								
	Distribution	25%	25%	50%								
	Text book/s*	Coppin Ben,	Artificial Intel	ligence Illuminated, Jones								
		and Bartlett P	ublishers									
	Other	1) Russell S	5 & Norvig I	P, Artificial Intelligence: A								
	References	Modern A	Approach, Pren	tice Hall								
		2) Rich E	& Knight K.	Artificial Intelligence, Tata								
		McGraw	Hill, Edition 3	C ,								
		3) Dan W.	Patterson, Arti	ficial Intelligence & Expert								
		Systems.	Pearson Educa	tion with Prentice Hall India.								
		Indian Ed	Indian Edition.									
		https://an	alyticsindiama	g.com/top-use-cases-ai-								
		human-re	sources/	-								
			_									
1	1	1										

S.		Course Outcome	Program Outcomes (PO) &
No.			Program Specific Outcomes
			(PSO)
1.	CO-1.	Define the requirement of Artificial Intelligence	PO1,PO2,PO3,PO4,
			PO5,PO6,PO7,PO8,
			PO9,PO10, PSO1,PSO2,PSO3
2.	CO-2.	Classify the functionality of agents along with acting	PO1,PO2,PO3,PO4,
		environment of Intelligence in Artificial Intelligence.	PO5,PO6,PO7,PO8,
			PO9,PO10, PSO1,PSO2,PSO3
3.	CO-3.	Apply the concepts of Propositional Logic for real-world AI	PO1,PO2,PO3,PO4,
		based problems.	PO5,PO6,PO7,PO8,
			PO9,PO10, PSO1,PSO2,PSO3
4.	CO-4.	Analyse the various ML techniques and apply them to solve	PO1,PO2,PO3,PO4,
		the real world societal problems.	PO5,PO6,PO7,PO8,
			PO9,PO10, PSO1,PSO2,PSO3
5.	CO-5.	Explain the Use Cases of AIML in real world societal	PO1,PO2,PO3,PO4,
		problems.	PO5,PO6,PO7,PO8,
			PO9,PO10, PSO1,PSO2,PSO3
6.	CO-6.	Discuss the applicability of Artificial Intelligence and	PO1,PO2,PO3,PO4,
		Machine learning Approaches to develop sustainable	PO5,PO6,PO7,PO8,
		solutions using professional ethics.	PO9,PO10, PSO1,PSO2,PSO3



**PO and PSO mapping with level of strength for Course Name** Introduction to Artificial Intelligence & Machine Learning (**Course Code** CSA-102)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O3
	CO1	3	3	3	1	2	1	1	1	2	3	1	3	2	3	1
Introduction to	CO2	3	3	3	1	2	3	3	1	2	3	1	3	2	3	2
Artificial Intelligence &	CO3	3	3	3	1	2	3	3	1	3	3	3	3	3	3	3
Machine Learning	CO4	3	3	3	1	2	3	3	1	3	3	3	3	3	3	3
(CSA-102)	CO5	3	3	3	1	2	3	3	1	3	3	3	3	3	3	3
	CO6	3	3	3	1	2	3	3	3	3	3	3	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Cours														PS	PS	PS
е	Course Name	РО	РО	РО	PO	РО	0	0	0							
Code		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CSA- 102	Introduction to Artificial Intelligence & Machine Learning	3.0 0	3.0 0	3.0 0	1.0 0	2.0 0	2.6 7	2.6 7	1.3 3	2.6 7	3.0 0	2.3 3	3.0 0	2.6 7	3.0 0	2.5 0

#### Total--37.83

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to *Moderate (Medium=2) extent*
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology		
Dep	artment	Computer Science & Engineering		
Pro	gram:	B.Tech		
Bra	nch:	CSE		
1	Course Code	CSI011		
2	Course Title	Android with IoT		
3	Credits	2		
4	Contact	2-0-0		
	Hours			
	(L-T-P)			
	Course Status	Elective		
5	Course	This course aim to give an overview of Android wi	ith IoT, its	s architecture,
	Objective	challenges and applications in different context.		
6	Course	CO1: Define the basics of Android platform		
	Outcomes	CO2: Outline the Components of Android		
		CO3: Identify IoT ecosystem and role of the Andr	roid Thing	gs
		CO4: Analyze Android Things with IoT cloud pla	atforms	
		CO5: Evaluate Android Things in IoT projects		
		CO6: Develop an Android App with IoT		
7	Course	The course is intended to know fundamentals	of Andro	oid Platform,
	Description	Android application components; integration of A	Android v	with IoT, The
		main focus is on implementing IoT projects using	<u>; Android</u>	Things.
8	Outline syllabi	18		CO
	<b>T</b> T •/ 4			Mapping
		Introduction to Android Platform		<u>CO1</u>
	A	Features of Android, Architecture of Android		
	B	Configuration of android SDK	7 12'1	<u>COI</u>
	C	Android application structure, Generation of APK	<b>Files</b>	COI
	I I	for Android Projects		
		Components of Android architecture		<u>CO1 CO2</u>
	A	A stivity A stivity life such		$\frac{CO1, CO2}{CO1, CO2}$
	B	Activity, Activity life cycle		$\frac{COI, CO2}{CO1, CO2}$
	U	Service, Service life cycle, Concept of Intent		<u>COI, CO2</u>
	Unit 3	Android and 101		<u> </u>
	A	Internet of Things overview & its components		<u>CO3</u>
	В	Android Things overview, Android Things board		03
	C	Compatibility		<u> </u>
	Unit 1	Installation of Android Things	forma	03
		Integrate Antirolu Inings with 101 Cloud Plat		CO3 CO4
		In cloud architecture & for cloud platform over	VICW	CO3, CO4
	D	Android with Android Things		$\frac{1000,004}{1000}$
	Unit 5	Android With Android Things		CO3, CO4
		Anarola Inngs Creating the first Android Things project		<u>CO5 CO6</u>
	A	Creating the first Android Things project		$\frac{100,000}{100}$
1	D	Streaming data to the IOT cloud platform		CU5, CU6



С	Developing Android Thin	an Android a	app to retrieves data from	CO5, CO6											
Mode of examination	Theory/Jury/I	Practical/Viva													
Weightage	CA	A CE (Viva) ESE													
Distribution	25%	5% 25% 50%													
Text book/s*	3. Android	3. Android Things Projects by Francesco Azzola													
	Publisher	r: Packt Publis	hing												
	4. Anubhav	Pradhan and A	Anil V. Deshpande,												
	Composi	ng Mobile Ap	os: Learn, Explore, Apply												
	Using Ar	Using Android , 1st Edition, Wiley India.													
Other															
References															

S.	Course Outcome	Program Outcomes (PO) & Program
No.		Specific Outcomes (PSO)
1.	CO1: Define the basics of Android platform	PO1, PO5, PO10, PO11, PO12
2.	CO2: Outline the Components of Android	PO1, PO5, PO11, PO12
3.	CO3: Identify IoT ecosystem and role of the	PO1, PO2, PO4, PO5, PO6, PO7,
	Android Things	PO9, PO10, PO11, PO12, PSO3
4.	CO4: Analyze Android Things with IoT cloud	PO1, PO2, PO4, PO5, PO9, PO10,
	platforms	PO11, PO12, PSO1, PSO2, PSO3
5.	CO5: Evaluate Android Things in IoT projects	PO1, PO2, PO3, PO4, PO5, PO6,
		PO7, PO8, PO9, PO10, PO11, PO12,
		PSO1, PSO2, PSO3
6.	CO6: Develop an Android App with IoT	PO1, PO2, PO3,PO4, PO5, PO6,
		PO7, PO8, PO9, PO10, PO11, PO12,
		PSO1, PSO2, PSO3

# PO and PSO mapping with level of strength for Course Name Android with IoT CSI011)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	P O4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
	CO1	2	-	-	-	2	-	-	-	-	1	2	2	-	-	-
001011	CO2	2	-	-	-	2	-	-	-	-	-	2	2	-	-	1
_Andro	CO3	2	2	-	2	2	2	3	-	2	2	2	3	-	-	-
id with IoT	CO4	2	2	-	2	2	-	-	-	2	2	2	3	1	1	3
	CO5	2	2	2	3	2	3	2	2	3	3	2	3	3	3	3
	CO6	2	3	3	3	2	3	2	2	3	3	2	3	3	3	3



#### Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	РО 2	PO 3	PO 4	P O 5	PO 6	Р О 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSI011	Android with IoT	2.0	2.3	2.5	2.5	2. 0	2.7	2.3	2.0	2.5	2.2	2.0	2.7	2.3	2.3	2.5

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology											
Dep	artment	Computer Science & Engineering											
Pro	gram:	B.Tech											
Bra	nch:	CSE											
1	Course Code	CSI032											
2	Course Title	Data Analytics for IoT											
3	Credits	3											
4	Contact	3-0-0											
	Hours												
	(L-T-P)												
	Course Status	Elective											
5	Course	The objective of this course is to learn techniques to solve	unique										
	Objective	problems associated with IoT and examine and analyze da	ta from your										
		IoT devices											
6	Course	CO1: Identify the main challenges of IoT analytics system	18										
	Outcomes	development and deployment.											
		CO2: Utilize IoT, Cloud and BigData Integration for IoT	Analytics										
		CO3: Evaluate the development tools for real-life applicat	ions using										
		analytics											
		4: Explain the paradigm for on-demand IoT analytics as a service											
		ed on the open source framework.											
		CO5: Analyze the data in smart buildings, including data	5: Analyze the data in smart buildings, including data stemming										
		from sensors and IoT devices.	~ ~~										
		CO6: Assess the popular tools for 101 data analytics, alon	g with their										
7	Course	Use in practical projects and applications.	and avaaaa										
/	Course	of LoT applications and investments. There are different to	and success										
	Description	of 101 applications and investments. There are different ty	nts to gain										
		advantages	nts to gain										
8	Outline syllabi		CO										
0		40	Manning										
	Unit 1	Introducing IoT Analytics	inapping										
	A	Defining IoT analytics and IoT. The concept of											
		constrained											
	В	IoT Data and BigData. Challenges of IoT Analytics											
		Applications											
	С	IoT Analytics Lifecycle and Techniques											
	Unit 2	IoT, Cloud and BigData Integration for IoT											
		Analytics											
	А	Cloud-based IoT Platform, Data Analytics for the IoT.											
		Data Collection Using Low-power, Long-range Radios											
	В	WAZIUP Software Platform											
	С	iKaaS Software Platform											
	Unit 3	Development Tools for IoT Analytics Applications											
	А	Introduction, The VITAL Architecture for IoT Analytics											
		Applications											



В	VITAL Deve												
	Nodes	Nodes IoT Analytics Applications											
С	IoT Analytics	Applications											
Unit 4	An Open Sou	arce Framewo	ork for IoT Analytics as a										
	Service		-										
А	Architecture	for IoT Analyt	ics-as-a-Service, Sensing-as-										
	a-Service Infr	astructure Ana	atomy										
В	Scheduling, N	Aetering and S	ervice Delivery										
С	From Sensing	rom Sensing-as-a-Service to IoT-Analytics- as-a-											
	Service	ervice											
Unit 5	Data Analyti	Data Analytics in Smart Buildings											
А	Addressing E	Addressing Energy Efficiency in Smart Buildings											
В	General Arch	General Architecture for Management Systems of Smart											
	Buildings												
С	IoT-based Inf	formation Man	agement System for Energy										
	Efficiency in	Smart Building	gs										
Mode of	Theory/Jury/I	Practical/Viva											
examination													
Weightage	CA	MSE	ESE										
Distribution	25%	5% 25% 50%											
Text book/s*													
Other													
References													

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: Identify the main challenges of IoT analytics	PO1, PO2, PO4, PO12,
	systems development and deployment.	PSO2
2.	CO2: Utilize IoT, Cloud and BigData Integration for IoT	PO1, PO4, PO5, PO11,
	Analytics	PO12, PSO1, PSO2
3.	CO2. Evaluate the devial armost tools for real life	PO1, PO2, PO3, PO4,
	cos. Evaluate the development tools for real-file	PO5, PO10, PO11, PO12,
	applications using for anarytics	PSO1, PSO2
4.	CO4: Explain the paradigm for on-demand IoT analytics	PO1, PO4, PO10, PO11,
	as a service based on the open source framework.	PO12, PSO2
5.		PO1, PO2, PO3, PO4,
	CO5: Analyze the data in smart buildings, including data	PO5, PO6, PO7, PO9,
	stemming from sensors and IoT devices.	PO10, PO11, PO12,
		PSO1, PSO2
6.		PO1, PO2, PO3, PO4,
	CO6: Assess the popular tools for IoT data analytics,	PO5, PO6, PO7, PO8,
	along with their use in practical projects and applications.	PO9, PO10, PO11, PO12,
		PSO1, PSO2



PO and PSO mapping with level of strength for Course Name Data Analytics for IoT (Course Code CSI032)

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	P O4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
	CO1	2	3	-	2	-	-	-	-	-	-	-	2	-	1	-
	CO2	3	-	-	2	2	-	-	-	-	-	2	2	2	1	-
CSI032_ Data	CO3	3	2	3	2	2	-	-	-	-	2	2	2	2	1	-
Analytics for IoT	CO4	2	-	-	2	-	-	-	-	-	2	2	2	-	1	-
101 101	CO5	3	3	3	2	2	3	2	-	2	2	2	2	2	2	-
	CO6	3	3	3	2	3	3	2	2	2	2	2	2	3	2	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	РО 2	PO 3	РО 4	P O 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
CSI032	Data Analytics for IoT	2.7	2.8	3.0	2.0	2. 3	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3	1.3	0.0

- 1. Addressed to Slight (Low=1) extent
   2. Addressed to Moderate (Medium=2) extent

   2. Addressed to Slight (Low=1) extent
   3. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology										
Dep	artment	Computer Science & Engineering										
Prog	gram:	B.Tech										
Bra	nch:	CSE										
1	Course Code	CSI202										
2	Course Title	IoT: Architecture and Programming										
3	Credits	2										
4	Contact	2-0-0										
	Hours											
	(L-T-P)											
	Course Status	Core										
5	Course	This course provides a preliminary view on Logical a	nd Physical									
	Objective	Design of IoT systems and gives an overview of Data	analytics for IoT.									
6	Course	CO1: Recall the basic concepts of Internet of Things										
	Outcomes	CO2: Explain the concepts of logical design of IoT S	ystem using									
		Python.	_									
		CO3: Demonstrate the Raspberry Pi interfaces with P	ython									
		CO4: Interpret the IoT Physical Servers and Cloud O	tterings									
		CO5: Make use of data analytics for loT using Apach	e Hadoop									
		CO6: Utilize the IoT reference architecture required i	n building loT									
-	0	based solutions.										
/	Course	The course focuses on understanding the vision of	The course focuses on understanding the vision of IoT from a global									
	Description	perspective, understand its applications, and dete	ermine its market									
		perspective, using gateways, devices and data managed	gement, building a									
		state of art arcmeeture in for and its applications in co	Similar building									
8	Outline syllaby		CO Manning									
0	Unit 1	Introduction to IoT										
		Introduction Physical Design of IOT I ogical design										
	A	of IoT, IoT Levels & Development Templates	CO1									
	В	Difference between IoT and M2M, SDN and NFV										
		for IoT, Need for IoT systems management, Simple	CO1									
		Network Management Protocol (SNMP)										
	С	Network operator requirements, NETCONF,										
		YANG, IoT systems Management with NETCONF,	CO1									
		YANG										
	Unit 2	IoT Systems- Logical Design using Python										
	А	Language features of Python, Data types, data	CO1 CO2									
		structures, Control of flow	001,002									
	В	Functions, modules, packaging, file handling,	CO1, CO2									
		data/time operations, classes										
	C	Python packages for Internet of Things	CO1, CO2									
	Unit 3	101 Physical Devices and Endpoints										
	A	Basic building blocks of an IoT device, Exemplary	CO1, CO2, CO3									
	D	About the board Deenbarry Di interfaces	CO1 CO2 CO2									
	D	About the board, Kaspberry P1 Interfaces	C01, C02, C03									
		riogramming Raspoerry Pi with Python	1001, 002, 003									



Unit 4	IoT Physical									
А	Introduction t	o Cloud Stora on APIs	ge models and	CO1, CO2, CO4						
В	Webserver –	CO1, CO2, CO4								
С	Python web a services for Io	CO1, CO2, CO4								
Unit 5	Data analytic	cs for IoT								
А	Introduction, MapReduce f	Apache Hadoo or Batch Data	op, Using Hadoop Analysis	CO5, CO6						
В	Apache Oozie	e, Apache Spar	rk, Apache Storm	CO5, CO6						
С	Using Apache	e Storm for Re	al-time Data Analysis	CO5, CO6						
Mode of examination	Theory/Jury/I	Practical/Viva								
Weightage	CA	MSE	ESE							
Distribution	25%	25%	50%							
Text book/s*	Approach "Int 2015. 2. "Internet of Hillar,Publish 35 Livery Stre 1-78588-138-	Things with P ed by Packt Pu et Birminghan	ython" Gastón C. blishing Ltd. Livery Place B3 2PB, UK. ISBN 978-							
Other References	<ol> <li>Kamal, R., Architecture a Mcgraw Hill.</li> <li>Misra, S., I NPTEL Cour Science &amp; En Technology B https://nptel.a</li> <li>Samuel Gree MIT press, 20</li> <li>Adrian McI the Internet of</li> </ol>	<ol> <li>Kamal, R., (2017), Internet of Things - Architecture and Design Principles, 1st Edition, Mcgraw Hill.</li> <li>Misra, S., Introduction to Internet of Things, NPTEL Course Material, Department of Computer Science &amp; Engineering, Indian Institute of Technology Kharagpur, https://nptel.ac.in/courses/106105166/</li> <li>Samuel Greengard, "The Internet of Things", The MIT press, 2015.</li> <li>Adrian McEwen and Hakim Cassimally "Designing the Internet of Things "Wiley.2014.</li> </ol>								



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Recall the basic concepts of Internet of Things	PO1, PO9, PO12, PSO2
2.	CO2: Explain the concepts of logical design of IoT System using Python.	PO1, PO9, PO12, PSO1, PSO2
3.	CO3: Demonstrate the Raspberry Pi interfaces with Python	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PO12, PSO1, PSO2
4.	CO4: Interpret the IoT Physical Servers and Cloud Offerings	PO1, PO4, PO5, PO7, PO9, PO10, PO12, PSO2
5.	CO5: Make use of data analytics for IoT using Apache Hadoop	PO1, PO2, PO5, PO9, PO10, PO12, PSO2, PSO3
6.	CO6: Utilize the IoT reference architecture required in building IoT based solutions.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3

PO and PSO mapping with level of strength for Course Name IoT: Architecture and Programming (Course Code CSI202)

Course Code_ Course Name	CO's	РО 1	РО 2	РО 3	PO4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PSO2	PSO3
	CO1	2	-	1	-	-	-	-	-	1	-	-	2	-	2	-
	CO2	2	-	-	-	-	-	-	-	2	-	-	2	2	2	-
CS1202_101: Architecture	CO3	2	3	2	3	3	-	2	1	2	3	-	2	3	2	-
and Programming	CO4	2	-	-	2	2	-	2	-	2	2	-	2	-	2	-
	CO5	2	2	-	-	3	-	-	-	2	3	-	2	-	2	2
	CO6	3	3	3	3	3	2	3	3	3	3	2	2	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO2	РО 3	РО 4	РО 5	PO 6	РО 7	РО 8	PO 9	PO 10	РО 11	PO 12	PSO 1	PSO 2	PSO 3
CSI202	IoT: Architecture and Programming	2.2	2.7	2.5	2.7	2.8	2.0	2.3	2.0	2.0	2.8	2.0	2.0	2.7	2.2	2.5

Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment	Computer Science & Engineering									
Pro	gram:	B.tech CSE (Specialization in Augmented and Virtual									
		Reality)									
Bra	nch:	CSE									
1	Course Code										
2	Course Title	<b>Object Oriented Programming Using C++ Lab</b>									
3	Credits	3									
4	Contact Hours	2-0-2									
	(L-T-P)										
	Course Status	Elective									
5	Course Objective	The objective of this course is to learn $C++$ for the	,								
		implementation of Unreal Engine.									
6	Course Outcomes	after studying this course student will be able to:									
		CO1: Describe the basics of Object-Oriented Progr	ramming								
		concepts.									
		<b>CO2:</b> Explain the object initialization and destroy	concept using								
		constructors and destructors.									
		<b>CO3</b> : Apply the concept of polymorphism to implement compile									
		time polymorphism in programs by using overloa	ding methods								
		and operators.									
		<b>CO4</b> : Examine the concept of inheritance to reduce	e the length of								
		code and evaluate its usefulness.									
		<b>CO5</b> : Asses the concept of run time polymorphism	by using								
		virtual functions, overriding functions and abstract	class in								
		programs.									
		<b>CO6</b> : Plan to Use I/O operations and file streams in	n programs.								
7	0										
/	Course	To introduce the principles and paradigms of OOPS for design									
-	Description	and implementation of Object-Oriented System.	~~								
8	Outline syllabus		CO								
	<b>TT 1</b> / 4		Mapping								
	Unit 1	Introduction to C++:	<b>GO1</b>								
	A	1. Calculator Program: A simple calculator that can	COI								
		subtraction multiplication and division									
		2. Gradebook Program: A program that reads in									
		student grades from a file and calculates their average									
		grade, highest grade, lowest grade, and overall class									
		average.									
	Unit 2										

**Object Oriented Programming Using C++ Lab** 



А	3. Tic Tac Toe Game: A game where two players take	
	turns placing X's and O's on a 3x3 grid, with the	
	objective of getting three in a row.	
	4. Hangman Game: A game where the user tries to	
	guess a random word by guessing one letter at a time.	
	For every incorrect guess, a part of a hangman figure	
	is drawn until the user runs out of guesses.	
Unit 3		
A	5. Bank Account Program: A program that allows the	CO3
	user to create and manage bank accounts, deposit and	
	withdraw money, and view account balances.	
	6 Binary Search Algorithm: A program that searches	
	for a value in a sorted array using the binary search	
	algorithm	
Unit 4		
		<u> </u>
А	7. Fibonacci Sequence: A program that generates the	CO4
	Fibonacci sequence up to a certain number of terms.	
	8. Sorting Algorithm: A program that implements a	
	sorting algorithm such as bubble sort, selection sort, or	
	insertion sort.	
Unit 5		
А	9. Text Adventure Game: A game where the player	CO5, CO6
	navigates through a story by making choices that affect	
	the outcome.	
	10. Encryption/Decryption Program: A program that	
	can encrypt and decrypt messages using a symmetric	
	encryption algorithm such as AES or DES.	
Mode of	Theory/Jury/Practical/Viva	
examination		
examination		
Text book/s*	Deitel "C++ How to Program" Prentice Hall	
Text book 5	Robert Lafore "Object Oriented Programming in	
	Turbo C++" The Waite Group Press	
	Payichandran "Programming with $C^{\pm\pm}$ " 2002 TMU	
	Ravionanulan, Flogramming with CTT, 2005, IMIT	
	Datagurusanny, Object oriented Programming with	
Other References	Unreal Engine C++ the Ultimate Developer's	
1	Uandhook by Stanhan Sath Illiharri	



S.	Course Outcome	Program Outcomes
No.		(PO) & Program
		Specific Outcomes
		(PSO)
1.	<b>CO1:</b> Describe the basics of Object-Oriented Programming	PO1,PO2,PO3, PO9,
	concepts.	PSO1,PSO2
2.	<b>CO2:</b> Explain the object initialization and destroy concept	PO1,PO3, PO4, PO5,
	using constructors and destructors.	PO9,
		PO11,PSO1,PSO2
3.	<b>CO3</b> : Apply the concept of polymorphism to implement	PO1,PO3,PO4, PO9,
	compile time polymorphism in programs by using	PSO2
	overloading methods and operators.	
4.	<b>CO4</b> : Examine the concept of inheritance to reduce the	PO1,PO3,PO4, PO9,
	length of code and evaluate its usefulness.	PSO2
5.	<b>CO5</b> : Asses the concept of run time polymorphism by using	PO1,PO3,PSO2
	virtual functions, overriding functions and abstract class in	
	programs.	
6.	CO6: Plan to Use I/O operations and file streams in	PO1,PO2,PO3,PO4,P
	programs.	09, PO11,PSO1 PSO2,PSO3

# PO and PSO mapping with level of strength

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	2	2	_	_	-	_	_	2	_	_	_	1	2	_
CO2	2	-	3	2	2	-	-	-	1	_	1	_	2	2	-
CO3	3	-	2	1	-	-	-	-	3	_	-	_	-	2	-
CO4	1	-	2	1	_	_	_	-	1	_	-	_	_	3	_
CO5	1	_	1	_	_	_	-	-	_	_	_	_	_	1	-
CO6	3	3	3	2	-	-	_	_	2	_	2	_	2	3	1


Cour se	Course Name	РО					P O	P O	P O		P O	РО	P O	PSO	PSO	PSO
Code		1	PO2	PO 3	PO 4	PO 5	6	7	8	PO 9	10	11	12	1	2	3
	Object															
	Oriented															
	Programmi															
	ng Using	1.8	2.5	2.1	1.5	2.0				1.8		1.5		1.6	2.1	1.0
	C++	3	0	7	0	0	-	-	-	0	-	0	-	7	7	0

Average of non-zeros	entrv in	following	table	(should be	auto calculated).
		1000000000			

# Strength of Correlation

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Pro	gram:	B.tech CSE (Specialization in Augmented and Virtua	al Reality)							
Bra	nch:	CSE								
1	Course Code									
2	Course Title	Object Oriented Programming Using C++								
- 3	Credits	3								
<u> </u>	Contact	2-0-2								
	Hours									
	$(I_T_P)$									
	(L-1-1) Course	Elective								
	Status	Liecuve								
5	Course	The objective of this course is to leave C + + for the invol	amontation of							
5	Objective	The objective of this course is to tearn C++ for the impl	ementation of							
6	Course	ofter studying this course student will be able to:								
0	Course	after studying this course student will be able to:	ina concenta							
	Outcomes	<b>CO2</b> : Euclain the chiest initialization and destroy concerned	ing concepts.							
		constructors and destructors								
		constructors and destructors. $CO2$ : Apply the exponent of polymorphism to implay								
		<b>CO3</b> : Apply the concept of polymorphism to implem	ent complie time							
		<b>CO4</b> : Examine the concept of inheritance to reduce the length of code and								
		<b>CO4</b> : Examine the concept of inheritance to reduce the length of code and								
		evaluate its usefulness.								
		<b>CO5</b> : Asses the concept of run time polymorphism by using virtual								
		functions, overriding functions and abstract class in programs.								
		<b>CO6</b> : Plan to Use I/O operations and file streams in programs.								
	~									
7	Course	To introduce the principles and paradigms of OOPS for	design and							
	Description	implementation of Object-Oriented System.								
8	Outline syllabu	1S	CO Mapping							
	Unit 1	Introduction to C++:								
	А	Object Oriented Concepts: Introduction to Objects and	CO1							
		Object Oriented Programming, Encapsulation (Information								
		Hiding), Access Modifiers: Controlling access to a class,								
		method, or variable(public, protected, private, package),								
		Other Modifiers, Polymorphism: Overloading, Inheritance,								
		Overriding Methods, Abstract Classes, Reusability, Class's								
	D	Benaviors.	<u> </u>							
	В	Classes and Data Abstraction: Introduction, Structure	01							
		and Accessing Class Mombers - Separating Interface from								
		and Accessing Class Members, Separating Interface from								

**Object Oriented Programming Using C++** 



	Implementation, Controlling Access Function and Utility	
	Functions,	
Unit 2		
А	Initializing Class Objects: Constructors, Using Default	
	Arguments with Constructors, Using Destructors, Classes:	
	Constructor (Constant) Object and Constructor Member	
	Functions, Object as Member of Classes, Friend Function	
	and Friend Classes, Using This Pointer, Dynamic Memory	
	Allocation with New and Delete, Static Class Members,	
	Container Classes And Integrators, Proxy Classes, Function	
	overloading.	
В	Operator Overloading: Introduction, Fundamentals of	CO2
	Operator Overloading, Restrictions on Operators	
	Overloading, Operator Functions as Class Members vs. as	
	Friend Functions, Overloading, <<, >> Overloading Unary	
	Operators, Overloading Binary Operators.	
Unit 3		
A	Inheritance: Introduction, Inheritance: Base Classes and	CO3
	Derived Classes, Protected Members, Casting Base- Class	
	Pointers to Derived- Class Pointers, Using Member	
	Functions, Overriding Base –Class Members in a Derived	
	Class, Public, Protected and Private Inheritance, Using	
	Constructors and Destructors in derived Classes, Implicit	
	Composition Va Inheritance	
D	Virtual Functions and Polymorphism: Introduction to	CO3
В	Virtual Functions Abstract Base Classes And Concrete	05
	Classes Polymorphism New Classes And Dynamic	
	Binding Virtual Destructors Polymorphism Dynamic	
	Binding	
 Unit 4	- Shieling.	
A	<b>Files and I/O Streams:</b> Files and Streams, creating a	CO4
	Sequential Access File. Reading Data From A Sequential	001
	Access File, Updating Sequential Access Files, Random	
	Access Files,	
В	Creating A Random-Access File, Writing Data Randomly	CO4
	To a Random Access File, Reading Data Sequentially from	
	a Random Access File. Stream Input/Output Classes and	
	Objects, Stream Output, Stream Input, Unformatted I/O	
	(with read and write).	
Unit 5		
Α	Templates: Function Templates, Overloading Template	CO5, <u>CO6</u>
	Functions, Class Template, Class Templates and Non-Type	
	Parameters, Templates and Inheritance, Templates and	
	Friends, Templates and Static Members,	



В	Basics of C++ Exception Handling: Try Throw, Catch,	
	Throwing an Exception, Catching an Exception, Re-	
	throwing an Exception, Exception specifications, Processing	
	Unexpected Exceptions, Constructors, Destructors and	
	Exception Handling, Exceptions and Inheritance.	
Mode of	Theory/Jury/Practical/Viva	
examination		
Text book/s*	Deitel, "C++ How to Program", Prentice Hall	
	Robert Lafore, "Object Oriented Programming in Turbo	
	C++", The Waite Group Press.	
	Ravichandran, "Programming with C++", 2003, TMH	
	Balagurusamy, "Object oriented Programming with C++",	
	Tata McGraw-Hill	
Other	Unreal Engine C++ the Ultimate Developer's	
References	Handbook by Stephen Seth Ulibarri	

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	<b>CO1:</b> Describe the basics of Object-Oriented Programming concepts.	PO1,PO2,PO3, PO9,
		PSO1,PSO2
2.	CO2: Explain the object initialization and destroy concept using	PO1,PO3, PO4, PO5, PO9,
	constructors and destructors.	PO11,PSO1,PSO2
3.	<b>CO3</b> : Apply the concept of polymorphism to implement compile time	PO1,PO3,PO4, PO9, PSO2
	polymorphism in programs by using overloading methods and operators.	
4.	CO4: Examine the concept of inheritance to reduce the length of code	PO1,PO3,PO4, PO9, PSO2
	and evaluate its usefulness.	
5.	CO5: Asses the concept of run time polymorphism by using virtual	PO1,PO3,PSO2
	functions, overriding functions and abstract class in programs.	
6.	CO6: Plan to Use I/O operations and file streams in programs.	PO1,PO2,PO3,PO4,PO9,
		PO11,PSO1
		PSO2,PSO3

	PO and PSO mapping with level of strength														
	РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	2	2	-	_	-	-	-	2	_	-	-	1	2	_
CO2	2	_	3	2	2	-	-	-	1	_	1	_	2	2	_
CO3	3	_	2	1	_	_	_	_	3	_	_	_	_	2	_
CO4	1	_	2	1	-	_	_	_	1	_	_	_	_	3	_
CO5	1	_	1	_	_	_	_	_	_	_	_	_	_	1	_



CO6	3	3	3	2	-	-	_	_	2	_	2	_	2	3	1	

#### Average of non-zeros entry in following table (should be auto calculated).

	0 0			/	0							<i>,</i>				
Cours							Р	Р	Р		Р		Р			
e	Course Name						0	0	0		0		0		PSO	
Code		PO 1	PO2	PO 3	PO 4	PO 5	6	7	8	PO 9	10	PO 11	12	PSO 1	2	PSO 3
	Object															
	Oriented															
	Programmin															
	g Using	1.8	2.5	2.1	1.5	2.0				1.8		1.5		1.6	2.1	1.0
	C++	3	0	7	0	0	-	-	-	0	-	0	-	7	7	0

Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Sc	hool: SET		Batch : 2023-27									
Pr	ogram: B.Tecl	h	Current Academic Year: 2023-24									
Br	anch: ALL		Semester: VII									
1	<b>Course Code</b>		CSA401 Course Name: Computer Vision									
2	<b>Course Title</b>		Computer Vision									
3	Credits		3									
4	<b>Contact Hour</b>	rs	3-0-0									
	(L-T-P)											
	Course Status	S	Program Elective									
5	Course Object	ive	21. To implement fundamental image processing tech	niques								
			22 To develop applications using computer vision tec	hniques								
6	Course		Students will be able to have thorough Understanding of:	linques								
	Outcomes		CO-1 Define the Fundamentals of Computer Vision and C	Computer								
			Graphics and relate them with real world applicatio	ns								
			CO-2 Explain Image formation models and Foundations for									
			Mathematical basis for various Projection Systems									
			CO- 3 Apply Image processing techniques such as Segmentation									
			and Edge Detection for real time and real world app	lications.								
			CO- 4 Analyze various feature extraction techniques for different									
			problem domain.									
			CO-5 Evaluate Pattern Recognition Using Clustering,									
			Classification, Supervised Learning and Unsupervised									
			Learning Techniques									
			CO-6 Build computer vision applications for real world									
7	Cauraa		Applications.	Same ati an								
/	Course		in this course students will learn basic principles of image	ond then								
	Description		analyzing the underlying patterns	and then								
8	Outline syllab	us	analyzing the underlying patterns.	CO								
-	J			Mappin								
				g								
	Unit 1	Int	roduction to Computer Vision	0								
	А	Cor	mputer Vision and Computer Graphics, What is Computer	CO1								
		Vis	ision - Low-level, Mid-level, High-level									
	В	Ove	verview of Diverse Computer Vision Applications:									
		Doo	cument Image Analysis, Biometrics, Object Recognition,									
		Tra	cking, Medical Image Analysis									



С	Face detection, Face recognition, Eigen faces, Active	CO1
	appearance and 3D shape models of faces, Surveillance,	
	foreground-background separation, vehicle vision system:	
	locating roadway, road markings, identifying road signs,	
	locating pedestrians	
Unit 2	Image Formation Models	
А	Monocular imaging system, Radiosity: The 'Physics' of	CO2
	Image Formation, Radiance, Irradiance, Brightness, color	
	etc,	
В	Orthographic & Perspective Projection, Camera model and	CO2
	Camera calibration, Binocular imaging systems	
С	Multiple views geometry, Structure determination, shape	CO2
	from shading, Weak perspective projection and orthographic	
	projection, Concept of image coordinate system and camera	
	coordinate system;	
Unit 3	Image Processing	
А	Image preprocessing: The Discrete Fourier Transform (DFT)	СОЗ,
	of Two Variables, Properties of the 2-D DFT, Discrete	CO6
	Cosine Transform (DCT)	
В	Wavelet Transforms in One Dimension-The Discrete	СОЗ,
	Wavelet Transform (DWT) and The Continuous Wavelet	CO6
	Transform. Wavelet Decomposition,	
С	Orthogonal, Euclidean, Affine, Projective, etc; Convolution	СОЗ,
	and Filtering, Image Enhancement, Restoration, Histogram	CO6
	Processing.	
Unit 4	Image Processing Operations	
А	Image Filtering (spatial domain), Mask-based (e.g.,	CO4
	correlation, convolution), Smoothing (e.g., Gaussian),	
	Sharpening (e.g., gradient)	
В	Segmentation : Edge-based (e.g., voting, optimization,	CO4
	perceptual grouping), Pixel-based (e.g., clustering)	
С	Colour fundamentals, Colour models, Colour transformation,	CO4
	Smoothing and Sharpening, Colour segmentation	
Unit 5	Feature Extraction	
А	Edge detection: Canny, Laplacian of Gaussian; Line	CO5,
	detectors (Hough Transform)	CO6
В	Corners - Harris and Hessian Affine, Orientation Histogram,	CO5,
~	SIFT, SURF, HOG, GLOH	CO6
C	Scale-Space Analysis- Image Pyramids and Gaussian	CO5,
	derivative filters, Gabor Filters	CO6



Mode of	Theory								
examination									
Weightage	CA	MTE	ETE						
Distribution	25%	25%	50%						
Text	1. Milan Sonka, Vaclav H	lavac, Rog	er Boyle, "Digital Image						
book/s*	Processing and Comput	er Vision'	'Cengage Learning, 1 <sup>st</sup>						
	Edition, 2008								
	2. Computer Vision - A modern approach, by D. Forsyth and								
	J. Ponce, Prentice Hall	Robot Vis	sion, by B. K. P. Horn,						
	McGraw-Hill.								
Reference	1, Introductory Technique	es for 3D	Computer Vision, by E.						
Books	Trucco and A. Verri, Publ	isher: Pren	tice Hall.						
	2. R. C. Gonzalez, R. E. Woods. Digital Image Processing.								
	Addison Wesley Longman, Inc., 1992.								
	3. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-								
	Hall, Englewood Cliffs, 19	982.							

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO-1 Define the Fundamentals of Computer Vision and	PO1,PO2,PO3,PO4,
	Computer Graphics and relate them with real world	PO5,PO6,PO7,PO8,
	applications	PO9,PO10, PSO1,PSO2,PSO3
2.	CO-2 Explain Image formation models and Foundations	PO1,PO2,PO3,PO4,
	for Mathematical basis for various Projection Systems	PO5,PO6,PO7,PO8,
	5.5	PO9,PO10, PSO1,PSO2,PSO3
3.	CO- 3 Apply Image processing techniques such as	PO1,PO2,PO3,PO4,
	Segmentation and Edge Detection for real time and real	PO5,PO6,PO7,PO8,
	world applications.	PO9,PO10, PSO1,PSO2,PSO3
4.	CO- 4 Analyze various feature extraction techniques for	PO1,PO2,PO3,PO4,
	different problem domain.	PO5,PO6,PO7,PO8,
	1	PO9,PO10, PSO1,PSO2,PSO3
5.	CO-5 Evaluate Pattern Recognition Using Clustering,	
	Classification, Supervised Learning and	PO1,PO2,PO3,PO4,
	Unsupervised Learning Techniques	PU5,PU6,PU7,PU8,
	construction for the formed and	r09,r010, r501,r502,P503
6.	CO-6 Build computer vision applications for real world	PO1,PO2,PO3,PO4,
	applications	PO5,PO6,PO7,PO8,
	"Ppiloutono.	PO9,PO10, PSO1,PSO2,PSO3



**PO and PSO mapping with level of strength for Course Name** Computer Vision (**Course Code** CSA-401)

Subject	PO's /	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	Р	PS	PS	PS
	PSO's	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	150 \$	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Comput	CO1	3	3	3	3	1	1	1	1	1	2	1	3	2	3	1
er	CO2	3	3	3	3	2	1	1	1	1	2	1	3	2	3	2
Vision	CO3	3	3	3	3	2	1	1	1	1	2	1	3	3	3	2
CSA-	CO4	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
401	CO5	3	3	3	3	2	2	1	1	1	2	1	3	3	3	2
	CO6	3	3	3	3	2	3	3	1	3	2	1	3	3	3	3

Average of non-zeros entry in following table (should be auto calculated).

Cours e Code	Course Name	PO 1	PO 2	PO 3	РО 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 0 1	PS O 2	PS O 3
CEA	Computer															
CSA-	Vision		3.0	3.0	3.0	1.8	1.6	1.3	1.0	1.3	2.0	1.0	3.0	2.6	3.0	2.0
401		3.00	0	0	0	3	7	3	0	3	0	0	0	7	0	0

## Total- 32.83 Strength of Correlation

1. Addressed to Slight (Low=1) extent 2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



Sc	hool: SET	Batch : 2023-27										
Pr	ogram:B.Tech	Current Academic Year: 2023-24										
Bı	ranch: ALL	Semester: VII										
1	<b>Course Code</b>	CAL401 Course Name: Computer Vision La	b									
2	<b>Course Title</b>	Computer Vision Lab										
3	Credits	1	1									
4	<b>Contact Hour</b>	rs 0-0-2										
	(L-T-P)											
	Course Statu	s Core										
5	Course Object	ive To implement fundamental image processing techniques	required									
		for computer vision										
		To develop applications using computer vision techniques	8									
6	Course	Students will be able to have thorough Understanding of:										
	Outcomes	CO-1 Define and show the Fundamentals of Computer Vi	ision									
		techniques on images	techniques on images									
		CO-2 Show the Image filtering and opening / closing operations										
		on Color images	on Color images									
		CO- 3 Apply Image transformation techniques such as for real time										
		and real world applications.										
		CO- 4 Analyze various feature extraction techniques for different										
		Problem domains.										
		CO-5 Evaluate Pattern Recognition Using Clustering,										
		Classification Techniques										
		CO-6 Build computer vision applications for real world										
7	Carrier	Problems.	_									
/	Course	In this course students will learn basic principles of image										
	Description	formation, image processing algorithms, extracting the features	atures and									
0	Outling oullab	then analyzing the underlying patterns.	CO									
0	Outline synab	us	Monnin									
			a									
	∐nit 1	Introduction to Computer Vision	Š									
	A	To create a program to display grayscale image using read and	CO1									
	1	write operation.	001									
	В	To create a vision program to find histogram value and display	CO1									
		histograph of a grayscale and color image.										
	C	Write a program for color image processing										
	Unit 2	Image Formation Models	mage Formation Models									
	Α	To Implement smoothing or averaging filter in spatial domain	CO2									
	В	Program for opening and closing of the image.	gram for opening and closing of the image. CO2									



С	To fill the region of interest	for the ima	ıge	CO2							
Unit 3	Image Processing										
А	To create a vision program	for Non-Li	near Filtering technique	СОЗ,							
	using edge detection			CO6							
В	To create a program to discr	etize an im	age using Fourier	СОЗ,							
	transformation.			CO6							
С	To create a vision program	СОЗ,									
	image using different operat	CO6									
Unit 4	Feature Extraction										
А	Program of sharpen image u	CO4									
В	Program for morphological	CO4									
С	Write a program for image s	Write a program for image segmentation using local and global									
	thresholding										
Unit 5	Pattern Analysis										
А	Write a program to impleme	CO5,									
В	Write a program to implement image clustering.										
				CO6							
С	Lab		1								
Weightage	CA	CE	ETE								
Distribution	25%	25%	50%								
Text	1. Milan Sonka, Vaclav H	Ilavac, Ro	ger Boyle, "Digital								
book/s*	Image Processing and Co	mputer Vi	sion"Cengage Learning,								
	1 <sup>st</sup> Edition, 2008										
	2. Computer Vision - A n	nodern app	broach, by D. Forsyth and								
	J. Ponce, Prentice Hall R	obot Visio	on, by B. K. P. Horn,								
	McGraw-Hill.										
Reference	1, Introductory Technique										
Books	Trucco and A. Verri, Pub										
	2. R. C. Gonzalez, R. E. V										
	Addison Wesley Longma	n, Inc., 19	92.								
	3. D. H. Ballard, C. M. B	rown. Coi	nputer Vision. Prentice-								
	Hall, Englewood Cliffs, 1	982.									



S.	Course Outcome	Program Outcomes (PO)
INO.		Outcomes (PSO)
1.	CO-1 Define and show the Fundamentals of Computer	PO1,PO2,PO3,PO4,
	vision techniques on images	105,1501,1502
2.	CO-2 Show the Image filtering and opening / closing	PO1,PO2,PO3,PO4,
	operations on Color images	PO5,PSO1,PSO2
3.	CO- 3 Apply Image transformation techniques such as	PO1,PO2,PO3,PO4,
	for real time and real world applications.	PO5,PO12,PSO1,PSO2, PSO3
4.	CO- 4 Analyze various feature extraction techniques for	PO1,PO2,PO3,PO4,
	different problem domains.	PO5,PSO1,PSO2
5.	CO-5 Evaluate Pattern Recognition Using Clustering,	PO1,PO2,PO3,PO4,
	Classification Techniques	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3
6.	CO-6 Build computer vision applications for real world	PO1,PO2,PO3,PO4,
	Problems.	PO5,PO6,PO7,PO8,
		PO9,PO10, PSO1,PSO2,PSO3

**PO and PSO mapping with level of strength for Course Name** Computer Vision (**Course Code** CSA-301)

Subject	PO's / PSO' s	P 0 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PS O 3
Comput	CO1	3	2	1	1	1	-	-	-	-	-	-	-	2	2	-
er	CO2	3	2	1	1	2	-	-	-	-	-	-	-	2	2	-
Vision	CO3	3	2	1	1	2	-	-	-	-	-	-	1	2	2	1
CAL-	CO4	3	3	1	1	1	-	-	-	-	-	-	-	2	2	-
401	CO5	3	3	2	2	2	-	-	-	-	-	-	-	2	2	-
	CO6	3	2	2	2	2	-	-	-	-	-	-	1	2	2	1

#### Average of non-zeros entry in following table (should be auto calculated).

Cour se Code	Course Name	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
CAL- 401	Comput er Vision	3.0 0	2.3 3	1.3 3	1.3 3	1.6 7	0.0 0	0.0 0	0.0 0	0.0 0	0.0 0	0.0 0	1.0 0	2.0 0	2.0 0	1.0 0

#### Total- 32.83 Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Moderate (Medium=2) extent
 Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Pro	gram:	B.Tech. DS								
Bra	nch:	CSE								
1	Course Code									
2	Course Title	Data Exploration and Visualization								
3	Credits	3								
4	Contact									
	Hours	2 0 2								
	(L-T-P)									
	Course	Core /Elective/Open Elective								
	Status	-								
5	Course	• To understand what is in a dataset and the chara	cteristics of							
	Objective	the data								
		• To design and create data visualizations based o	n data							
		available and tasks to be achieved.								
		• To evaluate the effectiveness of visualization de	signs, and							
		think critically about each design decision, such	as choice of							
		<ul> <li>Students will create their own data visualizations and learn to</li> </ul>								
		• Students will create their own data visualization use Open Source data visualization tools, especi	ally $D3$ is							
6	Course	CO1: Design an approach to leverage data using the ste	ps in the							
	Outcomes	machine learning process.	r ~							
		CO2: Design and create data visualizations.								
		CO3: Craft visual presentations of data for effective con	nmunication.							
		CO4: Design and evaluate color palettes for visualization	on based on							
		principles of perception								
		CO5: Apply data transformations such as aggregation a	nd filtering							
		for visualization	ing mitering							
		CO6: Use JavaScript with D3 is to develop interactive y	visualizations							
		for the Web	15 duit2 duit0115							
7	Course	This course uses ecological datasets to discuss data exp	loration and							
,	Description	visualization tools. It also explains how to visualize the	results of							
	Description	statistical models. The course also includes the JavaScri	int with D3 is							
		needed to construct visualize and explore the main features of the								
		data sten by sten								
8	Outline syllabi									
		Manning								
	Unit 1	INTRODUCTION	P1115							
	A	Introduction to data exploration, Data Terminology,	CO1							



В	Data Exploration through summary statistics,	CO 2, CO3
	Exploring data with KNIME plots, Data Exploration	
	in Spark	
С	Classification Techniques, Clustering Techniques,	CO 1, CO2
	Regression Methods,	
Unit 2	OVERVIEW OF DATA VISUALIZATION,	
	INTRODUCTION TO WEB TECHNOLOGIES	
А	Why Visualize Data?, Introduction to SVG and CSS,	CO3
	Introduction to JavaScript, Introduction to VizHub,	
	Making a Face with D3.js	
В	Input for Visualization: Data and Tasks, Loading and	CO2. CO3,
	Parsing Data with D3.js	CO4
С	Encoding Data with Marks and Channels, Rendering	CO3, CO4
	Marks and Channels with D3.js and SVG,	
	Introduction to D3 Scales, Creating a Scatter Plot with	
	D3.js	
Unit 3	DATA MANAGEMENT ISSUES	
А	Integrity and Quality of Data - Data type issues,	CO1,
	Exploratory data analysis, simple viz.	CO4,CO5
В	Handling missing data, Handling outliers, Attribute	CO4, CO5
	creation, modification conversion: categorical –	
	numeric.	
С	Understanding and naming the attributes and files,	CO3, CO4
	Replicability	
Unit 4	VISUALIZATION OF SPATIAL DATA,	
	NETWORKS, AND TREES	
А	Reusable Dynamic Components using the General	CO2, CO3
	Update Pattern:-Reusable Scatter Plot	
	Common Visualization Idioms with D3.js:-	
	Bar Chart, Vertical & Horizontal, Pie Chart and	
	Coxcomb Plot, Line Chart, Area Chart	
В	Making Maps, Visualizing Trees and Networks	CO3, CO4
C	Encoding Data using Color, Encoding Data using	CO4, CO5
	Size, Stacked & Grouped Bar Chart, Stacked Area	
	Chart & Streamgraph, Line Chart with Multiple Lines	
Unit 5	INTERACTION TECHNIQUES	
А	Adding interaction with Unidirectional Data Flow,	CO1,CO2,
	Using UI elements to control a scatter plot, Panning	CO3, CO5
	and Zooming on a Globe, Adding tooltips	
В	Small Multiples, Linked Highlighting with Brushing,	CO4, CO5,
	Linked Navigation: Bird's Eye Map	CO6



С	Case S	tudy:	Covid19 D	Dashb	oard by joining interactive	CO4, CO5,			
	technic	ques ai	nd spatial c	lata r	networks and trees	CO6			
Mode of									
examination									
Weightage	CA		MTE		ETE				
Distribution	25%		25%		50%				
Text book/s*	1.	Adva	nced Meth	ods o	of Data Exploration and				
		Mode	elling by B	rian l	Everitt, Graham Dunn				
	2.	Intera	ctive Data	ı Vist	alization for the Web by				
		Scott	Murray 2r	nd Ed	lition (2017)				
Other	1.	Visua							
References		Data							
		Fry							
	2.	Visua	lization A	nalys	is and Design by Tamara				
		Munz	zner						

S.	Course Outcome	Program Outcomes (PO)
No.		& Program Specific
		Outcomes (PSO)
1.	CO1: Design an approach to leverage data using the	$P \cap 1 P \cap 2$
	steps in the machine learning process.	101,102
2.	CO2: Design and create data visualizations	PO1, PSO2, PSO3
3.	CO3: Craft visual presentations of data for effective	DOI DOY DOY DSOY
	communication.	101,102,103,1302
4.	CO4: Design and evaluate color palettes for	
	visualization based on principles of perception.	PO4, PO5, PO6
5	CO5. Apply data transformations such as accuration	
5.	cos: Apply data transformations such as aggregation	PO1, PO2, PSO2,PSO3
	and filtering for visualization.	
6.	CO6: Use JavaScript with D3.js to develop interactive	PO2, PO3, PO5, PSO2,
	visualizations for the Web.	PSO3



Course Code_ Course Name	CO's	РО 1	РО 2	PO 3	РО 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	CO1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	CO2	2	0	0	0	0	0	0	0	0	0	0	0	0	3	2
Data Explora	CO3	3	2	3	0	0	0	0	0	0	0	0	0	0	3	0
Visualiz ation	CO4	0	0	0	3	2	3	0	0	0	0	0	0	0	0	0
	CO5	2	3	0	0	0	0	0	0	0	0	0	0	0	2	3
	CO6	0	2	3	0	3	0	0	0	0	0	0	0	0	3	2

#### PO and PSO mapping with level of strength for Data Exploration and Visualization

# Strength of Correlation

1. Addressed to Slight (Low=1) extent

2. Addressed to Moderate (Medium=2) extent

3. Addressed to Substantial (High=3) extent



# INT248: Human Computer interaction

School: School of Engineering & Technology	School of Engineering & Technology								
Department Computer Science & Engineering									
Program: B.Tech									
Branch: CSE									
1 Course Code INT249									
2 Course Title Human Computer Interaction									
3 Credits 3									
4 Contact 3-0-0									
Hours									
(L-T-P)									
Course Core /Elective/Open Elective									
Status									
5 Course The main objective is to make student think construct	tively and								
Objective analytically about how to design and evaluate interact	tive technologies.								
6 Course CO1: Define the capabilities of both humans and c	computers from the								
Outcomes viewpoint of HCI.									
$CO_2$ : Explain different types of User interfaces.	ards and guidelines								
CO4: Understand the fundamental aspects of design	CO4: Understand the fundamental aspects of designing and evaluating								
interfaces.	interfaces.								
CO5: Analyse and identify user models, use	r support, socio-								
organizational issues, and stakeholder requirements	of HCI systems.								
CO6: Adapt methodologies to design, implement and	l evaluate a user								
interface for a project									
7 Course HCI is an interdisciplinary field that integrates theory	es and								
Description methodologies from computer science, cognitive psy	chology, design,								
and many other areas. This course is an introduction	to the								
fundamentals of human-computer interaction, user in	iterface design, and								
usability analysis. Students will learn principles and	guidelines for								
usability and apply them through critiques of existing	g interfaces and								
Queting sullabus	<u> </u>								
8 Outline synabus	CO								
Unit 1 Introduction	wiapping								
A Introduction to HCL CHL MML Human System	CO1								
A Introduction to field, effit, which, futurian System	coi								
Good Design Benefits of Good Design Principles of	f								
User Interface Design	L								
B Techniques and Tasks Basic Interaction Tasks	Tachniques and Tasks Basic Interaction Tasks								
Composite Interaction Task. Interaction Styles Spee	ch								



		Recognition, Natural Language Processing, Fields of	
		HCI	
	С	The Contents of Human-Computer Interaction, Nature	CO1
		of Human-Computer Interaction, Applications, Goals	
		and Aspects, HCI Groups	
,	Unit 2	Interfaces	
	А	Term Interface, Good and Bad Interfaces, Features of a	CO2,CO6
		Good Interface,	
	В	User interface, Quality of User Interface, Types of User Interfaces, Command Line Interface, Advantages of Command Line Interface, Graphical User Interface	CO2,CO6
	С	Document Interfaces and their types, Single Document	CO2,CO6
		Interface (SDI), Multiple Document Interface (MDI),	
		Tabbed Document Interface.	
	Unit 3	User Interface Design & GUI	
	А	Understanding How User Interact With Computers,	CO3,CO6
		User Interface Models, Design Methodologies,	
		Designing an Interface, Process of Interaction Design.	
	В	Human Interaction with Computers, Human Interaction	CO3,CO6
		Speeds, Human Characteristics in Design, Human	
		Consideration in Design, Eight golden rules user	
		interface design	
	С	Popularity of Graphics, Characteristics of Graphical	CO3,CO6
		User Interface, Concepts of Direct Manipulation,	
		Graphical System Advantages and Disadvantages, Web	
		User Interface Characteristics and Popularity	
	Unit 4	Design Models and Ergonomics	
	А	User interface models, User interface design	CO4,CO6
		methodologies, Efficacy of user interface design,	
		Dialogue box design, Development and evaluation of	
		user interface design, user centered design.	
	В	Factors in user interface design, HCI design models,	CO4,CO6
		Process of interface analysis,	
	С	User documentation, Ergonomics introduction, Human	CO4,CO6
		factors, Physical issues in ergonomics, cognitive issues	
		in ergonomic	
	Unit 5	Usability	
	А	Usability introduction & its need, usability acceptability,	CO5,CO6
	В	What to measure in Usability, Usability Engineering,	CO5,CO6
	С	Life cycle, how to achieve high usability, Usability	CO5,CO6
		evaluation and testing, Learnability, Flexibility.	



Mode of	Theory/Jury/									
examination										
Weightage	CA	CA MTE ETE								
Distribution	25%	25%	50%							
Text book/s*	Alan Dix, Jane	Alan Dix, Janet Finlay, Gregory Abowd. Ruel Beale "Human								
	Computer Inte	Computer Interaction", PHI.								
Other	1. Kuma	1. Kumar Rajendra, " Human Computer								
References	Interaction" S	Interaction" Second Edition, Firewall Media New Delhi.								
	2. Ben S									
	Strategies for									
	Pearson Educ	ation.								

S.	Course Outcome	Program Outcomes (PO) & Program Specific
No.		Outcomes (PSO)
1.	CO1: Define the capabilities of both	PO1,PO4,PO5,PO6,PO7,PO8,PO9,
	humans and computers from the	PO10,PO12,PSO1
	viewpoint of HCI.	
2.	CO2: Explain different types of User	PO1,PO2,PO4,PO5,PO6,PO7,PO8,PO9,
	interfaces.	PO10,PO12,PSO1
3.	CO3: Describe and use HCI design	PO1,PO2,PO4,PO5,PO6,PO7,PO8,PO9,
	principles, standards and guidelines.	PO10,PO12,PSO1
4.	CO4: Understand the fundamental	PO1,PO2,PO4,PO5,PO6,PO7,PO8,PO9,
	aspects of designing and evaluating	PO10,PO12,PSO1
	interfaces.	
5.	CO5: Analyze and identify user	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PO9
	models, user support, socio-	,
	organizational issues, and stakeholder	PO10,PO11,PO12,PSO1
	requirements of HCI systems.	
6.	CO6: Adapt methodologies to design,	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PO9
	implement and evaluate a user interface	,
	for a project	PO10,PO11,PO12,PSO1,PSO2



# PO and PSO mapping with level of strength for Course Name Human Computer Interaction(Course Code INT 249)

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	Р О4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
INT2	CO1	1	-	-	1	1	1	2	1	2	3	-	3	1	-	-
49_H	CO2	1	1	-	1	1	1	2	2	2	3	-	3	1	-	-
uman	CO3	1	1	-	1	1	1	2	2	2	3	-	3	2	-	-
Comp	CO4	1	2	-	1	1	1	2	2	2	3	-	3	1	-	-
uter Intera	CO5	3	3	3	3	2	1	2	2	2	3	3	3	1	-	-
ction	CO6	2	3	3	3	2	2	3	2	2	3	3	3	3	2	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	РО 1	РО 2	РО 3	РО 4	P O 5	PO 6	P O 7	PO 8	PO 9	PO 10	РО 11	PO 12	PS O 1	PS O 2	PSO 3
NITO	Human Comput															
INT2 49	er Interacti	1.5			1.6	1. 3	1.1	2.1	1.8	2	3	3	3	1.5	2	-
	on															

# Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sche	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Prog	gram:	B.Tech								
Bra	nch:	CSE								
1	Course Code	CIP011								
2	Course Title	Android with IoT Lab								
3	Credits	1								
4	Contact Hours	0-0-2								
	(L-T-P)									
	Course Status	Elective								
5	Course	This course aim to give an overview of Android	with IoT, its							
	Objective	architecture, challenges and applications in different con	text.							
6	Course	CO1: Demonstrate the basics of Android Things on Rast	oberry							
	Outcomes	CO2: Build the Android Things project	5							
		CO3: Construction of connecting control peripherals	with Android							
		Things								
		CO4: Experiment with GPIO pins and PIR sensors u	using Android							
		Things	8							
		CO5: Develop a small Android App with IoT								
		CO6: Build IoT application using Android Things								
7	Course	The course is intended to know fundamentals of And	roid Platform,							
	Description	Description Android application components; integration of Android with IoT, The								
		main focus is on implementing IoT projects using Andro	id Things.							
8	Outline syllabus		CO							
	5		Mapping							
	Unit 1	Introduction								
		Install Android Things on Raspberry	CO1, CO6							
		Testing the installation: Connect Raspberry Pi to a	CO1, CO6							
		video using the HDMI, Connect Raspberry Pi to your	,							
		network using the LAN connection, Connect								
		Raspberry Pi to your Mac/PC using a USB cable								
	Unit 2	Android Things Project								
		Creating the first Android Things project	CO2, CO6							
		Cloning the template project, Create the project	CO2, CO6							
		manually	,							
	Unit 3	Connecting Control peripherals with Android								
		Things								
		Study the Android Things and how it works	CO3, CO6							
		Create your first Android Things app	CO3. CO6							
	Unit 4	Android Things with IoT-I								
		Creating an Alarm System Using Android	CO4. CO6							
		Things								
		Use GPIO pins and PIR sensors handle events from a	CO4, CO6							
		GPIO pin								
	Unit 5	Android Things with IoT-II								
		Build an app that is independent of the board	CO5 CO6							
		Dana an app that is independent of the board	0.00, 0.00							



	Implementat Things to Ar	Implementation of notifying events from Android Things to Android									
Mode of examination	Jury/Practica	Jury/Practical/Viva									
Weightage	CA	CE (Viva)	ESE								
Distribution	25%	25%	50%								
Text book/s*	5. Andr Publi 6. Anub Com Appl	oid Things Pro sher: Packt Pu bhav Pradhan a posing Mobile y Using Andro	ojects by Francesco Azzola blishing nd Anil V. Deshpande , Apps: Learn, Explore, oid , 1st Edition, Wiley								
	India										
Other References											

## PO and PSO mapping with level of strength for Android with IoT Lab CIP011

Course Code_ Course Name	CO's	РО 1	PO 2	РО 3	Р О4	РО 5	PO 6	PO 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS 03
CIP011	CO1	2	1	1	-	3	1	1	-	2	2	2	2	1	1	-
	CO2	2	2	2	1	3	2	2	2	1	1	1	2	3	2	2
_Andro	CO3	2	2	2	1	3	2	2	2	3	3	3	3	3	2	2
Id with IoT Lab	CO4	2	2	2	2	3	2	2	2	3	3	3	3	3	2	2
	CO5	3	2	2	3	3	2	2	2	3	3	3	3	3	2	2
	CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2

#### Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO	РО	PO	РО	PO	РО	РО	PO	PO	PO	PO	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	O 1	2	O 3
CIP011	Android with IoT Lab	2.3	2.0	2.0	2.0	3.0	2.0	2.0	2.2	2.5	2.5	2.5	2.7	2.7	2.0	2.0

#### Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology								
Dep	artment	Computer Science & Engineering								
Pro	gram:	B.Tech								
Bra	nch:	CSE								
1	Course Code	CIP202								
2	Course Title	IoT: Architecture and Programming Lab								
3	Credits	1								
4	Contact Hours (L-T-P)	0-0-2								
	Course Status	Core								
5	Course Objective	This course provides a preliminary view on Logical and Physical Design of IoT systems and gives an overview of Data analytics for IoT.								
6	Course Outcomes	<ul> <li>CO1: Demonstrate the concepts of IoT for home automation and security.</li> <li>CO2: Develop of logical design of IoT System using Python.</li> <li>CO3: Construct the Raspberry Pi interfaces with Python</li> <li>CO4: Interpret the IoT Physical Servers and Cloud Offerings</li> <li>CO5: Evaluate data analytics for IoT using Apache Hadoop</li> <li>CO6: Utilize the IoT reference architecture required in building</li> </ul>								
7	Course Description	The course focuses on understanding the vision of Ic perspective, understand its applications, and deter perspective, using gateways, devices and data manage state of art architecture in IoT and its application building automation and real world design constraints	oT from a global mine its market ement, building a is in commercial 3.							
8	Outline syllabus	3	CO Mapping							
	Unit 1	Introduction to IoT								
		Sending e-mail from IoT kit.	CO1							
		Internet based home automation and home security system	CO1							
	Unit 2	IoT Systems- Logical Design using Python								
		Python-Based Multicolored-LED control	CO1. CO2							
		Water level monitoring using Python and Moisture sensing and logging using python.	CO1, CO2							
	Unit 3	IoT Physical Devices and Endpoints								
		Touchscreen photo-booth with a Raspberry Pi	CO1, CO2, CO3							
		Raspberry Pi weather forecast display and Programming Raspberry Pi for Home automation system.	CO1, CO2, CO3							
	Unit 4	IoT Physical Servers and Cloud Offerings								
		Internet or intranet controlled motor	CO1, CO2, CO4							
		Design IoT-Enabled Embedded Web Server and	CO1, CO2,							
		Server-less based web application.	CO4							
	Unit 5	Data analytics for IoT								



		Improvement pollution level	of smart city tec ls	chnologies to reduce	CO5, CO6
		Enhance traffi control	c conditions and	d Internet-based street light	CO5, CO6
Mode exam	e of ination	Jury/Practica	l/Viva		
Weig	htage	CA	MTE	ETE	
Distri	ibution	25%	25%	50%	
Text	book/s*	<ol> <li>Arshdeep I Approach "In 2015.</li> <li>"Internet o Hillar,Publish 35 Livery Str 1-78588-138-</li> </ol>	Bahga and Vija Iternet of Thing f Things with P ned by Packt Pu eet Birminghan -1	i Madisetti : A Hands-on s", Universities Press lython" Gastón C. Iblishing Ltd. Livery Place n B3 2PB, UK. ISBN 978-	
Other Refer	rences	<ol> <li>Kamal, R. Architecture Mcgraw Hill</li> <li>Misra, S., NPTEL Cours Science &amp; En Technology https://nptel.a</li> <li>Samuel Gr MIT press, 20</li> <li>Adrian Mc the Internet o</li> </ol>	, (2017), Interr and Design Pr Introduction to rse Material, D ngineering, Inc Kharagpur, ac.in/courses/1 eengard, "The D15. Ewen and Haki f Things "Wile	net of Things - inciples, 1st Edition, o Internet of Things, pepartment of Computer lian Institute of 06105166/ Internet of Things", The im Cassimally "Designing y,2014.	

# PO and PSO mapping with level of strength for IoT: Architecture and Programming Lab CIP202)

Course Code_ Course Name	CO's	РО 1	PO 2	РО 3	Р О4	РО 5	PO 6	PO 7	РО 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
CIP202	CO1	2	2	1	2	2	2	2	-	2	1	3	3	2	2	-
_IoT:	CO2	2	2	2	1	2	-	-	-	2	1	2	3	2	2	-
Archite cture	CO3	2	2	2	1	2	-	-	-	2	-	3	3	2	2	-
and Progra	CO4	2	2	2	1	2	-	-	2	2	-	3	3	2	2	-
mming	CO5	2	2	2	2	2	-	-	2	2	-	3	3	3	3	-
Lab	CO6	2	2	2	2	2	3	2	2	3	1	3	3	3	3	2

Average of non-zeros entry in following table (should be auto calculated).



Course	Course	РО	PO	PO	РО	РО	РО	РО	РО	PO	PO	PO	PO	PS	PSO	PS
Code	Name	1	2	3	4	5	6	7	8	9	10	11	12	0 1	2	O 3
CIP202	IoT: Architect ure and Program ming Lab	2.0	2.0	1.8	1.5	2.0	2.5	2.0	2.0	2.2	1.0	2.8	3.0	2.3	2.3	2.0

# Strength of Correlation

- 1. Addressed to Slight (Low=1) extent
   2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



# B.Tech (CSE) with Specialization in Full Stack Web Development in association with Xebia Academic Alliance



S	vllahus:	Fundamentals	with	craftsmansh	nin
D.	ynabus.	r unuamentais	<b>WILLI</b>	ci ai ismansi	որ

Scho	ool: SET	Batch: 2023-2027
Prog	gram: B. Tech	Current Academic Year: 2023-24
Bra	nch: CS	Semester: 1
1	Course Code	
2	Course Title	Fundamentals with
		craftsmanship
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Core/Compulsory
5	Course Objective	The course aims to provide an understanding of software craftsmanship principles and practices, code design, structure, formatting, documentation, testing, debugging, and refactoring techniques.
6	Course Outcomes	<ul> <li>CO1: Recall and identify software development processes and paradigms, and recognize the principles of software craftsmanship to develop code.</li> <li>CO2: Understand the fundamental concepts of clean code design, software design considerations, and principles of software design to develop software systems.</li> <li>CO3: I Apply best practices for organizing code using classes, packages, and methods, and evaluate the quality of code based on characteristics such as size, cohesion, and coupling.</li> <li>CO4: Apply best practices for code formatting and documentation, including naming conventions, intention-revealing names, and appropriate use of comments, to ensure clear and maintainable code.</li> <li>CO5: Apply software testing and debugging techniques, including TDD, unit testing, and refactoring, to improve the quality and maintainability of code.</li> <li>CO6: Apply basic test-driven development (TDD) principles to write test cases before implementing code.</li> </ul>
7	Course Description	This course covers the essential topics of software craftsmanship, including software design principles, code structure, formatting and documentation, and testing, debugging and refactoring techniques. Students will learn about the history and emergence of software craftsmanship, various programming paradigms, and best practices for writing well-crafted code. Additionally, the



		course will cover SOLID design principles, design patter metaphors. Students will gain practical experience with unit te and using frameworks and tools. The course aims to develop create high-quality, maintainable code that meets industry stan	rns, and software esting, refactoring, students' ability to idards.
8	Outline syllabus	5	CO Mapping
	Unit 1	Introduction to Software Craftsmanship	
	A	Definition, History of the emergence of software craftsmanship, Software craftsmanship, Process versus paradigm, Software development processes, Software development models	CO1
	В	Software design paradigms, Software development paradigms, Major programming paradigms Procedural programming paradigm, Object-oriented programming paradigm, Functional programming paradigm,	CO1
	С	Dimensions of craftsmanship, Craftsmanship - Mastery of the paradigm Describing and defining well-crafted code, Becoming a craftsman, The programming process	CO1
	Unit 2	Code Design	
	Unit 2 A	Code Design Clean code and its fundamental concepts, Code Design, Software design considerations,	CO2
	Unit 2 A B	Code DesignClean code and its fundamental concepts, Code Design, Software design considerations,Kent Beck's principle of simple design, Fundamental characteristics of good design,	CO2 CO2
	Unit 2 A B C	Code DesignClean code and its fundamental concepts, Code Design, Software design considerations,Kent Beck's principle of simple design, Fundamental characteristics of good design,Design Patterns: Reusing best practices, SOLID design principles, Programming Principles	CO2 CO2 CO2
	Unit 2 A B C Unit 3	Code Design         Clean code and its fundamental concepts, Code Design,         Software design considerations,         Kent Beck's principle of simple design, Fundamental         characteristics of good design,         Design Patterns: Reusing best practices, SOLID design         principles, Programming Principles         Code Structure	CO2 CO2 CO2
	Unit 2 A B C Unit 3 A	Code DesignClean code and its fundamental concepts, Code Design, Software design considerations,Kent Beck's principle of simple design, Fundamental characteristics of good design,Design Patterns: Reusing best practices, SOLID design principles, Programming PrinciplesCode StructureClasses, packages and methods: building blocks of code, organizing code: the size of methods and classes,	CO2 CO2 CO2 CO3
	Unit 2 A B C Unit 3 A B	Code DesignClean code and its fundamental concepts, Code Design, Software design considerations,Kent Beck's principle of simple design, Fundamental characteristics of good design,Design Patterns: Reusing best practices, SOLID design principles, Programming PrinciplesCode StructureClasses, packages and methods: building blocks of code, organizing code: the size of methods and classes,What makes methods and classes "good", Software metaphors,	CO2 CO2 CO2 CO3 CO3
	Unit 2 A B C Unit 3 A B C	Code DesignClean code and its fundamental concepts, Code Design, Software design considerations,Kent Beck's principle of simple design, Fundamental characteristics of good design,Design Patterns: Reusing best practices, SOLID design principles, Programming PrinciplesCode StructureClasses, packages and methods: building blocks of code, organizing code: the size of methods and classes,What makes methods and classes "good", Software metaphors,Objects and data structures, data transfer objects, Using libraries, Overview of the best practices in structure: Law of demeter and open close principle	CO2 CO2 CO2 CO3 CO3



A	Introduction, Distance and	Variants, Ver Ordering,	tical Openness, Vertical Density,	CO4
В	Naming Best Mental Mappi	Practices, In ings,	tention-Revealing Names, Avoid	CO4
С	Naming Class Code Docume	es, Methods ar entation	nd Functions, Comments, Writing	CO4
Unit 5	Testing Debu	gging & Refa	ctoring-	
А	Testing and D	ebugging, Bas	sic Test-driven	CO5, CO6
	Development Unit Testing 7	(TDD), Categ Fechniques, Au	ories of TDD and Unit tests, utomating	
	Testing Using	Junit,		
В	Refactoring: I Code Structur	mproving Stru e	cture, Refactoring: Changing	CO5, CO6
	without Chang The Refactori	ging Functionand	ality, The need for Refactoring, I the	
	Different Leve	els of Refactor	ring, Refactoring Strategies,	
С	Code Smells:	Symptoms of	Poorly	CO5, CO6
	Designed Cod Using Framev	le, Categories vorks & Tools	of Code Smells, Code Base,	
Mode of examination	Theory			
Weightage	CA	MTE	ETE	
Distribution	25%	25%	50%	
Text book/s*				
Other References				



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Recall and identify software development processes and paradigms, and recognize the principles of software craftsmanship to develop code	PO1, PO2, PO3, PO4, PO5, PO10, PSO1, PSO2
2.	CO2: Understand the fundamental concepts of clean code design, software design considerations, and principles of software design to develop software systems	PO1, PO2, PO3, PO4, PO8, PO10, PSO1, PSO2
3.	CO3: I Apply best practices for organizing code using classes, packages, and methods, and evaluate the quality of code based on characteristics such as size, cohesion, and coupling	PO1, PO2, PO3, PO4, PO5, PO9, PSO1, PSO2
4	CO4: Apply best practices for code formatting and documentation, including naming conventions, intention-revealing names, and appropriate use of comments, to ensure clear and maintainable code	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2
5	CO5: Apply software testing and debugging techniques, including TDD, unit testing, and refactoring, to improve the quality and maintainability of code.	PO1, PO2, PO3, PO4, PO5, PO8 PO10, PSO1, PSO2
6	CO6: Apply basic test-driven development (TDD) principles to write test cases before implementing code.	PO1, PO2, PO3, PO4, PO5, PO8 PO10, PSO1, PSO2



# PO and PSO mapping with level of strength for Course Name Fundamentals with craftsmanship (Course Code )

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PSO1	PSO2
CO1	3	2	3	3	3	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	3	-	2	2	3
CO3	2	3	2	2	2	-	-	-	3	-	3	2
CO4	3	2	2	2	-	3	3	-	-	-	3	3
CO5	2	3	3	3	3	-	-	2	-	3	2	3
CO6	2	3	3	3	3	-	-	2	-	3	2	3

Average of non-zeros entry in following table (should be auto calculated).

Course	Course	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
Code	Name	1	2	3	4	5	6	7	8	9	10	1	2
	Fundame ntals with craftsman ship	2.5	2.7	2.7	2.7	2.7	3	3	2.3	3	2.5	2.5	2.8

Strength of Correlation:

1-Slight (Low)

2-Moderate (Medium)

**3-Substantial (High)** 



## Syllabus: UX Expert

Scho	ool: SET	Batch: 2023-27			
Prog	gram: B.Tech	Current Academic Year: 2023-27			
Brai	nch: CS	Semester: II			
1	Course Code				
2	Course Title	UX Expert			
3	Credits	3			
4	Contact Hours (L-T-P)	3-0-1			
	Course Status	Core/Compulsory			
5	Course Objective	The course objective is to provide learners the skills to create responsive web applications using various tools and technolog	eate dynamic and ies.		
6	Course Outcomes	<ul> <li>CO1: Identify key features of ES6 programming language.</li> <li>CO2: Understand React application using JSX syntax, component apply validation to props using propTypes.</li> <li>CO3: Differentiate between functional and class component props and state, and utilize HTTP requests with Axios and F applications.</li> <li>CO4: Develop a React application that incorporates event han rendering, and forms with validation, and implement controlled components using refs.</li> <li>CO5: Demonstrate the ability to utilizes routing and state mana implementing routing and utilizing the Context API and Redux to explain the advantages and limitations of using Redux for state in web applications.</li> </ul>	ents, and state, and ats, explain React FetchAPI in React adling, conditional d and uncontrolled agement, including k, while being able tate management.		
7	Course Description	The course covers an introduction to Full Stack development, HTML, HTML5, CSS, JavaScript, and JavaScript functions, objects, and events. The purpose of this course is to give students the basic understanding of how things work in the Web world.			
8	Outline syllabus	<u>.</u>	CO Mapping		



Unit 1	Introduction to ES6	
А	Introduction to ES6, ECMA Script, The let and const	CO1
В	The arrow functions, Interface, Classes, Inheritance using extends, Spread Operator	C01
С	Iterators and Generators, using extends, Default Parameter Values, Spread Operator	C01
Unit 2	Introduction to React	
A	Introduction to React, Features of React, Why React?, Angular vs React, Installation and Setup	CO2
В	Introduction to JSX, Why JSX, Why JSX, Embedding JavaScript, Expression in JSX, JSX as an Expression, Nested elements in JSX, JSX Attributes, JSX Comments, JSX Styling and representation as object	CO2
С	The State of the Component, Defining State, Changing the State, Props, Validation, Validators	CO2
Unit 2	React Components	
Unit 5		
A	Introduction to React Components, Components based Architecture, Type of Components, Functional vs Class Components	CO3
A B	Introduction to React Components, Components based Architecture, Type of Components, Functional vs Class Components React Props and State, Component Life Cycle, Error Boundaries, Introduction to List in React, why keys	CO3
A B C	Introduction to React Components, Components based Architecture, Type of Components, Functional vs Class Components React Props and State, Component Life Cycle, Error Boundaries, Introduction to List in React, why keys How to make HTTP Request, Introduction to Axios and FetchAPI, Styling in React, Different way of Styling components	CO3 CO3 CO3
A B C Unit 4	Introduction to React Components, Components based Architecture, Type of Components, Functional vs Class Components React Props and State, Component Life Cycle, Error Boundaries, Introduction to List in React, why keys How to make HTTP Request, Introduction to Axios and FetchAPI, Styling in React, Different way of Styling components <b>Events &amp; Forms in React</b>	CO3 CO3 CO3
A B C Unit 4 A	Introduction to React Components, Components based Architecture, Type of Components, Functional vs Class Components React Props and State, Component Life Cycle, Error Boundaries, Introduction to List in React, why keys How to make HTTP Request, Introduction to Axios and FetchAPI, Styling in React, Different way of Styling components <b>Events &amp; Forms in React</b> Event Handling in React, Conditional Rendering, creating forms in React,	CO3 CO3 CO3 CO4
A B C Unit 4 A B	Introduction to React Components, Components based Architecture, Type of Components, Functional vs Class Components React Props and State, Component Life Cycle, Error Boundaries, Introduction to List in React, why keys How to make HTTP Request, Introduction to Axios and FetchAPI, Styling in React, Different way of Styling components <b>Events &amp; Forms in React</b> Event Handling in React, Conditional Rendering, creating forms in React, How to add validation in forms, Introduction to Refs	CO3 CO3 CO3 CO4 CO4
A B C Unit 4 A B C	Introduction to React Components, Components based Architecture, Type of Components, Functional vs Class Components React Props and State, Component Life Cycle, Error Boundaries, Introduction to List in React, why keys How to make HTTP Request, Introduction to Axios and FetchAPI, Styling in React, Different way of Styling components <b>Events &amp; Forms in React</b> Event Handling in React, Conditional Rendering, creating forms in React, How to add validation in forms, Introduction to Refs Controlled Components, Uncontrolled Components	CO3 CO3 CO3 CO4 CO4 CO4



А	A Introduction to Routing, How to implement Routing,							
В	Introduction t	CO5, CO6						
С	Advantage of Installation	CO5, CO6						
Mode of examination	Theory							
Weightage	СА	MTE	ETE					
Distribution	25%	25%	50%					
Text book/s*	1. Mark Public							
Other References	1. Jon D Front-Enc							

S. No.	Course Outcome	Program Outcomes (PO) &
		Program Specific Outcomes (PSO)
1.	CO1: Identify key features of ES6 programming language.	PO1, PO2, PO3, PO5, PO10, PSO1
2.	CO2: Understand React application using JSX syntax, components, and state, and apply validation to props using propTypes.	PO1, PO2, PO3, PO4, PO8, PO10, PO12, PSO1, PSO2
3.	CO3: Differentiate between functional and class components, explain React props and state, and utilize HTTP requests with Axios and FetchAPI in React applications.	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PSO1, PSO2
4	CO4: Develop a React application that incorporates event handling, conditional rendering, and forms with validation, and implement controlled and uncontrolled components using refs.	PO1, PO2, PO3, PO4, PO5, PO6, PSO1, PSO2



5	CO5: Demonstrate the ability to utilizes routing	PO1, PO2, PO3, PO4, PO5, PO6, PO8
	and state management, including implementing	PO10, PSO1, PSO2
	routing and utilizing the Context API and Redux,	
	while being able to explain the advantages and	
	limitations of using Redux for state management.	
6	CO6: Analyze and evaluate the different routing	PO1, PO2, PO3, PO4, PO5, PO6, PO8
	mechanisms and strategies used in web	PO10, PSO1, PSO2
	applications.	

#### PO and PSO mapping with level of strength for Course Name: UX Expert..(Course Code ......)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO1 2	PSO1	PSO2
CO1	2	2	2	1	3	-	-	-	-	2	-	2	3	3
CO2	2	1	2	2	-	-	-	2	-	2		2	2	3
CO3	3	2	2	2	3	-	-	2	3	2		2	3	2
CO4	3	3	2	2	2	2	-	-	-	1		2	3	3
CO5	3	3	3	3	3	2	-	2	-	3		2	2	3
CO6	3	3	3	3	3	2	-	2	-	3		2	2	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Cours e Name	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2
		2.6	2.3	2.3	2.1	2.75	2		2	3	2.1		2	2.6	2.8

Strength of Correlation:

1-Slight (Low)

2-Moderate (Medium)

**3-Substantial (High)** 



# Syllabus: UI Specialist

School: SET		Batch: 2023-27						
Program: B.Tech		Current Academic Year: 2023-27						
Branch: CS		Semester: II						
1	Course Code							
2	Course Title	UI Specialist						
3	Credits	3						
4	Contact Hours (L-T-P)	3-0-1						
	Course Status	Core/Compulsory						
5	Course Objective	The course objective is to provide learners the skills to create dynamic responsive web applications using various tools and technologies.						
6	Course Outcomes	CO1: Understand the basic concepts and components of Full Stack development and differentiate between Web development and Full Stack development. (L1)						
		CO2: Identify and describe various HTML elements and attributes used to create structured and formatted web pages. (L2)						
		CO3: Apply HTML5 and CSS3 techniques to design and develop responsive pages with interactive features. (L3)						
		CO4: Analyze and evaluate the use of JavaScript in developing interactive web applications. (L4)						
	CO5: Demonstrate the ability to use JavaScript functions, objects, and e manipulate and control data, elements, and events on a web page. (L3)							
		CO6: Apply the JavaScript knowledge to implement Full Stack web appli						
7	Course Description	The course covers an introduction to Full Stack development, HTML, HTML5, CSS, JavaScript, and JavaScript functions, objects, and events. The purpose of this course is to give students the basic understanding of how things work in the Web world.						
8	Outline syllabus	3	CO Mapping					
	Unit 1	Introduction						


А	Introduction to Full Stack, Web development vs FullStack Development, Client-Server architecture	C01
В	MEAN, MERN, MEAN vs MERN stack	CO1
С	Rails, Django Stack and LAMP, Front End Frameworks and Libraries	CO1
Unit 2	Introduction to HTML	
A	Intoduction, Need of HTMl, HTML Tags, HTML Elements, Formatting Text in HTML, Headings, HTML Paragraphs	CO2
В	Identifying HTML Elements, HTML Basics & Attributes, HTML Links, Lists, Colors, Tables, Symbols	CO2
С	Overview of Attributes, Core Attributes, Styles, Class Attribute, Generic Attributes	CO2
Unit 3	Creating web pages with HTML5 & CSS	
A	HTML5 introduced features, HTML5 form validate/no validate, HTML5 canvas, embedding audio, and video in a webpage, drag and drop, HTML5 Local Storage, HTML5 web workers and server sent events, HTML Attributes, Forms, Form Validation, Validation to HTML Page	CO2, CO3
В	CSS Semantics, CSS Selectors CSS Styling, CSS Color, CSS Backgrounds, Borders, Margins, Padding, Box Model, Height width, Tables, Selectors, Display, CSS Buttons, CSS Animation, CSS Display, CSS Float & Clear, CSS Overflow	CO3
С	CSS Align- Horizontal & Center Responsive Web Design, View Port, Grid View, Media Queries, Flex Box	CO3
Unit 4	JavaScript	
A	JavaScript, importance, What can JavaScript Do, Need of JavaScript, JavaScript with HTML Content, HTML Attributes, HTML DOM Elements Java script with CSS	CO4
В	HTML Nodes, Syntax, Rules, Writing JavaScript, Tags, Programming Errors, Syntax Error, Runtime Error, Logical Errors, Data Types, Non-primitive, JavaScript Data Types,	CO4
С	Objects in JavaScript, Events in JavaScript Objects, Changing HTML Styles, Events, Event Handler	CO4, CO6



	Attributes, Ad directly, Usin	lding Event H g Event Attrib	andlers, Using Element Attribute							
	Using HTML	DOM, Reacti	ing to Events							
Unit 5	JavaScript F	unctions, Ob	jects & Events							
A	Introduction, methods, As o Nesting Functions & O	Execution of I constructor, ca Closure, Objec	Functions, Invoking Functions, As all (), arguments, apply (), bind (), cts	CO5, CO6						
В	Primitive Va Literal Synta: JavaScript	CO5, CO6								
С	nents array elements, objects Arrays, ag Array, Array Elements using Array array Elements, Converting Array d Joining Array into Strings with ethods & Manipulations, Sorting fethods, The Map ()	CO5, CO6								
Mode of examination	Theory									
Weightage	СА	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	1. Ivan CGI" 2. Rick JavaS	Bayross, "HTI , BPB Publica Delorme," Pro Script and CSS	ML,DHTML, JavaScript, Perl & tion ogramming in HTML5 with 53", Microsoft							
Other References	1. POW Complete	1. POWELL and THOMAS "Html & CSS: The Complete Reference", McGraw Hill								



S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Understand the basic concepts and components of Full Stack development and differentiate between Web development and Full Stack development.	PO1, PO2, PO3, PO5, PO10, PSO1
2.	CO2: Identify and describe various HTML elements and attributes used to create structured and formatted web pages.	PO1, PO2, PO3, PO4, PO8, PO10, PO12, PSO1, PSO2
3.	CO3: Apply HTML5 and CSS3 techniques to design and develop responsive web pages with interactive features.	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PSO1, PSO2
4	CO4: Analyze and evaluate the use of JavaScript in developing interactive web applications.	PO1, PO2, PO3, PO4, PO5, PO6, PSO1, PSO2
5	CO5: Demonstrate the ability to use JavaScript functions, objects, and events to manipulate and control data, elements, and events on a web page.	PO1, PO2, PO3, PO4, PO5, PO6, PO8 PO10, PSO1, PSO2
6	CO6: Apply the JavaScript knowledge to implement Full Stack web application	PO1, PO2, PO3, PO4, PO5, PO6, PO8 PO10, PSO1, PSO2

# PO and PSO mapping with level of strength for Course Name: UI Specialist .....(Course Code ......)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO1 2	PSO1	PSO2
CO1	2	2	2	1	3	-	-	-	-	2	-	2	3	3
CO2	2	1	2	2	-	-	-	2	-	2		2	2	3
CO3	3	2	2	2	3	-	-	2	3	2		2	3	2
CO4	3	3	2	2	2	2	-	-	-	1		2	3	3
CO5	3	3	3	3	3	2	-	2	-	3		2	2	3
CO6	3	3	3	3	3	2	-	2	-	3		2	2	3



Average of non-zeros entry in following table (should be auto calculated).

Course Code	Cours e Name	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2
		2.6	2.3	2.3	2.1	2.8	2		2	3	2.1		2	2.5	2.8

Strength of Correlation:

1-Slight (Low)

2-Moderate (Medium)

**3-Substantial (High)** 



# Syllabus: Backend Development

Scho	ool:	School of Engineering & Technology									
Dep	artment	Computer Science & Engineering									
Prog	gram:	B.tech									
Brai	nch:	Semester: IV									
1	Course Code										
2	Course Title	Backend Development									
3	Credits	4									
4	Contact Hours (L-T-P)	3-0-2									
	Course Status										
5	Course Objective	<ol> <li>Understand fundamentals of Node.js open-source platform for we application development.</li> <li>Demonstrate the knowledge of different techniques for the purpor of back-end development.</li> <li>Apply theories and concepts associated with effective work desig to real world applications</li> </ol>									
6	Course	after studying this course student will be able to: <b>CO1:</b> Describe fundamentals of Node.js and visual studio <i>for</i> <i>web application development</i> . <b>CO2:</b> Analyse the working of file system and buffering mod for the purpose of handling and designing files and streaming <b>CO3:</b> Analyse asynchronous programming techniques in or potentially long running task. <b>CO4:</b> Apply the concept of express node routing framework. <b>CO5:</b> Apply REST API for data accessing and manipulation. <b>CO6:</b> Develop various web application projects by u mechanism of Node.js.	the purpose of ules of Node.js of binary data. order to start a using different								
7	Course Description	Students will learn the fundamental concepts of Node.js, express node routing framework and other associated API th in teams on web application projects, supported by lectures, d implementation. They will learn to evaluate and desig appropriate software based on technical analysis.	visual Studio, rough working liscussions, and gn usable and								
8	Outline syllabus		CO Mapping								
	Unit 1										
	Α	Introduction to Node.js-What is Node.js, History of Node.js, Why Node.js, Node.js Architecture, Working and Features.	CO1								
	В	Installation and Setup, Installing Node.js, Launching REPL.	CO1								
	C	Environment, Installing Visual Studio, Code Editor, Components of Node.js, Node.js success stories, Node.js architecture, Features, Nodejs Module.	CO1								
1	Unit 2										



А	NPM- File Systems, Operating Systems.	CO2
В	Writing to Buffers, Reading from Buffers, Concatenating	CO2
	Buffers, Copying Buffers, Slicing Buffers.	
С	The Stream Module, Reading from Stream, Writing to	CO2
	Stream, Pipes, Pipe Chaining.	
Unit 3		
А	Asynchronous Programming in Node.js- Explain the Event	CO3
	Loops, Callback hell	
В	Promises, how to work with Promises, discuss about Async	CO3
	and Await, Error Handling	
Unit 4		
А	Express Framework, Installing Express, Express Request.	CO4
В	Request Properties, Express Response, Response Object	CO4
	Properties	
С	Response Object Methods, Routing, Routing Parameters,	CO4
	Middleware	
Unit 5		
А	Node.js to Build REST APIs- BUILLDING A REST API,	CO5, CO6
	Request Object, Response Object.	
В	The GET, The GET with Parameter, The POST, create a	CO5, CO6
	REST API for User Management, creating a CRUD API	
	using Express, GET Route, Using POSTMAN.	
Mode of	Theory/Jury/Practical/Viva	
examination		
Text book/s*		
Other		
References		



S.	Course Outcome	Program Outcomes
No.		(PO) & Program
		Specific Outcomes
		(PSO)
1.	CO1: Describe fundamentals of Node.js and visual studio for the	PO1, PO2, PO3, PO5
	purpose of web application development	
2.	<b>CO2:</b> Analyse the working of file system and buffering modules of	PO1, PO2, PO3, PO5,
	Node.js for the purpose of handling and designing files and	PO9, PO10
	streaming of binary data	
3.	<b>CO3</b> : Analyse asynchronous programming techniques in order to	PO1, PO2, PO3, PO9
	start a potentially long running task.	
4.	<b>CO4</b> : Apply the concept of express node routing framework	PO1, PO2, PO3, PO5,
		PO9, PO10
5.	CO5: Apply REST API for data accessing and manipulation	PO1, PO2, PO3, PO5,
		PO9, PO10
6.	<b>CO6:</b> Develop various web application projects by using different	PO1, PO2, PO3, PO5,
	mechanism of Node.js.	PO9, PO10, PO11,
		PO12

### PO and PSO mapping with level of strength

Course Code_ Course Name	CO's	РО 1	РО 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS 0 1	PSO2
	CO1	5	3	3		4							
	CO2	1	5	4		5				4	1		
	CO3	3	3	3						4			
	CO4	3	3	3		4				3	3		
Backend	CO5	2	2	2		3				4	4		
Development	CO6	2	2	2		3				4	4	3	3

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
	Backend Develop ment												

Strength of Correlation

1. Addressed to Slight (Low=1) extent2. Addressed to Moderate (Medium=2) extent3. Addressed to Substantial (High=3) extent



Sch	ool:	School of Engineering & Technology									
Dep	artment	Computer Science & Engineering									
Pro	gram:	B.Tech									
Bra	nch:	Semester: V									
1	Course Code										
2	Course Title	Test Automation									
3	Credits	3									
4	Contact	2-0-2									
	Hours										
	(L-T-P)										
	Course										
	Status										
5	Course	1- Understand fundamentals and techniques of so	ftware testing								
	Objective	for the purpose of UI testing.									
		2- Analyse and apply different automated testing to	ols.								
		3- Design and develop test suite for the purpose of testing and perform comparative study on	of application								
		testing and perform comparative study on manual and automated testing.									
6	Course	after studying this course student will be able to:									
	Outcomes	<b>CO1:</b> Define fundamentals and technologies of software tes	ting in order to								
		test the different functionalities.									
		CO2: Analyse the task of different automated testing tools for web									
		applications.									
		<b>CO3:</b> Apply the concept of selenium 3.x automated tool in order to									
		perform automated testing.									
		<b>CO4:</b> Contrast the working of manual testing with automated testing.									
		<b>CO5:</b> Design test suite for platform testing.									
		CO6: Develop real world web applications on the basi	s of technical								
		analysis and perform automated testing by using different	nt tools.								
7	Course	Student will learn the basics of software testing includin	g functional								
	Description	and GUI testing. They will perform comparative survey	based on the								
		automated and manual testing. Student will apply variou	is modern								
		tools for the purpose of automated testing by designing	test cases.								
8	Outline syllabi	18	CO								
Ũ			Mapping								
	Unit 1										
	А	Introduction to Software Testing- Seven principles of	CO1								
		Software Testing, SDLC vs STLC, Testing Life Cycle.									
	В	Usability Testing, why do we need Usability Testing, how to	CO1								
		do Usability testing, Advantages & Disadvantages.									

Syllabus: Test Automation



	С	Functional Testing, End to End Testing, Methods,	CO1
		GUI testing, Techniques API testing, Advantages.	
	Unit 2		
·	A	Test Automation- Selenium, Selenium components,	CO2
		Selenium Architecture.	
	В	TestNGInstalling TestNg in Eclipse, TestNG annotations –	CO2
		Understanding usage, setting priority of execution for test cases.	
	С	Hard Assertion, Soft Assertion, TestNG Reports, ANT-	CO2
		Downloading & Configuring, XSLT report generation using	
		TestNg and Ant, Creating Test Scripts using JavaScript	
	Unit 3		
	А	Introduction to Selenium 3.x- Describe Selenium 3.x	CO3
		advantages and implementation, define drivers for Firefox,	
		IE, chrome, iPhone, Android etc, Analyse first Selenium	
		Code, differentiate between Close and Quit.	
	В	Describe Firepath and firebug Add-ons installation in	CO3
		Mozilla, inspect elements in Mozilla, Chrome and IE,	
		Identifying Web Elements using id, name, class, Generate	
		own CSS Selectors. Differentiate between performance of	
		CSS Selectors as compared to Xpaths	
	C	Define class attribute, Handle Dynamic objects/ids on the	
		page, Analyse whether object is present on page or not	
-	Unit 4		
	A	Manual Testing- Manual Testing, Manual Testing – How to	CO4
		Approach? Manual Testing – Myth and fallacy, Defect Life	
		Cycle, Qualities of a good Manual Tester.	<u> </u>
	В	Manual Testing vs Automation Testing, Types, System	CO4
		Interaction Tracting, Smole, Sanity Testing, Techniques,	
	Init 5	integration resting, smoke- samty resting.	
-		Introduction to Test Design Test Scenerio	CO5 CO6
	A	The Case Decise Test Design-Test Scenario.	CO3, CO6
	B	Test Case Design, Test Basis Traceability Matrix.	005,006
	Mode of	Theory/Jury/Practical/Viva	
	examination		
	Text book/s*		
	Other		
	References		
00	10016		

S.	Course Outcome	Program Outcomes
No.		(PO) & Program



		Specific Outcomes
		(PSO)
1.	<b>CO1:</b> Define fundamentals and technologies of software testing in	PO1, PO2
	order to test the different functionalities.	
2.	<b>CO2:</b> Analyse the task of different automated testing tools for	PO1, PO2, PO3,
	web applications.	PO5
3.	<b>CO3:</b> Apply the concept of selenium 3.x automated tool in	PO1, PO2, PO3,
	order to perform automated testing.	PO5, PO9, PO10
4.	<b>CO4:</b> Contrast the working of manual testing with automated	PO1, PO2, PO3,
	testing.	PO4, PO10
5.	<b>CO5:</b> Design test suite for platform testing.	PO2, PO3, PO5,
		PO10
6.	CO6: Develop real world web applications on the basis of	PO1, PO2, PO3,
	technical analysis and perform automated testing by using	PO4, PO5, PO6,
	different tools.	PO9, PO10

# PO and PSO mapping with level of strength

Course Code_ Course Name	CO's	PO 1	PO 2	РО 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O 1	PSO2
	CO1	3	3										
	CO2	3	3	3		3							
	CO3	3	3	3		5				2	2		
	CO4	3	3	3	3						3		
Test	CO5		3	3		5					4		
Automation	CO6	2	2	2	2	5	3			3	3		

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
	Test Automati on												

## Strength of Correlation

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to Moderate (Medium=2) extent
- 3. Addressed to Substantial (High=3) extent



Scho	ool: SET	Batch: 2023-2027							
Prog	gram: B. Sc.	Current Academic Year: 2023-24							
Brai	nch: CS	Semester: VI							
1	Course Code								
2	Course Title	Database Engineering with MongoDB							
3	Credits	4	4						
4	Contact Hours	3-0-2							
	(L-T-P)								
	Course Status	Core/Compulsory							
5	Course	To develop skills in analyzing the knowledge of file syste	To develop skills in analyzing the knowledge of file system namespace,						
	Objective	NoSQL database approach, sharding in NoSQL, MongoL	OB operations,						
		and read and query operations.							
6	Course	CO1: Understand file system namespace, terminology	, hierarchy, and						
	Outcomes	limitations of traditional file systems.							
		CO2: Recognize the benefits and types of NoSQL data	bases, including						
		key-value, wide-column, document, and graph-based data	abases.						
		CO3: Identify database scaling, replication, sharding, an	d its challenges,						
		along with the scaling of NoSQL databases.	<b>C</b>						
		CO4: Apply MongoDB principles, design goals, tools, CRUD operations,							
		and basic commands to install, use features, and operate ]	MongoDB.						
		CO5: Demonstrate the application of MongoDB	uerv operators.						
		projections, and indexes to filter and sort data using nested	d documents and						
		arrays as well as querying on nested arrays with multiple	conditions						
		CO6: Elaborate on MongoDB query operations' imple	ementation with						
		purpose syntax and examples on nested documents and	arrays						
7	Course	The course explores a range of topics related to database engineering							
,	Description	including traditional storage devices file systems NoSOL detabases							
	F	abarding raphication and Manage DP, with a former an anaptical analization							
		and analysis of these concepts	lical application						
8	Outline syllabus	and analysis of these concepts.	CO Manning						
0	Unit 1	The File System Nemosnace	CO Mapping						
		Interne System Namespace	CO1						
	А	Introduction to Data Storage, Types of Data Storage	COI						
	6	Media, Traditional Storage Devices.	<b>GO1</b>						
	В	he File System Namespace – an Introduction, File	COI						
		Systems, File System Terminologies, Extents and							
		Attributes, File Metadata, Directories, Some Basic							
		Filesystem Operations.							
	С	File System Hierarchy, Common File Systems,	CO1						
		Limitations of Traditional File Systems							
	Unit 2	NoSQL Database Approach							
	A	What is the NoSQL approach? Why Use the NoSQL	CO2						

Syllabus: Database Engineering



	Approach?, Benefits of NoSQL.							
В	Types of Databases, Key-Value Stores, Wide-column	CO2, CO3						
	Stores/Columnar Databases.							
С	Document/ Document-store/ Document oriented	CO2, CO3						
	Databases, Graph based Databases.							
Unit 3	Sharding in NoSQL							
А	Managing Database for Availability and Performance,	CO2, CO3						
	Database Scaling, Database Distribution Models,							
	Database Replication, Types of Database Replication,							
	Master-Slave Replication, Peer-to-Peer Replication.							
В	B Introduction to Sharding, Why Sharding, The Lookup							
	and Replication.							
С	Scaling of NoSQL Databases with Sharding,	CO2, CO3						
	Algorithmic Sharding, Dynamic Sharding, Entity							
Unit 4	Introduction to MongoDB & Its Operations							
А	Introduction to MongoDB, CAP Theorem, Collections	CO4						
	& documents, understanding data types in MongoDB,							
	Features of MongoDB Module.							
В	Overview of MongoDB, Principles & Design Goals for	CO4						
	MongoDB Server and Database, MongoDB tools.							
C	MongoDB Installation on Windows, and Cloud, CRUD	CO4						
	operations, Basic MongoDB Commands.							
Unit 5	Read and Query Operations							
Α	Importing data, Nested documents, Arrays in	CO5, CO6						
	MongoDB, Sorting Documents, Mongo Shell / Driver,							
	Query Comparison Operators, Nested Documents,							
-	Matching an embedded document.	<u> </u>						
В	Query on Nested Field, Setting up filters using query	CO5, CO6						
	operators, Arrays in MongoDB, Querying on Array,							
	Querying the array for an Element, Querying for an							
C	CO5 CO7							
C	Nested Arrays in MongoDB, Querying on Nested	005, 006						
	Arrays, Querying on Array of Embedded Documents,							
	querying with multiple conditions on nested Fields,							
	Projections Operations, working with indexes.							



Mode of	Theory	Theory								
examination										
Weightage	CA	MTE	ETE							
Distribution	25%	25%	50%							
Text book/s*	1. "Dat	abase Syster	ns: Design, Imple	ementation,						
	and	and Management" by Carlos Coronel, Steven								
	Mor	Morris, and Peter Rob, published by Cengage								
	Lear	Learning.								
	2. "Mo	ngoDB: The								
	Choo	lorow, publis								
	3. "Nos	SQL Distille	d: A Brief Gui	de to the						
	Eme	rging World	of Polyglot Persi	istence" by						
	Pran	Pramod J. Sadalage and Martin Fowler,								
	publ	ished by Addi	son-Wesley Profes	ssional.						
Other	1. "File	System Fo	rensic Analysis"	by Brian						
References	Carri	er, publish	ed by Addis	son-Wesley						
	Profe	ssional.								

S. No.	Course Outcome	Program Outcomes (PO) &
		Program Specific Outcomes (PSO)
1.	CO1: Understand file system namespace,	PO1, PO2, PO3, PO4, PO5, PO10,
	terminology, hierarchy, and limitations of	PSO1, PSO2
	traditional file systems	
2.	CO2: Recognize the benefits and types of NoSQL	PO1, PO2, PO3, PO4, PO8, PO10,
	databases, including key-value, wide-column,	PSO1, PSO2
	document, and graph-based databases.	
3.	CO3: Identify database scaling, replication,	PO1, PO2, PO3, PO4, PO5, PO9,
	sharding, and its challenges, along with the	PSO1, PSO2
	scaling of NoSQL databases	
4	CO4: Apply MongoDB principles, design goals,	PO1, PO2, PO3, PO4, PO6, PO7,
	tools, CRUD operations, and basic commands to	PSO1, PSO2
	install, use features, and operate MongoDB	
5	CO5: Demonstrate the application of MongoDB	PO1, PO2, PO3, PO4, PO5, PO8
	query operators, projections, and indexes to filter	PO10, PSO1, PSO2
	and sort data using nested documents and arrays,	
	as well as querying on nested arrays with multiple	
	conditions	
6	CO6: Elaborate on MongoDB query operations'	PO1, PO2, PO3, PO4, PO6, PO7, PO9,
	implementation with purpose, syntax, and	PO10, PSO1, PSO2
	examples on nested documents and arrays	



**PO and PSO mapping with level of strength for Course Name** Database Engineering with MongoDB (**Course Code:** )

Cos	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PSO 1	PSO2
CO1	3	2	3	3	3	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	3	-	2	2	3
CO3	2	3	2	2	2	-	-	-	3	-	3	2
CO4	3	2	2	2	-	3	3	-	-	-	3	3
CO5	2	3	3	3	3	-	-	2	-	3	2	3
CO6	3	3	3	3	-	2	2	-	2	2	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
		2.7	2.7	2.7	2.7	2.7	2.5	2.5	2.5	2.5	2.3	2.7	2.8

### Strength of Correlation

Addressed to Slight (Low=1) extent
 Addressed to Substantial (High=3) extent



Scho	ool: SET	Batch: 2023-2027						
Prog	gram: B. Sc.	Current Academic Year: 2023-24						
Brai	nch: CS	Semester: VI						
1	Course Code							
2	Course Title	Deployment with Development Operations						
3	Credits	4						
4	Contact Hours	3-0-2						
	(L-T-P)							
	Course Status	Core/Compulsory						
5	Course	To develop a comprehensive understanding of DevOps p	rinciples, tools,					
	Objective	and practices, enabling them to effectively implement and	d manage					
		DevOps processes for efficient software development and	d deployment.					
6	Course	CO1: Define DevOps principles, identify challenges	in traditional IT					
	Outcomes	systems, and understand the need for building a business of	case for DevOps.					
		CO2: Utilize Linux, Git, Docker, Jenkins, and other too	ols to implement					
		DevOps practices effectively.						
		CO3: Apply version control systems, with a focus on Git, and unders						
		the advantages of distributed version control.						
		CO4: Analyze containerization concepts, Docker architecture,						
		deployment using Docker Swarm and Kubernetes.						
		CO5: Design and implement advanced CI/CD processes, including code						
		analysis, artifact management, and automated functional	testing					
		CO6: Elaborate the usage of different DevOps tool in rea	l life.					
7	Course	This course is an overview of the modern Web technolog	ies used for the					
	Description	Web development. The purpose of this course is to give s	students the					
		basic understanding of how things work in the Web work	d.					
8	Outline syllabus		CO Mapping					
	Unit 1	Introduction to DevOps	11 0					
	Α	Definition of DevOps: Challenges of traditional IT	CO1					
		systems & processes. History and emergence of						
		DevOps, DevOps definition and principles governing						
		DevOps.						
	В	DevOps and Agile, the need for building a business use	CO1					
		case for DevOps, Purpose of DevOps, Application						
		Deployment Automated Application Deployment						
	С	Application Release Automation (ARA) Components	CO1					
		of Application Release Automation (ARA) Best						
		Practices of CL Benefits of CL CAMS						
	Unit 2	Introduction to DevOps Tools & Technologies						
		introduction to Devops roots & rectinologies						

Syllabus: Deployment with Development Operations



А	Introduction to Linux (OS) & why it is important to	CO2
	know Linux while working with DevOps, Git & GitHub	
	(SCM).	
В	Docker (Containerization), Jenkins (CI/CD Pipelines),	CO2
	Terraform (Provisioning), Maven (Build & Release	
	Management), Ansible (Configuration Management).	
С	Selenium (Test Automation), AWS (Cloud Computing),	CO2
	SonarQube (Code Quality Checking),	
	Prometheus/Nagios (Monitoring).	
Unit 3	Source Code Management	
А	History of Version Control Systems (VCS), Basic	CO2, CO3
	operations in a VCS, Examples of version control	
	systems, Subversion (SVN), Features and Limitations.	
В	Mercurial, Git, Overview, History - Linux and Git by	CO3
	Linus Torvalds, Advantages of Git, Explain how local	
	version control works.	
С	Centralized Version Control Systems (CVCS),	CO3
	Distributed Version Control Systems (DVCS),	
	advantages of DVCS, Private Workspace.	
Unit 4	Application Containerization	
A	Understanding Containers: Transporting Goods	CO4
	Analogy, Problems in Shipping Industry before	
	Containers, Shipping Industry Challenges, Container:	
	Virtualization Introduction, Hypervisor, Scope of	
	Virtualization, Containers vs Virtual Machines,	
	Understanding Containers, Containerization.	
В	The Chroot System, FreeBSD Jails, Linux Containers	CO4
	(LXC), Docker, Introduction to Containerization Docker	
	architecture, Docker Daemon (Container Platform),	
	Docker Rest API, CLI Different environments.	
С	Development Environment Docker Swarm and	CO4,CO6
	Kubernetes, Jenkins Installation, Jenkins Dashboard &	
	UI understanding, Jenkins Job, Jenkins Triggers, Jenkins	
	Plugins, Multi Node cluster setup with architecture,	
	Installing/Configuring Nexus Deploying the application	
	to staging/prod environment, Docker integration with	
 Unit 5	Introduction to CI	
A	Continuous Integration Workflow, Benefits of	CO5, CO6
	Continuous Integration, How CI Benefits Distributed	
	Teams, Continuous Delivery, Steps Involved in CICD,	



	Pipelines, Pr										
	Continuous										
	Deployment										
В	The HP Lase	CO5, CO6									
	Key metrics										
	Bug Report										
	Frameworks										
	Coverage an										
	Coverage, L										
	reports to Jer										
С	Uploading b	Uploading build artifact to a repository, Advanced CI									
	process, Aut	process, Automated Functional Testing, Publish Report									
	to the Devel	opment Team	n, Google Canary release Case								
	study.										
Mode of	Theory										
examination											
Weightage	CA										
Distribution	25%	25%	50%								
Text book/s*	1. "The	DevOps Han	dbook: How to Create World-								
	Class	Agility, H	Reliability, and Security in								
	Huml	ble Patrick De	bois and John Willis (Publisher								
	IT Re										
	2. "Dev										
	(Publ										
Other	1. "Cont										
References	through										
	Dy J										
	2 "Effe										
	Z. Elle Colla	boration. Affi	nity, and Tooling at Scale" by								
	Jenni	fer Davis and	Ryn Daniels (Publisher: O'Reilly								
	Media	a)									

S. No.	Course Outcome	Program Outcomes (PO) &				
		Program Specific Outcomes (PSO)				
1.	CO1: Define DevOps principles, identify	PO1, PO2, PO3, PO4, PO5, PO10,				
	challenges in traditional IT systems, and	PSO1, PSO2				
	understand the need for building a business case for					
	DevOps.					
2.	CO2: Utilize Linux, Git, Docker, Jenkins, and	PO1, PO2, PO3, PO4, PO8, PO10,				
	other tools to implement DevOps practices	PSO1, PSO2				
	effectively.					



3.	CO3: Apply version control systems, with a focus	PO1, PO2, PO3, PO4, PO5, PO9,				
	on Git, and understand the advantages of	PSO1, PSO2				
	distributed version control.					
4	CO4: Analyze containerization concepts, Docker	PO1, PO2, PO3, PO4, PO6, PO7,				
	architecture, and deployment using Docker Swarm	PSO1, PSO2				
	and Kubernetes.					
5	CO5: Design and implement advanced CI/CD	PO1, PO2, PO3, PO4, PO5, PO8				
	processes, including code analysis, artifact	PO10, PSO1, PSO2				
	management, and automated functional testing.					
6	CO6: Elaborate the usage of different DevOps tool	PO1, PO2, PO3, PO4, PO6, PO7, PO9,				
	in real life.	PO10, PSO1, PSO2				

# **PO and PSO mapping with level of strength for Course Name** Deployment with Development Operations (**Course Code** )

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PSO1	PSO2
CO1	3	2	3	3	3	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	3	-	2	2	3
CO3	2	3	2	2	2	-	-	-	3	-	3	2
CO4	3	2	2	2	-	3	3	-	-	-	3	3
CO5	2	3	3	3	3	-	-	2	-	3	2	3
CO6	3	3	3	3	-	2	2	-	2	2	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
	Deployment with Developmen t Operations	2.7	2.7	2.7	2.7	2.7	2.5	2.5	2.5	2.5	2.3	2.7	2.8

### Strength of Correlation

- 1. Addressed to Slight (Low=1) extent
- 2. Addressed to *Moderate* (*Medium=2*) *extent*
- 3. Addressed to Substantial (High=3) extent