

PROGRAMME STRUCTURE

Sharda School of Engineering & Technology

Department of Computer Science & Applications

Bachelor of Computer Application

Programme Code: SET0103

Batch: 2023-2026

Programme Structure								
Sharda School of Engineering & Technology								
Department of Computer Science & Applications								
BCA								
Batch: 2023-26						SEMESTER: I		
S. No.	Course Code	Paper ID	Course	Teaching Load			Credits	Type of Course
								1. CC
								2. DSE
								3. OE
							4. SEC	
							5. AECC	
				L	T	P	6. VAC-I	
THEORY SUBJECTS								
1	BCA181		Problem solving using C Programming	4	0	0	4	CC
2	BCA183		Digital Electronics & Computer Organization	4	0	0	4	DSE
3			Open Elective -1					
	BCA176		Introduction to Computers & Technology	3	0	0	3	OE
	BCA189		Entrepreneurship Development					
	BCA283		Artificial Intelligence					
4	BCA041		Introduction to IoT	2	0	0	2	SEC
5	ARP103		Communicative English-1	2	0	0	2	AECC
6	BCA173		Ethics and Social Implications of AI	3	0	0	3	VAC-1
Practical/Viva-Voce/Jury								
7	BCP181		Problem solving using C Programming Lab	0	0	2	1	CC
8	BCP041		Introduction to IOT with hands-on lab Implementation	0	0	2	1	SEC
TOTAL CREDITS							20	

Programme Structure									
Sharda School of Engineering & Technology									
Department of Computer Science & Applications									
BCA									
Batch: 2023-26						SEMESTER: II			
S. No.	Course Code	Paper ID	Course	Teaching Load			Credits	Type of Course	
								1. CC	
								2. OE	
								3. SEC	
				L	T	P		4. AECC	
								5. VAC-II	
THEORY SUBJECTS									
1	BCA286		Data Structures Using C	4	0	0	4		CC
2	BCA185		Operating System and Unix Shell Programming	3	0	0	3		CC
			Open Elective-2						
3	BCA188		Ethics and Social Implications of AI	3	0	0	3		OE
4	BCA289		Mobile Application Development						
5	VOC102		Design thinking & creative learning	1	0	0	1		SEC
6	ARP105		Communicative English -2	2	0	0	2		AECC
7	EVS		Environmental Studies	3	0	0	3		VAC-2
Practical/Viva-Voce/Jury									
8	BCP286		Data Structures Lab	0	0	2	1		CC
9	BCP185		Operating System and Unix Shell Programming Lab	0	0	2	1		CC
10	VOCP102		Design thinking & creative learning Lab	0	0	4	2		SEC
TOTAL CREDITS							20		

Programme Structure									
Sharda School of Engineering & Technology									
Department of Computer Science & Applications									
BCA									
Batch: 2023-26						SEMESTER: III			
S. No.	Course Code	Paper ID	Course	Teaching Load			Credits	Type of Course	
				L	T	P		1. CC	2. DSE
THEORY SUBJECTS									
1	BCA186		Object Oriented Programming Using Java	4	0	0	4	CC	
2	BCA184		Principles of Data Base Management System	4	0	0	4	CC	
3	BCAO222		Computational Methods	4	0	0	4	DSE	
			Open Elective-3						
4	BCA369		Introduction to Blockchain Technology	3	0	0	3	OE	
5	BCA370		Cyber Analytics						
6	VOC201		Augmented Reality Applications Development	2	0	0	2	SEC	
7	ARP209		Logical Skills Building and Soft Skills	2	0	0	2	AECC	
Practical/Viva-Voce/Jury									
8	BCP185		Object Oriented Programming Using Java Lab	0	0	2	1	CC	
9	BCP184		Principles of Data Base Management System Lab	0	0	2	1	CC	
10	RBL001		Research Based Learning-1	0	0	2	0	Audit Course	
TOTAL CREDITS							21		

Programme Structure									
Sharda School of Engineering & Technology									
Department of Computer Science & Applications									
BCA									
Batch: 2023-26						SEMESTER: IV			
S. No.	Course Code	Paper ID	Course	Teaching Load			Credits	Type of Course	
				L	T	P		1. CC	2. DSE
THEORY SUBJECTS									
1	BCA284		Design and Analysis of Algorithm	4	0	0	4	CC	
2	BCA282		Computer Networks and Data Communication	4	0	0	4	CC	
3	BCA281		Application based Programming in Python	4	0	0	4	DSE	
4			Open Elective-IV						
	BCA402		Data Warehousing and Data Mining	3	0	0	3	OE	
5	BCA403		Social Media Analytics						
6	ARP210		Quantitative & Qualitative Aptitude Skill Building	2	0	0	2	AEC	
Practical/Viva-Voce/Jury									
7	BCP284		Design and Analysis of Algorithm Lab	0	0	2	1	CC	
8	BCP281		Application based Programming in Python Lab	0	0	2	1	DSE	
9	RBL002		Research Based Learning-2	0	0	2	0	Audit Course	
TOTAL CREDITS							19		

Programme Structure								
Sharda School of Engineering & Technology								
Department of Computer Science & Applications								
BCA								
Batch: 2023-26						SEMESTER: V		
S. No.	Course Code	Paper ID	Course	Teaching Load			Credits	Type of Course
								1. CC
				L	T	P		2. DSE
								3. INTERNSHIP
THEORY SUBJECTS								
1	BCA381		Web Technologies	4	0	0	4	CC
2	BCA285		Introduction to R	4	0	0	4	CC
3	BCA382		Software Engineering and Quality Assurance	4	0	0	4	CC
4	BRM002		Research Methodology	3	0	0	3	DSE
Practical/Viva-Voce/Jury								
5	BCP381		Web Technology Lab	0	0	2	1	CC
6	BCP285		Introduction to R Lab	0	0	2	1	CC
7	RBL003		Research Based Learning-3	0	0	4	2	DSE
8	INC003		Industry Connect	0	0	2	1	INTERNSHIP
TOTAL CREDITS							20	

Programme Structure									
Sharda School of Engineering & Technology									
Department of Computer Science & Applications									
BCA									
Batch: 2023-26					SEMESTER: VI				
S. No.	Course Code	Paper ID	Course	Teaching Load			Credits	Type of Course	
								1. CC	
								2. OE	
								3. DSE	
			L	T	P	4. VAC			
THEORY SUBJECTS									
1	BCA606		Dot Net Framework using C#	4	0	0	4		CC
2	BCA368		Machine Learning	4	0	0	4		CC
3	BCA190		Cloud Computing	4	0	0	4		CC
			Open Elective-V						
4	BCA604		Information Security and Cyber Laws	3	0	0	3		OE
5	BCA605		Big Data Analytics						
Practical/Viva-Voce/Jury									
6	BCP606		Dot Net Framework using C# Lab	0	0	2	1		CC
7	BCP368		Machine Learning Lab	0	0	2	1		CC
8	RBL004		Research Based Learning-4	0	0	4	2		DSE
9	CCU108		Community Connect	0	0	2	1		VAC
TOTAL CREDITS							20		



Course Modules

TERM-I

Syllabus: Problem solving using C Programming

School		Sharda School of Engineering & Technology	
Batch		2023-2026	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		I	
1	Course Code	BCA181	
2	Course Title	Problem solving using C Programming	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Programme core	
5	Course Objective	To learn computer fundamentals and basic computer organisation. Along with that the objective is to learn basic Programming constructs –data types, decision structures, control structures in C to apply knowledge in real life software building.	
6	Course Outcomes	Students will be able to: CO1: Enumerate core concept of C Programming CO2: Discuss Programmes using Array and String CO3: Develop Functions for any problem CO4: Classify Union and Structure to write any Programme CO5: Implement concept of Pointers CO6: Predict a real world problem with the help of c Programming	
7	Course Description	Programming for problem solving gives the Understanding of C Programming and implement code from flowchart or algorithm	
8	Outline syllabus		CO Mapping
	Unit 1	Computer Fundamentals and Basic Computer Organization	CO1, CO6
	A	Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of computers, Types and generations of Computers, introduction to operating systems, Types of Software; Application software and system software.	
	B	Units of a computer, CPU, ALU, memory hierarchy, registers, I/O devices, number system.	
	C	Techniques of Problem Solving: Flowchart, decision table, algorithms, Structured Programming concepts, Programming methodologies viz. top-down and bottom-up Programming .	
	Unit 2	Introduction to C Programming	CO2, CO6
	A	Introduction to C Programming language, Data types, Variables, Constants, Identifiers and keywords, Storage classes	
	B	Operators and expressions, Types of Statements: Assignment, Control, jumping, Control statements: Decisions, Loops, break, continue	

	C	Dynamic memory allocation (malloc, calloc, realloc, free), recursion-definition, Example-Tower of Hanoi problem, Tail Recursion.	
	Unit 3	Arrays and Functions	CO3, CO6
	A	Arrays: One dimensional and multidimensional arrays: Declaration, Initialization and array manipulation	
	B	Functions: Definition, Declaration/Prototyping and Calling, Types of functions, Parameter passing: Call by value, Call by reference.	
	C	Passing and Returning Arrays from Functions, Recursive Functions.	
	Unit 4	Pre-processors and Pointers	CO4, CO6
	A	Pre-processors: Types, Directives, Pre-processors Operators (#,##,\)	
	B	Pointer: Introduction, declaration of pointer variables, Operations on pointers: Pointer arithmetic, Arrays and pointers, Dynamic memory allocation.	
	C	String: Introduction, predefined string functions, Manipulation of text data, Command Line Arguments.	
	Unit 5	User Defined Data Types and File Handling	CO5, CO6
	A	Structure and Unions: Introduction, Declaration, Difference, Application, Nested structure, self-referential structure, Array of structures, Passing structure in function.	
	B	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.	
	C	Industry oriented Question solving, Expert talk on Coding challenges.	
	Mode of examination	Theory	
	Weightage Distribution	CA 25%	MTE 25%
			ETE 50%
	Text book/s*	Kernighan, Brian, and Dennis Ritchie. <i>The C Programming Language</i>	
	Other References	1. 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 Hill- 1999	

Course outline	
This course implements array and pointer and Recursive applications. The course talks primarily about Array, string, functions, structure & union and Pointers etc.	
Course Evaluation	
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. <i>The C Programming Language</i>
Other References	1. B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004. 2. E. Balagurusamy - Programming in ANSIC - Second Edition - Tata McGraw Hill- 1999
Software	Turbo C

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Enumerate core concept of C Programming	PO1,PO2,PO3, PO9, PSO1,PSO2
2.	CO2: Discuss Programmes using Array and String.	PO1,PO3, PO4, PO5, PO9, PO11,PSO1,PSO2
3.	CO3: Develop Functions for any problem	PO1,PO3,PO4, PO9, PSO2
4.	CO4: Classify Union and Structure to write any Programme	PO1,PO3,PO4, PO9, PSO2
5.	CO5: Implement concept of Pointers	PO1,PO3,PSO2
6	CO6: Predict a realworld problem with the help of c Programming	PO1,PO2,PO3,PO4,PO9, PO11,PSO1 PSO2,PSO3

PO and PSO mapping with level of strength for Course Name- Problem solving using C Programming (Course Code BCA181)

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	PSO 1	PSO2
BCA181_Problem solving using C Programming	CO1	2	2	3	2	2	2	-	-	2	-	3	2
	CO2	3	2	3	2	2	2	-	-	3	-	3	3
	CO3	2	2	3	2	2	3	-	-	2	2	2	3
	CO4	1	1	2	1	1	2	-	2	2	1	2	2
	CO5	2	3	3	2	2	2	-	2	3	2	3	2
	CO6	3	2	3	3	1	3	-	3	2	2	2	3

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

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
BCA181	Problem solving using C Programming	2.17	2	2.83	2	1.67	2.33	-	2.33	2.33	1.75	2.50	2.50

Strength of Correlation

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

School		Sharda School of Engineering & Technology	
Batch		2023-26	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		I	
1	Course Code	BCA183	
2	Course Title	Digital Electronics & Computer Organization	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	UG	
5	Course Objective	To provide students with an overview of digital electronics that forms the basic foundation of digital computer. It will include the number system, binary logic circuit and k-maps, evaluating circuit designs within the context of digital and combinational circuits. This course is designed to introduce the organization of a computer and its primary components, namely ALU, Control, Memory, and Input/Output. Additionally, the student will be able to comprehend the design components of a digital subsystem.	
6	Course Outcomes	CO1: Define the basic logic operations and simplify expressions using Boolean algebra and/or Karnaugh mapping techniques, sum of products (SOP) and product of sums (POS). CO2: Illustrate combinational logic circuits and explain their operation. CO3: Construct different types of sequential logic circuits using Flip Flops. CO4: Analyze the basic structure and functional units of a digital computer & understand basic processing unit and organization of simple processor. CO5: Explain hierarchical memory systems including cache memories & select appropriate interfacing standards for I/O devices. CO6: Finding and highlighting the applications of digital electronics and computer organization in real life.	
7	Course Description	This course covers the core concepts of digital electronics that include logic gates functions and integrated circuits, combinational and sequential logic circuits. The course also provides a study of Boolean algebra, binary and hexadecimal number systems, binary codes, and the analysis of the basic components and circuits used in semiconductor switching. This course also discusses the basic structure of a digital computer and used for understanding the organization of various units such as control unit, Arithmetic and Logical unit and Memory unit and I/O unit in a digital computer.	
8	Outline syllabus		CO Mapping
	Unit 1	Logic Gates & Boolean Algebra	
	A	AND, OR, NOT, NAND, NOR, XOR, XNOR, NAND & NOR as Universal Gates	CO1 CO6
	B	Theorems, Simplification of Boolean Expression using Boolean Algebra, SOP & POS Forms, Realization of Boolean Expression using Gates	CO1 CO6
	C	K-Maps, Simplification of Boolean Expression using K-Maps (upto 4- variables)	CO1 CO6
	Unit 2	Combinational Logic Circuits	
	A	Half Adder & Half Subtractor, Full Adder & Full Subtractor	CO2, CO6
	B	Multiplexers & Demultiplexers, Implementation of Boolean equations using Multiplexer and Demultiplexer	CO2, CO6
	C	Encoders & Decoders, Comparator, Basic Concepts of A/D and D/A converters	CO2, CO6
	Unit 3	Sequential Logic Circuits: Synchronous & Asynchronous	
	A	Latch, Flip Flops- R-S, J-K, Master-Slave J-K Flip-Flop, Race Condition, Removing Race Condition	CO3, CO6
	B	D Flip-Flop, T Flip-Flop, Sequential Circuits: Registers and Counters: Shift Registers, Ripple Counter, Synchronous Counter, Ring counter	CO3, CO6

C	Asynchronous Circuits: Analysis procedure, circuit with latches, Design procedure, Race free state assignment, hazards	CO3, CO6						
Unit 4	Basic Computer Organization and Design							
A	Digital computer: functional units and their interconnections, buses, Bus architecture, types of buses and bus arbitration. Bus and memory transfer, micro-operations	CO4, CO6						
B	Control Unit: Processor organization: general register organization, stack organization and addressing modes	CO4, CO6						
C	Memory Unit: Basic concept and hierarchy, semiconductor devices, RAM memories and types, ROM memories and types	CO4, CO5, CO6						
Unit 5	Memory Management & I/O Interfaces							
A	Virtual memory vs Cache memory, Cache memory: concept and design issues, performance, address mapping and replacement techniques	CO5, CO6						
B	Peripheral devices, I/O interface, I/O ports, interrupts, types of interrupts, modes of data transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access	CO5, CO6						
C	Memory Management	CO5, CO6						
Mode of examination	Theory							
Weightage Distribution	<table border="1"> <tr> <td>CA</td> <td>MTE</td> <td>ETE</td> </tr> <tr> <td>25%</td> <td>25%</td> <td>50%</td> </tr> </table>	CA	MTE	ETE	25%	25%	50%	
CA	MTE	ETE						
25%	25%	50%						
Text book/s*	<ol style="list-style-type: none"> Moris Mano, "Digital Logic and Computer Design", PHI Publications, 2002 Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", McGraw-Hill, Fifth Edition, Reprint 2012 David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface" 							
Other References	<ol style="list-style-type: none"> Digital Electronics (TMH) 1998: Malvino and Leach Computer Organization and Architecture: William Stallings A.S.Tannenbaum : Structured Computer Organization, Pearson 							

CO and PO Mapping

S. No.	Course Outcome (CO)	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Define the basic logic operations and simplify using Boolean algebra and/or Karnaugh mapping techniques, sum of products (SOP) and product of sums (POS).	PO1, PO2, PO3, PO4, PO8, PO9, PO10, PSO1
2.	CO2: Illustrate combinatorial logic circuits and explain their operation.	PO1, PO2, PO3, PO4, PO8, PO10
3.	CO3: Construct different types of sequential logic circuits using Flip Flops.	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
4.	CO4: Analyze the basic structure and functional units of a digital computer & understand basic processing unit and organization of simple processor.	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
5.	CO5: Explain hierarchical memory systems including cache memories & select appropriate interfacing standards for I/O devices.	PO1, PO2, PO3, PO4, PO6, PO10
6.	CO6: Finding and highlighting the applications of digital electronics and computer organization in real life.	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10, PSO1

PO and PSO mapping with level of strength for Course Name: Digital Electronics & Computer Organization (Course Code: BCA183)

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

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

Course Code	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
BCA183	2.67	2.83	2.80	3.00	2.00	2.00	-	2.80	2.50	2.67	2.80	-

Syllabus for Entrepreneurship Development

School		Sharda School of Engineering & Technology	
Batch		2023-26	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		I	
1	Course Code	BCA189	
2	Course Title	Entrepreneurship Development	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
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 instill and kindle the spirit of Entrepreneurship amongst students. The idea of this course is to create “job providers rather than job seekers”.	
6	Course Outcomes	<p>After successfully completion of this course students will be able to:</p> <p>CO1. To understand how start up entrepreneurship is supportive for enhancing business.</p> <p>CO2. Outline different ways of idea generation as innovator.</p> <p>CO3. Identify & utilize various Government policy for Small Scale Enterprises and its impact on Business.</p> <p>CO4. Analyze various financial schemes available to start up their enterprise.</p> <p>CO5. Assess the importance & significance of institutional support at various levels for determining the entrepreneurial climate.</p> <p>CO6. Develop the art of creativity and innovations in managing the entrepreneurial activities effectively.</p>	
7	Outline syllabus		CO Mapping
	Unit 1	Introduction to Entrepreneurship	CO1
	A	Meaning, Definition and concept of Enterprise, Entrepreneurship and Entrepreneurship Development, Evolution of Entrepreneurship	CO1
	B	Theories of Entrepreneurship. Characteristics of Entrepreneurship, Concepts of Intrapreneurship, Entrepreneur v/s Intrapreneur, Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager	CO1
	C	Role of Entrepreneurship in Economic Development, Factors affecting Entrepreneurship, Problems of Entrepreneurship	CO1
	Unit 2	Entrepreneurship Journey as Innovator	CO2
	A	Idea generation, Feasibility Study and opportunity assessment	CO2
	B	Business Plan: meaning, purpose and elements, Execution of Business Plan	CO2
	C	Entrepreneurs as problem solvers, Innovations and Entrepreneurial Ventures – Global and Indian,	CO2, CO6
	Unit 3	Setting Up Small Business Enterprises	CO3
	A	Identifying the business Opportunity – Business opportunity in various Sectors – Formalities for setting up a small Business Enterprise	CO3
	B	Benefits to Small Scale Enterprises: Tax Holiday, Rehabilitation Allowance, Investment Allowance,	CO3
	C	Government policy for Small Scale Enterprises: New Small Enterprise Policy 1991, Micro Small & Medium Enterprises Development (MSMED) Act 2006	CO3, CO6
	Unit 4	Role of Government in promoting Entrepreneurship	CO4

A	MSME policy in India, Agencies for Policy Formulation and Implementation: District Industries Centres (DIC), Entrepreneurship Development Institute of India (EDII),	CO4, CO6	
B	National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB),	CO4, CO6	
C	Financial Support System: long term and short-term financial support, Investment Institutions.	CO4, CO6	
Unit 5	IPM & Institutional support for small businesses in India	CO5	
A	Intellectual Property Management, Importance of innovation, patents & trademarks in small businesses,	CO5	
B	Introduction to laws relating to IPR in India, Support in areas of entrepreneurship development	CO5	
B	Case Studies based on Role of Industry 4.0 in innovations, Case Studies based on IPR & Patents	CO5, CO6	
Mode of examination	Theory/Jury/Practical/Viva		
Weightage Distribution	CA	CE (VIVA)	ESE
	25%	25%	50%
Text book/s*	1. Udyamita by Dr. MMP. Akhouri and S.P Mishra, By National Institute for Entrepreneurship and Small Business Development (NIESBUD), NSIC-PATC Campus, Okhla 2. Entrepreneurial Development by Dr S S Khanka, S Chand & Company Ltd 3. Entrepreneurship Development & Small Business Enterprises by Poornima M Charantimath, Pearson. 4. Lall & Sahai: Entrepreneurship (Excel Books 2 edition) Couger, C-Creativity and Innovation (IPP, 1999) 5. Kakkar D N - Entrepreneurship Development (Wiley Dreamtech)		

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1. To understand how start up entrepreneurship is supportive for enhancing business.	PO5, PO9, PO11, PO12
2.	CO2. Outline different ways of idea generation as innovator.	PO1, PO2, PO3, PO4, PO5, PO6
3.	CO3. Identify & utilize various Government policy for Small Scale Enterprises and its impact on Business.	PO10, PO11, PO12
4.	CO4. Analyze various financial schemes available to start up their enterprise.	PO10, PO11, PO12
5.	CO5. Assess the importance & significance of institutional support at various levels for determining the entrepreneurial climate.	PO4, PO7, PO12
6.	CO6. Develop the art of creativity and innovations in managing the entrepreneurial activities effectively.	PO2, PO3, PO4, PO5, PO11, PO12

PO and PSO mapping with level of strength for Course Name Introduction of Entrepreneurship Development (Course Code BCA189)

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	PSO 1	PSO2
BCA189_ Introduction of Entrepreneurship Development	CO1	-	-	-	-	1	-	-	-	2	-	-	-
	CO2	1	1	2	3	3	3	-	-	-	-	-	-
	CO3	-	-	-	-	-	-	-	-	-	3	-	-
	CO4	-	-	-	-	-	-	-	-	-	1	-	-
	CO5	-	-	-	1	-	-	3	-	-	-	-	-
	CO6	-	1	3	2	1	-	-	-	-	-	-	-

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

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 11	PSO 2
BCA189	Introduction of Entrepreneurship Development	1	1	2.5	2	1.67	3	3	0	2	2	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**

School:		Sharda School of Engineering & Technology	
Batch		2023-26	
Department:		Computer Science & Applications	
Programme:		BCA, Academic Year: 2023-24	
Semester:		II	
1	Course Code	BCA283	
2	Course Title	Artificial Intelligence	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
Course Status		Core	
5	Course Objective	The objective of the course is to introduce basic fundamental concepts in Artificial Intelligence (AI) and Expert Systems, with a practical approach in understanding them. To visualize the scope of AI and its role in futuristic development.	
6	Course Outcomes	After the completion of this course, students will be able to: CO1: Relate the goals of Artificial Intelligence and AI and non-AI solution. CO2: Analyze and various AI uninformed and informed search algorithms. CO3: Extend knowledge representation, reasoning, and theorem proving techniques to real-world problems. CO4: Make use of various learning techniques to understand AI problems. CO5: Explain about Expert system & discuss various case studies of it. CO6: Develop independent (or in a small group) research with help of AI techniques and communicate it effectively.	
7	Course Description	In this course students will learn basic introduction of Artificial Intelligence, problem solving agents, reasoning, learning and applications of artificial intelligence.	
8	Outline syllabus		CO Mapping
Unit 1		INTRODUCTION TO AI	
	A	Foundation of AI, Goals of AI, The AI Problems, Importance of AI, AI and its related field, AI techniques, Criteria for success.	CO1
	B	Introduction to Intelligent Agents; Environment; Structure of Agent	CO1
	C	Problems, problem space and search: Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem.	CO1, CO2
Unit 2		SEARCH METHODS	
	A	Problem Characteristics Searching Strategy –Uninformed search and Informed search strategies. State space search, Uniformed search techniques: Depth first search, Breadth first search, Bidirectional Search,	CO1, CO2
	B	Informed search: Heuristic Function, Hill climbing search, Best first search, A* & AO* Search, Generate and Test, Heuristic Search Techniques Hill climbing– issues in hill climbing. Problem solving using Search Techniques;	CO1, CO2
	C	Constraint satisfaction problem; Game tree, Evaluation function, Mini-Max search, Alpha-beta pruning, Games of chance.	CO1, CO2
Unit 3		KNOWLEDGE REPRESENTATION & REASONING	
	A	Introduction to KR, Knowledge agent, Predicate logic, Inference rule & theorem proving forward chaining, backward chaining,	CO3
	B	Propositional Proposition Knowledge ,Boolean circuit agents; Rule Based Systems, Forward reasoning: Conflict resolution,	CO3
	C	Backward reasoning: Structured KR: Semantic Net - slots, inheritance	CO3
Unit 4		LEARNING	
	A	Common Sense Vs Learning; Components; Representations; Feedback	CO3, CO4
	B	Learning Type :Supervised; Unsupervised; Reinforcement Learnings	CO3, CO4
	C	Rote learning, Learning by Taking Advice, Learning in Problem-solving, Learning from example: induction, Explanation-based learning.	CO3, CO4
Unit 5		EXPERT SYSTEM	

A	What is Expert system, Components of Expert System, Representing and using Domain Knowledge, Reasoning with knowledge, Expert System Shells, Knowledge acquisition examples			CO5, CO6
B	Existing Expert Systems			CO5, CO6
C	Study on Expert System			CO5, CO6
Mode of examination	Theory			
Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	
Text book/s*	1. Rich E & Knight K, Artificial Intelligence , Tata McGraw Hill, Edition 3.			
Reference Books	1. Russell S & Norvig P, <i>Artificial Intelligence: A Modern Approach</i> , Prentice Hall. 2. Dan W. Patterson, <i>Artificial Intelligence & Expert Systems</i> , Pearson Education with Prentice Hall India. Indian Edition. 3. <i>Artificial Intelligence and Intelligent Systems</i> by Padhy, Oxford University Press,			

CO and PO Mapping

Sl. No.	Course Outcome (CO)	
1.	Relate the goals of Artificial Intelligence and AI & non-AI solution.	PO1, PO2, PO3, PO4, PO5, PO10, PSO1, PSO2,
2.	Analyze and various AI uninformed and informed search algorithms.	PO1, PO2, PO3, PO4, PO5, PO10, PSO1, PSO2
3.	Extend knowledge representation, reasoning, and theorem proving techniques to real-world problems	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO10, PSO1, PSO2
4.	Make use of various learning techniques to understand AI problems.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PSO1, PSO2,
5.	Explain about Expert system & discuss various case studies of it.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2
6.	Develop independent (or in a small group) research with help of AI techniques and communicate it effectively.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name Artificial Intelligence (Course Code:BCA283)

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

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

Course Code/ Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
BCA283/ Artificial Intelligence	2.2	2.8	3.0	2.7	2.5	1.8	1.5	2.0	3.0	1.8	3.0	2.5

School:		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme:		BCA, Academic Year: 2023-24	
Batch		2023-26	
1	Course Code	BCA041	
2	Course Title	Introduction to IoT	
3	Credits	2	
4	Contact Hours (L-T-P)	2-0-0	
Course Status			
5	Course Objective	In this course, student will explore various concepts of Internet of things such as things, enabling technologies, M2M to IoT and IoT architecture. In the end they will also be able to identify the challenges in IoT and its various areas of application. SENSEnuts platform can be used to test newly developed routing and application layer algorithms.	
6	Course Outcomes	CO1: Define the general concepts of Internet of Things. CO2: Recognize the basic M2M Ecosystem and change from M2M to IoT. CO3: Outline the concepts of SENSEnut platform CO4: Explain basic sensor functions available with SENSEnuts devices CO5: Explain the challenges in IoT specific application. CO6: Discuss the various domains where IOT can be applied successfully.	
7	Course Description	This course introduces the concepts for internet of things 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 to their problem statements.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction to IoT	
	A	Defining IoT, History of IoT, Importance of IoT, IoT Basic Characteristics, Enabling Technologies of IoT	CO1
	B	About the Internet in IoT, IoT Advantages and Disadvantages, M2M Overview, M2M Features	CO1
	C	M2M Ecosystem, Comparison of the Main Characteristics of M2M and IoT, M2M Applications	CO1
	Unit 2	IoT Architecture	
	A	Basic Building blocks of IoT system: Sensors, Processors, gateways, Applications	CO1, CO2
	B	Physical design of IoT: Things in IOT, IoT Protocols, Logical design of IoT: IoT Functional Blocks, IoT Communication Models. IoT Communication API's	CO1, CO2
	C	IoT Service Oriented Architecture (SOA), API Oriented Architecture.	CO1, CO2
	Unit 3	Introduction to IoT Platform	
	A	IoT Working, Introduction to Arduino and Raspberry Pi	CO1, CO3
	B	The SENSEnut Platform, Peripheral Hardware Specific Calls: DIO Functions, I ² C Functions	CO1, CO3
	C	MAC functions: General Functions, Coordinator Functions, genMac Functions	CO1, CO3
	Unit 4	Sensor Functions	

A	Phy Layer Functions, Routing Functions			CO1, CO4, CO5
B	Sensor Functions: Light Sensor Functions, Temperature Sensor Functions, Humidity Sensor Functions			CO1, CO4, CO5
C	Pressure and Temperature sensor Functions, GPS Functions, Passive Infrared Functions			CO1, CO4, CO5
Unit 5	Domain specific applications of IoT			
A	Home automation concept and case study			CO1, CO3, CO6
B	Industry applications concept and case study			CO1, CO3, CO6
C	Surveillance applications concept and case study, Other IoT applications			CO1, CO3, CO6
Mode of examination	Theory/Jury/Practical/Viva			
Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	
Text book/s*	<ol style="list-style-type: none"> The Internet of Things: Connecting Objects to the Web edited by Hakima Chaouchi, Reference for Unit-1. Introduction to Internet of Things, Prof. Sudip Misra, NPTEL Lectures Notes, Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, Reference for Unit 2, 3 (c), 4. Internet of Things, RajkumarBuyya, Reference for Unit 3 (c) Arshdeep Bahga and Vijay Madiseti, "Internet of Things – A Hand-on Approach", Universities press, 2015, Reference for Unit 3 (B) API REFERENCE GUIDE: SENSEnuts WSN sensation 			
Other References	<ol style="list-style-type: none"> Charalampos Doukas , "Building Internet of Things with the Arduino", Create space, April 2002 Dr. Ovidiu Vermesan and Dr. Peter Friess, "Internet of Things: From research and innovation to market deployment", River Publishers 2014. Contiki : The open source for IOT, www.contiki-os.org 			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Understand the general concepts of Internet of Things.	PO1, PO2, PO3, PO6, PO7, PSO2
2.	CO2: Recognize the basic M2M Ecosystem and change from M2M to IoT.	PO1, PO2, PO3, PO6, PO7, PSO2
3.	CO3: Outline the concepts of SENSEnut platform	PO1, PO4, PO5, PO6, PO9, PO10, PSO2
4.	CO4: Explain basic sensor functions available with SENSEnuts devices	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO9, PO10, PSO2
5.	CO5: Explain the challenges in IoT specific application.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PSO2
6.	CO6: Discuss the various domains where IOT can be applied successfully.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO9, PSO2

PO and PSO mapping with level of strength for Course Name Introduction to IoT (Course Code BCA041)

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	PSO1	PSO2
BCA041_ Introduction to IoT	CO1	3	1	1	-	-	2	1	-	-	-	-	3
	CO2	2	2	1	-	-	1	3	-	-	-	-	3
	CO3	2	2	2	2	3	2	2	-	2	2	-	3
	CO4	2	3	2	2	3	2	2	-	2	2	-	3
	CO5	3	3	3	3	3	2	3	-	-	-	-	3
	CO6	2	2	2	2	3	2	3	-	-	-	-	3

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

Course Code	Course Name	PO 1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
BCA041	Introduction to IoT	2.3	2.2	1.8	2.3	3.0	1.8	2.3	0.0	2.0	2.0	0.0	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*

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Batch		2023-26	
Programme		BCA, Academic Year: 2023-24	
Semester		I	
1	Course Code	ARP103	
2	Course Title	Communicative English-1	
3	Credits	2	
4	Contact Hours (L-T-P)	2-0-0	
5	Course Objective	To minimize the linguistic barriers that emerges in varied socio-linguistic environments through the use of English. Help students to understand different accents and standardize their existing English. Guide the students to hone the basic communication skills - listening, speaking, reading and writing while also uplifting their perception of themselves, giving them self-confidence and building positive attitude.	
6	Course Outcomes	<p>After completion of this course, students will be able to:</p> <p>CO1 Develop a better understanding of advanced grammar rules and write grammatically correct sentences</p> <p>CO2 Acquire wide vocabulary and punctuation rules and learn strategies for error-free communication.</p> <p>CO3 Interpret texts, pictures and improve both reading and writing skills which would help them in their academic as well as professional career</p> <p>CO4 Comprehend language and improve speaking skills in academic and social contexts</p> <p>CO5 Develop, share and maximise new ideas with the concept of brainstorming and the documentation of key critical thoughts articulated towards preparing for a career based on their potentials and availability of opportunities.</p> <p>CO6 Function effectively in multi-disciplinary teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality</p>	
7	Course Description	The course is designed to equip students, who are at a very basic level of language comprehension, to communicate and work with ease in varied workplace environment. The course begins with basic grammar structure and pronunciation patterns, leading up to apprehension of oneself through written and verbal expression as a first step towards greater employability.	
8	Outline syllabus – ARP 103		
	Unit A	Sentence Structure	CO Mapping
	Topic 1	Subject Verb Agreement	CO1
	Topic 2	Parts of speech	
	Topic 3	Writing well-formed sentences	
	Unit B	Vocabulary Building & Punctuation	
	Topic 1	Homonyms/ homophones, Synonyms/Antonyms	CO1, CO2
	Topic 2	Punctuation/ Spellings (Prefixes-suffixes/Unjumbled Words)	CO1, CO2

	Topic 3	Conjunctions/Compound Sentences	CO1, CO2
	Unit C	Writing Skills	
	Topic 1	Picture Description – Student Group Activity	CO3
	Topic 2	Positive Thinking - Dead Poets Society-Full-length feature film - Paragraph Writing inculcating the positive attitude of a learner through the movie SWOT Analysis – Know yourself	CO3, CO2, CO3
	Topic 3	Story Completion Exercise –Building positive attitude - The Man from Earth (Watching a Full length Feature Film)	CO2, CO3
	Topic 4	Digital Literacy Effective Use of Social Media	CO3
	Unit D	Speaking Skill	
	Topic 1	Self-introduction/Greeting/Meeting people – Self branding	CO4
	Topic 2	Describing people and situations - To Sir With Love (Watching a Full length Feature Film)	CO4
	Topic 3	Dialogues/conversations (Situation based Role Plays)	CO4
	Unit E	Professional Skills Career Skills	
	Topic 1	Exploring Career Opportunities	CO4, CO5
	Topic 2	Brainstorming Techniques & Models	CO4, CO5
	Topic 3	Social and Cultural Etiquettes	CO4, CO5
	Topic 4	Internal Communication	CO4, CO5
	Unit 5	Leadership and Management Skills	
	Topic 1	Managerial Skills	CO6
	Topic 2	Entrepreneurial Skills	CO6
9	Evaluations	<i>Class Assignments/Free Speech Exercises / JAM Group Presentations/Problem Solving Scenarios/GD/Simulations (60% CA and 40% ETE</i>	N/A
10	Texts & References Library Links	<ul style="list-style-type: none"> Blum, M. Rosen. <i>How to Build Better Vocabulary</i>. London: Bloomsbury Publication Comfort, Jeremy (et.al). <i>Speaking Effectively</i>. Cambridge University Press 	

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

Syllabus: Problem solving using C Programming Lab

School		Sharda School of Engineering & Technology	
Batch		2023-26	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		I	
1	Course Code	BCP181	
2	Course Title	Problem solving using C Programming Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	To learn computer fundamentals and basic computer organisation. Along with that the objective is to learn basic Programming constructs –data types, decision structures, control structures in C to apply knowledge in real life software building.	
6	Course Outcomes	Students will be able to: CO1: Enumerate core concept of C Programming CO2: Discuss Programmes using Array and String CO3: Develop Functions for any problem CO4: Classify Union and Structure to write any Programme CO5: Implement concept of Pointers CO6: Predict a real world problem with the help of c Programming	
7	Course Description	Programming for problem solving gives the Understanding of C Programming and implement code from flowchart or algorithm	
8	Outline syllabus		CO Mapping
	Unit 1	Logic Building	CO1, CO6
		Draw flowchart for finding leap year	
		Write a c Programme to Add Two Integers	
		Write a Programme to create a calculator	
	Unit 2	Introduction to C Programming	CO2, CO6
		Write a c Programme to convert length meter to centimetre	
		Write a c Programme to convert temp	
		Write a c Programme to swap two numbers	
	Unit 3	Arrays and Functions	CO3, CO6
		Write a c Programme to calculate the average using arrays	
		Write a c Programme to find the largest element of the array	
	Unit 4	Pre-processors and Pointers	CO4, CO6
		Write a c Programme to swap two values using pointers	
		Write a c Programme to find largest number from array using pointers	
	Unit 5	User Defined Data Types and File Handling	CO5, CO6
		Write a c Programme to store information of a student using structure	

		Write a c Programme to store information of a student using union							
	Mode of examination	Practical							
	Weightage Distribution	<table border="1"> <tr> <td>CA</td> <td>CE</td> <td>ESE</td> </tr> <tr> <td>25%</td> <td>25%</td> <td>50%</td> </tr> </table>	CA	CE	ESE	25%	25%	50%	
CA	CE	ESE							
25%	25%	50%							
	Text book/s*	Kernighan, Brian, and Dennis Ritchie. <i>The C Programming Language</i>							
	Other References	1. 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 Hill- 1999							

Course outline

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

Course Evaluation

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. <i>The C Programming Language</i>
Other References	1. 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 Hill- 1999
Software	Turbo C

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Enumerate core concept of C Programming	PO1,PO2,PO3, PO9, PSO1,PSO2
2.	CO2: Discuss Programmes using Array and String.	PO1,PO3, PO4, PO5, PO9,PSO1,PSO2
3.	CO3: Develop Functions for any problem	PO1,PO3,PO4, PO9, PSO2
4.	CO4: Classify Union and Structure to write any Programme	PO1,PO3,PO4, PO9, PSO2

5.	CO5: Implement concept of Pointers	PO1,PO3,PSO2
6	CO6: Predict a real world problem with the help of c Programming	PO1,PO2,PO3,PO4,PO9,PSO1 PSO2

PO and PSO mapping with level of strength for Course Name- Problem solving using C Programming Lab (Course Code BCP181)

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	PSO 1	PSO2
BCP181_Programming for problem solving Lab	CO1	2	2	3	2	2	2	-	-	2	-	3	2
	CO2	3	2	3	2	2	2	-	-	3	-	3	3
	CO3	2	2	3	2	2	3	-	-	2	2	2	3
	CO4	1	1	2	1	1	2	-	2	2	1	2	2
	CO5	2	3	3	2	2	2	-	2	3	2	3	2
	CO6	3	2	3	3	1	3	-	3	2	2	2	3

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

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
BCP181	Programming for problem solving Lab	2.17	2	2.83	2	1.67	2.33	-	2.33	2.33	1.75	2.50	2.50

Strength of Correlation

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

School		Sharda School of Engineering & Technology	
Batch		2023-26	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		I	
1	Course Code	BCP041	
2	Course Title	Introduction to IoT Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Core	
5	Course Objective	The objective of the course is to deploy a network for statistical analysis or control applications. This course can help in connecting the sensors to platform to get the desired readings using extender.	
6	Course Outcomes	CO1: Understand the working of IoT Platforms. CO2: Recognize the various sensors and actuators. CO3: Outline the concepts of SENSEnut platform CO4: Demonstrate Blink application using SENSEnuts devices CO5: Experiment with environment sensors on SENSEnuts GUI. CO6: Design embedded applications using SENSEnut Platform	
7	Course Description	SENSEnuts platform can be used to test newly developed routing and application layer algorithms. It provides a flexible mac with around 9 parameters that can be controlled at mac and4 at physical giving user the kind of flexibility to control their network environment.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction to IoT Platforms	
		Demonstrate Arduino and its pins.(Students have to prepare the Report for the same)	CO1
		Demonstration of Setup & Working of Raspberry Pi. (Students have to prepare the Report for the same)	CO1,CO2
	Unit 2	Study of Sensors and Actuators	
		PIR Motion Sensor, Moisture Sensor, Temperature Sensor, Touch Sensor	CO2
		Infrared Sensor, Servo Motor, RFID Sensor	CO2
	Unit 3	Sensenut Platform	

		Introduction to SENSEnuts Platform, the components that make up an SENSEnuts board and their functions.	CO3						
		Installing and working with SENSEnuts.	CO3						
	Unit 4	Working with SENSEnuts device							
		To develop a code for LED blinks operation for SENSEnuts device.	CO3, CO4						
		To develop a code for RGB blinks operation for SENSEnuts device.	CO3,CO4						
	Unit 5	Working with Environment Sensors							
		To develop a code to read temperature and light sensor data from sensor module attached	CO2,CO4						
		To develop a code to Programme the temperature and light sensor with threshold values, and catch the interrupt generated by them when threshold is passed.	CO2, CO5						
	Mode of examination	Jury/Practical/Viva							
	Weightage Distribution	<table border="1"> <thead> <tr> <th>CA</th> <th>MTE</th> <th>ETE</th> </tr> </thead> <tbody> <tr> <td>25%</td> <td>25%</td> <td>50%</td> </tr> </tbody> </table>	CA	MTE	ETE	25%	25%	50%	
CA	MTE	ETE							
25%	25%	50%							
	Text book/s*	<ol style="list-style-type: none"> The Internet of Things: Connecting Objects to the Web edited by Hakima Chaouchi, Reference for Unit-1. Introduction to Internet of Things, Prof. Sudip Misra, NPTEL Lectures Notes, Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, Reference for Unit 2, 3 (c), 4. Internet of Things, Rajkumar Buyya, Reference for Unit 3 (c) Arshdeep Bahga and Vijay Madisetti, "Internet of Things – A Hand-on Approach", Universities press, 2015, Reference for Unit 3 (B) API REFERENCE GUIDE: SENSEnuts WSN sensation							
	Other References	<ol style="list-style-type: none"> Charalampos Doukas , "Building Internet of Things with the Arduino", Create space, April 2002 Dr. Ovidiu Vermesan and Dr. Peter Friess, "Internet of Things: From research and innovation to market deployment", River Publishers 2014. Contiki : The open source for IOT, www.contiki-os.org							

PO and PSO mapping with level of strength for Course Name Introduction to IoT and Applications Lab (Course Code BCP041)

Course Code_ Course Name	CO's	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO 10	PSO 1	PSO2
BCP041_ Introduction to IoT Lab	CO1	2	2	2	-	3	1	1	-	2	2	-	1
	CO2	2	2	2	1	3	2	2	2	1	1	-	2
	CO3	2	2	2	1	3	2	2	2	3	3	-	2
	CO4	2	2	2	2	3	2	2	2	3	3	-	2
	CO5	3	2	2	3	3	2	2	2	3	3	-	2
	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 Code	Course Name	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PSO1	PSO 2
BCP041	Introduction to IoT Lab	2.3	2.2	2.2	2.0	3.0	2.0	2.0	2.2	2.5	2.5	0.0	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*



TERM-II

Syllabus: Data Structures Using C

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme:		BCA, Academic Year: 2023-24	
Semester:		II	
1	Course Code	BCA286	Course Name: Data Structures Using C
2	Course Title	Data Structures Using C	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
Course Status		Compulsory	
5	Course Objective	This course provides Programming concepts for subsequent study in Computer Science, as well as developing the skills necessary to solve practical problems.	
6	Course Outcomes	<p>After the completion of this course, students will be able to:</p> <p>CO-1. Apply the basic operations on arrays.</p> <p>CO-2. Construct complex Programmes like matrix implementations on arrays.</p> <p>CO-3. Apply the concept of stacks and queues in real life problem solving.</p> <p>CO-4. Apply the concepts of data structure, like linked list to solve complex problems.</p> <p>CO-5. Solving the real-life problems based on trees.</p> <p>CO-6 Implementing the graphs and apply graph concept in computer networks.</p>	
7	Course Description	The purpose of this course is to understand and use data structures that are backbone of computer science. A basic understanding of data structure topics is fundamental for work in computer science. In this course we will discover taking form arrays to stacks, queues, linked list, trees and graphs including searching and sorting.	
8	Outline syllabus		CO Mapping
	Unit 1	Arrays and Strings	
	A	Arrays: Initialization – Declaration – One dimensional Simple Programme.	CO1, CO6
	B	and two-dimensional arrays. String-: String operations – String Arrays.	CO1, CO6
	C	sorting- searching – matrix operations like matrix addition, subtraction and multiplication	CO1, CO6
	Unit 2	Stacks and Queues	
	A	Abstract data Types, Data Structure and Structured Types, Difference between Abstract Data Types, Data Types and Data Structures.	CO2, CO6
	B	Data Types, Linear data type, Non-Linear data type, Primitive data type, non-primitive data type, Introduction to Complexity, Big OH notation, Time and Space trade-offs.	CO2, CO6

C	Representation of stacks & queues using linked, sequential and their applications. Making a Programme that implement Stack and Queue.	CO2, CO6	
Unit 3	Linked list sorting and searching		
A	Linked list, singly linked list and doubly linked list, representation of linked list in memory	CO1,CO3, CO6	
B	Algorithms like insertion, deletion at beginning, middle and at the end of the linked list	CO1,CO3, CO6	
C	Various types of sorting like bubble sort, selection sort, insertion sort, heap sort, quick sort and searching like linear and binary search algorithms	CO1,CO3, CO6	
Unit 4	Introduction to Trees		
A	Trees: Definition, Binary tree, Binary tree traversal: pre-order, in-order and post-order, Binary search tree.	CO4,CO5	
B	Binary search trees and operation like insertion deletion on binary search trees, AVL search trees with insertion deletion and rotation.	CO4,CO5	
C	M-way search trees, B-Trees and B+ Trees	CO4,CO5	
Unit 5	Trees and Graph Theory.		
A	Graphs: Definition and terminology, Representation of graphs	CO4,CO5	
B	Minimum spanning trees by Prim's Algorithms and Krushkal's Algorithm	CO4,CO5	
C	Multi graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.	CO4,CO5, CO6	
Mode of examination	Theory/Jury/Practical/Viva		
Weightage Distribution	CA 25%	MTE 25%	ETE 50%
Text book/s*	1. A Common-Sense Guide to Data Structures and Algorithms, Second Edition: Level Up Your Core Programming Skills 2nd Edition 2. Data Structures Through C (A Practical Approach) Paperback – 1 January 2016 by G.S. Baluja		
Other References	3. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI 4. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication		

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO)
1.	CO-1. Apply the basic operations on arrays.	PO1,PO2,PO3,PO4,PO7,PO10,PSO1,PSO2
2.	CO-2. Construct complex Programmes like matrix implementations on arrays.	PO1,PO2,PO3,PO4,PO7,PO10,PSO1,PSO2

3.	CO-3. Apply the concept of stacks and queues in real life problem solving.	PO1,PO2,PO3,PO4,PO7,PO10,PSO1,PSO2
4.	CO-4. Apply the concepts of data structure, like linked list to solve complex problems.	PO1,PO2,PO3,PO4,PO5,PO7,PO10,PSO1,PSO2
5.	CO-5. Solving the real-life problems based on trees.	PO1,PO2,PO3,PO4,PO5,PO7,PO10,PSO1,PSO2
6.	CO-6. Implementing the graphs and apply graph concept in computer networks.	PO1,PO2,PO3,PO4,PO5,PO7,PO10,PSO1,PSO2

PO and PSO mapping with level of strength for Course Name: Data Structures Using C(BCA286)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	2	1	1	1	-	-	2		-	1	1	1
CO2	2	2	2	1	-	-	2	-	-	1	1	2
CO3	2	2	2	1	-	-	2	-	-	1	2	2
CO4	2	1	2	3	2	-	2	-	-	1	1	1
CO5	2	2	3	2	2	-	2	-	-	1	2	2
CO6	3	3	3	2	2	-	2	-	-	1	2	2
Avg. PO attained	2.16	1.8	2.16	1.67	2		2			1	1.5	1.67

School:		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme:		BCA, Academic Year: 2023-24	
Semester		II	
1	Course Code	BCA185	
2	Course Title	Operating Systems and Unix shell Programming	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	<ol style="list-style-type: none"> 1. This course introduces the challenges for designing operating systems. 2. Includes different design principles and algorithms. 3. Evaluation of algorithms proposed. 4. Implementation of algorithms and utilities. 	
6	Course Outcomes	<p>CO1: Define role, responsibilities, features, and design of operating system.</p> <p>CO2: Demonstrate the Process Management and Scheduling techniques</p> <p>CO3: Implement tools and utility of operating systems.</p> <p>CO4: Apply various memory management techniques to understand file and disk management and analyze it.</p> <p>CO5: Understand the concepts of Unix and shell Programming .</p> <p>CO6: Design and develop solutions to real world problem using Unix</p>	
7	Course Description	This course introduces the design principles of operating systems, resource management, identifying challenges and applying respective algorithms. This course will also provide the basics of unix and shell Programming .	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction to Operating System Concepts	
	A	Operating System Concepts and functions, Components of Computer System, Need of Operating system,	CO1, CO2
	B	Types of Operating Systems- Batch, MultiProgramming , Multi-Tasking, Multiprocessing, Distributed, Clustered, Embedded and Real Time Operating System.	CO1, CO2
	C	User Mode Vs Kernel Mode, Threading, Comparison between Process and Thread	CO1, CO2
	Unit 2	Process Management and Scheduling	
	A	Process Concepts- PCB, Process States, Process Operations.	CO1, CO2
	B	CPU Scheduling: Concept , Types of schedulers- (Short term, Long term, Middle term), Dispatcher,	CO1, CO2, CO4
	C	Performance Criteria CPU Scheduling Algorithms (FCFS, SJF, Priority, Round Robin, Multilevel Queue, Multilevel feedback Queue)	CO1,CO2,CO4

	Unit 3	Deadlock Handling			
	A	Race condition, Critical sections, Mutual exclusion,			CO1,CO2
	B	Deadlock concepts & Handling Techniques: Avoidance, Prevention			CO1,CO3
	C	Deadlock Detection & Recovery			CO4
	Unit 4	Memory Management and File Management			
	A	Memory Hierarchy, Memory Management Unit, Paging, Segmentation			CO1, CO5
	B	Virtual memory concept, demand paging, Page replacement algorithms(FCFS, Optimal, LRU),			CO3, CO5
	C	File Concept ,File operations, File Directories, Case study of Windows Operating System, Disk structure , Disk scheduling(FCFS,SSTF, SCAN, LOOK,C-SCAN, C-LOOK)			CO2,CO3, CO5
	Unit 5	Unix and Shell Scripting			
	A	Unix file system, Commands related to Process and File Handling.			CO1, CO2,CO3
	B	System Calls (File related, Device related, Information related, Process Control Related and Communication related)			CO1, CO4,CO6
	C	Fork System Call, Creating a Parent - Child Process			CO1, CO4,CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ESE	
		25%	25%	50%	
	Text book/s*	1. Silberschatz G, Operating System Concepts, Wiley			
	Other References	1. W. Stalling, “Operating System”, Maxwell Macmillan 2. Tannenbaum A S, Operating System Design and Implementation, Prentice Hall India 3. Milenkovic M, Operating System Concepts, McGraw Hill			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Define role, responsibilities, features, and design of operating system.	PO1,PO2,PO3,PO4,PSO1
2.	CO2: Demonstrate the Process Management and Scheduling techniques	PO1, PO3, PO4, PSO2
3.	CO3: Implement tools and utility of operating systems.	PO1,PO2,PO3,PO4

4.	CO4: Apply various memory management techniques to understand file and disk management and analyze it.	PO9, PO10, PO11
5.	CO5: Understand the concepts of Unix and shell Programming .	PO1, PO2, PO8, PO9, PO10, PSO1
6.	CO6: Design and develop solutions to real world problem using Unix	PO1, PO2, PO10, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name: Operating Systems and Unix shell Programming (Course Code BCA185)

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	PSO 1	PSO2
BCA185_ OS & Shell Programming	CO1	3	3	3	3	--	--	--	2	2	1	3	2
	CO2	3	2	3	3	--	--	--	2	2	2	2	3
	CO3	3	3	3	3	--	--	--	1	1	1	3	2
	CO4	2	2	2	2	1	--	--	2	3	3	2	2
	CO5	2	2	2					3	3	1	3	
	CO6	3	2								2	2	2

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

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
BCA185	OS & shell Programming	2.83	2.67	1.67	1.67	1.00	1.00	1.00	2.00	1.00	2.67		2.50

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: SSET		Batch: 2023-26	
		Current Academic Year: 2023-24	
Programme: BCA(AI-ML)		Semester: I	
1	Course Code	BCA188	
2	Course Title	Ethics and Social Implications of AI	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	The objective of the course "Ethics and Social Implications of AI" is to provide students with a comprehensive understanding of the ethical considerations and broader societal implications associated with artificial intelligence (AI) technologies	

6	Course Outcomes	After the completion of this course, students will be able to: CO1: Relate and explain the ethical considerations in the development and deployment of AI. CO2: Analyze and evaluate the social and ethical impacts of AI on various stakeholders and society as a whole. CO3: Extend propose ethical decision-making models relevant to AI applications. CO4: Make use of the implications of AI on privacy, data protection, bias, fairness, transparency, and accountability. CO5: Explain and address ethical challenges in AI research, development, and governance. CO6: Develop and discuss the ethical responsibilities of AI practitioners, policymakers, and organizations.	
7	Course Description	The course "Ethics and Social Implications of AI" is designed to explore the ethical dimensions and social implications of AI technologies. It provides an in-depth examination of the ethical considerations that arise in the development, deployment, and use of AI systems.	
8	Outline syllabus	CO Mapping	
	Unit 1	Introduction to Ethics and Social Implications of AI	
	A	Introduction to Ethics and AI, Historical and philosophical foundations of ethics, Ethical theories and frameworks ,Ethical decision-making models	CO1
	B	Impact of AI on society Ethical considerations in AI development and deployment Privacy and data protection in AI,	CO1
	C	Bias ,fairness, and accountability in AI Transparency and explainability in AI systems Ethical challenges in AI research	CO1, CO2
	Unit 2	Ethical Issues in AI Governance and Policy	
	A	AI governance frameworks and initiatives, Ethical considerations in AI regulation and policy-making, Intellectual property and AI, Ethical implications of AI patents	CO1, CO2
	B	Ethical issues in AI transparency and auditability, Algorithmic accountability and responsibility, Ethical considerations in AI procurement and use by governments	CO1, CO2
	C	AI ethics committees and their role, Ethical challenges in AI governance and policy, International perspectives on AI ethics and regulation	CO1, CO2
	Unit 3	AI and Human Rights	
	A	AI and privacy rights, Ethical considerations in AI surveillance technologies, AI and freedom of expression	CO3
	B	Ethical implications of AI in law enforcement and criminal justice, AI and discrimination in employment and hiring, AI and social inequality	CO3
	C	Ethical issues in AI-powered decision-making systems, AI and the right to access information, Ethical considerations in AI-mediated communication,AI and the right to a fair trial	CO3
	Unit 4	AI and Workforce Ethics	
	A	AI and the future of work, Ethical implications of AI in job displacement and automation, AI and job creation	CO3, CO4
	B	Ethical considerations in AI-based hiring and recruitment, AI and workplace surveillance, Bias and discrimination in AI-based employment systems	CO3, CO4
	C	Ethical challenges in AI-driven skill assessment and training, AI and worker well-being, AI and ethical implications for professional responsibilities, AI and labor rights	CO3, CO4
	Unit 5	Ethical AI Development and Deployment	
	A	Ethical considerations in AI system design and development, Ethical use of data in AI, responsible AI research and innovation	CO5, CO6
	B	Ethical implications of AI in healthcare, AI and autonomous systems ethics, AI and environmental sustainability, Ethical considerations in AI for social good	CO5, CO6

C	AI and the ethical challenges in autonomous vehicles, AI and ethical implications in education, AI and the future of humanity			CO5, CO6
Mode of examination	Theory			
Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	
Text book/s*	1. Paula Boddington, —Towards a Code of Ethics for Artificial Intelligence, Springer, 2017 2. Markus D. Dubber, Frank Pasquale, Sunit Das, —The Oxford Handbook of Ethics of AI, Oxford University Press Edited book, 2020.			
Reference Books	3. Wallach, W., & Allen, C, —Moral machines: teaching robots right from wrong, Oxford University Press, 2008. 4. Bostrom and E. Yudkowsky. —The ethics of artificial intelligence. In W. M. Ramsey and K. Frankish, editors, The Cambridge Handbook of Artificial Intelligence, Cambridge University Press, Cambridge, 2014.			

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		II	
1	Course Code	VOC102	Course Name: Design Thinking and Creative Learning
2	Course Title	Design Thinking and Creative Learning	
3	Credits	1	
4	Contact Hours (L-T-P)	1-0-0	
Course Status		Compulsory	
5	Course Objective	<ol style="list-style-type: none"> 1. To familiarize students with Design Thinking concepts and principles. 2. To familiarize students with Architecture of a product and its financial Analysis 3. Development of a new product, new service or the radical innovation of processes 4. Apply Design Thinking approach to various examples and real life applications. 	
6	Course Outcomes	<p>After the completion of this course, students will be able to:</p> <p>CO1: Explain the basics concepts of Design Thinking</p> <p>CO2: Design solutions as per needs and Translate customer needs into product specifications</p> <p>CO3: To apply product development concepts to the service environment.</p> <p>CO4: Learning to Design the Architecture of a product.</p> <p>CO5: To apply environmental design concepts to the life cycle of a product.</p> <p>CO6: To apply Design Thinking approach to various examples and real life applications.</p>	
7	Course Description	<p>This course introduces Design Thinking methodologies, processes and tools that can be used to make the world a better place. Students explore Design thinking theories and how they can be applied to practical situations relevant to various academic disciplines and organizational roles. Among the topics covered are ideation, prototyping, iteration and innovation. Through personal reflection, students will also examine how they can harness the power of design thinking for leading the creation of value for businesses, organizations and society.</p>	
8	Outline syllabus	CO Mapping	
	Unit 1	Skills in Design Thinking	
	A	Learn how to use critical design thinking skills to improve an existing product or create a new one.	CO1
	B	As a first step toward user innovation, learn to identify consumer requirements and write customer needs statements.	CO1, CO6

Unit 2	Product Specifications and Applying Creativity			
A	Learn how to statistically translate customer needs into product specifications and how product metrics can aid in the definition of those specs.	CO2		
B	Learn how to design needs solutions using creativity, brainstorming, and concept generation.	CO2, CO6		
Unit 3	Prototyping and Services-oriented design			
A	Investigate prototyping techniques, tactics, and real-world examples of how they were used to generate a design that reflects client wants and product specifications.	CO3,CO4		
B	Learn how to recognize the potential for innovation in service design and how to apply product development concepts to the service environment.	CO5,CO6		
Unit 4	Architecture of a Product and Financial Analysis			
A	Learn how to determine the building blocks of a product using modular and integral product architectures.	CO4		
B	Learn how to run a financial analysis on your project idea to see if it has a solid business case (Worth-It).	CO1,CO3, CO6		
Unit 5	Environmental Design and Processes of Product Development			
A	Learn how to apply environmental design concepts to the life cycle of a product.			
B	Learn how to choose and implement a product development approach that's right for your project (staged, spiral, or agile).	CO5, CO6		
Mode of examination	Practical			
Weightage Distribution	CA 25%	CE (Viva) 25%	ETE 50%	
Text book/s*	Design Thinking: A Guide to Creative Problem Solving for Everyone by Andrew Pressman			
Other References	1. Design thinking the guidebook 2. Change by Design by Tim Brown's 3. Design Thinking For Dummies by Christian Muller-Roterberg.			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO)
1.	CO1: Explain the basics concepts of Design Thinking	PO1,PO2,PO3,PO4,PO7,PO9,PSO1,PSO2
2.	CO2: Design solutions as per needs and Translate customer needs into product specifications	PO1,PO2,PO3,PO4,PO7,PO9,PSO1,PSO2
3.	CO3: To apply product development concepts to the service environment.	PO1,PO2,PO3,PO4,PO7,PO9,PSO1,PSO2
4.	CO4: Design the Architecture of a product.	PO1,PO2,PO3,PO4,PO6,PO7,PO9,PSO1,PSO2
5.	CO5: To apply environmental design concepts to the life cycle of a product.	PO1,PO2,PO3,PO4,PO6,PO7,PO9,PSO1,PSO2
6.	CO6: To apply Design Thinking approach to various examples and real life applications.	PO1,PO2,PO3,PO4,PO6,PO7,PO9,PSO1,PSO2

PO and PSO mapping with level of strength for Course Name: Design Thinking and Creative Learning (VOC102)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2

CO1	2	1	1	1	-	-	2		1	-	1	1
CO2	2	2	2	1	-	-	2		1	-	1	2
CO3	2	2	2	1	-	-	2		1	-	2	2
CO4	2	1	2	3	-	2	2		1	-	1	1
CO5	2	2	3	2	-	2	2		1	-	2	2
CO6	3	3	3	2	-	2	2		1	-	2	2
Avg. PO attained	2.16	1.8	2.16	1.67		2	2		1		1.5	1.67

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		II	
1	Course Code	ARP105	
2	Course Title	Communicative English -2	
3	Credits	2	
4	Contact Hours (L-T-P)	2-0-0	
5	Course Objective	To Develop LSRW skills through audio-visual language acquirement, creative writing, advanced speech et al and MTI Reduction with the aid of certain tools like texts, movies, long and short essays.	
6	Course Outcomes	<p>After completion of this course, students will be able to:</p> <p>CO1 Acquire Vision, Goals and Strategies through Audio-visual Language Texts</p> <p>CO2 Synthesize complex concepts and present them in creative writing</p> <p>CO3 Develop MTI Reduction/Neutral Accent through Classroom Sessions & Practice</p> <p>CO4 Determine their role in achieving team success through defining strategies for effective communication with different people</p> <p>CO5 Realize their potentials as human beings and conduct themselves properly in the ways of world.</p> <p>CO6 Acquire satisfactory competency in use of Quantitative aptitude and Logical Reasoning</p>	
7	Course Description	The course takes the learning from the previous semester to an advanced level of language learning and self-comprehension through the introduction of audio-visual aids as language enablers. It also leads learners to an advanced level of writing, reading, listening and speaking abilities, while also reducing the usage of L1 to minimal in order to increase the employability chances.	
8	Outline syllabus – ARP105		
	Unit A	Acquiring Vision, Goals and Strategies through Audio-visual Language Texts	CO Mapping
	Topic 1	Pursuit of Happiness / Goal Setting & Value Proposition in life	CO1
	Topic 2	12 Angry Men / Ethics & Principles	
	Topic 3	The King’s Speech / Mission statement in life strategies & Action Plans in Life	
	Unit B	Creative Writing	
	Topic 1	Story Reconstruction - Positive Thinking	CO2
	Topic 2	Theme based Story Writing - Positive attitude	
	Topic 3	Learning Diary Learning Log – Self-introspection	
	Unit C	Writing Skills 1	
	Topic 1	Precision	CO2

	Topic 2	Paraphrasing	
	Topic 3	Essays (Simple essays)	
	Unit D	MTI Reduction/Neutral Accent through Classroom Sessions & Practice	
	Topic 1	Vowel, Consonant, sound correction, speech sounds, Monothongs, Diphthongs and Triphthongs	CO3
	Topic 2	Vowel Sound drills , Consonant Sound drills, Affricates and Fricative Sounds	
	Topic 3	Speech Sounds Speech Music Tone Volume Diction Syntax Intonation Syllable Stress	
	Unit 4	Gauging MTI Reduction Effectiveness through Free Speech	
	Topic 1	Jam sessions	CO3
	Topic 2	Extempore	
	Topic 3	Situation-based Role Play	
	Unit F	Leadership and Management Skills	
	Topic 1	Innovative Leadership and Design Thinking	CO4
	Topic 2	Ethics and Integrity	CO4
	Unit 5	Universal Human Values	
	Topic 1	Love & Compassion, Non-Violence & Truth	CO5
	Topic 2	Righteousness, Peace	CO5
	Topic 3	Service, Renunciation (Sacrifice)	CO5
	Unit G	Introduction to Quantitative aptitude & Logical Reasoning	
	Topic 1	Analytical Reasoning & Puzzle Solving	CO6
	Topic 2	Number Systems and its Application in Solving Problems	CO6
9	Evaluations	<i>Practical Basis - Class Assignments/Free Speech Exercises / JAM Group Presentations/Problem Solving Scenarios/GD/Simulations (CA,CE and ESE component) and NO MSE CA-25%; CE-25%; ESE-50%</i>	N/A
10	Texts & References Library Links	<ul style="list-style-type: none"> Wren, P.C. & Martin H. <i>High English Grammar and Composition</i>, S. Chand & Company Ltd, New Delhi. Blum, M. Rosen. <i>How to Build Better Vocabulary</i>. London: Bloomsbury Publication Comfort, Jeremy(et.al). <i>Speaking Effectively</i>. Cambridge University Press. <p>The Luncheon by W.Somerset Maugham - http://mistera.co.nf/files/sm_luncheon.pdf</p>	

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

Syllabus: Data Structure Using C Lab

School:		Sharda School of Engineering & Technology		
Programme:		Computer Science & Applications.		
Branch:		BCA, Academic Year: 2023-24		
Semester:		II		
1	Course Code	BCP286		
2	Course Title	Data Structure Using C Lab		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Compulsory		
5	Course Objective	<ul style="list-style-type: none"> • To Develop arrays-based Programme to implement matrix • To write Programme to implement stacks and queues • Perform operation on various data structures like trees and graphs 		
6	Course Outcomes	<p>By the end of this course, the student will be able to:</p> <p>CO1 Apply the basic operations on arrays (K2)</p> <p>CO2 Construct complex Programmes like matrix implementations on arrays (K2)</p> <p>CO3 Apply the concept of stacks and queues in real life problem solving (K3)</p> <p>CO4. Apply the concepts of data structure, like linked list to solve complex problems (K4)</p> <p>CO5. Solving the real-life problems based on trees (K5)</p> <p>CO6 Implementing the graphs and apply graph concept in computer networks (K6)</p>		
7	Course Description	An introduction design and implement data structures. Design and develop various Programmes in lab like Programmes on stacks and queues, Programme on linked list like singly linked list and doubly linked list, Programme on trees and graphs.		
8	Outline syllabus		CO Mapping	
	Unit 1	Programmes based on arrays		
		Write Programmes to implement the matrix operations	CO1, CO6	
	Unit 2	Programmes based on stacks and queues		
		Programmes to implement the stacks and queues operations	CO2, CO6	
	Unit 3	Programmes based on linked list, searching and sorting		
		Programmes to implement the linked list, searching and sorting	CO3, CO6	
	Unit 4	Programmes based on Trees		
		Programme to implement the trees like insertion, deletion of a node including tree traversal	CO4, CO6	
	Unit 5	Programmes based on Graphs		
		Programme to implement the graphs like Dijkstra algorithm, Prims algorithm and Kruskal's algorithm	CO5, CO6	
	Mode of examination	Jury/Practical/Viva		
	Weightage Distribution	CA	CE (Viva)	ESE
		25%	25%	50%
	Text book/s*	1. A Common-Sense Guide to Data Structures and Algorithms, Second Edition: Level Up Your Core Programming Skills 2nd Edition		

		2. Data Structures Through C (A Practical Approach) Paperback – 1 January 2016 by G.S. Baluja		
Other References		1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++”, PHI 2. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication		

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO-1 Apply the basic operations on arrays (K2)	PO1, PO3, PO4, PO8, PO9, PO10, PSO1
2.	CO-2 Construct complex Programmes like matrix implementations on arrays (K2)	PO1, PO2, PO3, PO4, PO8, PO9, PO10
3.	CO-3 Apply the concept of stacks and queues in real life problem solving (K3)	PO1, PO2, PO3, PO4, PO8, PO9, PO10
4.	CO-4. Apply the concepts of data structure, like linked list to solve complex problems (K4)	PO1, PO2, PO3, PO4, PO8, PO9, PO10, PSO1
5.	CO-5. Solving the real-life problems based on trees (K5)	PO1, PO2, PO3, PO4, PO8, PO9, PO10, PSO1
6.	CO-6 Implementing the graphs and apply graph concept in computer networks (K6)	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PSO1

PO and PSO mapping with level of strength for Course Name Data Structure Using C lab (Course Code: BCP286)

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

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

Course Code/ Name	PO 1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2
BCP286_ DS lab	3	3	3	2.2	2	-	2	2.8	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

Syllabus: Operating Systems and Unix shell Programming Lab

School:		Sharda School of Engineering & Technology	
Programme:		Computer Science & Applications.	
Branch:		BCA, Academic Year: 2023-24	
Semester:		II	
1	Course Code	BCP185	
2	Course Title	Operating Systems and Unix shell Programming Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Core	
5	Course Objective	Introduces the UNIX operating system, including: task scheduling and management, memory management, input/output processing, internal and external commands, shell configuration, and shell customization. Explores the use of operating system utilities such as text editors, electronic mail, file management, scripting, and C/C++ compilers	
6	Course Outcomes	<p>On completion of this course the student should be able to:</p> <p>CO1: To Identify and use UNIX utilities to create and manage simple file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks.</p> <p>CO2: To accomplish typical personal, office, technical, and software development tasks.</p> <p>CO3: To Analyze system performance and network activities. Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.</p> <p>CO4: Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines.</p> <p>CO5: Analyze various utilities to structure the Linux Programme</p> <p>CO6: Implement the Unix utilities to successfully write a Programme</p>	
7	Course Description	This courses introduces Unix Operating System	
8	Outline syllabus	CO Mapping	
	Unit 1	Practical based on Basic Unix Commands	
	A	Introduction to Unix, Unix architecture	CO1, CO2, CO4
	B	Features of Unix, Internal & External Commands	CO1, CO2, CO4

	C	Basic unix commands: pwd, cd, mkdir, rmdir, ls, help, man, whatis		CO1, CO2, CO4	
	Unit 2	Practical based on File Management			
	A	Unix file system		CO1, CO2, CO3, CO4	
	B	File Permission		CO1, CO2, CO3, CO4	
	C	File Handling Commands		CO1, CO2, CO3, CO4	
	Unit 3	Practical based on process Management			
	A	Process basics		CO2, CO3, CO4	
	B	Process and Threads		CO2, CO3, CO4	
	C	Process States, PID,PPID and other commands		CO2, CO3, CO4	
	Unit 4	Practical Based on Filters			
	A	Simple filters		CO2, CO3, CO4	
	B	pr, head, tail, tr, grep commands		CO2, CO3, CO4	
	C	cut, paste, sort, nl commands		CO2, CO3, CO4	
	Unit 5	Practical Based on Shell Scripting			
	A	Shell script		CO1, CO2, CO3, CO4, CO6	
	B	Execution of shell scripts.		CO1, CO2, CO3, CO4, CO6	
	C	Using command line arguments, loops , condition		CO1, CO2, CO3, CO4, CO6	
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	CE (Viva)	ETE	
		25%	25%	50%	

Text book/s*	1. Sumitabha Das, “Unix Concepts and Applications”, Tata McGraw Hill.		
Other References	1. Unix Shell Programming by Stephen G. Kochan and Patric Wood 2. Unix and shell Programming by Richard F. Gilberg and Behrouz A. forouzan		

PO and PSO mapping with level of strength for Course Name Operating Systems Using unix shell Programming Lab (Course Code BCP185)

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	PSO 1	PSO2
BCP185_OS & shell Programming lab	CO1	3	3	3	3	--	--	--	2	2	1	3	2
	CO2	3	2	3	3	--	--	--	2	2	2	2	3
	CO3	3	3	3	3	--	--	--	1	1	1	3	2
	CO4	2	2	2	2	2	--	--	2	3	3	2	2
	CO5	2	2	2	2	2	--	--	2	3	3	2	2
	CO6	2	2	2	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	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
BCP185	OS & shell Programming lab	2.5	2.33	2.5	2.5	1.0			1.8	2.3	2.1	2.3	2.1

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		SSET	
Department		Computer Science & Applications.	
Programme		BCA, Academic Year: 2023-24	
Semester		II	
1	Course Code	VOCP102	Course Name: Design Thinking and Creative Learning Lab
2	Course Title	Design Thinking and Creative Learning Lab	
3	Credits	2	
4	Contact Hours (L-T-P)	0-0-4	
Course Status		Compulsory	
5	Course Objective	<ol style="list-style-type: none"> 1. To familiarize students with Design Thinking concepts and principles. 2. To familiarize students with Architecture of a product and its financial Analysis 3. Development of a new product, new service or the radical innovation of processes 4. Apply Design Thinking approach to various examples and real life applications. 	
6	Course Outcomes	<p>After the completion of this course, students will be able to:</p> <p>CO1: Explain the basics concepts of Design Thinking</p> <p>CO2: Design solutions as per needs and Translate customer needs into product specifications</p> <p>CO3: To apply product development concepts to the service environment.</p> <p>CO4: Learning to Design the Architecture of a product.</p> <p>CO5: To apply environmental design concepts to the life cycle of a product.</p> <p>CO6: To apply Design Thinking approach to various examples and real life applications.</p>	
7	Course Description	<p>This course introduces Design Thinking methodologies, processes and tools that can be used to make the world a better place. Students explore Design thinking theories and how they can be applied to practical situations relevant to various academic disciplines and organizational roles. Among the topics covered are ideation, prototyping, iteration and innovation. Through personal reflection, students will also examine how they can harness the power of design thinking for leading the creation of value for businesses, organizations and society.</p>	
8	Outline syllabus	CO Mapping	
	Unit 1	Skills in Design Thinking	
	A	Learn how to use critical design thinking skills to improve an existing product or create a new one.	CO1
	B	As a first step toward user innovation, learn to identify consumer requirements and write customer needs statements.	CO1, CO6
	Unit 2	Product Specifications and Applying Creativity	
	A	Learn how to statistically translate customer needs into product specifications and how product metrics can aid in the definition of those specs.	CO2

B	Learn how to design needs solutions using creativity, brainstorming, and concept generation.	CO2, CO6
Unit 3	Prototyping and Services-oriented design	
A	Investigate prototyping techniques, tactics, and real-world examples of how they were used to generate a design that reflects client wants and product specifications.	CO3,CO4
B	Learn how to recognize the potential for innovation in service design and how to apply product development concepts to the service environment.	CO5,CO6
Unit 4	Architecture of a Product and Financial Analysis	
A	Learn how to determine the building blocks of a product using modular and integral product architectures.	CO4
B	Learn how to run a financial analysis on your project idea to see if it has a solid business case (Worth-It).	CO1,CO3, CO6
Unit 5	Environmental Design and Processes of Product Development	
A	Learn how to apply environmental design concepts to the life cycle of a product.	
B	Learn how to choose and implement a product development approach that's right for your project (staged, spiral, or agile).	CO5, CO6
Mode of examination	Practical	
Weightage Distribution	CA 25%	CE (Viva) 25%
		ETE 50%
Text book/s*	Design Thinking: A Guide to Creative Problem Solving for Everyone by Andrew Pressman	
Other References	<ol style="list-style-type: none"> Design thinking the guidebook Change by Design by Tim Brown's Design Thinking For Dummies by Christian Muller-Roterberg. 	

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO)
1.	CO1: Explain the basics concepts of Design Thinking	PO1,PO2,PO3,PO4,PO7,PO9,PSO1,PSO2
2.	CO2: Design solutions as per needs and Translate customer needs into product specifications	PO1,PO2,PO3,PO4,PO7,PO9,PSO1,PSO2
3.	CO3: To apply product development concepts to the service environment.	PO1,PO2,PO3,PO4,PO7,PO9,PSO1,PSO2
4.	CO4: Design the Architecture of a product.	PO1,PO2,PO3,PO4,PO6,PO7,PO9,PSO1,PSO2
5.	CO5: To apply environmental design concepts to the life cycle of a product.	PO1,PO2,PO3,PO4,PO6,PO7,PO9,PSO1,PSO2
6.	CO6: To apply Design Thinking approach to various examples and real life applications.	PO1,PO2,PO3,PO4,PO6,PO7,PO9,PSO1,PSO2

PO and PSO mapping with level of strength for Course Name: Design Thinking and Creative Learning Lab (VOCP102)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	2	1	1	1	-	-	2		1	-	1	1
CO2	2	2	2	1	-	-	2		1	-	1	2
CO3	2	2	2	1	-	-	2		1	-	2	2



CO4	2	1	2	3	-	2	2		1	-	1	1
CO5	2	2	3	2	-	2	2		1	-	2	2
CO6	3	3	3	2	-	2	2		1	-	2	2
Avg. PO attained	2.16	1.8	2.16	1.67		2	2		1		1.5	1.67



TERM-III

School:		Sharda School of Engineering & Technology	
Department:		Computer Science & Applications	
Programme:		BCA	
Semester:		III	
1	Course Code	BCA186	
2	Course Title	Object Oriented Programming Using Java	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Core	
5	Course Objective	Understand the fundamentals of object-oriented concept in Java, defining classes, objects, invoking methods inheritance, interfaces and exception handling mechanisms. To develop skills in analyzing the usability of a web and understand the fundamentals of web design and its technologies.	
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Compare and contrast different features of java with other Programming paradigms. CO2: Describe the fundamental of object-oriented concepts in java. CO3: Explain the concept of inheritance, polymorphism, interfaces and multithreading. CO4: Analyze Exception and Error in java Programmes. CO5: Design web pages by using HTML & CSS. CO6: Develop real world related problems using object-oriented concepts of java.	
7	Course Description	Basic Object-Oriented Programming (OOP) concepts, including objects, classes, methods, parameter passing, information hiding, inheritance and polymorphism are introduced and their implementations using Java are discussed. HTML and CSS are discussed to give basic understanding and its implementation to design the web pages.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction to Object-Oriented Paradigm	
	A	Procedural Languages, object-based languages, object-oriented languages, difference between Programming paradigms, advantages of OOPs.	CO1, CO2
	B	Object-oriented Programming features: Abstraction, class, object, Encapsulation, data hiding, polymorphism, inheritance.	CO1, CO2
	C	Java virtual machine, Byte Code, Architecture of JVM, Class Loader, Execution Engine, Garbage collection.	CO1, CO2
	Unit 2	Introduction to Java with class and object	
	A	Java development Kit (JDK), Introduction to IDE for java development, setting java environment (steps for path and CLASSPATH setting)	CO1, CO2
	B	Constants, Variables, Data Types, Type conversion & casting, Operators, Expressions, Decision Making, Branching, Loops, command line argument, Input from keyboard.	CO1, CO2
	C	Classes, Objects, Methods, Constructors, Constructor's overloading, static keyword, Introducing Access Control.	CO2, CO6
	Unit 3	Inheritance, Polymorphism, Interface, Array & String	
	A	Types of inheritance, Concept of multiple inheritances, use of this and super, Implementing Interface	CO3, CO6
	B	Polymorphism, Compile Time Polymorphism, Run Time Polymorphism, Method overloading, Overriding methods	CO3, CO6
	C	Final class, method and variable, Abstract class and method, Introduction to, Arrays and String handling.	CO3, CO6
	Unit 4	Exception and Multithreading	
	A	Exception Handling, Introduction to try, catch, throw and throws.	CO4, CO6
	B	Checked and Unchecked exceptions, User define exception,	CO4, CO6
	C	Introduction to Multithreading: multithreading advantages and issues, creating thread using Runnable interface and Thread class, Thread life cycle.	CO3, CO6
	Unit 5	Html & Style sheets	
	A	Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images,	CO5, CO6

B	forms, XHTML, frames and frame sets, Overview and features of HTML 5.	CO5, CO6
C	Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3.	CO5, CO6
Mode of examination	Theory	
Weightage Distribution	CA	MTE
	25%	50%
Text book/s*	1.Schildt H, “The Complete Reference JAVA2”, TMH 2. Douglas Comer “The Internet Book - Pearson Education”, Asia	
Reference Books	1. Balagurusamy E, “Programming in JAVA”, TMH 2. Professional Java Programming : BrettSpell, WROX Publication 3. Douglas E. Comer “Internetworking with TCP/IP”, Volume-I, PHI 4. HTML 5, Black Book, Dreamtech Press	

CO and PO Mapping

Sl. No.	Course Outcome (CO)	
1.	CO1: Compare and contrast different features of java with other Programming paradigms.	PO1, PO2
2.	CO2: Describe the fundamental of object-oriented concepts in java.	PO1, PO2, PO4
3.	CO3: Explain the concept of inheritance, polymorphism, interfaces and multithreading.	PO1, PO2, PO3, PO4, PO10, PSO1
4.	CO4: Analyze Exception and Error in java Programmes.	PO1, PO2, PO3, PO10
5.	CO5: Design web pages by using HTML & CSS.	PO2, PO3, PO4, PO10
6.	CO6: Develop real world related problems using object-oriented concepts of java.	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO10, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name Object Oriented Programming Using Java and Web Designing (Course Code OLBCA-301)

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	PSO 1	PSO2
BCA 186 Object Oriented Programming Using Java	CO1	3	2	-	-	-	-	-	-	-	2	-	-
	CO2	2	3	-	2	-	-	-	-	-	-	-	-
	CO3	2	3	2	3	-	-	-	-	-	2	2	-
	CO4	2	3	2	-	-	-	-	-	-	2	-	-
	CO5	-	2	2	3	-	-	-	-	-	2	2	1
	CO6	2	3	2	3	3	2	-	2	-	2	2	2

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

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
BCA 186	Object Oriented Programming Using Java and Web Designing	2.2	2.67	2	2.75	3	2	0	2	0	2	2	1.5

Syllabus: Principles of Database Management System

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA	
Semester		III	
1	Course Code	BCA184	
2	Course Title	Principles of Database Management Systems	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Core	
5	Course Objective	The objective of this course is to: 1. To learn about basic concepts of databases, terms, 2. Introduce students to build database management systems 3. Apply DBMS concepts to various examples and real life applications	
6	Course Outcomes	At the end of the course student will be able to: CO1: Explain the basics concepts of database & design an ER model for a given example from real world description.(K2,K6) CO2: Design & Solve the given problem using Relational Algebra, Relational Calculus, SQL and PL/SQL.(K6,K3) CO3: Apply normalization techniques to reduce redundancy from the database.(K3) CO4: Appraise the basic issues of Transaction processing, Serializability & deadlock.(K5) CO5: Determine the roles of concurrency control techniques in database design.(K5) CO6: Design & develop database system for real life problems.(k6)	
7	Course Description	This course introduces developing and managing efficient and effective database applications that requires understanding the fundamentals of database management systems, techniques for the design of databases, and principles of database administration.	
8	Outline syllabus		CO Mapping
	Unit 1	INTRODUCTION TO DATABASES & ENTITY-RELATIONSHIP (ER) MODEL	
	A	Overview of DBMS, Database System vs File System, Data Independence Database languages: DDL, DML, Database Users, Database Administrator	CO1, CO6
	B	Data Models, Hierarchical, Network Data Modeling, Database System Architecture, Overall Database Structure, Relational data model concepts, ER Model Concepts, Notation for ER Diagram	CO1, CO6
	C	Keys, Concept of keys, Weak Entity Types, Generalization, Aggregation, Converting ER diagrams to relational tables.	CO1, CO6
	Unit 2	RELATIONAL DATA MODEL & CONCEPTS OF SQL	
	A	Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints	CO1, CO2, CO6
	B	Relational Algebra, Relational Calculus, Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION	CO1, CO2, CO6
	C	Introduction on SQL: Characteristics of SQL, Advantage of SQL, Views and Indexes. Queries and Subqueries, Joins, Cursors, Triggers, Procedures in SQL/PL SQL	CO1, CO2, CO6
	Unit 3	RELATIONAL DATABASE DESIGN & NORMALIZATION	

A	Functional Dependency, Different anomalies in designing a Database, loss less join decompositions	CO3, CO6
B	Normal Forms: First, Second, Third normal forms and Boyce Codd normal form (BCNF), Multivalued dependencies, fourth normal forms	CO3, CO6
C	Case Study based on Relational Database Design & Normalization	CO3, CO6
Unit 4	TRANSACTION PROCESSING CONCEPTS	
A	Introduction to Transaction processing; ACID property, Testing of Serializability, Serializability of Schedules,	CO4
B	Conflict & View Serializable, Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock,	CO4
C	Case Study based on Transaction Processing System	CO4
Unit 5	CONCURRENCY CONTROL TECHNIQUES	
A	Concurrency Control, Two-Phase Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control,	CO5
B	Validation Based Protocol, Multiple Granularity, Multi Version Schemes,	CO5
C	Case Study based on Oracle	CO5
Mode of examination	Theory	
Weightage Distribution	CA	MTE ETE
	25%	25% 50%
Text book/s*	1. Korth , Silberschatz& Sudarshan, Data base Concepts, Tata McGraw-Hill 2. Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education Inc.	
Other References	1. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to design, Implementation and Management, Pearson Education, Latest Edition. 2. Jeffrey D. Ullman, Jennifer Windon, A first course in Database Systems, Pearson Education. 3. Date C.J., An Introduction to Database Systems, Addison Wesley. 4. Richard T. Watson, Data Management: databases and organization, Wiley.	

CO and PO Mapping

S. No.	Course Outcome (CO)	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	Explain the basics concepts of database & design an ER model for a given example from real world description.	PO1, PO4, PO8, PO9, PO10
2.	Design & Solve the given problem using Relational Algebra, Relational Calculus, SQL and PL/SQL.	PO1, PO2, PO4, PO8, PO10
3.	Apply normalization techniques to reduce redundancy from the database.	PO1, PO2, PO3, PO4, PO8, PO10
4.	To appraise the basic issues of Transaction processing, Serializability & deadlock.	PO1, PO2, PO3, PO4, PO8
5.	Determine the roles of concurrency control techniques in database design.	PO1, PO2, PO3, PO4, PO10
6.	Design & develop database system for real life problems	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO10, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name: Principles of Database Management Systems (Course Code: BCA184)

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

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

Course Code/ Name	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
BCA184/ DBMS	2.5	2.6	2.5	3	2	2	2	2.6	2.5	2.4	2	2

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

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA Academic Year: 2023-24	
Semester		III	
1	Course Code	BCAO222	
2	Course Title	Computational Methods	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objective	The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.	
6	Course Outcomes	CO1: Explain the concept of differential calculus, illustrate the curvature and Maxima, minima and saddle point. (K2, K3, K4) CO2: Explain the basic concepts matrices and determinate, evaluate system of linear equation by using rank and inverse method. (K2, K3, K5) CO3: Explain the basic concept of sets, relation, functions, groups Rings and Field. (K2, K4) CO4: Discuss the basic of Vector spaces. (K1, K3) CO5: Describe and use the linear transformation and evaluate nullity and kernel. (K1, K2, K3, K5) CO6: Explain the concept of Eigen values and Eigen vectors; evaluate the diagonalization of matrices, explain the basic introduction of Inner product spaces. (K2, K3, K4, K5)	
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 differential and integral calculus, linear Algebra and Abstract Algebra.	
8	Outline syllabus: Mathematics in Computer Applications		CO Mapping
	Unit 1	Differential Calculus:	
	A	Successive differentiation, Leibnitz Theorem, Taylors theorem with Lagranges forms of remainders,	CO1
	B	Expansion of a function of one variable in Taylors and Meclanrin's infinite series. Maxima and Minima of one variable, partial Derivatives, Euler's theorem, change of variables, total differentiation,	CO1
	C	Errors and approximation. Taylors series in two variables. Maxima and Minima of two or more variables	CO1,CO2
	Unit 2	Integral Calculus:	
	A	Definite integral and its application for area, length and volume.	CO2
	B	Multiple integrals. Change of order of integration.	CO2
	C	Transformation of integral from Cartesian to polar. Applications in areas, volume and surfaces.	CO2
	Unit 3	Differential Equation:	
	A	First degree and first order Differential equation	CO3
	B	Higher order differential equation with constant coefficients.	CO3
	C	Linear partial differential equation of first order P.D.E. of higher with constant coefficients.	CO3,CO5
	Unit 4	LINEAR ALGEBRA:	
	A	Spaces and Subspaces, Basic and Dimension of Vector Spaces,	CO4
	B	Linear Transformation,	CO4
	C	Their Nullity and Rank.	CO4
	Unit 5	MATRIX ALGEBRA:	

A	Elementary Transformation, Inverse of a Matrix by Row Operation, Rank,			CO5	
B	Solution of a System of Linear Simultaneous Equation by Matrix Methods,			CO5	
C	Eigen Values and Eigen Vectors, Quadratic Forms.			CO5, CO6	
Mode of examination	Theory				
Weightage Distribution	CA	MTE	ETE		
	25%	25%	50%		
Text book/s*	1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. 2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.				
Other References	1. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005. 2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. 3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. 4. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.				

CO and PO Mapping

S. No.	Course Outcome (CO)	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	Explain the concept of differential calculus, illustrate the curvature and Maxima, minima and saddle point.	PO1,PO4PO8,PO9,PO10
2.	Explain the basic concepts matrices and determinant, evaluate system of linear equation by using rank and inverse method.	PO1,PO2,PO4,PO8,PO10
3.	Explain the basic concept of sets, relation, functions, groups Rings and Field.	PO1,PO2,PO3,PO4,PO9,PO10,PSO1, PSO2
4.	Discuss the basic of Vector spaces.	PO1,PO2,PO3,PO4,PO8,PO10
5	Describe and use the linear transformation and evaluate nullity and kernel.	PO1,PO2, PO3,PO4,PO10
6	Explain the concept of Eigen values and Eigen vectors; evaluate the diagonalization of matrices, explain the basic introduction of Inner product spaces..	PO1, PO2,PO3,PO5,PO6,PO,PSO1, PSO2

PO and PSO mapping with level of strength for Course Name Mathematics in Computer Applications

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

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

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
BCAP222	Numerical Analysis Lab	2.5	2.6	2.5	3	2	2	2	2.5	2	2.2	2	3

Strength of Correlation

School		Sharda School of Engineering & Technology		
Department		Computer Science & Applications		
Programme		BCA (Online), Academic Year: 2023-24		
Semester		III		
1	Course Code	BCA369		
2	Course Title	Introduction to Blockchain Technology		
3	Credits	3		
4	Contact Hours (L-T-P)	3	0	0
Course Status		Core		
5	Course Objective	<p>By the end of the course, students will be able to:</p> <ol style="list-style-type: none"> Understand how blockchain systems work, To securely interact with them, Design, build, and deploy smart contracts and distributed applications, Integrate ideas from blockchain technology into their own projects 		
6	Course Outcomes	<p>At the end of this course, students will be able to:</p> <p>CO1: Define principles of Blockchain networks, distributed ledger, and the layered architecture of blockchain</p> <p>CO2: Demonstrate an understanding of key terms related to cryptocurrencies</p> <p>CO3: Evaluate the differences among key consensus algorithms</p> <p>CO4: Evaluate the Ethereum and Hyperledger Fabric blockchain frameworks and their applications in enterprise contexts</p> <p>CO5: Apply the knowledge of smart contracts to design and develop simple Programmes using the Solidity Programming language and Remix IDE</p> <p>CO6: Evaluate the benefits and challenges of using blockchain technology in various domains and identify potential use cases</p>		
7	Course Description	<p>Decentralized blockchain-based systems, such as Bitcoin and Ethereum, are successful beyond all expectations. Although still in their infancy, they promise to revolutionize how we think of financial, information, and other infrastructures. This course covers the technical aspects of public distributed ledgers, blockchain systems, cryptocurrencies, and smart contracts. Students will learn how these systems are built, how to interact with them, how to design and build secure distributed applications.</p>		
8	Outline syllabus	CO Mapping		
	Unit 1	Introduction		
	A	Introduction to Blockchain networks, distributed ledger, layered architecture of blockchain	CO1 , CO2	
	B	Blockchain principles: Decentralization, immutability, transparency, hashing and digital signature	CO1 , CO2	

C	Types of Blockchain: Public, private and consortium. Permissionless and permissioned	CO1 , CO2	
Unit 2	Cryptocurrency		
A	Definition, Types, Benefits, Limitations	CO1, CO3	
B	Different Cryptocurrencies: Bitcoin, Ethereum, Altcoins.	CO1, CO3	
C	Crypto Wallets, Mining, Initial Coin Offering, Merkle Tree	CO1, CO3	
Unit 3	Consensus Algorithms		
A	Proof of Work(PoW), Proof of Stake(PoS), Proof of Elapsed Time (PoET)	CO3, CO4	
B	Practical Byzantine Fault Tolerance: Definition, Working, Limitations	CO3, CO4	
C	Delegated Byzantine Fault Tolerance, Directed Acyclic Graphs,	CO3, CO4	
Unit 4	Ethereum and Hyperledger		
A	Ethereum blockchain, Ethereum Virtual Machine (EVM), Ether and Gas	CO4, CO5	
B	Smart Contracts: Definition, Features, Working of Smart Contracts, Benefits and Limitations, Basic Programming concepts of Solidity, Introduction to Remix IDE	CO3, CO5	
C	Hyperledger Project, Hyperledger Fabric, Working and Consensus algorithm	CO3, CO5	
Unit 5	Application and future of Blockchain		
A	Blockchain in Finance, Blockchain in Governance, Blockchain in smart energy	CO5, CO6	
B	Blockchain in supply chain management, Blockchain and Artificial Intelligence, Blockchain and Internet of Things	CO5, CO6	
C	Applications: Electronic Health Record Management System, Land Record Management, Blockchain based traceability systems, Hashgraphs	CO5, CO6	
Mode of examination	Theory		
Weightage Distribution	CA	MTE	ETE
	25%	25%	50%
Text book/s*	Blockchain Technology and Applications, Manoj Kumar M. V., Likewin Thomas, Sourav Kanti Addya, Niranjana Murthy M., Annappa B. CRC Press, 2022		
Other References	<p>1. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015 (article available for free download) { curtain raiser kind of generic article, written by seasoned experts and pioneers}.</p> <p>2. J.A.Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOI 9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048) . (</p>		

	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).
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CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1	Define principles of Blockchain networks, distributed ledger, and the layered architecture of blockchain	PO1,PO2,PO3, PO4, PO10, PSO1, PSO2
2	Demonstrate an understanding of key terms related to cryptocurrencies	PO1,PO2,PO3, PO4, PO10, PSO1, PSO2
3	Evaluate the differences among key consensus algorithms	PO1,PO2,PO3, PO4, PO10, PSO1, PSO2
4	Evaluate the Ethereum and Hyperledger Fabric blockchain frameworks and their applications in enterprise contexts	PO1,PO2,PO3, PO4, PO10, PSO1, PSO2
5	Apply the knowledge of smart contracts to design and develop simple Programmes using the Solidity Programming language and Remix IDE	PO1,PO2,PO3, PO4, PO8, PO10, PSO1, PSO2
6	Evaluate the benefits and challenges of using blockchain technology in various domains and identify potential use cases	PO1,PO2,PO3, PO4, PO5, PO6, PO7, PO8, PO10, PSO1, PSO2

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	PSO1	PSO2
BCA369_ Introduction to Blockchain Technology	CO1	3	3	2	2	-	-	-	-	-	3	2	3
	CO2	3	3	2	2	-	-	-	-	-	3	2	3
	CO3	3	3	2	2	-	-	-	-	-	3	2	3
	CO4	3	3	3	3	-	-	-	-	-	3	3	3
	CO5	3	3	3	3	-	-	-	2	-	3	3	3
	CO6	3	2	3	2	2	2	2	2	2	-	3	3
	AVG	3.00	2.83	2.50	2.33	2.00	2.00	2.00	2.00	0	3.00	2.50	3.00

School: SSET	Batch: 2023-26	
Department	Computer Science and Applications	
Batch: 2021-25	Current Academic Year: 2023-24	
Programme: BCA	Semester: III	
1 Course Code	BCA370	
2 Course Title	Cyber Analytics	
3 Credits	3	
4 Contact Hours (L-T-P)	3-0-0	
Course Status	Core	
5 Course Objective	The objective of this course is to provide knowledge to secure corrupted systems, protect personal data, and secure computer networks in an organization. Additionally, to practice with an expertise in academics to design and implement security solutions.	
6 Course Outcomes	<p>After the completion of this course, students will be able to:</p> <p>CO1: Explain the broad set of technical, social & political aspects of Computer Security.</p> <p>CO2: Describe the operational and psychology security Aspects.</p> <p>CO3: Explain Authentication Methods and Intrusion detection system.</p> <p>CO4: Describe the Cyber Crime Strategy analysis.</p> <p>CO5: Apply the Concepts of Cyber Crime and Digital Forensics in Real Time Scenarios.</p> <p>CO6: Develop and Utilize cyber analytics data to inform and support strategic decision-making in online marketing campaigns.</p>	
7 Course Description	The course 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.	
8 Outline syllabus		CO Mapping
Unit 1	INTRODUCTION TO CYBER FORENSICS	
A	Introduction to Cyber Forensics - Cyber Threats and Vulnerabilities	CO1
B	Concept of Cyber Security, Cyber Crimes and Cyber-attack.	CO1
C	Current Threats and Trends – Confidentiality – Cyber Hate Crimes.	CO1, CO2
Unit 2	CYBER CRIME	
A	National Security Strategy – Organized Crime Strategy – Cyber Crime Strategy	CO1, CO2
B	Policy Cyber Crime – International Response – National Cyber Security Structure	CO1, CO2
C	Strategic Policy Requirements – Police and Crime Commissioners.	CO1, CO2
Unit 3	CYBER SECURITY AND THREATS	
A	User, Group, and Role Management - Password Policies - Single Sign-On -	CO3
B	Security Controls and Permissions - Preventing Data Loss or Theft	CO3
C	The Remote Access Process - Remote Access Methods. - Network-Based IDSs -	CO3
Unit 4	CYBER SECURITY	
A	Security Policies, Security Procedures, Standards, and Guidelines	CO3, CO4
B	Security Awareness and Training - Interoperability Agreements - The Security Perimeter, Physical Security	CO3, CO4
C	Environmental Issues - Wireless - Electromagnetic Eavesdropping - People—A Security Problem - People as	CO3, CO4
Unit 5	SECURITY SPACE	
A	Intrusion Detection System (IDS) and Intrusion Protection System (IPS).	CO5, CO6
B	Web Based Automated System for Cyber Analytics	CO5, CO6
C	Collection of Links, Scraping of Information, Structuring Information, Analysis of Data.	CO5, CO6

Mode of examination	Theory			
Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	
Text book/s*	1. Francois Chollet, Deep Learning with Python, Manning publications, Shelter Island, New York, 2018. 2. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.			
Reference Books	1. Navin Kumar Manaswi, Deep Learning with Applications using Python, Apress, New York, 2018. 2. Ethem Alpaydin, Introduction to Machine Learning, 3rd Edition, MIT Press, 2014.			

School:	Sharda School of Engineering & Technology	
Department	Computer Science & Applications	
Programme:	BCA, Academic Year: 2023-24	
Semester:	III	
1	Course Code	VOC201
2	Course Title	Augmented Reality Application Development
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	Compulsory
5	Course Objective	The objective of this course is to provide a foundation to the fast-growing field of AR and make the students aware of the various AR devices
6	Course Outcomes	after studying this course students will be able to: 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: <i>Apply</i> the concept of AR in unity game engine to develop various applications. CO4: <i>Compare</i> and understand the working of various state of the art AR devices CO5: <i>Assess</i> different AR techniques for application development CO6: <i>Plan</i> future challenge and opportunity of augmented reality
7	Course Description	This Course introduce the concept of augmented reality and its utilization to develop various applications using unity engine. The future utilization of this course will be to merge with computer vision.
8	Outline syllabus	CO Mapping
	Unit 1	Augmented Reality: Introduction
	A	What Is Augmented Reality, Applications of Augmented Reality, Components of Augmented Reality, History of AR, CO1
	B	Concept of Displays and Tracking (Tracking, Calibration and Registration), AR architecture CO2
	C	How Does Augmented Reality Work, Trends in Augmented Reality, Mobile Augmented Reality CO2
	Unit 2	Augmented Reality Hardware
	A	Augmented Reality Hardware – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, CO2, CO4
	B	Visual Perception, Requirements and Characteristics, Spatial Display Model. Processors – Role of Processors, Processor System Architecture, Processor Specifications. CO2, CO4
	C	Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion. CO2, CO4
	Unit 3	Introduction to Unity
	A	Engine Concepts: Development Tools, Introducing Unity, IDE Basics, Unity Concepts CO3

B	Sprites: Introduction to Scripting, C# Language Concepts, Creating Scripts, C# Coding Fundamentals, Game Loops and Functions, Simple Movement, and Input: Simple Movement, Simple Rotation and Scaling, Easy Input Handling in Unity			CO3
C	2D and 3D Physics Concepts: Rigidbody Components, Unity Colliders, Physics Materials, Scripting Collision Events, Organizing Game Objects, Parent-Child Objects, Sorting Layers, Tagging Game Objects, Collision Layers			CO3
Unit 4	AR Techniques- Marker based & Marker less tracking			
A	Marker-based approach- Introduction to marker-based tracking, types of markers, marker camera pose and identification, visual tracking			CO5
B	mathematical representation of matrix multiplication Marker types- Template markers, 2D barcode markers, imperceptible markers.			CO4, CO5
C	Marker-less approach- Localization based augmentation, real world examples Tracking methods- Visual tracking, feature based tracking, hybrid tracking, and initialization and recovery			CO5
Unit 5	Augmented Reality Challenges and Future			
A	Human Factor Consideration in AR – What are Human Factors, Physical Side Effects, Visual Side Effects,			CO6
B	Legal and Social Considerations in AR – Legal Considerations, Moral and Ethical Considerations,			CO6
C	Today's challenges for AR, Current State of Augmented Reality, Future of Augmented Reality			CO6
Mode of examination	Theory/Jury/Practical/Viva			
Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	
Text book/s*	1. Augmented Human: How Technology Is Shaping the New Reality by Helen Papagiannis 2. Picnic Comma Lightning: In Search of a New Reality by Laurence Scott 3. The Fourth Transformation by Robert Scoble and Shel Israel			
Other References	1. Augmented Reality: Where We Will All Live by Jon Peddie			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: <i>Describe</i> the basic concepts and different applications of Augmented Reality.	PO1, PO2, PO5, PO8, PSO1, POS2
2.	CO2: <i>Explain</i> how AR systems work and list the applications of AR.	PO1, PO2, PO3, PO4, PO8, PSO1, PSO2
3.	CO3: <i>Apply</i> the concept of AR in unity game engine to develop various applications.	PO1, PO3, PO4, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2
4.	CO4: <i>Compare</i> and understand the working of various state of the art AR devices	PO1, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PSO1, PSO2
5.	CO5: <i>Assess</i> different AR techniques for application development	PO1, PO2, PO3, PO4, PO5, PO6, PO10, PSO1, PSO2
6.	CO6: <i>Plan</i> future challenge and opportunity of augmented reality	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2

PO and PSO mapping with level of strength

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	PSO 1	PSO2
VOC201_Augmented Reality Application Development	CO1	3	3			2			2			3	3
	CO2	3	3	2	2				2			3	3
	CO3	3		3	3		2	2	2		2	3	3
	CO4	2		2	2	1	1	1	2	2		2	2
	CO5	2	2	2	2	1	1				2	2	2
	CO6	3	3	2	2	2	2	1	1	1	1	1	2

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
VOC201	Augmented Reality Application Development	2.67	2.75	2.20	2.20	1.50	1.50	1.33	1.80	1.50	1.67	2.50	2.50

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		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA , Academic Year: 2023-24	
Semester		III	
1	Course Code	ARP209	
2	Course Title	Logical Skills Building and Soft Skills	
3	Credits	2	
4	Contact Hours (L-T-P)	2-0-0	
Course Status		Compulsory	
5	Course Objective	To enhance holistic development of students and improve their employability skills. To provide a 360 degree exposure to learning elements of Business English readiness Programme, behavioural traits, achieve softer communication levels and a positive self-branding along with augmenting numerical and altitudinal abilities. To step up skill and upgrade students' across varied industry needs to enhance employability skills. By the end of this semester, a student will have entered the threshold of his/her 1 st phase of employability enhancement and skill building activity exercise.	
6	Course Outcomes	<p>After completion of this course, students will be able to:</p> <p>CO1: Ascertain a competency level through Building Essential Language and Life Skills</p> <p>CO2: Build positive emotional competence in self and learn GOAL Setting and SMART Goals techniques</p> <p>CO3: Apply positive thinking, goal setting and success-focused attitudes, time Management, which would help them in their academic as well as professional career</p> <p>CO4: Acquire satisfactory competency in use of aptitude, logical and analytical reasoning</p> <p>CO5: Develop strategic thinking and diverse mathematical concepts through building number puzzles</p> <p>CO6: Demonstrate an ability to apply various quantitative aptitude tools for making business decisions</p>	
7	Course Description	This Level 1 blended training approach equips the students for Industry employment readiness and combines elements of soft skills and numerical abilities to achieve this purpose.	
8	Outline syllabus – OLBCA306		
	Unit 1	BELLS (Building Essential Language and Life Skills)	CO Mapping
	A	<i>Know Yourself</i> : Core Competence. A very unique and interactive approach through an engaging questionnaire to ascertain a student's current skill level to design, architect and expose a student to the right syllabus as also to identify the correct TNI/TNA levels of the student.	CO1
	B	Techniques of Self Awareness Self Esteem & Effectiveness Building Positive Attitude Building Emotional Competence	CO1, CO2
	C	Positive Thinking & Attitude Building Goal Setting and SMART Goals – Milestone Mapping Enhancing L S R W G and P (Listening Speaking Reading Writing Grammar and Pronunciation)	CO1, CO2,CO3
	Unit 2	Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical	

	A	Syllogism Letter Series Coding, Decoding , Ranking & Their Comparison Level-1	CO4
	B	Number Puzzles	CO5
	C	Selection Based On Given Conditions	CO5
	Unit 3	Quantitative Aptitude	
	A	Number Systems Level 1 Vedic Maths Level-1	CO6
	B	Percentage ,Ratio & Proportion Mensuration - Area & Volume Algebra	CO6
	Unit 4	Verbal Abilities - 1	
	A	Reading Comprehension	CO1
	B	Spotting the Errors	CO2
	Unit 5	Time & Priority Management	
	A	Steven Covey Time Management Matrix	CO3
	B	Creating Self Time Management Tracker	CO3
	Evaluation Weightage Distribution	<i>Practical Basis - Class Assignment/Free Speech Exercises / JAM Group Presentations/Mock Interviews/GD/ Reasoning, Quantitative Aptitude and Logical Reasoning (CA,CE and ESE component) and NO MSE</i> CA-25%; CE-25%; ESE-50%	
	Text book/s*	<i>Wiley's Quantitative Aptitude-P Anand Quantum CAT – Arihant Publications Quicker Maths- M. Tyra Power of Positive Action (English, Paperback, Napoleon Hill) Streets of Attitude (English, Paperback, Cary Fagan, Elizabeth Wilson) The 6 Pillars of self-esteem and awareness – Nathaniel Brandon Goal Setting (English, Paperback, Wilson Dobson</i>	

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

School:		Sharda School of Engineering & Technology		
Department		Computer Science & Applications		
Programme:		BCA		
Semester:		III		
1	Course Code	BCP185		
2	Course Title	Object Oriented Programming Using Java		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Compulsory/Elective		
5	Course Objective	To implement Java language syntax and semantics and concepts such as classes, objects, inheritance, polymorphism, packages and multithreading.		
6	Course Outcomes (must be 6 COs, following verbs given in Bloom's Taxonomy)	CO1: Demonstrate Java environment and executing Java Programmes CO2: Understand and formulate the problems in basic Programming constructs CO3: Applying OOP concepts to solve real world problems CO4: Implement inheritance and polymorphism features of Java CO5: Implementing multithreading to enhance efficiency and handle run time errors CO6: Develop Java Programmes for software development		
7	Course Description	Apply features of OOPS and Java Programming including objects, classes, methods, parameter passing, information hiding, inheritance and polymorphism are discussed.		
8	Outline syllabus	CO Mapping		
	Unit 1	Jdk, IDE installation and Programme execution		
		Installing jdk, setting path, Installation and uses of IDE, Writing Java Programmes, Programme execution, JVM, JVM for other operating systems, .class files		CO1
	Unit 2	Programming revisited		
		Programmes on different data types, promotion rules in expressions, narrowing & type casting, logical-bit wise-arithmetic operators, Programmes using if .. else, switch .. case statements, for, while, do .. while loop control structures, break and continue Programmes using command line arguments, taking input from keyboard, Arrays in Java, nested control structures		CO2, CO3
	Unit 3	class , object and constructor		
		Programmes to define classes, defining data members & member function, create objects, accessing members of a class through objects, Programmes to define constructors, initializing instance variables, method overloading, constructor overloading.		CO2, CO3, CO6
	Unit 4	Inheritance, package and Interface		
		Programmes on different types of inheritance, method overriding, achieving multiple inheritance through interfaces, inheritance in interfaces, private, protected and public mode		CO3, CO4, CO6
	Unit 5	I/O, Exception and Multithreading		
		Programmes to use try.. catch.. finally for exception handling, throw user defined exceptions, uses of throws, nested try catch, rethrowing exceptions, Programmes to define Thread, run and synchronize multiple threads by extending Thread class and implementing Runnable interface.		CO3, CO5, CO6
	Mode of examination	Jury/Practical/Viva		
	Weightage Distribution	CA 25%	CE (Viva) 25%	ETE 50%
	Text book/s*	1. Schildt H, "The Complete Reference JAVA2", TMH		
	Other References	1. Balagurusamy E, "Programming in JAVA", TMH Professional Java Programming : BrettSpell, WROX Publication		

PO and PSO mapping with level of strength for Course Name Introduction to OOP using Java Lab (Course Code MCP168)

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	PSO 1	PSO2
BCP185 Object Oriented Programming Using Java	CO1	1			2	2					2	1	1
	CO2	2			2	2					2	2	2
	CO3	2	3	3	3	2					2	2	3
	CO4	3			3	2					2	2	2
	CO5	3			3	2					2	2	2
	CO6	3	3	3	3	2					2	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	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
BCP185	Introduction to OOP using Java Lab	2.3	3	3	2.5	3					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*

List of Experiments

1. WAP in Java to print Hello and explore the difference between print() and println()
2. WAP in Java with two classes create an object of first class and call into another class (having main method)
3. WAP in Java to find product of two numbers.
4. WAP in Java product of two numbers (Input by the user)
5. WAP in Java to illustrate the concept of local, instance and static variable
6. WAP in Java to count the total number of vowels and consonants in a string.
7. WAP in Java input a string and check whether it is palindrome or not.
8. WAP in Java to implement implicit and explicit type casting
9. WAP in Java to implement various operators in java
10. WAP in Java to check whether the given number is prime or not.
11. WAP in Java for constructor overloading
12. WAP in Java for method overloading
13. WAP in Java for method overriding
14. WAP in Java to find the factorial of a given number.
15. WAP in Java to show run time polymorphism (up casting)
16. WAP in Java for access specifiers (all four)
17. WAP in Java to implement the single dimension array
18. WAP in Java to copy the elements from one array to another array
19. WAP in Java to perform the addition and multiplication in 2-D array
20. WAP in Java to print the duplicate elements of an array.
21. WAP in Java to find the sum of each row and each column of a matrix
22. WAP in Java to sort the elements of an array in ascending/ descending order using Bubble Sort and Insertion sort.
23. WAP in Java for simple inheritance
24. WAP in Java for Final keyword
25. WAP in Java for super keyword

26. WAP in Java to create package (user defined)
27. WAP in Java for abstract method, class
28. WAP in Java for interface
29. WAP in Java multiple inheritance
30. WAP in Java for exception handling by using try, catch and finally
31. WAP in Java for throw and throws exception
32. WAP in Java to throw your own exceptions
33. WAP in Java to reading and writing through console class.
34. WAP in Java how to create thread using Thread Class.
35. WAP in Java how to create thread using runnable interface.
36. WAP in Java to implement the multithreading.
37. WAP in Java to implement the concept of Priorities in threads.

Syllabus: Principles of Database Management System Lab

School		Sharda School of Engineering & Technology		
Department		Computer Science & Applications		
Programme		BCA		
Semester		III		
1	Course Code	BCP184		
2	Course Title	Principles of Database Management System Lab		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Compulsory		
5	Course Objective	<ul style="list-style-type: none"> • To Develop efficient SQL Programmes to access Oracle databases • Build database using Data Definition Language Statements • Perform operations using Data Manipulation Language statements like Insert, Update and Delete 		
6	Course Outcomes	<p>By the end of this course, the student will be able to:</p> <p>CO1: Understand the basic concept of SQL commands in DBMS. (K2)</p> <p>CO2: Demonstrate various DDL Commands used to create and alter a table. (K2)</p> <p>CO3: Experiment with operations using Data Manipulation Language statements like Insert, Update and Delete. (K3)</p> <p>CO4: Examine data to apply various grouping clauses and aggregate functions. (K4)</p> <p>CO5: Evaluate the queries using the concepts like sub-queries, JOINS, Views, Cursors, Triggers. (K5)</p> <p>CO6: Develop project based on various SQL commands. (K6)</p>		
7	Course Description	An introduction to the design and creation of relational databases. Create database-level applications and tuning robust business applications. Lab sessions reinforce the learning objectives and provide participants the opportunity to gain practical hands-on experience.		
8	Outline syllabus	CO Mapping		
	Unit 1	Practical based Data types		
		Classification SQL, Data types of SQL/Oracles		CO1, CO6
	Unit 2	Practical based on DDL commands		
		Create table, Alter table and Drop table		CO2, CO6
	Unit 3	DML commands		
		Introduction about the INSERT, SELECT, UPDATE & DELETE commands.		CO3, CO6
	Unit 4	Practical based on Grouping Clauses GROUP BY, ORDER BY, HAVING & Aggregate Functions		
		Briefly explain Group by, order by, having clauses with examples. Aggregate function: sum, avg, count, max, min		CO4, CO6
	Unit 5	Practical based on Sub- queries, JOINS, Views		
		Related example of Sub- queries, Joins and related examples, Views, Cursors, Trigger, PL/SQL		CO5, CO6
	Mode of examination	Jury/Practical/Viva		
	Weightage Distribution	CA	CE (Viva)	ESE
		25%	25%	50%
	Text book/s*	1. Korth, Silberschatz & Sudarshan, Database Concepts, Tata McGraw-Hill		
	Other References	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, Latest Edition.	
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CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Understand the basic concept of SQL commands in DBMS.	PO1, PO3, PO4, PO8, PO9, PO10, PSO1
2.	CO2: Demonstrate various DDL Commands used to create and alter a table.	PO1, PO2, PO3, PO4, PO8, PO9, PO10
3.	CO3: Experiment with operations using Data Manipulation Language statements like Insert, Update and Delete.	PO1, PO2, PO3, PO4, PO8, PO9, PO10
4.	CO4: Examine data to apply various grouping clauses and aggregate functions.	PO1, PO2, PO3, PO4, PO8, PO9, PO10, PSO1
5.	CO5: Evaluate the queries using the concepts like sub-queries, JOINS, Views, Cursors, Triggers.	PO1, PO2, PO3, PO4, PO8, PO9, PO10, PSO1
6.	CO6: Develop project based on various SQL commands.	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PSO1

PO and PSO mapping with level of strength for Course Name Database Management System lab (Course Code: BCP184)

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

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

Course Code/ Name	PO 1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PSO 2
BCP184_ DBMS lab	3	3	3	2.2	2	-	2	2.8	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

Syllabus: Research Based Learning -1

School		Sharda School of Engineering & Technology		
Department		Computer Science & Applications		
Programme		BCA		
Semester		III		
1	Course Code	RBL001	Course Name: Research Based Learning -1	
2	Course Title	Research Based Learning -1		
3	Credits	0 (Audit Course)		
4	Contact Hours (L-T-P)	0-0-2		
Course Status		Compulsory (Audit Course)		
5	Course Objective	1. To align student's skill and interests with a realistic Problem or Research Gap 2. To understand the significance of problem and its scope 3. Students will find the rational solution with correct methodology		
6	Course Outcomes	Students will be able to: CO1: Identify and formulate problem statement with systematic approach. CO2: Develop teamwork and problem-solving skills, along with the ability to perform literature review with others. CO3: Plan the solution of problem as per the problem statement framed. CO4: Classify and understand basic methodology for hypothesis verification and validation of Research successfully. CO5: Implement the solution by using different aspects of Programming language/other tools and techniques. CO6: Develop a glory of the need to engage in life-long learning.		
7	Course Description	In RBL-1, the students will learn how to define the problem for developing Research scope, identifying the skills required for developing the Research based on given a set of specifications and all subjects of that Semester.		
	Mode of examination	Practical /Viva		
	Weight age Distribution	CA 25%	CE (Viva) 25%	ETE 50%

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO)
1.	CO1: Identify and formulate problem statement with systematic approach.	PO1, PO2,
2.	CO2: Develop teamwork and problem-solving skills, along with the ability to perform literature review with others.	PO2, PO8, PO10
3.	CO3: Plan the solution of problem as per the problem statement framed.	PO3, PO4

4.	CO4: Classify and understand basic methodology for hypothesis verification and validation of Research successfully.	PO2,PO3,PO7,
5.	CO5: Implement the solution by using different aspects of Programming language/other tools and techniques.	PO2,PO4
6.	CO6: Develop a glory of the need to engage in life-long learning	PO10

**PO and PSO mapping with level of strength for Course Name Research Based Learning -1
(Course Code OLBCP307)**

CO/PO Mapping												
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	3	-	2	-	-
CO3	-	-	2	2	-	-	-	-	-	-	-	-
CO4	-	2	2	-	-	-	2	-	-	-	-	-
CO5	-	2	-	2	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	2	-	-



TERM-IV

School:		Sharda School of Engineering & Technology	
Department:		Computer Science & Applications	
Programme:		BCA , Academic Year: 2023-24	
Semester:		IV	
1	Course Code	BCA284	
2	Course Title	Design and Analysis of Algorithm	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Core	
5	Course Objective	The objective of this course is to teach student about the techniques for designing algorithms and provide an ability to compare and analyze various algorithms.	
6	Course Outcomes	<p>After completion of this course, the student shall be able to :</p> <p>CO1:Analyze the asymptotic performance of algorithms CO2: Describe the dynamic-Programming and Greedy paradigm and explain when an algorithmic design situation calls for it. CO3: Demonstrate a familiarity with major algorithms and data structures CO4:Apply important algorithmic design paradigms and methods of analysis CO5: Discuss NP-complete problems and develop algorithms to solve the problems. CO6: Choose appropriate algorithm design techniques for solving problems.</p>	
7	Course Description	<p>This course introduces concepts related to the design and analysis of algorithms. Specifically, it discusses recurrence relations, and illustrates their role in asymptotic and probabilistic analysis of algorithms. It covers in detail study of greedy strategies, divide and conquer techniques, dynamic Programming paradigms for designing algorithms, and illustrates them using a number of well-known problems and applications. It also covers advanced concepts in data structures for solving newer problems. The Programming assignments can be coded in C/Python/Java.</p>	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction	
	A	<p>Algorithm design paradigms-Explanation of all 5 paradigms, motivation for algorithm design, concept of algorithmic efficiency with examples.</p> <p>Run time analysis of algorithms-should be computer independent, dependency upon input size, Growth of Functions- definition and examples, Asymptotic Notations- definition of all three notations (Ω, Θ, O), examples.</p>	CO1, CO6

B	Divide and conquer: Structure of divide-and-conquer algorithms: examples-Binary search-Algorithm, Calculation of Complexity and numerical examples, Algorithm, Calculation of Complexity and numerical examples (Insertion Sort, Merge sort, Quick sort).	CO1, CO6
C	Recurrence relations-Definitions, Examples, solution of recurrence relations using Master Method, Recurrence Tree Method and Iteration Method.	CO1, CO6
Unit 2	Greedy Methods	
A	Overview of the Greedy paradigm, Analysis and examples of exact optimization solution with examples. Minimum cost spanning tree-Definition, Kruskal's and Prim's algorithm, calculation of complexity, numerical example.	CO2,CO3
B	Fractional Knapsack problem-Problem definition, algorithm, calculation of complexity, numerical example, differences with 0/1 knapsack problem.	CO1, CO2, CO3, CO4
C	Single source shortest paths-Problem definition, examples, Dijkstra's and Bellman Ford algorithm, calculation of complexity. Task Scheduling Problem-Problem definition, examples, algorithm, Calculation of complexity	CO1, CO2, CO3
Unit 3	Dynamic Programming	
A	Overview, Difference between dynamic Programming and divide and conquer with some examples. Difference between Dynamic Programming and Greedy approach.	CO3
B	Matrix Chain Multiplication- Problem definition, solution by dynamic Programming method, algorithm, calculation of complexity, numerical example. Longest Common sequence-Problem definition, complexity of dynamic Programming method, examples, algorithm, calculation of complexity-solution, 0/1 Knapsack Problem- Problem definition, complexity of solution by dynamic Programming method, examples, algorithm, calculation of complexity.	CO3
C	Applications and analysis: All-pairs Shortest path in graphs-Algorithm, Calculation of Complexity and numerical examples, Similarity between all pair's shortest path and matrix multiplication algorithms.	CO3
Unit 4	Advanced Data Structure	
A	Height Balanced Trees: Red-Black Trees-Definition, Applications, Insertion and deletion of elements in RB-Tree.	CO1,CO2,CO3,
B	B-Tree : Definition and Applications, Insertion and deletion of keys in B-Tree.	CO1,CO2,CO3

C	Graph Algorithms: Breadth First Search and Depth First Search – applications and analysis.			CO1,CO2,CO3, CO4
Unit 5	Selected Topics			
A	String Matching- Definition, Naive String Matching and its complexity, Robin Karp Algorithm, Complexity, Concept of Spurious Hits, and Numerical Example.			CO1, CO2, CO3, CO4
B	NP Complete and NP Hard Problems- Definitions, Examples related to computer science problems. Approximation Algorithms- Requirement, Approximate Vertex Cover Problem and Algorithm, Set Covering Problem and Algorithm with its complexity.			CO4, CO5, CO6
C	Industry oriented Question solving, Expert talk on Coding challenges.			CO4, CO5, CO6
Mode of examination	Theory			
Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	
Text book/s*	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. "Introduction to Algorithms", 3/e, TMH			
Other References	<ol style="list-style-type: none"> Sahni et al., "Fundamentals of Computer Algorithms", Galgotia Publication. Hopcroft A., "The Design and Analysis Computer Algorithms", Addison Wesley 			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Analyze the asymptotic performance of algorithms	PO1, PO2, PO3, PO4, PO9, PSO1, PSO2
2.	CO2: Describe the dynamic-Programming and Greedy paradigm and explain when an algorithmic design situation calls for it.	PO1, PO2, PO3, PO4, PO9, PSO1, PSO2
3.	CO3: Demonstrate a familiarity with major algorithms and data structures	PO1, PO2, PO3, PO9, PSO1, PSO2
4.	CO4: Apply important algorithmic design paradigms and methods of analysis	PO1, PO2, PO3, PO4, PO9, PSO1, PSO2
5.	CO5: Discuss NP-complete problems and develop algorithms to solve the problems.	PO1, PO2, PO3, PO4, PO9, PSO1, PSO2

6	CO6: Choose appropriate algorithm design techniques for solving problems.	PO1, PO2, PO3, PO4, PO5, PO9, PSO1, PSO2
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PO and PSO mapping with level of strength for Course Name: Design and Analysis of Algorithm (Course Code: BCA284)

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

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

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
BCA284	Design and Analysis of Algorithm	2	2.17	1.83	2.4	2	-	-	-	2.2	-	2.5	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		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA Academic Year: 2023-24	
Semester		IV	
1	Course Code	BCA282	
2	Course Title	Computer Networks and Data Communication	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objective	The students will be introduced to the basic concepts and fundamentals of computer networks along with the study of individual layers of OSI reference model.	
6	Course Outcomes	<p>Students will be able to:</p> <p>CO1: Classify the basic network infrastructure to learn the overall function of networking systems and transmission mediums.</p> <p>CO2: Demonstrate analog and digital transmission techniques.</p> <p>CO3: Apply knowledge of switching and error detection and correction.</p> <p>CO4: Illustrate the network layer and transport layer including IP Addressing, routing, TCP and UDP services.</p> <p>CO5: Explain the functionality of application layer.</p> <p>CO6: Outline the cryptography and network security.</p>	
7	Course Description	This course provides detailed concepts of computer networking. Familiarize the student with the basic taxonomy and terminology of the computer networking area.	
8	Outline syllabus	CO Mapping	
	Unit 1	Introduction:	
	A	Overview of networks in daily life, Network Topologies- Bus, Star, Ring, Mesh, Hybrid.	CO1
	B	Connecting devices-Hub, Repeater, Router, Switch, Gateway, Modem, Multiplexers Transmission Media- Coaxial cables, twisted pair cables-Unshielded, shielded	CO1
	C	Modes of Transmission-Simplex, half duplex and Full duplex, Network Architecture and structure, Types of networks- LAN, MAN, WAN, Broadcast, Point to Point, Peer to peer Networks	CO1, CO2
	Unit 2	Digital Transmission and Analog Transmission	
	A	Digital Transmission: Digital-to-Digital Conversion, Analog-to-Digital Conversion	CO2, CO6

	B	Analog Transmission: Digital-to-Analog Conversion, ASK,FSK,PSK, Analog-to-Analog Conversion,			CO2, CO6	
	C	Modulation Techniques, Pulse Code Modulation, Delta Modulation.			CO2, CO6	
	Unit 3	Switching & Data Link Layer				
	A	Switching: Circuit switched networks, Datagram networks, Virtual circuit networks, Dial up modems, DSL.			CO3, CO6	
	B	Framing , Errors in communication, Types of Error- Single Bit error, Burst error			CO3, CO6	
	C	Flow Control- simplex protocol and stop and Wait protocol, Random Access- Aloha, CSMA			CO3, CO6	
	Unit 4	Network Layer & Transport Layer				
	A	Network Layer Services. IPV4 addressing basics and Header format			CO4, CO6	
	B	IP Addressing: IPv4, IPv6 subnetting, super-netting, MASK. Routing Protocols: IP, ARP, RARP, ICMP, IGMP functionalities and characteristics.			CO4, CO6	
	C	Transport layer Basics, Process to Process delivery, TCP services and header format UDP: services, features, header format			CO4, CO6	
	Unit 5	Application Layer				
	A	DNS namespace, distribution of namespace, DNS in internet, resolution			CO5, CO6	
	B	Email Architecture, services and Features Network Security: Definition of -symmetric, Asymmetric Cryptography			CO5, CO6	
	C	Digital signature, Message Digest			CO5, CO6	
	Mode of examination	Theory				
	Weightage Distribution	CA	MTE	ETE		
		25%	25%	50%		
	Text book/s*	1. Forouzan, B., “Communication Networks”, TMH, Latest Edition				
	Other References	2. Tanenbaum, A.S.” Computer Networks”, 4th Edition, PHI				

		1. W. Stallings, “Data and Computer Communication” Macmillan Press		
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CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Classify the basic network infrastructure to learn the overall function of networking systems and transmission mediums.	PO1, PO2, PO3,PO4 PSO2
2.	CO2: Demonstrate analog and digital transmission techniques.	PO1, PO2, PO3,PO4 PSO2
3.	CO3: Apply knowledge of switching and error detection and correction.	PO1, PO2, PO3,PO4 PSO2
4	CO4: Illustrate the network layer and transport layer including IP Addressing, routing, TCP and UDP services.	PO1, PO2, PO3,PO4 PSO2
5	CO5: Explain the functionality of application layer.	PO1, PO2, PO3,PO4 PSO2
6.	CO6: Outline the cryptography and network security.	PO1, PO2, PO3,PO4 PSO2

PO and PSO mapping with level of strength for Course Name Computer Networks and Data Communication (BCA282)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS O1	PS O2
CO1	3	2	2	2	--	--	--	--	--	--	--	2
CO2	3	2	2	2	---	---	--	---	---	---	---	2
CO3	3	2	2	2	---	---	--	---	---	---	---	2
CO4	3	2	2	2	---	---	--	---	---	---	---	2
CO5	3	2	2	2	--	--	--	--	--	--	--	2
CO6	3	2	2	2	--	--	--	--	--	--	--	2
AVG.	3	2	2	2		--	--	--	--	--	--	2

Syllabus: Application-based Programming in Python

School:	Sharda School of Engineering & Technology	
Department:	Computer Science & Applications	
Programme:	BCA, Academic Year: 2023-24	
Semester:	IV	
1	Course Code	BCA281
2	Course Title	Application based Programming in Python
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	Emphasis is placed on procedural Programming and object oriented , algorithm design, and language constructs common to most high-level languages through Python Programming and Machine Learning.
6	Course Outcomes	Upon successful completion of this course, the student will be able to: CO1. Apply the concepts of decision-making and looping structures in Programming . CO2. Understanding Modular Programming approach using methods and functions. CO3. Understand and Implement the use of Python lists, tuples and dictionaries. CO4. Incorporate object-oriented Programming concept in Programming . CO5: Creating python packages in Complex applications. CO6: Design real life Applications in python using Machine Learning
7	Course Description	Python is a language with a simple syntax, and a powerful set of libraries. It is widely used in many scientific areas for data exploration. This course is an introduction to the Python Programming language for students without prior Programming experience. We cover data types, control flow, object-oriented Programming and apply to basic concepts of Machine learning.
8	Outline syllabus	CO Mapping
	Unit 1	Introduction
	A	History, Python Environment, Variables, Data Types, Operators.
	B	Conditional Statements: If, If- else, Nested if-else. Looping: For, While, Nested loops.
	C	Control Statements: Break, Continue, And Pass. Comments
	Unit 2	List, Tuple , Dictionaries and Functions
	A	Lists and Nested List: Introduction, Accessing list, Operations, Working with lists, Library Function And Methods with Lists.
	B	Tuple: Introduction, Accessing tuples, Operations, Working, Library Functions and Methods with Tuples. Dictionaries :Introduction, Accessing values in dictionaries, Working with dictionaries, LibraryFunctions
	C	Functions: Defining a function, Calling a function, Types of functions, Function Arguments Anonymous functions, Global and local variables
	Unit 3	Exception Handling , OOP and File Handling
	A	Exception Handling: Definition Exception, Exception handling Except clause, Try,finally clause
	B	OOPs concept : Class and object, Attributes, Abstraction, Encapsulation, Polymorphism and Inheritance
	C	Static and Final Keyword, Access Modifiers and specifiers, scope of a class User Defined Exceptions
	Unit 4	Module and Applications
	A	Modules: Importing module, Math module, Random module
	B	Matplotlib, Packages
	C	Applications: Searching Linear Search, Binary Search. Sorting: Bubble Sort
	Unit 5	Introduction to python Applications
		CO6

A	Introduction to machine learning, Problems under the category of machine learning, Basic algorithms of machine learning with labeled data, Naïve Bays classifiers concepts		
B	Confusion matrix, precision and Recall and other metrics		
C	Django frameworks basics for web designing		
Mode of examination	Theory		
Weightage Distribution	CA 25%	MTE 25%	ETE 50%
Text book/s*	1. The Complete Reference Python, Martin C. Brown, McGrwHill		
Other References	1. Introduction to computing in problem solving using Python, E Balahurusamy, McGrwHill 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		

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1. Apply the concepts of decision-making and looping structures in Programming .	PO1,PO2,PO3,PO4,PO8,PO10, PSO1,PSO2
2.	CO2. Understanding Modular Programming approach using methods and functions.	PO1,PO2,PO3,PO4,PO8,PO10, PSO1,PSO2
3.	CO3. Understand and Implement the use of Python lists, tuples and dictionary.	PO1,PO2,PO3,PO4,PO8,PO10, PSO1,PSO2
4.	CO4. Incorporate object-oriented Programming concept in Programming .	PO1,PO2,PO3,PO4,PO5,PO8,PO10, PSO1,PSO2
5.	CO5: Creating python packages in Complex applications.	PO1,PO2,PO3,PO4,PO5,PO8,PO10, PSO1,PSO2
6.	CO6: Design real life Applications in python using Machine Learning	PO1,PO2,PO3,PO4,PO5,PO8,PO10, PSO1,PSO2,

PO and PSO mapping with level of strength for Course Name Application based Programming in Python and Machine Learning

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

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
BCA 281	Application based Programming in Python	3	3	3	3	1			1		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*

School		Sharda School of Engineering & Technology
Department		Computer Science & Applications
Programme		BCA , Academic Year: 2023-24
Semester		IV
1	Course Code	BCA402
2	Course Title	Data Warehousing and Data Mining
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
Course Status		Elective
5	Course Objective	<ol style="list-style-type: none"> 1. Provide students with an overview of the methodologies and approaches to data mining 2. Gain insight into the challenges and limitations of different data mining techniques 3. Provide the students with practice on applying data mining solutions 4. Prepare students for research in the area of data mining and related applications 5. Enhance students communication and problem solving skills
6	Course Outcomes	Students will be able to: CO1: To understand the basic concept of datamining CO2: Demonstrate the Data Pre-processing & transformation Techniques CO3: Explain Various Pattern Mining Methodology CO4: Compare & Contrast Classification& Prediction Mechanism CO5: Experiment with Clustering Algorithms CO6: Apply Data mining Techniques in real world Knowledge Discovery
7	Course Description	This course introduces advanced aspects of data warehousing and data mining, encompassing the principles, analyse the data, identify the problems, and choose the relevant models and algorithms to apply.
8	Outline syllabus	CO Mapping
Unit 1		Introduction
A	Evolution of Data mining and introductory concepts, Kind of Data & issues in Data Mining	CO1
B	Knowledge Discovery Process,	
C	Introduction to outlier.	
Unit 2		Data Pre processing
A	Descriptive Data Summarization, Data Cleaning,	CO1, CO2,CO6
B	Integration and Transformation,	
C	Data Reduction, Discretization and Concept Hierarchy Generation.	
Unit 3		Frequent Pattern Mining
A	Efficient and Scalable Frequent Item set Mining Methods: Apriori Algorithm	CO3, CO6
B	FP -Growth, ECLAT Algorithm	
C	correlation Analysis.	
Unit 4		Classification & Prediction
A	What is classification, requirements of classification, Decision Tree-ID3 Algorithm, ,	CO4, CO6
B	Naive Bayes Classifier, Rule Based classification, Backpropogation	
C	Support Vector Machine for linearly separable data. Prediction: - Linear Regression.	
Unit 5		Clustering
A	What is cluster analysis, requirements of cluster analysis, Applications of Cluster Analysis	CO5,CO6
B	Partitioning methods-k-means and k-mediods,	

C	Hierarchical Methods-Agglomerative and divisive, Density based methods- DBSCAN			
Mode of examination	Theory			
Weightage Distribution	CA 25%	MTE 25%	ETE 50%	
Text book/s*	1. J.Han,M. Kamber, J. Pei “ <i>Data Mining Concepts and Techniques</i> ”,Edition:3 , Morgan Kaufmann			
Other References	1. M.H. Dunham, <i>Data Mining Introductory and Advanced Topics</i> , Pearson Education. 2. Adriaans, <i>Data Mining</i> , Pearson Education 3. VikramPudi& P. Radhakrishnan, “Data Mining”, Oxford University Press			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes(PSO)
1.	CO1: To understand the basic concept of datamining	PO1,PO10
2.	CO2: Demonstrate the Data Pre processing & transformation techniques	PO1, PO5, PO10
3.	CO3: Explain Various Pattern Mining Methodology	PO1 ,PO2, PO3,PO5
4.	CO4: Compare & Contrast Classification& Prediction Mechanism	PO1, PO2 PO3, PO4, PSO1, PSO2
5.	CO5 :Experiment with Clustering Algorithms	PO1 ,PO2 PO3,PO4,PO5, PSO1, PSO2
6.	CO6: Apply Data mining Techniques in real world Knowledge Discovery	PO2, PO3,PO4,PO5,PO6,PO7,PO8,PO9,PO10, PSO2

PO and PSO mapping with level of strength for Course Name Data Mining & Knowledge discovery (Course Code BCA402)

BCA 402	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
		Domain Knowledge	Problem Analysis	Application Development	Modern Tool Usage	Innovation and Entrepreneurship	Environment and Sustainability	Personal and Professional Ethics	Communication	Project Management	Life - Long Learning		
	CO1	3	-	-	-	-	-	-	-	-	3	-	-
	CO2	3	-	-	-	-	-	-	-	-	3	-	-
	CO3	2	2	2	-	2	-	-	-	-	-	-	-
	CO4	2	2	2	3	-	-	-	-	-	-	2	2
	CO5	2	3	3	3	3	-	-	-	-	-	2	2
	CO6	-	3	3	3	2	2	2	2	3	2	-	3

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

Course Code/ Name	PO 1	PO2	PO 3	P O 4	PO5	PO6	PO7	PO8	PO9	PO10	PSO 1	PS O 2
BCA 402	2.5	2.5	2.5 .5	3	2.3	2	2	2	3	2.6	2	2.3

School: SET		Batch: 2023-26	
Department		Computer Science and Applications	
Batch: 2023-26		Current Academic Year: 2023-24	
Programme: BCA		Semester: IV	
1	Course Code	BCA403	
2	Course Title	Social Media Analytics	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	The objective of this course is to understand the role of social media data and analytics in helping organizations achieve their goals and understand their Publics and to identify and select key performance indicators to accurately measure the success of social media efforts;	
6	Course Outcomes	After the completion of this course, students will be able to: CO1: Explain the basic concepts of social network analysis CO2: Collaborative with peers to apply these methods to a variety of social media CO3: Describe the link between qualitative and quantitative methods of social network analysis CO4: Explain how these social technologies impact society and vice versa CO5: Examine the ethical and legal implications of leveraging social media data. CO6: Develop and Utilize SM analytics data to inform and support strategic decision-making in online marketing campaigns.	
7	Course Description	The course will introduce students to the science and social science of network analysis. Through real world examples, including analysis of their own social networks, students will develop skills for describing and understanding the patterns and usage of services like Facebook, Twitter, YouTube, and others.	
8	Outline syllabus		CO Mapping
	Unit 1	INTRODUCTION TO SOCIAL MEDIA ANALYTICS	
	A	Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas	CO1
	B	Network fundamentals and models: The social networks perspective - nodes, ties and influencers, social network and web data and methods	CO1
	C	Graphs and Matrices- Basic measures for individuals and networks. Information visualization	CO1, CO2
	Unit 2	CONNECTIONS & WEB ANALYTICS TOOLS	
	A	Making connections: Link analysis. Random graphs and network evolution.	CO1, CO2
	B	Social contexts: Affiliation and identity, Web analytics tools: Clickstream analysis, A/B testing, online surveys, Web crawling and Indexing.	CO1, CO2
	C	Natural Language Processing Techniques for Micro-Text Analysis	CO1, CO2
	Unit 3	SOCIAL ANALYTICS (FACEBOOK, INSTAGRAM, TWITTER)	
	A	Facebook Analytics: Introduction, parameters, demographics, Analyzing page audience.	CO3
	B	Reach and Engagement analysis. Post- performance on FB, Social campaigns. Measuring and analyzing social campaigns	CO3
	C	Defining goals and evaluating outcomes, Network Analysis. 9 (LinkedIn, Instagram, YouTube Twitter etc. Google analytics).	CO3
	Unit 4	PROCESSING AND VISUALIZING DATA	
	A	Processing and Visualizing Data, Influence Maximization, Link Prediction,	CO3, CO4
	B	Collective Classification, Applications in Advertising and Game Analytics.	CO3, CO4
	C	Introduction to Python Programming , Collecting and analyzing social media data; visualization and exploration	CO3, CO4
	Unit 5	CASE STUDY IMPLEMENTATION	
	A	Practical component: CASE STUDY Students should analyze the social media of any ongoing campaigns and present the findings	CO5, CO6

Mode of examination	Theory			
Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	
Text book/s*	1. Marshall Sponder(2017), Social Media Analytics, McGraw Hill, Latest edition			
Reference Books	1. Jim Sterne(2021), Social Media Metrics: How to Measure and Optimize Your Marketing Investment, Wiley Latest Edition.			

School: SSET		Batch : 2023-2026	
Programme:		Academic Year: 2023-2024	
Branch: BCA BSC		Semester: IV	
1	Course Code	ARP210	Course Name : Quantitative and Qualitative Aptitude Skill Building
2	Course Title	Quantitative and Qualitative Aptitude Skill Building	
3	Credits	2	
4	Contact Hours (L-T-P)	1-0-2	
	Course Status	Active	
5	Course Objective	To enhance holistic development of students and improve their employability skills. Provide a 360 degree exposure to learning elements of Business English readiness Programme, behavioural traits, achieve softer communication levels and a positive self-branding along with augmenting numerical and altitudinal abilities. To up skill and upgrade students' across varied industry needs to enhance employability skills. By the end of this semester, a will have entered the threshold of his/her 2 nd phase of employability enhancement and skill building activity exercise.	
6	Course Outcomes	<p>After completion of this course, students will be able to:</p> <p>CO1: Develop and deliver the effective presentations to interpret the deeper meaning of life.</p> <p>CO2: Improve listening skills so as to understand complex business communication in a variety of global English accents through proper pronunciation</p> <p>CO3: Demonstrate a good understanding of effective business writing and telephone handling Skills</p> <p>CO4: Acquire higher level competency in use of aptitude, logical and analytical reasoning</p> <p>CO5: Develop higher level strategic thinking and diverse mathematical concepts through building number puzzles</p> <p>CO6: Demonstrate higher level quantitative aptitude tools for making business decisions</p>	
7	Course Description	This course bundle allows students to build vision, mission and strategy statements while exposing them to various models of communication along with MTI reduction and the 2 nd level of quant, aptitude and reasoning abilities	

8	Outline syllabus – ARP210		CO MAPPING
	Unit 1	Communicate to Conquer	
	A	VMOSA (Vision, Mission, Values and Ethics) Business Communication -Verbal Communication Skills Barriers in communication Basics of effective communication – PRIDE & STAR Model	CO1
	B	Different styles of communication & style flexing (Based on the 4 social styles-Analytical, Driving, Expressive, Amiable) Importance of Listening & practice of Active Listening The Art of Giving Feedbacks Feedback Skills Asking fact finding questions- Probing Skills	CO2
	C	Email Etiquette Business Writing Skills Telephone Etiquette Skills (Telephone Handling Skills) Non Verbal Communication- Kinesthetics, Proxemics, Paralanguage MTI Reduction Programme	CO3
	Unit 2	Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical	
	A	Coding Decoding , Ranking & Their Comparison Level-2	CO4
	B	Series, Blood Relations & Number Puzzle	CO5
	Unit 3	Quantitative Aptitude	
	A	Number System Level 2	CO5
	B	Vedic Maths Level-2 Probability Permutation & Combination	CO6
	C	Percentage, Profit & Loss ,Partnership, Simple Interest & Compound Interest	CO6
	Unit 4	Verbal Abilities - 2	
	A	Paragraph Jumbles	CO2
	B	Critical Reasoning	CO2
	Unit 5	Basics of GD and PI	
	A	Understanding and Practicing Mock Group Discussions	CO2
	B	Understanding and Practicing Mock Personal Interviewsss	CO2
	Weightage Distribution	CA-25% MTE-25% ETE-50%	
	Text book/s*	Wiley's Quantitative Aptitude-P Anand Quantum CAT – Arihant Publications Quicker Maths- M. Tyra Power of Positive Action (English, Paperback, Napoleon Hill) Streets of Attitude (English, Paperback, Cary Fagan, Elizabeth Wilson) The 6 Pillars of self-esteem and awareness – Nathaniel Brandon Goal Setting (English, Paperback, Wilson Dobson	

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

Syllabus: Application based Programming in Python lab

School:		Sharda School of Engineering & Technology
Department:		Computer Science & Applications
Programme:		BCA , Academic Year: 2023-24
Semester:		IV
1	Course Code	BCP281
2	Course Title	Application based Programming in Python lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
Course Status		Compulsory
5	Course Objective	Emphasis is placed on procedural Programming , algorithm design, and language constructs common to most high-level languages through Python Programming and Machine Learning.
6	Course Outcomes	Upon successful completion of this course, the student will be able to: CO1. Apply the concepts of decision-making and looping structures in Programming . CO2. Understanding Modular Programming approach using methods and functions. CO3. Understand and Implement the use of Python lists, tuples and dictionaries. CO4. Incorporate object-oriented Programming concept in Programming . CO5: Creating python packages in Complex applications. CO6: Design real life Applications in python using Machine Learning
7	Course Description	Python is a language with a simple syntax, and a powerful set of libraries. It is widely used in many scientific areas for data exploration. This course is an introduction to the Python Programming language for students without prior Programming experience. We cover data types, control flow, object-oriented Programming and apply to basic concepts of Machine learning.
8	Outline syllabus	CO Mapping
Unit 1		Introduction
A	1. Getting started with python environment like Jupyter, Spyder, Pycharm 2. Demonstrate basic data type in python. Demonstrate the working of 'id' and 'type'	CO1,CO2
B	3. Demonstration of type casting. 4. Demonstrate different in-built string functions. 5. Programme to implement all conditional statements	
C	6. Programme to implement different control structures	
Unit 2		List, Tuple , Dictionaries and Functions
A	1. Programme to implement operations on lists 2. Programme to implement operations on Dictionaries.	CO3
B	3. Programme to implement operations on Tuple 4. Programme to implement Exception Handling	
C	5. Programme to use different functions 6. Write a python Programme to find the factorial of a given number using functions. 7. Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding. Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius If (distance between two balls centers) <= (sum of their radii) then (they are colliding) Write a python to print Fibonacci series using functions.	
Unit 3		Exception Handling , OOP and File Handling
A	1. Programme to use object oriented concepts like inheritance, overloading polymorphism etc. 2. Programme for file handling	CO4

B	3. Write a Python Programme to demonstrate working of classes and objects. Write a Python Programme to demonstrate class method & static method							
C	4. Write a Python Programme to demonstrate constructors. 5. Write a Programme to perform division by handling exceptions. Demonstrate a python code to print try, except and finally block statements.							
Unit 4	Module and Applications	CO5						
A	1. Programme to use modules and package 2. Programme to implement searching and sorting							
B	3. Write a python Programme to create a package (Engg), sub-package(years),modules (sem) and create staff and student function to module.							
C	Write a python Programme to create a package (college),sub -package (aldept),modules(it,cse) and create admin and cabin function to the module.							
Unit 5	Machine Learning Application	CO6						
A	Wap to understand the concept of data, labeled data, supervised techniques for a machine learning application. Implementation of SVM, Naïve Bayes classifier							
B	<ul style="list-style-type: none"> ○ WAP to implement unsupervised machine learning algorithms such as K-means clustering ○ KNN (k-nearest neighbors) ○ Hierarchal clustering 							
C	Create a website using Django framework.							
Mode of examination	Practical/Viva							
Weightage Distribution	<table border="1"> <tr> <td>CA</td> <td>CE (Viva)</td> <td>ESE</td> </tr> <tr> <td>25%</td> <td>25%</td> <td>50%</td> </tr> </table>	CA	CE (Viva)	ESE	25%	25%	50%	
CA	CE (Viva)	ESE						
25%	25%	50%						
Text book/s*	1. The Complete Reference Python, Martin C. Brown, McGrwHill							
Other References	1. Introduction to computing in problem solving using Python, E Balahurusamy, McGrwHill 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							

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1. Apply the concepts of decision-making and looping structures in Programming .	PO1,PO2,PO3,PO4,PO8,PO10, PSO1,PSO2
2.	CO2. Understanding Modular Programming approach using methods and functions.	PO1,PO2,PO3,PO4,PO8,PO10, PSO1,PSO2
3.	CO3.Understand and Implement the use of Python lists, tuples and dictionaries.	PO1,PO2,PO3,PO4,PO8,PO10, PSO1,PSO2
4.	CO4. Incorporate object-oriented Programming concept in Programming .	PO1,PO2,PO3,PO4,PO5,PO8,PO10, PSO1,PSO2
5.	CO5: Creating python packages in Complex applications.	PO1,PO2,PO3,PO4,PO5,PO8,PO10, PSO1,PSO2
6.	CO6: Design real life Applications in python using Machine Learning	PO1,PO2,PO3,PO4,PO5,PO8,PO10, PSO1,PSO2,

PO and PSO mapping with level of strength for Course Name Application based Programming in Python Lab

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

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
BCP281	Application based Programming in Python Lab	3	3	3	3	1			1		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**

School		Sharda School of Engineering & Technology		
Department		Computer Science & Applications		
Programme		BCA, Academic Year: 2023-24		
Semester		IV		
1	Course Code	RBL002	Course Name: Research Based Learning -2	
2	Course Title	Research Based Learning -2		
3	Credits	0		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Compulsory (Audit Course)		
5	Course Objective	1. To align student's skill and interests with a realistic research problem or project 2. To understand the significance of problem and its scope 3. Students will make decisions within a framework		
6	Course Outcomes	Students will be able to: CO1: Identify and formulate problem statement with systematic approach. CO2: Develop teamwork and problem-solving skills, along with the ability to perform literature review with others. CO3: Plan the solution of problem as per the problem statement framed. CO4: Classify and understand basic methodology for hypothesis verification and validation of Research successfully. CO5: Implement the solution by using different aspects of Programming language/other tools and techniques. CO6: Develop a glory of the need to engage in life-long learning.		
7	Course Description	In RBL-2, the students will learn how to define the problem for developing Research scope, identifying the skills required for developing the Research based on given a set of specifications and all subjects of that Semester.		
	Mode of examination	Practical /Viva		
	Weight age Distribution	CA 25%	CE (Viva) 25%	ETE 50%

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO)
1.	CO1: Identify and formulate problem statement with systematic approach.	PO1,PO2,PO5,PO6
2.	CO2: Develop teamwork and problem-solving skills, along with the ability to perform literature review with others.	PO2,PO3,PO4,PO8
3.	CO3: Plan the solution of problem as per the problem statement framed.	PO2,PO3,PO4
4.	CO4: Classify and understand basic methodology for hypothesis verification and validation of Research successfully.	PO3,PO4

5.	CO5: Implement the solution by using different aspects of Programming language/other tools and techniques.	PO3,PO4,PO10,PSO1,PSO2
6.	CO6: Develop a glory of the need to engage in life-long learning.	PO8,PO9, PO10

**PO and PSO mapping with level of strength for Course Name Research Based Learning 2
(Course Code RBL002)**

CO/PO Mapping												
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low												
Cos	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	3	-	-	2	2	-	-	-	-	-	-
CO2	-	3	2	3	-	-	-	2	-	-	-	-
CO3	-	3	2	3	-	-	-	-	-	-	-	-
CO4	-	-	2	2	-	-	-	-	-	-	-	-
CO5	-	-	3	2	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	3	3	3		-

TERM V

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		V	
1	Course Code	BCA381	
2	Course Title	Web Technologies	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Core/Compulsory	
5	Course Objective	To develop skills in analyzing the usability of a web and understand fundamentals of tools and technology of web design.	
6	Course Outcomes	CO1: Analyze a web page and identify its elements and attributes. CO2: Apply the languages HTML and CSS to develop web page. CO3: Apply HTML and CSS to design web pages. CO4: Demonstrate the concepts of PHP. CO5: Understand the working of MYSQL CO6: Design webpages using different web technologies to real world.	
7	Course Description	This course is an overview of the modern Web technologies used for the Web development. The purpose of this course is to give students the basic understanding of how things work in the Web world.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction to web	
	A	Introduction to Web: History of Internet, WWW, Client or Browser, website, internet browsers,	CO1
	B	HTTP Protocol: Basic features of HTTP, Working of HTTP, Request and Response, Web browser and Web servers, Features of Web 2.0	CO1
	C	Web Design: Web site design principles, Concepts of effective web design, Web design issues, planning the site and navigation.	CO1
	Unit 2	HTML & STYLE SHEETS	
	A	HTML: HTML: History of HTML (Hypertext Mark-up Language), Structure of HTML Document: Text Basics, Structure of HTML Document: Images and Multimedia, Links and webs, Document Layout, Creating Forms, Frames and Tables.	CO2, CO6
	B	Style sheets: Need for CSS, introduction, basic syntax and structure, using CSS, background images,	CO2, CO6

	C	Colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2		CO2, CO6
	Unit 3	Java Script & DHTML		
	A	Javascript: Client-side scripting, what is Javascript, how to develop Javascript, simple Javascript, variables, functions, conditions, loops and repetition		CO3, CO6
	B	Advance script, Javascript and objects, the DOM and web browser environments, forms and validations		CO3, CO6
	C	DHTML: Combining HTML, CSS and Javascript, events and buttons, controlling the browser, Events and buttons		CO3, CO6
	Unit 4	PHP		
	A	PHP: - Introduction and basic syntax of PHP, decision and looping with examples		CO4,CO6
	B	PHP and HTML, Arrays, Functions, Form processing,		CO4,CO6
	C	Advance Features: Cookies and Sessions, Object Oriented Programming with PHP		CO4,CO6
	Unit 5	PHP and MySQL:		
	A	PHP and MySQL: PHP myadmin, Basic commands with PHP examples, Connection to server,		CO5, CO6
	B	Creating database, selecting a database, listing database		CO5, CO6
	C	listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables		CO5, CO6
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		25%	25%	50%
	Text book/s*	1. HTML Complete Reference, BPB Publication		
	Other References	1. HTML, DHTML, JavaScript, Perl, CGI, Ivan Bayross, BPB Publication. 2. HTML Complete Reference, BPB Publication 3. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson		

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Analyze a web page and identify its elements and attributes	PO1, PO2, PO3, PO4, PO10, PSO1
2.	CO2: Apply the languages HTML and CSS to develop web page.	PO1, PO2, PO3, PO4, PO5, PO10, PSO1, PSO2

3.	CO3: Apply the Java Script and DHTML in web page.	PO1, PO2, PO3, PO4, PO5, PO10, PSO1
4	CO4: Demonstrate the concepts of PHP.	PO1, PO2, PO3, PO4, PO5, PSO1
5	CO5: Understand the working of MYSQL	PO1, PO2, PO3, PO4, PO5, PO8 PO10, PSO1
6	CO6: Design webpages using different web technologies to real world	PO1, PO2, PO3, PO4, PO5, PO7, PO9, PO10, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name Web Technology (Course Code BCA381)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	2	3	3	-	-	-	-	-	2	3	-
CO2	3	3	3	3	2	-	-	-	-	2	2	3
CO3	3	3	3	2	2	-	-	-	-	2	3	-
CO4	2	3	3	2	2	-	-	-	-	-	3	-
CO5	2	3	3	3	3	-	-	2	-	3	2	-
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
BCA381	Web Technology	2.7	2.8	3	2.7	2.7	-	2	2	2	2.2	2.7	3

Strength of Correlation:

1-Slight (Low)

2-Moderate (Medium)

3-Substantial (High)

Syllabus- Introduction to R

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA , Academic Year: 2023-24	
Semester		V	
1	Course Code.	BCA285	
2	Course Title	Introduction to R	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
Course status		Compulsory	
5	Course Objectives	To familiarize the students with the basics of Programming in R language, and its applications in data analysis.	
Course Outcomes		<p>Upon successful completion of this course, student will be able to:</p> <p>CO1: Demonstrate R Programming using Decision statements, Loops and Functions. (K3)</p> <p>CO2: Apply functions to improve readability of Programmes. (K3)</p> <p>CO3: Select and construct Programmes using different data structures available in R. (K1, K3)</p> <p>CO4: Summarize data using descriptive statistics and perform distribution analysis. (K2, K4)</p> <p>CO5: Design visualizations of data using different types of graphs and plots. (K5)</p> <p>CO6: Estimate data using complex statistical testing. (K6)</p>	
7	Course Description	R is a Programming language and software environment for statistical analysis, graphics representation and reporting. This course provides an introduction to the basics of Programming in R, and its applications in data analysis.	
8	Outline syllabus:		CO Mapping
Unit 1		Introduction to R Programming , Decisions, Loops and Functions	
A	Introduction to R Programming , R-Studio Installation (GUI): R Windows Environment, Simple Math in R	CO1	
B	Introduction to Data Types, Variables, Operators	CO1	
C	Decision Statements, R Loops, R Functions	CO2	
Unit 2		Data Structures in R	
A	Introduction to Arrays, Working with Strings	CO3	
B	Data Structures/ Objects in R: Vector, List, Matrix, Factor, Data Frame	CO3, CO2, CO6	
C	Conversion of Data Objects: Matrix to Data frame, Data frame to Matrix, Data Frame to list, Matrix to list.	CO3, CO2	
UNIT 3		Descriptive Statistics	
A	Reading Datasets, Working with different file types .txt, .csv etc., Combining Datasets	CO4	
B	Descriptive Statistics and Tabulation: Summarizing data with R, Contingency Tables	CO4	
C	Data Distribution Analysis: Shapiro Wilk Test, Kolmogorov Smirnov, Quantile Plots	CO4	
Unit 4		Data Visualization in R	
A	Load data in R environment and plotting a graph, histograms (equal class intervals and unequal class intervals), Bar Chart, Box plot,	CO5	
B	Stem-leaf plot, Scatter Plot, Line Chart, Pie chart,	CO5, CO6	
C	Customization of plot settings, adding text, saving plot to a file, adding legends.	CO5, CO6	
Unit 5		Hypothesis Testing and Correlation Analysis	

A	Hypothesis Testing: Student t test, Mann Whitney Test			CO6
B	Correlation Analysis, Random number generation and sampling procedures.			CO6
C	Complex Statistics: One way and two-way ANOVA			CO6
Mode of examination	Theory			
Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	
Text book/s*	1. Gardener, M (2012): Beginning R: The Statistical Programming Language, Wiley Publications. 2. Braun W J, Murdoch D J (2007): A First Course in Statistical Programming with R. Cambridge University Press. New York			
Other References	1. Crawley, M.J. (2015): Statistics: An Introduction Using R, 2 nd Edition. Wiley. 2. Crawley, M.J. (2012): The R Book, 2 nd Edition. Wiley.			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1. Demonstrate R Programming using Decision statements, Loops and Functions.	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
2.	CO2. Apply functions to improve readability of Programmes	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
3.	CO3. Select and construct Programmes using different data structures available in R.	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
4.	CO4. Summarize data using descriptive statistics and perform distribution analysis.	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
5.	CO5. Design visualizations of data using different types of graphs and plots.	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
6.	CO6. Estimate data using complex statistical testing.	PO1, PO2, PO3, PO4, PO8, PO 10, PSO1

PO and PSO mapping with level of strength for Course Name Introduction to R Programming (Course Code BCA285)

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	PS O 1	PSO 2
BCA 285 Introduction to R	CO1	2	1	1	2	-	-	-	2	-	-	2	-
	CO2	2	2	2	2	-	-	-	2	-	-	2	-
	CO3	2	2	1	2	-	-	-	2	-	-	2	-
	CO4	2	2	2	2	-	-	-	2	-	-	2	-
	CO5	2	2	2	2	-	-	-	2	-	-	2	-
	CO6	3	3	2	2	-	-	-	2	-	-	2	-

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

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
BCA 285	Introduction to R	2.1	2	1.7	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		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA , Academic Year: 2023-24	
Semester		V	
1	Course Code	BCA382	
2	Course Title	Software Engineering and Quality Assurance	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Core Course	
5	Course Objective	<p>The objective of this course is to provide</p> <ol style="list-style-type: none"> 1. Fundamental knowledge of software engineering. 2. To make student aware of best software engineering practices. 3. Inculcate ability in students to work as an effective member or leader in software engineering teams. 4. To help students to develop skills that will enable them to develop software of high quality. 	
6	Course Outcomes	<p>CO1: Illustrate and compare an effective software engineering process, based on knowledge of widely used development lifecycle model. CO2: Apply effective requirement elicitation techniques to develop SRS for a project. CO3: Construct design documents with the help of designing tools. CO4: Analyze testing strategies for a software system. CO5: Develop and deliver quality software as an individual or as part of a multidisciplinary team. CO6: Adapt techniques and tools necessary for software engineering practices.</p>	
7	Course Description	<p>This course provides knowledge of software engineering. It introduces concepts such as software processes and agile methods and essential software development activities, from initial specification to system maintenance. Formalisms and tools to assist in software development are also presented, including common design patterns and UML notation. Course focuses on all levels of testing.</p>	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction to Software Engineering and Process Models	
	A	Significance, challenges and Software Myths in software engineering, Software Characteristics	CO1
	B	Software Development Methodologies : Waterfall model, prototyping model, Incremental model, Spiral model, V model	CO1
	C	Agility, Agile Process models: Extreme Programming (XP), Adaptive Software Development (ASD), Scrum	CO1
	Unit 2	Requirement Engineering	
	A	Types of Requirements, Feasibility study	CO2
	B	Requirement Engineering process, Elicitation techniques	CO2
	C	Requirement Documentation : Document SRS according to IEEE standards, Characteristics of SRS	CO2
	Unit 3	Software Design	

	A	Design Concepts, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design	CO3, CO6
	B	Effective modular design: Cohesion, Coupling	CO3, CO6
	C	UML Diagrams and Tools: Introduction to UML Diagrams, Use Case, Object and Class, Interaction diagrams: Sequence & Collaboration	CO3, CO6
	Unit 4	Software Implementation and Testing	
	A	Fundamental of testing: Objectives, principles, myths and facts, limitations of testing	CO4
	B	Levels of testing, Acceptance Testing and its types, Integration techniques	CO4, CO6
	C	White Box Testing, Black Box Testing, Verification and Validation, Test case designing, Debugging	CO4, CO6
	Unit 5	Maintenance & Quality Management	
	A	Introduction to Maintenance, Need for Maintenance, Categories of Maintenance, Cost of Maintenance	CO5, CO6
	B	Quality Concepts: Quality, Quality Control, Cost of Quality, Software Quality Assurance, SQA Plan	CO5, CO6
	C	Statistical Software Quality Assurance: Six Sigma, The ISO 9000 Quality Standards, Capability Maturity Model	CO5, CO6
	Mode of examination	Theory/Jury/Viva	
	Weightage Distribution	CA 25%	MTE 25%
			ETE 50%
	Text book/s*	1. Pressman R S, Software Engineering: A Practitioners Approach, McGraw Hill.	
	Other References	1. Datta S, Software Engineering: Concepts and Applications, Oxford University Press, 2010. 2. K.K. Aggrawal and Yogesh Singh, "Software Engineering", New Age International Publication 3. Sommerville, Ian. "Software Engineering", Pearson(Latest Ed).	

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Illustrate and compare an effective software engineering process, based on knowledge of widely used development lifecycle model	PO1,PO3,PO8,PO9,PO10,PSO1,PSO2
2.	CO2: Apply effective requirement elicitation techniques to develop SRS for a project	PO1,PO2,PO3,PO4,PO5,PO8,PO9,PO10,PSO1,PSO2
3.	CO3: Construct design documents with the help of designing tools	PO1,PO2,PO3,PO4,PO5, PO8,PO9,PO10,PSO1,PSO2
4.	CO4:Analyze testing strategies for a software system	PO1,PO2,PO4,PO5,PO6,PO7,PO8,PO9,PO10,PSO1,PSO2

5.	CO5: Develop and deliver quality software as an individual or as part of a multidisciplinary team.	PO1,PO2,PO3,PO4,PO5, PO6,PO7, PO8,PO9,PO10, PSO1,PSO2
6.	CO6: Adapt techniques and tools necessary for software engineering practices	PO1,PO4,PO5,PO8,PO9,PO10, PSO2

PO and PSO mapping with level of strength for Course Name Software Engineering and Quality Assurance (Course Code BCA382)

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	PSO 1	PSO2
BCA 382 Software Engineering and Quality Assurance	CO1	3	-	2	-	-	-	-	1	2	3	1	2
	CO2	3	3	2	3	3	-	-	1	2	3	2	3
	CO3	3	2	3	3	3	-	-	1	2	3	2	3
	CO4	3	1	-	1	3	2	2	2	3	3	1	3
	CO5	3	1	3	3	3	3	3	2	3	3	1	3
	CO6	2	-	-	1	3	-	-	1	2	2	-	3

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

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
BCA382	Software Engineering and Quality Assurance	2.8	1.75	2.5	2.2	3	2.5	2.5	1.3	2.3	2.8	1.4	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*

Syllabus: Research Methodology

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		V	
1	Course Code	BRM002	
2	Course Title	Research Methodology	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Compulsory	
5	Course Objective	The primary objective of this course is to develop a research orientation among the scholars and to acquaint them with fundamentals of research methods. Specifically, the course aims at introducing them to the basic concepts used in research and to scientific social research methods and their approach. It includes discussions on sampling techniques, research designs and techniques of analysis.	
6	Course Outcomes	CO1: Understand the basic framework of research process CO2: Formulate hypotheses or suggested solutions CO3: Categorize various sources of research design, information for literature review and data collection CO4: Discuss the different sampling techniques CO5: Escalate the components of scholarly writing and evaluate its quality CO6: Conduct disciplined research under supervision in an area of their choosing	
7	Course Description	Research Methodology is a hands-on course designed to impart education in the foundational methods and techniques of academic research in social sciences and business management context. Research scholars would examine and be practically exposed to the main components of a research framework i.e., problem definition, research design, data collection, ethical issues in research, report writing, and presentation.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction to Research	
	A	Meaning of Re-search, Retracing the path, Importance of re-search.	CO1
	B	Philosophies, and the language of research theory building Theoretical background of a research philosophy The meaning of methodology (structured definition and examples)	CO1

	C	Understanding research terminologies i.e., Concepts, Constructs, Variables, and Definitions etc.			CO1
	Unit 2	Problems and Hypotheses			
	A	Identifying research problem, State-of-the-Art, The problem definition lifecycle			CO1, CO2
	B	Meaning/Definition of a hypothesis. Real world examples.			CO1, CO2
	C	Testing and Verification of Hypothesis.			CO1, CO2
	Unit 3	Research design			
	A	Experimental and Non-experimental research design			CO1, CO3
	B	Field research, Survey Research, Survey outcomes			CO1, CO3
	C	Methods of data collection – Secondary data collection methods, qualitative methods of data collection, and Survey methods of data collection			CO1, CO3
	Unit 4	Sampling Techniques			
	A	Research Population and Sample. Target Population, Accessible Population			CO1, CO4, CO5
	B	Sampling techniques – The nature of sampling, Probability sampling design			CO1, CO4, CO5
	C	Nonprobability sampling design, Determination of sample size			CO1, CO4, CO5
	Unit 5	Data Analysis & Report Generation			
	A	Types of Data Sources, Web Data, Survey Data			CO1, CO3, CO6
	B	Data attributes, Discrete vs Continuous Data attributes Mean, Median, Mode; Range, Quartile, Variance, SD, Interquartile Range			CO1, CO3, CO6
	C	Report generation, report writing, and APA format – Title page, Abstract, Introduction, Methodology, Results, Discussion, References, and Appendices			CO1, CO3, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	CE(Viva)	ESE	
		25%	25%	50%	

Text book/s*	<ol style="list-style-type: none"> 1. Bryman, Alan & Bell, Emma (2011). Business Research Methods (Third Edition), Oxford University Press. 2. Kerlinger, F.N., & Lee, H.B. (2000). Foundations of Behavioural Research (Fourth Edition), Harcourt Inc. 3. Rubin, Allen & Babbie, Earl (2009). Essential Research Methods for Social Work, Cengage Learning Inc., USA. 	
Other References	<ol style="list-style-type: none"> 1. Chawla, Deepak & Sondhi, Neena (2011). Research methodology: Concepts and cases, Vikas Publishing House Pvt. Ltd. Delhi. 2. Pawar, B.S. (2009). Theory building for hypothesis specification in organizational studies, Response Books, New Delhi. 3. Neuman, W.L. (2008). Social research methods: Qualitative and quantitative approaches, Pearson Education. 	

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Understand the basic framework of research process	PO1, PO2, PO3, PO4, PO9, PO10, PSO1, PSO2
2.	CO2: Formulate hypotheses or suggested solutions	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2
3.	CO3: Categorize various sources of research design, information for literature review and data collection	PO1, PO3, PO4, PO5, PO7, PO8, PO10, PSO1, PSO2
4	CO4: Discuss the different sampling techniques	PO1, PO2, PO3, PO4, PO6, PO9, PSO1, PSO2
5	CO5: Escalate the components of scholarly writing and evaluate its quality	PO1, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PSO1, PSO2
6	CO6: Conduct disciplined research under supervision in an area of their choosing	PO1, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2

**PO and PSO mapping with level of strength for Course Name Research Methodology
(Course Code BRM002)**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	2	2	2	-	-	-	-	2	2	2	3
CO2	2	3	3	3	-	2	-	-	-	-	3	3
CO3	2	2	-	2	2	-	2	2	-	2	2	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

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
BRM002	Research Methodology	2.5	2.5	2.75	2.5	2.3	2.3	2.3	2.3	2.25	2.25	2.5	2.7

Strength of Correlation:

1-Slight (Low)

2-Moderate (Medium)

3-Substantial (High)

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA , Academic Year: 2023-24	
Semester		V	
1	Course Code	BCP381	
2	Course Title	Web Technology Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Core/Compulsory	
5	Course Objective	The objective of this course is to provide a foundation of technologies and technical skills in web development. Based upon the development of a web, this course provides an insight of computer and networking technologies, and hands on experience in web Programming .	
6	Course Outcomes	CO1: Understand the basic concepts of HTML. CO2: Design the web page using CSS CO3: Apply java script to validate the different fields of the web pages. CO4: Implement the basic construct, arrays, and session using PHP. CO5: Demonstrate to build a connection with database and perform the basic operations of DBMS. CO6: Develop a website using html, CSS, JavaScript and MYSQL	
7	Course Description	This course is an overview of the modern web technologies used for the Web development. The purpose of this course is to give students the basic understanding of how things work in the Web world from the technology point of view as well as to give the basic overview of the different technologies.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction	
	A	Introduction to various HTML Tags .	CO1
	B	Write a Programme to display list of items in different styles.	CO1
	C	Write an HTML Programme to design an entry form of student details.	CO1
	Unit 2	CSS	
	A	Create Style sheet to set formatting for text tags and embed that style sheet on web pages created for your site.	CO2

	B	Develop and demonstrate the usage of inline, internal and external style sheet using CSS	CO2	
	C	Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).	CO2	
	Unit 3	Java Script		
	A	Design signup form to validate username, password, and phone numbers etc. using Java script.	CO3	
	B	Write a JavaScript Programme to convert temperatures to and from Celsius, Fahrenheit.	CO3	
	C	Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.	CO3	
	Unit 4	PHP		
	A	Implement the basic construct of PHP	CO4	
	B	Write Programmes to implement arrays and functions in PHP	CO4	
	C	Implement the advanced features of PHP like, Cookies and Sessions	CO4	
	Unit 5	MYSQL		
	A	Create the database-on-database server like MYSQL, Oracle. Perform basic DDL operation on it.	CO5	
	B	Perform the basic operation like Insert, update, delete and select	CO5, CO6	
	C	Write an HTML Programme to design an entry form of student details and send it to store at database server like MYSQL, Oracle etc.	CO6	
	Mode of examination	Practical/Viva		
	Weightage Distribution	CA	CE(Viva)	ESE
		25%	25%	50%
	Text book/s*	1. HTML and CSS: Design and build websites, by Jon Duckett 2. Learning Web Design: A beginner's guide to HTML, CSS, JavaScript, and Web Graphics, By Jennifer Niederst Robbins		
	Other References			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Understand the basic concepts of HTML.	PO1, PO2, PO3, PO5, PO10, PSO1, PSO2
2.	CO2: Design the web page using CSS	PO1, PO2, PO3, PO4, PO9, PO10, PSO1, PSO2
3.	CO3: Apply java script to validate the different fields of the web pages.	PO1, PO2, PO3, PO5, PO6, PO8, PSO1, PSO2
4	CO4: Implement the basic construct, arrays, and session using PHP.	PO1, PO2, PO3, PO4, PO6, PO8 PO10, PSO1, PSO2
5	CO5: Demonstrate to build a connection with database and perform the basic operations of DBMS.	PO1, PO2, PO3, PO4, PO7, PO9, PSO1, PSO2
6	CO6: Develop a website using html, CSS, JavaScript and MYSQL	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name Web Technology Lab (Course Code BCP381)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	2	2	3	-	2	-	-	-	-	2	3	3
CO2	2	3	3	3	-	-	-	-	2	2	3	3
CO3	2	3	3	-	3	2	-	2	-	-	3	3
CO4	3	2	3	2	-	2	-	2	-	2	3	2
CO5	2	3	3	3	-	-	2	-	2	-	2	3
CO6	2	3	3	3	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	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
BCP381	Web Technology Lab	2.2	2.7	3	2.75	2.3	2.3	2.5	2	2.3	2.25	2.8	2.8

Syllabus- Introduction to R Lab

School		Sharda School of Engineering & Technology		
Department		Computer Science & Applications		
Programme		BCA, Academic Year: 2023-24		
Semester		V		
1	Course Code.	BCP285		
2	Course Title	Introduction to R Lab		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course status	Compulsory		
5	Course Objectives	To familiarize the students with the basics of Programming in R language, and its applications in data analysis.		
	Course Outcomes	<p>Upon successful completion of this course, student will be able to:</p> <p>CO1: Demonstrate R Programming using Decision statements, Loops and Functions. (K3)</p> <p>CO2: Apply functions to improve readability of Programmes. (K3)</p> <p>CO3: Select and construct Programmes using different data structures available in R. (K1, K3)</p> <p>CO4: Summarize data using descriptive statistics and perform distribution analysis. (K2, K4)</p> <p>CO5: Design visualizations of data using different types of graphs and plots. (K5)</p> <p>CO6: Estimate data using complex statistical testing. (K6)</p>		
7	Course Description	R is a Programming language and software environment for statistical analysis, graphics representation and reporting. This course provides an introduction to the basics of Programming in R, and its applications in data analysis.		
8	Outline syllabus:			CO Mapping
	Unit 1	Introduction to R Programming , Decisions, Loops and Functions		
	A	P1. Write a R Programme to make simple calculate. P2. Write a R Programme to demonstrate the usage of different types of operators. P3. Write a R Programme to find whether a given year is leap year or not. P4. Write a R Programme to calculate factorial of a given number.		CO1, CO2
	Unit 2	Data Structures in R		
	A	P5. Write R Programmes to create vector using c, rep, paste and seq functions. P6. Write a R Programme to find transpose of a given matrix. P7. Write R Programmes to create and manipulate data frames.		CO3, CO2, CO6
	UNIT 3	Descriptive Statistics		
	A	P8. Write a R Programme to print summary statistics of a given dataset. P9. Write a R Programme to perform Shapiro Wilk Test, Kolmogorov Smirnov test. P10. Write a R Programme to plot quantile quantile plots.		CO4
	Unit 4	Data Visualization in R		
	A	P11. Write R Programmes to create bar chart, histogram, pie chart, scatter plot, line chart, stem leaf plot.		CO5, CO6
	Unit 5	Hypothesis Testing and Correlation Analysis		
	A	P12. Write R Programmes to implement Student t and Mann Whitney Test. P13. Write a R Programme to perform correlation analysis of a given dataset. P14. Write a R Programme to implement ANOVA technique.		CO6
	Mode of examination	Theory		
	Weightage Distribution	CA 25%	CE(Viva) 25%	ETE 50%

Text book/s*	1. Gardener, M (2012): Beginning R: The Statistical Programming Language, Wiley Publications. 2. Braun W J, Murdoch D J (2007): A First Course in Statistical Programming with R. Cambridge University Press. New York
Other References	1. Crawley, M.J. (2015): Statistics: An Introduction Using R, 2 nd Edition. Wiley. 2. Crawley, M.J. (2012): The R Book, 2 nd Edition. Wiley.

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1. Demonstrate R Programming using Decision statements, Loops and Functions.	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
2.	CO2. Apply functions to improve readability of Programmes	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
3.	CO3. Select and construct Programmes using different data structures available in R.	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
4.	CO4. Summarize data using descriptive statistics and perform distribution analysis.	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
5.	CO5. Design visualizations of data using different types of graphs and plots.	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
6.	CO6. Estimate data using complex statistical testing.	PO1, PO2, PO3, PO4, PO8, PO 10, PSO1

PO and PSO mapping with level of strength for Course Name Introduction to R Programming Lab (Course Code BCP285)

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	PSO 1	PSO 2
BCP285_ Introduction to R Lab	CO1	2	1	1	2				2			2	
	CO2	2	2	2	2				2			2	
	CO3	2	2	1	2				2			2	
	CO4	2	2	2	2				2			2	
	CO5	2	2	2	2				2			2	
	CO6	3	3	2	2				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	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
BCP285	Introduction to R lab	2.1	2	1.7	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		Sharda School of Engineering & Technology		
Department		Computer Science & Applications		
Programme		BCA, Academic Year: 2023-24		
Semester		V		
1	Course Code	RBL003	Course Name: Research Based Learning -3	
2	Course Title	Research Based Learning -3		
3	Credits	2		
4	Contact Hours (L-T-P)	0-0-4		
	Course Status	Compulsory		
5	Course Objective	1. To align student's skill and interests with a realistic problem or Research. 2. To understand the significance of problem and its scope. 3. Students will make decisions within a framework.		
6	Course Outcomes	Students will be able to: CO1: Identify and formulate problem statement. CO2: Design a Hypothesis. CO3: Develop the solution by using different aspects of Research Methodology. CO4: Classify and understand various tools and techniques for verification and validation of Research. CO5: Analyze and make use of modern methods for solving real word problems. CO6: Develop teamwork and need to engage in life-long learning, along with the ability to communicate effectively with others.		
7	Course Description	In RBL, the students will learn how to define the problem for developing Research, and Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.		
8	Outline syllabus			CO Mapping
	Unit 1	Identify and formulate problem statement and Design a Hypothesis.	CO1,CO4	
	Unit 2	Problem Definition and identification.	CO2,CO6	
	Unit 3	Team/Group formation and Research Assignment. Finalizing the problem statement, resource requirement.	CO3	
	Unit 4	Design; implement Research work in any Programming language or research tool	CO4,CO5	
	Unit 5	Use of various test tools and techniques for Hypothesis verification and validation of Research	CO6	
	Mode of examination	Practical /Viva		
	Weight age Distribution			
		CA	CE(Viva)	ETE
		25%	25%	50%

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO)
1.	CO1: Identify and formulate problem statement.	PO1, PO2, PO4, PO6, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
2.	CO2: Design a Hypothesis.	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO11, PO12, PSO1, PSO2, PSO3
3.	CO3: Develop the solution by using different aspects of Research Methodology.	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO11, PO12, PSO1, PSO2
4.	CO4: Classify and understand various tools and techniques for verification and validation of Research.	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
5.	CO5: Analyze and make use of modern methods 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 Research Based Learning -3
(Course Code RBL003)**

CO/PO Mapping												
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low												
Cos	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	3	-	2	-	1	-	1	2	-	2	2
CO2	3	2	2	2	2	-	-	1	2	-	2	1
CO3	3	2	2	2	2	3	-	1	2	-	2	2
CO4	3	3	2	2	3	-	-	1	2	-	2	2
CO5	3	2	-	-	3	-	-	1	2	-	2	2
CO6		1	-	1	-	-	-	2	2	3	1	-
Avg PO attained	3	2.2	1	1.5	1.7	0.7	0	1.2	2	1	2	

School		Sharda School of Engineering & Technology		
Department		Computer Science & Applications		
Programme		BCA (Online), Academic Year: 2023-24		
Semester		V		
1	Course Code	INC003		
2	Course Title	Industry connect		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
Course Status				
5	Course Objective	1. Experience the activities and functions of business professionals. 2. Develop and refine oral and written communication skills. 3. Identify areas for future knowledge and skill development.		
6	Course Outcomes	<ul style="list-style-type: none"> ● Students will be able to: ● CO1. Integrate the concepts and strategies of academic study in a real time environment. ● CO2. Identify, formulate and model problems and find engineering solution based on a systems approach. ● CO3. Develop teamwork and apply prior acquired knowledge in problem solving. ● CO4. Develop communication, interpersonal and other critical skills required for career growth. ● CO5. Practice engineer's responsibilities, self-understanding, self-discipline and ethical standards. ● CO6. Explore career alternatives prior to graduation. 		
7	Course Description	The opportunity to explore potential career paths while putting classroom knowledge and abilities into practise in a professional context is provided by an internship. Students also have the chance to network professionally and have a better understanding of what they still need to study thanks to the experience.		
8	Outline syllabus			CO Mapping
	Unit 1	Establish the internship's goals and requirements and make sure students understand how they relate to their University study plan.		CO1,CO2
	Unit 2	Definition and identification of the problem, creation of teams and groups, and project assignment. completing the problem definition and, if necessary, the resource requirements.		CO2
	Unit 3	The work plan for the internship is created by encouraging teamwork and using previously learned problem-solving skills.		CO3
	Unit 4	Execute the project with the team and demonstrate it. the intern's final report and assessment form must be submitted.		CO4
	Unit 5	Final evaluation form completed by the supervisor at the Host Organization and final presentation before departmental committee.		CO5,CO6
	Mode of examination	Practical		
	Weightage Distribution	CA 25%	MTE 25%	ETE 50%
	Text book/s*	1. Scrum: The Art of Doing Twice the Work in Half the Time by Jeff Sutherland and J.J. Sutherland		

Other References	<ol style="list-style-type: none"> 1. A Guide to the Project Management Body of Knowledge by Project Management Institute 2. Project Management for The Unofficial Project Manager by Kory Kogon, Suzette Blakemore, & James Wood 3. Project Management Absolute Beginner's Guide by Gregory M. Horine
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CO and PO Mapping

S. No	Course Outcome	Programme Outcomes (PO)
1.	CO1. Integrate the concepts and strategies of academic study in a real time environment.	PO1,PO2,PO4,PO5,PO7,PO8,PO9,PSO1,PSO2
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, PSO1,PSO2
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.	PSO1,PSO2

PO and PSO mapping with level of strength for Course Name Industry connect

CO/PO Mapping												
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low												
Cos	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	2	2	-	3	2	-	1	1	1	-	1	2
CO2	1	2	1	2	2	-	1	1	1	-	1	2
CO3	2	-	2	2	2	-	-	1	3	-	1	2
CO4	-	-	-	-	-	-	-	1	-	3	-	-
CO5	-	-	-	-	-	2	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	2	2

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

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
INC003	Industry connect	1.6	2	1.5	2.3	2	2.0	1	1.4	1.7	3	1.25	2

Strength of Correlation:

1-Slight (Low)

2-Moderate (Medium)

3-Substantial (High)

TERM VI

School: SET		Batch: 2023-26	
Programme: BCA		Current Academic Year: 2023-24	
Semester: VI			
1	Course Code	BCA606	
2	Course Title	Dot Net Framework using C#	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-1	
	Course Status	Programme Elective 3	
5	Course Objective	Understand the fundamentals of object-oriented concept in C#, defining classes, objects, invoking methods inheritance, interfaces and exception handling mechanisms. To develop skills in analyzing the usability of a web and understand the fundamentals of ASP.NET with ADO.NET.	
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Understand the philosophy and architecture of .NET Framework. CO2: Describe the fundamental of C# Programming language and learn how to build object oriented applications using C#. CO3: Explain the concept of Namespace system, multithreading and exception handling. CO4: Implement the ASP.Net web controls in web form. CO5: Apply the validation controls and ADO.NET. CO6: Develop real world problems using C# & ASP.NET.	
7	Course Description	Basic Object-Oriented Programming (OOP) concepts, including objects, classes, methods, parameter passing, information hiding, inheritance and polymorphism are introduced and their implementations using C# are discussed. ASP.NET and ADO.NET are discussed to give basic understanding and its implementation to design the web pages.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction to .Net framework & components	
	A	Introduction, The Origin of .Net Technology, Common Language Runtime (CLR),	CO1, CO2
	B	Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL),	CO1, CO2
	C	Just-In -Time Compilation, Framework Base Classes, Assemblies and its types	CO1, CO2
	Unit 2	Introduction to C# with class and object	
	A	Introduction, Data Types, Identifiers, Variables, Constants, Literals, Type conversion, Array and Strings,	CO1, CO2
	B	Object and Classes, Abstraction, Encapsulations & Data hiding, Inheritance	CO1, CO2
	C	Polymorphism, Operator Overloading, Interfaces, Delegates and Events.	CO2, CO6
	Unit 3	Namespace-System, Multi-threading and Exception handling	
	A	Namespace- System, Access Modifiers: Public, Private, Protected, Internal and Protected Internal	CO3, CO6
	B	Introduction to Multi-Threading: creating thread using Thread class, Thread life cycle, sleep, join, abort and Thread priority	CO3, CO6
	C	Managing Console, I/O Operations, Input-Output in C#, Error Handling: try, catch, throw and throws, Checked and Unchecked exceptions, User define exception	CO3, CO6
	Unit 4	ASP.NET Controls	
	A	ASP.NET Web Controls: ASP.Net Life cycle, Differentiate Client side and Server-side controls.	CO4, CO6
	B	Label, Textbox, Button Controls, Drop-down list, List box,	CO4, CO6
	C	Radio Button list, Check box list, File Upload, Data Grid, Grid View	CO3, CO6
	Unit 5	ASP.NET validation controls & ADO.NET	
	A	ASP.NET Validation: Compare Validator, Range Validator, Regular Expression Validator, Required Field Validator, Validation Summary	CO5, CO6
	B	ADO.Net: Introduction to ADO.Net. Architecture ADO.NET, Data Set, Data Table,	CO5, CO6
	C	Data Row, Data Adapter, Data Reader, DB Command and DB Connection Objects	CO5, CO6
	Mode of examination	Theory	

Weightage Distribution	CA 25%	MTE 25%	ETE 50%	
Text book/s*	1 Balagurusamy, "Programming with C#", (TMH) 2 Shibi Parikkar, "C# with .Net Frame Work", Firewall 3 Media.ASP.NET: The Complete Reference:Matthew Macdonald			
Reference Books	1 Mark Michaelis, "Essential C# 3.0: For .NET Framework 4.5, 2/e, Pearson Education 2 Fergal Grimes, "Microsoft .Net for Programmers". (SPI)			

CO and PO Mapping

Sl. No.	Course Outcome (CO)	
1.	CO1: Uunderstand the philosophy and architecture of .NET Framework.	PO1, PO2
2.	CO2: Describe the fundamental of C# Programming language and learn how to build object-oriented applications using C#.	PO1, PO2, PO4
3.	CO3: Explain the concept of Namespace system, multithreading and exception handling.	PO1, PO2, PO3, PO4, PO10, PSO1
4.	CO4: Implement the ASP.Net web controls in web form.	PO1, PO2, PO3, PO10
5.	CO5: Apply the validation controls and ADO.NET.	PO2, PO3, PO4, PO10
6.	CO6: Develop real world problems using C# & ASP.NET.	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO10, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name C# with ASP.Net (Course Code - BCA606)

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	PSO 1	PSO2
BCA606 Dot Net Framwork using C#	CO1	3	2	-	-	-	-	-	-	-	2	-	-
	CO2	2	3	-	2	-	-	-	-	-	-	-	-
	CO3	2	3	2	3	-	-	-	-	-	2	2	-
	CO4	2	3	2	-	-	-	-	-	-	2	-	-
	CO5	-	2	2	3	-	-	-	-	-	2	2	1
	CO6	2	3	2	3	3	2	-	2	-	2	2	2

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

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
BCA606	Dot Net Framfork Using C#	2.2	2.67	2	2.75	3	2	0	2	0	2	2	1.5

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		VI	
1	Course Code	BCA368	Course Name: Machine Learning
2	Course Title	Machine Learning	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objective	The objective of the course is to introduce basic fundamental concepts in Artificial Intelligence (AI), with a practical approach in understanding them. To visualize the scope of AI and its role in futuristic development.	
6	Course Outcomes	<p>Students will be able to:</p> <p>CO1: Compare AI and non-AI solutions. Basics of machine learning and differentiation with AI</p> <p>CO2: To Apply machine learning on labelled and unlabelled data.</p> <p>CO3: To explore the concept of machine learning for various problem solving in AI</p> <p>CO4: Classify supervised and unsupervised learning and knowledge representation and introduction to fuzzy logic</p> <p>CO5: Learning extension in the form of deep learning concepts.</p> <p>CO6: Practical implementation on various types of data of Machine Learning algorithms</p>	
7	Course Description	This course introduces basic aspects of Artificial intelligence and how the concept of AI can be extended in the sub domain of machine learning with overall coverage starting from supervised learning, unsupervised learning up to deep learning.	
8	Outline syllabus		CO Mapping
	Unit 1	INTRODUCTION TO AI and ML	
	A	Foundation of AI, Goals of AI, History and AI course line	CO1, CO5
	B	Introduction to Intelligent Agents; Environment; Structure of Agent, AI Solutions Vs Conventional Solutions; a philosophical, approach; a practical approach.	CO1, CO5
	C	Learning, Difference between AI and Machine Learning Types of Learning, Well defined learning problems, Designing a Learning System, History of ML,	CO1, CO5
	Unit 2	Machine Learning Approaches and various types	
	A	Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning;	CO1, CO2, CO3
	B	SUPPORT VECTOR MACHINE(SVM): Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel, and Gaussian kernel)	CO1, CO2, CO3
	C	Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM.	CO1, CO2, CO3
	Unit 3	Supervised Learning and Unsupervised machine learning Algorithms	
	A	DECISION TREE LEARNING - Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning.	CO1, CO4
	B	INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression. K-means clustering), Hierarchical clustering, Anomaly detection	CO1, CO4
	C	Radial basis function networks, Case-based learning.	CO4
	Unit 4	Neural Networks	

A	ARTIFICIAL NEURAL NETWORKS – Perceptron’s, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks.			CO4
B	Different types of parameters optimization in machine learning.			CO4
C	Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker, Self-deriving car etc			CO4
Unit 5	Deep Learning			
A	DEEP LEARNING - Introduction, concept of convolution neural network , Types of layers – (Convolution Layers , Activation function , pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network,			CO1,CO5
B	Introduction to Reinforcement Learning, Learning Task, Example of Reinforcement Learning in Practice			CO1,CO5
C	Learning Models for Reinforcement – (Markov Decision process , Q Learning - Q Learning function, Q Learning Algorithm), Application of Reinforcement Learning, Introduction to Deep Q Learning.			CO1,CO5
Mode of examination	Theory			
Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	
Text book/s*	1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. 2. Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), MIT Press 2004.			
Other References	3. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009. 4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag. 5. M. Gopal, “Applied Machine Learning”, McGraw Hill Education			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Compare AI and non-AI solutions. Basics of machine learning and differentiation with AI	PO1, PO2, PO3, PO4, PO5, PO10, PSO1, PSO2,
2.	CO2: To Apply machine learning on labelled and unlabelled data.	PO1, PO2, PO3, PO4, PO5, PO10, PSO1, PSO2
3.	CO3: To explore the concept of machine learning for various problem solving in AI	PO1, PO2, PO3, PO4, PO5, PO6, PO7,PO10,PSO1, PSO2
4.	CO4: Classify supervised and unsupervised learning and knowledge representation and introduction to fuzzy logic	PO1, PO2, PO3, PO4, PO5, PO6, PO7,PSO1, PSO2,
5.	CO5: Learning extension in the form of deep learning concepts.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2
6	CO6: Practical implementation on various types of data of Machine Learning algorithms	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name: Concepts of Machine Learning

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	PSO 1	PSO 2
Machine Learning	CO1	1	2	3	2	2	-	-	-	-	2	3	2

BCA368	CO2	2	3	3	2	3	-	-	-	-	2	3	3
	CO3	3	3	3	3	2	1	1	-	-	1	3	2
	CO4	3	3	3	3	2	2	1	-	-	2	3	2
	CO5	2	3	3	3	3	2	2	2	3	2	3	3
	CO6	2	3	3	3	3	2	2	2	3	2	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	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
BCA368	Machine Learning	2.2	2.8	3.0	2.7	2.5	1.8	1.5	2.0	3.0	1.8	3.0	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*

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA, Academic Year: 2023-24	
Semester		VI	
1	Course Code	BCA190	Course Name: Cloud Computing s
2	Course Title	Cloud Computing	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objective	<p>1. Provide students with an overview of the fundamental concepts of Cloud Computing.</p> <p>2. Gain insight into the challenges and limitations Models of cloud computing.</p> <p>3. To learn the various technologies of the cloud computing paradigm and learn about recent advances in Cloud Computing and enabling technologies.</p> <p>4. Prepare students for research in the area of cloud Computing risks and cloud security challenges.</p>	
6	Course Outcomes	<p>At the end of the course, students will have achieved the following learning objectives.</p> <p>CO 1. Define the basics of cloud and recall the computer Science concepts which are helpful in understanding on demand service architecture.</p> <p>CO 2. Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory</p> <p>CO 3. Apply and Manage Virtualization and Workflow to use the cloud in file systems and applications.</p> <p>CO 4. Categorize and Characterize between Infrastructure services, deployment models, and governance in cloud computing</p> <p>CO 5. Evaluate the importance of cloud using monitoring and management of services for performance improvement of HPC and to follow the Governance and Compliances.</p> <p>CO 6. Elaborate the design concept and formulate to build the solution using cloud service providers.</p>	
7	Course Description	This course introduces advanced aspects of Cloud Computing, encompassing the principles, to analyze the cloud, identify the problems, and choose the relevant models and algorithms to apply.	
8	Outline syllabus		CO Mapping
	Unit 1	Cloud Computing Fundamentals	

	<p>A. Types of Computing, Grid computing, distributed computing, Client-server computing, Introduction to distributed systems,</p> <p>B. Cloud Computing definition, Roots of Cloud Computing, Layers and Types of Clouds</p> <p>C. Infrastructure as a Service Providers, Platform as a Service Providers</p>	CO1, CO2, CO3
Unit 2	Understanding Abstraction and Virtualization	
	<p>A. Introduction to Virtual Machines, The Anatomy of Cloud Infrastructures,</p> <p>B. Management of Virtual Machines for Cloud Infrastructures, Understanding The Logical</p> <p>C. Design, Secure Distributed Data Storage in Cloud Computing.</p>	CO1, CO2,CO3
Unit 3	Cloud Computing Services and Applications	
A	<p>A. Introduction of CometCloud, Aneka and CloudSim, Integration of Private and Public Clouds.</p> <p>B. Introduction of Enterprises Demand and Cloud Computing, Dynamic ICT Services,</p> <p>C. Scientific Application for Cloud Environments, Classification of Scientific</p>	CO2,CO3,CO4
Unit 4	Cloud Computing Risk and Performance Issues	
A	<p>A. Model for Federated Cloud Computing, Security Considerations.</p> <p>B. HPC in the Cloud: Performance-related Issues, Game Hosting on Cloud Resources,</p> <p>C. Legal Issues in Cloud Computing(PCI DSS), Data Privacy and Security Issues</p>	CO3, CO4,CO5
Unit 5	AWS, MS Azure and Google Cloud Services	
A	<p>A. AWS Services:Elastic Compute Cloud, Identity and Access Management, Simple Storage Service</p> <p>B. MS Azure Services:Azure Virtual Machine, SQL Server on Virtual Machines, Azure SQL Database,</p> <p>C. Google Cloud: Compute Engine,Migrate for Compute Engine</p>	CO4,CO5, CO6
Mode of examination	Theory	

Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	
Text book/s* Other References	1. CLOUD COMPUTING Principles and Paradigms, Edited by Rajkumar Buyya, Jam 2. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter 3. Barrie Sosinsky “Cloud Computing (Bible)”, Wiley. 4. Ronald L. Krutz and Russell Dean Vines, “Cloud Security: A comprehensive Guide to Secure Cloud Computing”, WILEY.			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	Define the basics of cloud and recall the computer Science concepts which are helpful in understanding on demand service architecture.	PO1, PO2, PO3, PSO3
2.	Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory	PO1, PO2, PO3, PSO1, PSO3
3.	Apply and Manage Virtualization and Workflow to use the cloud in file systems and applications.	PO1, PO2, PO3, PSO1, PSO2
4.	Categorize and Characterize between Infrastructure services, deployment models, and governance in cloud computing	PO1, PO2, PO4, PSO1, PSO2
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, PO4, PSO1, PSO3
6.	Elaborate the design concept and formulate to build the solution using cloud service providers.	PO1, PO2, PO3, PSO1, PSO2, PSO3

Course Code	CO's	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO2

Course Name													
Cloud Computing	CO1	3	3	3	3	--	--	--	2	2	1	3	2
	CO2	3	2	3	3	--	--	--	2	2	2	2	3
	CO3	3	3	3	3	--	--	--	1	1	1	3	2
	CO4	2	2	2	2	1	--	--	2	3	3	2	2
	CO5	2	2	2					3	3	1	3	
	CO6	3	2								2	2	2

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

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
	Cloud Computing	2.83	2.67	1.67	1.67	1.00	1.00	1.00	2.00	1.00	2.67		2.50

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:	Sharda School of Engineering and Technology	
Department:	Department of Computer Science and Engineering	
Programme:	BCA, Academic Year: 2023-24	
Semester:	VI	
1	Course Code	BCA604
2	Course Title	Information Security and Cyber Law
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Active
5	Course Objective	Introduce to Information Security theories, techniques & applications that are often required.
6	Course Outcomes	On successful completion of this module students will be able to: CO1: Demonstrate basic concepts of information security & Apply different symmetric and asymmetric key ciphers CO2: Apply basic mathematical methods of modular arithmetic. CO3: Illustrate types and objectives of virus CO4: Evaluate the different type of intrusion detection and firewall design principles. CO5: Apply the principles in real life application. CO6: Distinguish between correct or incorrect data practices.
7	Course Description	This course introduces basic concepts of Information security & public key cryptography. Also imparts the knowledge of types of virus & system security.
8	Outline syllabus	CO Mapping
	Unit 1	Introduction
	A	Information Security Concepts, Elements of security, security policy, security techniques, Models, terminology
	B	encryption methods, cryptography, cryptanalysis & steganography
	C	Mathematics of cryptography- GCD, Euclidian , Extended Euclidian algorithm
	Unit 2	Symmetric key Cryptosystem
	A	Introduction to symmetric key cryptography, Substitution Cipher
	B	Mono-alphabetic substitution cipher:- Caesar cipher, additive and multiplicative cipher
	C	Polyalphabetic substitution cipher- playfair cipher, hill cipher, Transposition cipher- rail fence cipher, column cipher
	Unit 3	Public key cryptosystem & Authentication
	A	Public key cryptosystem, authentication , application , symmetric vs asymmetric cryptosystem
	B	RSA-key generation , encryption and decryption
	C	Authentication – introduction , methods-password based, two factor, biometrics, MD2
	Unit 4	Virus
	A	Malicious software- virus, worms, zombie, logic bombs, trapdoors, spyware, Trojan horse
	B	Phases of virus and worm propagation
	C	Types of virus , worms, Attacks –Hoax , backdoor, brute force, denial of service, distributed denial of service, spoofing , sniffing, replay, traffic analysis
	Unit 5	System Security

	A	Intruders, intrusion detection , introduction detection system, password management			CO4, CO5, CO6
	B	Anomaly based intrusion detection system , rule based intrusion detection system			CO4, CO5, CO6
	C	Firewalls- firewall design principles, firewall types			CO4, CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		25%	25%	50%	
	Text book/s*	<ol style="list-style-type: none"> 1. V. Pachghare” cryptography and Information security”- PHI 2. Behrouz A. Forouzan, “Cryptography And Network Security”- McGraw Hill 			
	Other References	<ol style="list-style-type: none"> 1. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc, 2001. 2. William Stallings, “Cryptography And Network Security Principles and Practices”, Prentice Hall of India, Fourth Edition 			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Demonstrate basic concepts of information security & Apply different symmetric and asymmetric key ciphers	PO1, PO2, PO4, PO5, PO7, PO8, PO9, PO10, PSO2
2.	CO2: Apply basic mathematical methods of modular arithmetic.	PO1, PO2, PO3, PO4, PO6, PO10, PSO2
3.	CO3: Illustrate types and objectives of virus	PO1, PO4, PO5, PO7, PO8 PO10, PSO2
4.	CO4: Evaluate the different type of intrusion detection and firewall design principles.	PO1, PO2, PO3, PO5, PO7 PO10, PSO2,
5.	CO5: Apply the principles in real life application.	PO1, PO2, PO5, PO7, PO8, PO9, PO10, PSO2
6.	CO6: Distinguish between correct or incorrect data practices.	PO1, PO2, PO3, PO6, PO8, PO9, PO10, PSO2

PO and PSO mapping with level of strength for Course Name Introduction to Cyber Security BCA604

BCA 604	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO2
	CO1	3	2		3	3		3	3	3	3	2
	CO2	2	3	3	3		3				3	3
	CO3	2	3			2		3	2		3	3

	CO4	2	3	3		2		3			3	3
	CO5	2	2			3		3	3	2	2	3
	CO6	3	2	3			3		3	2	2	2

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

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PSO2
BCA604	Introduction to Cyber Security	2.3	2.5	3	3	2.5	3	3	2.75	2.3	2.6	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*

School: SET		Batch: 2023-25	
Programme: BCA		Current Academic Year: 2023-24	
		Semester: VI	
1	Course Code	BCP606	
2	Course Title	Dot Net Using C# Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Programme Elective 3	
5	Course Objective	This course is prepared for the beginners to help them to understand basics of C# along with classes, objects, invoking methods inheritance, interfaces and exception handling mechanisms and ASP.NET Programming . After completing this course, students will be able to find yourself at a moderate level in ASP.NET using C# Programming from where you can take yourself to next levels.	
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Demonstrate C# environment and executing C# Programmes. CO2: Understand and formulate the problems in basic Programming constructs using C#. CO3: Applying OOP concepts to solve real world problems. CO4: Implement inheritance, polymorphism, multithreading features using C# and handle run time errors. CO5: Apply the validation controls in web forms and connect with database using ADO.NET. CO6: Develop real world problems using C# & ASP.NET.	
7	Course Description	ASP.NET is a web application framework developed and marketed by Microsoft to allow Programmers to build dynamic web sites. It allows you to use an object-oriented Programming language such as C# to build web applications easily	
8	Outline syllabus		CO Mapping
	Unit 1	Visual Studio installation and Programme execution	
		Installing Visual-Studio, uses of IDE, Writing C# Programmes, Programme execution, Programmes on different data types, promotion rules in expressions, narrowing & type casting, logical-bit wise-arithmetic operators.	
	Unit 2	Programming revisited	
		Programmes using if .. else, switch .. case statements, for, while, do. while loop control structures, break and continue Programmes using command line arguments, taking input from keyboard, Arrays, nested control structures.	
	Unit 3	class, object and constructor	
		Programmes to define classes, defining data members & member function, create objects, accessing members of a class through objects, Programmes to define constructors, initializing instance variables, method overloading, constructor overloading.	
	Unit 4	Inheritance, package, Interface, Exception and Multithreading	
		Programmes on different types of inheritance, method overriding, achieving multiple inheritance through interfaces, inheritance in interfaces, private, protected and public mode, try. catch. finally for exception handling, throw user defined exceptions, uses of throws, nested try catch, rethrowing exceptions. Programmes to define Thread, achieving multithreading using Thread class.	
	Unit 5	ASP.NET, Validation and ADO.NET	
		Design the Web Forms using ASP.NET controls, Validations using various validators in VS. Establish the connection using ADO.NET component in connected and Dis-connected mode.	
	Mode of examination	Theory	
	Weightage Distribution	CA	MTE
		25%	25%
	Text book/s*	4 Balagurusamy, " Programming with C#", (TMH)	
		5 Shibi Parikkar, " C# with .Net Frame Work" , Firewall	
		6 Media.ASP.NET: The Complete Reference:Matthew Macdonald	

Reference Books	3 Mark Michaelis, "Essential C# 3.0: For .NET Framework 4.5, 2/e, Pearson Education 4 Fergal Grimes," Microsoft .Net for Programmers". (SPI)
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CO and PO Mapping

Sl. No.	Course Outcome (CO)	
1.	CO1: Demonstrate C# environment and executing C# Programmes.	PO1, PO2
2.	CO2: Understand and formulate the problems in basic Programming constructs using C#.	PO1, PO2, PO4
3.	CO3: Applying OOP concepts to solve real world problems.	PO1, PO2, PO3, PO4, PO10, PSO1
4.	CO4: Implement inheritance, polymorphism, multithreading features using C# and handle run time errors.	PO1, PO2, PO3, PO10
5.	CO5: Apply the validation controls in web forms and connect with database using ADO.NET	PO2, PO3, PO4, PO10
6.	CO6: Develop real world problems using C# & ASP.NET.	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO10, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name C# with ASP.Net (Course Code - BCP606)

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	PSO 1	PSO2
Dotnet Using C# Lab	CO1	3	2	-	-	-	-	-	-	-	2	-	-
	CO2	2	3	-	2	-	-	-	-	-	-	-	-
	CO3	2	3	2	3	-	-	-	-	-	2	2	-
	CO4	2	3	2	-	-	-	-	-	-	2	-	-
	CO5	-	2	2	3	-	-	-	-	-	2	2	1
	CO6	2	3	2	3	3	2	-	2	-	2	2	2

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

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
	Dot Net using C#	2.2	2.67	2	2.75	3	2	0	2	0	2	2	1.5

List of Programmes

Write a Simple Programme to print your name in C#
Write a Programme to print the given string by using the Write and Write Line Method.
Write a Programme how to read the values form console given by the user using Read Line Method
Write a Programme to make a function (addition of Two numbers) in Single Class
Write a Programme to make a function in first class (addition of Two numbers) and call a function by creating object of first class in to second class and inputs given by the user.
Write a Programme to make a function in first class and call a function into second class by declare static method of first class
Write a Programme to print the element of collections (like. Array) by using For each Loop.
Write a Programme to print the element of an Array by using For each Loop and inputs given by the user.
Write a Programme to print the tables from 1 to 10 by using the 2- Dimensional Array

Write a Programme to implements the methods and properties on Array (like: Get Length(),Get Value Get Length(),,Copy To(),Reverse(),Length)
Write a Programme to print the elements by using Jagged Array with For each Loop.
Write a Programme to print the elements by using the Array List Class and inputs given by the user.
Write a Programme to implements the methods and properties on Array List. (like: Add(),Clear(),Insert(),Remove(),Sort(), Count, Capacity).
Write a Programme to display the given string by using Immutable String (String Class).
Write a Programme to implements the methods and properties on string (like: Compare(),Compare To(), Concat(),Trim(),Insert()).
Write a Programme to display the given sting by using Mutable String (String Builder Class).
Write a Programme to implements the methods and properties on String Builder (like: Compare(),Compare To(),Concat(),Trim(),Insert()).
Write a Programme to create a class for Room and make a Constructor & Destructor for Room Class and then use the Construct to pass the values in method for Area and display it.
Write a Programme to calculate the Area of Circle by using the Parameterized Constructor and inputs given by the user (Length, Width).
Write a Programme to calculate the Area of Rectangle and perimeter by using the Constructor Overloaded and inputs given by the user (Length, Width)
Write a Programme to calculate the Area of Room and inherit the base class and calculate the volume of Room in second class and then display the area and volume (Single Inheritance).
Write a Programme to design a class vehicle, car and bike by using Multi Level inheritance and then call the method of vehicles, car and bike by creating object of bike class (Multi -level inheritance).
Write a Programme to implement the interfaces which contains the methods Addition, Multiplication respectively and create a new class which implement both methods and display the output of these methods by creating a new class.
Write a Programme to create a class and make a function for Multiplication for two numbers and overload the existing function then display the output.
Write a Programme how the unary minus operator is overloaded
Write a Programme how the binary plus operator is overloaded on addition of two complex numbers.
Write a Programme to create a class and make the function Display and override the existing Function by using the Virtual and Override keywords.
Write a Programme how a delegate is created and used in Programme.
Write a Programme to Create the Multicast delegate by call the several methods in one call.
Write a Programme to simulate a calculator by using the delegate
Write a Programme to create the two event handler of an event and implement by the delegate.
Write a Programme to handle an arithmetic exception by using try and multiple catch blocks.
Write a Programme to handle an arithmetic exception by using try and finally block.
Write a Programme how to create a thread and starts it running
Write a Programme how to create the multiple thread in a Programme
Write a Programme how to manage the priority of threads
Write a Programme to implement the methods of thread (like: Wait (), Suspend (), Resume (), Abort ()).
Write a Programme to connect the SQL Database by using the ADO.Net
Write a Programme to connect the Ms Access by using the ADO.Net
Write a Programme to illustrate the concept of Connected Mode by using ADO.Net
Write a Programme to illustrate the concept of Dis-connected Mode by using ADO.Net
Write a Programme to implement the Pointer in C # by using unsafe mode.
Create a Simple web application by using ASP.Net and Connect with SQL Database and also perform some operation (like: Insert, Update, Delete and Select).

Syllabus: : Machine Learning Lab

School		Sharda School of Engineering & Technology	
Department		Computer Science & Applications	
Programme		BCA (Online), Academic Year: 2023-24	
Semester		VI	
1	Course Code	BCP368	
2	Course Title	Machine Learning Lab	
3	Credits	2	
4	Contact Hours (L-T-P)	0-0-4	
	Course Status	Compulsory	
5	Course Objective	<p>The objective of the course is to introduce basic fundamental concepts in Artificial Intelligence (AI) with machine Learning, with a practical approach in understanding them. To visualize the scope of Machine Learning</p> <ul style="list-style-type: none"> ● To develop machine learning concept. ● To workout various libraries and tool with the help of R or Python. ● To have an overview of the various processes involved in Machine Learning in supervised and unsupervised domain <p>To develop a working model of real life problem base on machine learning</p>	
6	Course Outcomes	<p>After the completion of this course, students will be able to:</p> <p>CO-1. To develop basic understanding of data structures required for machine learning.</p> <p>CO-2. To process the data for various statistical and probability calculation form mathematical base.</p> <p>CO-3. To extends data structure for implementation of supervised learning.</p> <p>CO-4. To extend implementation from the point of view of unsupervised machine learning .</p> <p>CO-5. Select Machine learning based applications.</p> <p>CO-6. To develop the artificial intelligence and machine learning approach for the project implementation .</p>	
7	Course Description	In this course students will learn basic introduction of Artificial Intelligence, problem solving agents, reasoning, learning and applications of artificial intelligence.	
8	Outline syllabus		CO Mapping
	Unit 1	Practical based on basics of LISP & goal based problems	
		Sub unit - a, b and c detailed in Instructional Plan	CO1, CO2, CO4
		Practical related to uninformed search algorithm.	
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 2	Practical related to informed search algorithm.	CO1, CO2. CO3, CO4
		Sub unit - a, b and c detailed in Instructional Plan	

	Unit 3	Practical related to machine learning algorithms			
		1. Sub unit - a, b and c detailed in Instructional Plan			CO2, CO3, CO4
		Practical based on goal based problems			
	Unit 4	Sub unit - a, b and c detailed in Instructional Plan			
		Practical related to uninformed search algorithm.			
		Sub unit - a, b and c detailed in Instructional Plan			CO2, CO3, CO4
	Unit 5	Practical related to informed search algorithm.			
		Sub unit - a, b and c detailed in Instructional Plan			CO1, CO2, CO3, CO4, CO6
	Mode of examination	Practical			
	Weightage Distribution	CA	CE	ESE	
		25%	25%	50%	
	Text book/s*	1. Rich E& Knight K, Artificial Intelligence, Tata McGraw Hill, Edition 3.			
	Other References	1. Russell S & Norvig P, Artificial Intelligence: A Modern Approach, Prentice-Hall. 2. Dan W. Patterson, Artificial Intelligence & Expert Systems, Pearson Education with Prentice Hall India. Indian Edition.			

CO and PO Mapping

S. No.	Course Outcome (CO)	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Relate the goals of Artificial Intelligence and AI and non-AI solution.	PO3, PO4, PO5, PO10, PSO1, PSO2
2.	CO2: Analyze and various AI uninformed and informed search algorithms.	PO1, PO2, PO3, PO4, PO5, PO10, PSO1, PSO2
3.	CO3: Extend knowledge representation, reasoning, and theorem proving techniques to real-world problems	PO1, PO2, PO3, PO4, PO5, PO12, PSO1, PSO2
4.	CO4: Make use of: Machine learning algorithms in various application domains of AI.	PO1, PO2, PO3, PO4, PO5, PO12, PSO1, PSO2
5.	CO5: Select Artificial Intelligent based applications.	PO1, PO2, PO3, PO4, PO5, PO9, PO10, PO12, PSO1, PSO2
6.	CO6: Develop independent (or in a small group) research and communicate it effectively.	PO1, PO2, PO3, PO4, PO5, PO9, PO10, PO12, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name Artificial Intelligence Lab

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	PSO 1	PSO2	PSO3
BCP368	CO1	1	2	3	2	2					2	3	2	2
	CO2	2	3	3	2	3					2	3	3	2
	CO3	3	3	3	3	2	1	1			1	3	2	3
	CO4	3	3	3	3	2	2	1			2	3	2	3
	CO5	2	3	3	3	3	2	2	2	3	2	3	3	2
	CO6	2	3	3	3	3	2	2	2	3	2	3	3	2

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

Course Code/ Name	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
BCP368	2.16	2.83	2.8	3.0	2.5	1.5	1	0.6	1	1.83	3.0	2.33

Strength of Correlation

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

List of Practical's:

	Unit 1	Practical based on basics of basics data structures in python/R	
Week 1	a	Lab expt.1	Write a python Programme to import and export data using Pandas library functions
Week 2, 3	b	Lab expt.2	Demonstrate various data pre-processing techniques for a given dataset. Implement Dimensionality reduction using Principle Component Analysis (PCA) method.
Week 4	c	Lab expt.3	Write a Python Programme to demonstrate various Data Visualization Techniques. Implement Simple and Multiple Linear Regression Models.
	Unit 2		
Week 5	a, b,	Lab expt.4	Develop Logistic Regression Model for a given dataset. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
Week 6	c	Lab expt.5	Implement Naïve Bayes Classification in Python Build KNN Classification model for a given dataset.
	Unit 3	Practical related to informed search algorithm.	
Week 7	Mid term		
Week 8	a,b,c	Lab expt.6	Build Artificial Neural Network model with back propagation on a given dataset.
	Unit 4	Practical related to knowledge representations and logical reasoning	
Week 9	A	Lab expt.7	Implement Random forest ensemble method on a given dataset.
Week 10	B	Lab expt.8	Implement Boosting ensemble method on a given dataset.
Week 11	c	Lab expt.9	Write a python Programme to implement K-Means clustering Algorithm.
	Unit 5	Practical related to machine learning algorithms	
Week 12	a,	Project	Project Work Evaluation-0: Problem Statement with implementation of machine learning for unsupervised/supervised machine learning
Week 13	b	Project	Project Work Evaluation-1: Design Specification. Identification of dataset and the objective of project.
Week 14	c	Project	Project Work Evaluation-2: Development. Python or R implementation for the development of project.

School		Sharda School of Engineering & Technology		
Department		Computer Science & Applications		
Programme		BCA, Academic Year: 2023-24		
Semester		VI		
1	Course Code	RBL004	Course Name: Research Based Learning -4	
2	Course Title	Research Based Learning -4		
3	Credits	2		
4	Contact Hours (L-T-P)	0-0-4		
	Course Status	Compulsory		
5	Course Objective	1. To align student's skill and interests with a realistic problem or Research. 2. To understand the significance of problem and its scope. 3. Students will make decisions within a framework.		
6	Course Outcomes	Students will be able to: CO1: Identify and formulate problem statement. CO2: Design a Hypothesis. CO3: Develop the solution by using different aspects of Research Methodology. CO4: Classify and understand various tools and techniques for verification and validation of Research. CO5: Analyze and make use of modern methods for solving real word problems. CO6: Develop teamwork and need to engage in life-long learning, along with the ability to communicate effectively with others.		
7	Course Description	In RBL, the students will learn how to define the problem for developing Research, and Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.		
8	Outline syllabus			CO Mapping
	Unit 1	Developing a draft literature review paper based on RBL 3.		CO1,CO4
	Unit 2	Framing a research based framework for solving the problem identified or bridging the research gap identified.		CO2,CO6
	Unit 3	Justification of Research Methods or tools applied		CO3
	Unit 4	Verification and Validation of propose research framework using proper tools.		CO4,CO5
	Unit 5	Communicating and Publishing the research article		CO6
	Mode of examination	Practical /Viva		
	Weight age Distribution			
		CA	CE(Viva)	ETE
		25%	25%	50%

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO)
1.	CO1: Identify and formulate problem statement.	PO1, PO2, PO4, PO6, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
2.	CO2: Design a Hypothesis.	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO11, PO12, PSO1, PSO2, PSO3
3.	CO3: Develop the solution by using different aspects of Research Methodology.	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO11, PO12, PSO1, PSO2
4.	CO4: Classify and understand various tools and techniques for verification and validation of Research.	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
5.	CO5: Analyze and make use of modern methods 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: Research Based Learning 4
(Course Code RBL004)**

CO/PO Mapping												
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low												
Cos	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	3	-	2	-	1	-	1	2	-	2	2
CO2	3	2	2	2	2	-	-	1	2	-	2	1
CO3	3	2	2	2	2	3	-	1	2	-	2	2
CO4	3	3	2	2	3	-	-	1	2	-	2	2
CO5	3	2	-	-	3	-	-	1	2	-	2	2
CO6		1	-	1	-	-	-	2	2	3	1	-
Avg PO attained	3	2.2	1	1.5	1.7	0.7	0	1.2	2	1	2	1.5

School		Sharda School of Engineering & Technology		
Department		Computer Science & Applications		
Programme		BCA, Academic Year: 2023-24		
Semester		VI		
1	Course Code	CCU108	Course Name: Community Connect	
2	Course Title	Community Connect		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
Course Status		Compulsory		
5	Course Objective	<p>1. The objective of assigning the project related to community work is to expose our students to different social issues faced by the people in different sections of society.</p> <p>2. This type of project work will help the students to develop better understanding of problems of people living in disadvantage position in the society, may be socially, medically, economically, or otherwise.</p> <p>3. This type of live project work will help our students to connect their class-room learning with practical issues/problems in the society.</p>		
6	Course Outcomes	<p>Students will be able to:</p> <ol style="list-style-type: none"> CO1: Students develop awareness of the social, health, and environmental challenges faced by the community CO2: Students are more appreciative of socio-economic realities beyond textbooks and classrooms CO3: Students learn to apply their knowledge through research, awareness creation, and services for community benefit CO4: Students are able to carry out community-based projects with sincerity, teamwork and timely delivery CO5: Students learn to respectfully engage with communities with purposive intent to contribute to society and sustainable development CO6: Students are able to document and present their community project findings in an academically robust manner 		
7	Course Description	In Community Connect projects, students will learn how to identify problems of rural and underprivileged communities by conducting surveys, or will help the communities by providing services or solutions for the issues faced by them.		
8	Outline syllabus			CO Mapping
	Unit 1	Team/Group formation and Project Assignment. Problem Definition & Finalizing the problem statement , Resource requirement, if any.		CO1, CO2
	Unit 2	Develop a useful questionnaire or service to the community that will aid in achieving the objectives of the project.		CO2, CO3. CO4
	Unit 3	Learn how to interact with the community members , whether in survey or service-based project – to help develop a more open mindset in the students.		CO3, CO4, CO5
	Unit 4	Analysis of survey data and/or impact on the community members.		CO3, CO4
	Unit 5	Demonstrate and justify their findings in light of the data they have gathered, or show the benefits to the community of the actions they have taken.		CO4, CO5, CO6
	Mode of examination	Practical /Viva		
	Weight age Distribution	CA 25%	CE 25%	ETE 50%

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO)
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1.	CO1: Students develop awareness of the social, health, and environmental challenges faced by the community	PO2, PO3, PO4, PO6, PO8, PO9, PO10, PO12
2.	CO2: Students are more appreciative of socio-economic realities beyond textbooks and classrooms	PO1, PO2, PO3, PO4, PO6, PO8, PO9, PO10, PO11, PO12
3.	CO3: Students learn to apply their knowledge through research, awareness creation, and services for community benefit	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO10, PO11, PO12, PSO1, PSO2, PSO3
4.	CO4: Students are able to carry out community-based projects with sincerity, teamwork and timely delivery	PO2, PO3, PO6, PO8, PO9, PO10, PO11, PO12, PSO2
5.	CO5: Students learn to respectfully engage with communities with purposive intent to contribute to society and sustainable development	PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12 PSO1, PSO2, PSO3
6.	CO6: Students are able to document and present their community project findings in an academically robust manner	PO1, PO2, PO4, PO5, PO9, PO10, PO11, PO12, PSO2, PSO3

**PO and PSO mapping with level of strength for Course Name: Community Connect
(Course Code OLBCP606)**

CO/PO Mapping													
(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low													
Cos	Programme Outcomes(POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	
CO1		1	1	2		3		1	1	1			
CO2	1	2	1	3		3		1	1	1			
CO3	3	3	3	3	2	3			1	2	1	1	
CO4		3	3	3		3		3	3	3		1	
CO5		2	1	1	1	3	3	3	2	3	1	1	
CO6	2	3	1	1	3				2	2		2	
Avg PO attained	1	2.3	1.7	2.3	1	2.5	0.5	1.3	1.7	2	0.3	0.8	