PROGRAMME STRUCTURE

SHARDA SCHOOL OF ENGINEERING & TECHNOLOGY

Department of Computer Science & Applications

Bachelor of Science
(Specialization in Information Technology)

Programme Code: SET0126
Batch: 2023-2026

<table>
<tr><td colspan="12" align="center">Programme Structure</td></tr>
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<thead>
<tr><th colspan="12" align="center">Programme Structure</th></tr>
<tr><th colspan="12" align="center">Sharda School of Engineering & Technology</th></tr>
<tr><th colspan="12" align="center">Department of Computer Science & Applications</th></tr>
<tr><th colspan="12" align="center">B. Sc. (Information Technology)</th></tr>
<tr><th colspan="8" align="center">Batch: 2023-2026</th><th colspan="2"></th><th colspan="2" align="center">SEMESTER: I</th></tr>
</thead>
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S. No.	Course Code	Paper ID	Course	Teaching Load			Credits	Type of 1. CC 2. DSE 3. OE 4. SEC 5. AECC 6. VAC-I
				L	**T**	**P**		
				L	**T**	**P**		
THEORY SUBJECTS								
1	BCO151		Problem Solving Using C	4	0	0	4	CC
2	BCO153		Digital Electronics & Computer	4	0	0	4	DSE
3	BCO176		Introduction to Computers & Technology	3	0	0	3	OE
	BCO174		Introduction to Entrepreneurship					
	BCO283		Introduction to Artificial Intelligence					
4	BCO041		Introduction to IoT	2	0	0	2	SEC
5	ARP103		Communicative English-1	2	0	0	2	AECC
6	BCO173		Ethics and Social Implications of AI	3	0	0	3	VAC-1
Practical/Viva-Voce/Jury								
7	BOL151		Problem Solving Using C Lab	0	0	2	1	CC
8	BOL041		Introduction to IOT with hands-on lab	0	0	2	1	SEC
TOTAL							20	

Programme Structure									
Sharda School of Engineering & Technology									
Department of Computer Science & Applications									
B. Sc. (Information Technology)									
Batch: 2023-2026							**SEMESTER: II**		
S. No.	Course Code	Paper ID	Course	Teaching Load			Credits		Type of 1. CC 2. OE 3. SEC 4. AECC 5. VAC-II
				L	T	P			
THEORY SUBJECTS									
1	BCO226		Data Structures Using C	4	0	0	4		CC
2	BCO155		Operating System and Unix Shell	3	0	0	3		CC
3	BCO283		Introduction to Artificial Intelligence	3	0	0	3		OE
	BCO229		Mobile Application Development						
4	VOC102		Design Thinking & Creative Learning	1	0	0	1		SEC
5	ARP105		Communicative English -2	2	0	0	2		AECC
6	EVS201		Environmental Studies	3	0	0	3		VAC-2
Practical/Viva-Voce/Jury									
8	BOL226		Data Structures using C Lab	0	0	2	1		CC
9	BOL155		Operating System and Unix Shell	0	0	2	1		CC
10	VOC102		Design Thinking & Creative Learning	0	0	4	2		SEC
TOTAL							**20**		

Programme Structure										
Sharda School of Engineering & Technology										
Department of Computer Science & Applications										
B. Sc. (Information Technology)										
Batch: 2023-2026						**SEMESTER: III**				
S. No.	Course Code	Paper ID	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite	Type of 1. CC 2. DSE 3. OE 4. SEC 5. AECC 6. Audit
				L	T	P			
THEORY SUBJECTS									
1	BCO156		Object Oriented	4	0	0	4		CC
2	BCO154		Principles of Data Base	3	0	0	3		CC
3	BCO222		Computational Methods	4	0	0	4		DSE
4	BCO330		Introduction to Blockchain	3	0	0	3		OE
	BCO331		Cyber Analytics						
5	VOC201		Augmented Reality	2	0	0	2		SEC
6	ARP209		Logical Skills Building and	2	0	0	2		AECC
Practical/Viva-Voce/Jury									
8	BOL156		Object Oriented	0	0	2	1		CC
9	BOL154		Principles of Data Base	0	0	2	1		CC
10	VOC201		Augmented Reality	0	0	2	1		SEC
11	RBL001		Research Based Learning-1	0	0	2	0		Audit
TOTAL							**21**		

			Programme Structure					
			Sharda School of Engineering & Technology					
			Department of Computer Science & Applications					
			B. Sc. (Information Technology)					
			Batch: 2023-2026		**Batch:**		**SEMESTER: IV**	
S. No.	**Course Code**	**Paper ID**	**Course**	**Teaching Load**			**Credits**	**Type of Course** 1. CC 2. DSE 3. OE 4. AECC 5. Audit Course
				L	**T**	**P**		
			THEORY SUBJECTS					
1	BCO224		Design and Analysis of Algorithm	4	0	0	4	CC
2	BCO221		Computer Networks and Data	4	0	0	4	CC
3	BCO220		Application based Programming in Python	4	0	0	4	DSE
4	BCO403		Social Media Analytics	3	0	0	3	OE
	BCO402		Data Warehousing and Data Mining					
5	ARP210		Quantitative and Qualitative Aptitude Skill	2	0	0	2	AECC
			Practical/Viva-Voce/Jury					
7	BOL224		Design and Analysis of Algorithm Lab	0	0	2	1	CC
8	BOL220		Application based Programming in Python	0	0	2	1	DSE
9	RBL002		Research Based Learning-2	0	0	2	0	Audit
	TOTAL						**19**	

				Teaching				Type of Course
							Credits	1. CC
S. No.	Course Code	Paper ID	Course					2. DSE
				L	T	P		3. INTERNSHIP

<table>
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S. No.	Course Code	Paper ID	Course	L	T	P	Credits	Type of Course
1	BCO321		Web Technologies	4	0	0	4	CC
2	BCO225		Introduction to R	4	0	0	4	CC
3	BCO322		Software	4	0	0	4	CC
4	BRM002		Research	3	0	0	3	DSE

Programme Structure

Sharda School of Engineering & Technology

Department of Computer Science & Applications

B. Sc. (Information Technology)

| Batch: 2023-2026 | | | | | | SEMESTER: V | | |

Practical/Viva-Voce/Jury

6	BOL321		Web Technology	0	0	2	1	CC
7	BOL225		Introduction to R	0	0	2	1	CC
8	RBL003		Research Based	0	0	4	2	DSE
9	INC003		Industry Connect	0	0	2	1	INTERNSHIP
TOTAL							**20**	

CSA, SSET, SU

						Programme Structure						

Programme Structure

Sharda School of Engineering & Technology

Department of Computer Science & Applications

B. Sc. (Information Technology)

Batch: 2023 Onwards						SEMESTER: VI		

S. No.	Course Code	Paper ID	Course	Teach		Credits	Type of Course		
							1. CC		
							2. OE		
							3. DSE		
				T	P		4. VAC		
			THEORY SUBJECTS						
1	BCO606		DotNet framework using C#	0	0	4	CC		
2	BCO368		Machine Learning	0	0	4	CC		
3	BCO190		Cloud Computing Fundamentals	0	0	4	CC		
4	BCO604		Information Security and Cyber	0	0	3	OE		
	BCO605		Big Data Analytics						
			Practical/Viva-Voce/Jury						
6	BOL606		DotNet framework using C# Lab	0	2	1	CC		
7	BOL368		Machine Learning Lab	0	2	1	CC		
8	RBL004		Research Based Learning-4	0	4	2	DSE		
9	CCU108		Community Connect	0	2	1	VAC		
	TOTAL					**20**			

Course Modules

Term 1

Syllabus: Problem solving using C Programming

School:	**School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**BSc IT, Academic Year: 2023-24**	
Batch	**2023-26**	
Semester	**I**	
1	Course Code	BCO151
2	Course Title	Problem solving using C Programming
3	Credits	4
4	Contact Hours	4-0-0
	Course Type	Programme core
5	Course Objective	To learn computer fundamentals and basic computer organization. Along with the advanced basic introduction and understand computer organization and
6	Course Outcome	Students will be able to:
7	Course Description	Programming for problem solving gives the Understanding of C programming and implementation of flow charts, algorithm with
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	Practical	
	Weightage Distribution	CA	MTE	ETE		
		25%	25%	50%		

Text book/s*	Kernighan, Brian, and Dennis Ritchie. *The C Programming Language*	
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 Evaluation

Attendance	None
Any other	CA judged on the practicals conducted in the lab , weightage may be

References

Text book	Kernighan, Brian, and Dennis Ritchie. *The C Programming Language*
Other	1. B.S. Gottfried - Programming With C - Schaum's Outline Series -
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 programs 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 program	**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, PO11,PSO1,PSO2,PSO3**

PO and PSO mapping with level of strength for Course Name- Problem solving using C Programming Lab **(Course Code BCO151)**

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
	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
BCO151_Programming for problem solving Lab	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
BCO151	Problem Solving using C	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) extent*

School:	School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	BSc IT, Academic Year: 2023-24	
Batch	2023-26	
1	Course Code	BCO153
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 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.
	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	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	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,
	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	CO5, CO6
	C	Memory Management	CO5, CO6
	Mode of examination	Theory	

	Weightage Distribution	CA		MTE	ETE
		25%		25%	50%

	Text book/s*	1. Moris Mano, "Digital Logic and Computer Design", PHI Publications, 2002	
	Other References	1. Digital Electronics (TMH) 1998: Malvino and Leach	

CO and PO Mapping

S. No.	Course Outcome (CO)	Programme Outcomes (PO) & Programme Specific
1.	**CO1:** Define the basic logic operations and simplify using Boolean algebra and/or Karnaugh mapping techniques, sum of products (SOP) and	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	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

CSA, SSET, SU

PO and PSO mapping with level of strength for Course Name: Digital Electronics & Computer Organization (Course Code: BCO153)

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	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
BCO153	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**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Semester	**I**	
1	**Course Code**	BCO174
2	**Course Title**	Introduction to 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 instil 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**	**After successfully completion of this course students will be able to:**
		CO1. To understand how start up entrepreneurship is supportive for enhancing business.
		CO2. Outline different ways of idea generation as innovator.
		CO3. Identify & utilize various Government policy for Small Scale Enterprises and its impact on Business.
		CO4. Analyze various financial schemes available to start up their enterprise.
		CO5. Assess the importance & significance of institutional support at various levels for determining the entrepreneurial climate.
		CO6. Develop the art of creativity and innovations in managing the entrepreneurial activities effectively.

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, Rehabitation 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	

CSA, SSET, SU

		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: Entreprenurship (Excel Books 2 edition) Couger, C- Creativity and Innovation (IPP, 1999)	
		5. Kakkar D N - Enterpreneurship Development (Wiley Dreamtech)	

CSA, SSET, SU

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.	, PO2, PO3, PO5, PO9,
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.	, PO2, PO3, PO10,
4.	**CO4.** Analyze various financial schemes available to start up their enterprise.	, PO2, PO3 PO10,
5.	**CO5.** Assess the importance & significance of institutional support at various levels for determining the entrepreneurial climate.	PO4, PO7
6.	**CO6.** Develop the art of creativity and innovations in managing the entrepreneurial activities effectively.	PO2, PO3, PO4, PO5

CSA, SSET, SU

PO and PSO mapping with level of strength for Course Name Introduction to Entrepreneurship Development

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
BOL451 Introduction to 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
BOL451	Introduction to 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*

CSA, SSET, SU

Syllabus for Introduction to Artificial Intelligence

School	Sharda School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
Semester	I	
1	Course Code	BCO283	
2	Course Title	Introduction to Artificial Intelligence
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Open Elective
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

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Unit 2	SEARCH METHODS		
A	Problem Characteristics Searching strategies –Uninformed search and Informed search strategies. State space search, Uniformed search	CO1, CO2	
B	Informed search: Heuristic function, Hill climbing search, Best first search, A* & AO* Search, Generate and Test, Heuristic Search	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 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 Types: Supervised; Unsupervised; Reinforcement Learnings	CO3, CO4	
C	Rote learning, Learning by Taking Advice, Learning in Problem-solving, Learning from example: induction, Explanation-based	CO3, CO4	
Unit 5	EXPERT SYSTEM		
A	What is Expert system, Components of Expert System, Representing and using Domain Knowledge, Reasoning with knowledge, Expert	CO5, CO6	
B	Robotics – Hardware; Vision; Navigation based case studies;	CO5, CO6	
C	Case studies 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, *Artificial Intelligence: A Modern Approach*, Prentice Hall.		

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

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
Introduction to Artificial Intelligence	CO1	1	2	3	2	2	-	-	-	-	2	3	2	1	2	3
	CO2	2	3	3	2	3	-	-	-	-	2	3	3	2	3	3
	CO3	3	3	3	3	2	1	1	-	-	1	3	2	3	3	3
	CO4	3	3	3	3	2	2	1	-	-	2	3	2	3	3	3
	CO5	2	3	3	3	3	2	2	2	3	2	3	3	2	3	3
	CO6	2	3	3	3	3	2	2	2	3	2	3	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	PO 11	PO 12	PSO 11	PSO 2	PSO 3
	Introduction to 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	2.2	2.8	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*

Syllabus for Introduction to IoT

School:	**School of Engineering & Technology**			
Department	**Computer Science & Applications**			
Programme:	**B. Sc. [Information Technology], Academic Year: 2023-24**			
Branch:	**Information Technology**			
1	**Course Code**	BCO041		
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 layeralgorithms.		
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 SENSEnutsdevices 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 toIoT Platform**	
	A	IoT Working, Introduction to Arduino and Raspberry Pi	CO1, CO3
	B	The SENSEnut Platform, Peripheral Hardware Specific Calls: DIO Functions, I²C 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*	1. The Internet of Things: Connecting Objects to the Web edited by HakimaChaouchi, Reference for Unit-1.
	2. Introduction to Internet of Things, Prof. SudipMisra, NPTEL Lectures Notes, Department of Information Technologyand Engineering, Indian Institute of Technology Kharagpur, Reference for Unit 2, 3 (c), 4.
	3. Internet of Things, RajkumarBuyya, Reference for Unit 3 (c)

	Other References	1.	CharalamposDoukas , "Building Internet of Things with the Arduino", Create space, April 2002	
		2.	Dr.OvidiuVermesan and Dr. Peter Friess, "Internet of Things: From research and innovation to market deployment", River Publishers 2014.	
		3.	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_ Course Name	CO's	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO1	PSO2
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	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
	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*

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Syllabus for Communicative English-1

School	Sharda School of Engineering & Technology
Department	**Computer Science & Applications**
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**
Semester	**I**

1	**Course Code**	**ARP103**
2	**Course Title**	Communicative English-1
3	**Credits**	0
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 standardise 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**	After completion of this course, students will be able to: **CO1** Develop a better understanding of advanced grammar rules and write grammatically correct sentences **CO2** Acquire wide vocabulary and punctuation rules and learn strategies for error-free communication. **CO3** Interpret texts, pictures and improve both reading and writing skills which would help them in their academic as well as professional career **CO4** Comprehend language and improve speaking skills in academic and social contexts **CO5** Develop, share and maximize 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. **CO6** Function effectively in multi-disciplinary teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality
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		

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	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 F		**Leadership and Management Skills**	
Topic 1		Managerial Skills	CO6

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		Topic 2	Entrepreneurial Skills	CO6
9		Evaluations	*Class Assignments/Free Speech Exercises / JAM Group Presentations/Problem Solving Scenarios/GD/Simulations (CA-25%, MTE-25%, ETE-50%*	*N/A*
10		Texts & References | Library Links	● Blum, M. Rosen. *How to Build Better Vocabulary*. London: Bloomsbury Publication ● Comfort, Jeremy (et.al). *Speaking Effectively*. Cambridge University Press	

PO and PSO mapping with level of strength for Course Name Communicative English -1

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	-	-

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Syllabus for Problem solving using C Programming Lab

School	Sharda School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
Branch: CS	**Semester: I**	
Batch	**2023-2026**	
1	**Course Code**	BOL151
2	**Course Title**	Problem solving using C Programming Lab
3	**Credits**	2
4	**Contact Hours (L-T-P)**	0-0-4
	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 programs using Array and String CO3: Develop Functions for any problem CO4: Classify Union and Structure to write any program CO5: Implement concept of Pointers CO6**: Predict** a realworld 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 Program to Add Two Integers			
	Write a program to create a calculator			
Unit 2	Introduction to C Programming			CO2, CO6
	Write a c program to convert length meter to centimetre			
	Write a c program to convert temp			
	Write a c program to swap two numbers			
Unit 3	Arrays and Functions			CO3, CO6
	Write a c program to calculate the average using arrays			
	Write a c program to find the largest element of the array			
Unit 4	Pre-processors and Pointers			CO4, CO6
	Write a c program to swap two values using pointers			
	Write a c program to find largest number from array using pointers			
Unit 5	User Defined Data Types and File Handling			CO5, CO6
	Write a c program to store information of a student using structure			
	Write a c program to store information of a student using union			
Mode of examination	Practical			
Weightage Distribution	CA	CE	ESE	
	25%	25%	50%	
Text book/s*	Kernighan, Brian, and Dennis Ritchie. *The C Programming Language*			

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. *The C Programming Language*
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 programs 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 program	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,PSO1 PSO2

PO and PSO mapping with level of strength for Course Name- Problem solving using C Programming Lab **(Course Code BCP151)**

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
BCP151_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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
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) extent*

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Syllabus: Introduction to IoT Lab

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Program	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**I**	
1	**Course Code**	BOL041
2	**Course Title**	Introduction to IoT Lab
3	**Credits**	1
4	**Contact Hours (L-T-P)**	0-0-2
	Course Status	
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 thesensors 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 SENSEnutsdevices CO5: Experiment with environment sensors onSENSEnuts GUI. CO6: Design embedded applications using SENSEnut Platform
7	**Course Description**	SENSEnuts platform can be used to test newly developed routing and application layeralgorithms. 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 andits 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 anSENSEnuts 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 program the temperature and light sensor with threshold values, andcatch the interrupt generated by them	CO2, CO5
Mode of examination		Jury/Practical/Viva	

Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	

Text book/s*	1. The Internet of Things: Connecting Objects to the Web edited by HakimaChaouchi, Reference for Unit-1.
	2. Introduction to Internet of Things, Prof. SudipMisra, NPTEL Lectures Notes, Department of Information Technologyand Engineering, Indian Institute of Technology Kharagpur, Reference for Unit 2, 3 (c), 4.
	3. Internet of Things, RajkumarBuyya, Reference for Unit 3 (c)
Other References	1. CharalamposDoukas , "Building Internet of Things with the Arduino", Create space, April 2002
	2. Dr.OvidiuVermesan 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

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PO and PSO mapping with level of strength for Course Name: Introduction to IoT Lab (Course Code BOL041)

Course Code_ Course Name	CO's	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO 10	PSO1	PSO2
BOL041 _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
BOL041	Introduction to IoT and Applications 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*

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TERM-II

Syllabus for Data Structures Using C

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch:	**2023-2026**	
Semester:	**II**	
1 **Course Code**	BCO226	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**	After the completion of this course, students will be able to: CO-1. Apply the basic operations on arrays. CO-2. Construct complex programs like matrix implementations on arrays. CO-3. Apply the concept of stacks and queues in real life problem solving. CO-4. Apply the concepts of data structure, like linked list to solve complex problems. CO-5. Solving the real-life problems based on trees. CO-6 Implementing the graphs and apply graph concept in computer networks.	
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 program.	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 program 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	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 Prims Algorithms and Krushkal's Algorithm	CO4,CO5
	C	Multi graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph colouring.	CO4,CO5, CO6
	Mode of examination	Theory/Jury/Practical/Viva	
	Weightage Distribution	CA	MTE	ETE	

		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	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 programs 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

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

Syllabus for Operating Systems and Unix shell Programming

School:	School of Engineering & Technology		
Department	Computer Science & Applications		
Programme	B. Sc. [Information Technology], Academic Year: 2023-24		
Batch	2023-2026		
Semester	II		
1	**Course Code**	BCO155	
2	**Course Title**	Operating Systems and Unix shell Programming	
3	**Credits**	3	
4	**Contact Hours**	3-0-0	
	Course Status	Core	
5	**Course Objective**	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**	CO1: Define role, responsibilities, features, and design of operating system. CO2: Demonstrate the Process Management and Scheduling techniques CO3: Implement tools and utility of operating systems. CO4: Apply various memory management techniques to understand file and disk management and analyze it. CO5: Understand the concepts of Unix and shell programming. CO6: Design and develop solutions to real world problem using Unix	
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	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	W. Stalling, "Operating System", Maxwell Macmillan Tannenbaum A S, Operating System Design and Implementation, Prentice Hall India	

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 Uinux	PO1,PO2,PO10,PSO1,PSO2

PO and PSO mapping with level of strength for Course Name: Operating Systems and Unix shell Programming **(Course Code BCO155)**

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
BCO155 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
	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*

Syllabus: Ethics and Social Implications of AI

School:	SHARDA SCHOOL OF ENGINEERING & TECHNOLOGY		
Department	Computer Science & Applications		
Programme:	B. Sc. [Information Technology], Academic Year: 2023-24		
Batch	2023-26		
1	Course Code	BCO173	
2	Course Title	Ethics and Social Implications of AI	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	OE	
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: ceaching 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.

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PO and PSO mapping with level of strength for Course Name: Ethics and Social Implications of AI

Course Code_Course Name	CO's	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO 10	PSO 1	PSO2
BCO173 Ethics and Social Implications of AI	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	Course Name	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PSO1	PSO 2
BCO173	Ethics and Social Implications of AI	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*

Syllabus for Design Thinking and Creative Learning

School	**Sharda School of Engineering & Technology**		
Department	**Computer Science & Applications**		
Programme	**B. Sc. [Information Technology], 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	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	After the completion of this course, students will be able to: **CO1:** Explain the basics concepts of Design Thinking **CO2:** Design solutions as per needs and Translate customer needs into product specifications **CO3:** To apply product development concepts to the service environment. **CO4:** Learning to Design the Architecture of a product. **CO5:** To apply environmental design concepts to the life cycle of a product. **CO6:** To apply Design Thinking approach to various examples and real life applications.	
7	Course Description	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.	
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

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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 recognise 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	MTE (Viva)	ETE
	30%	NA	70%

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.

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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**

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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

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Syllabus for Communicative English -2

School	Sharda School of Engineering & Technology
Department	Computer Science & Applications
Program	B. Sc. [Information Technology], Academic Year: 2023-24
Batch	2023-2026
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**	After completion of this course, students will be able to: CO1 Acquire Vision, Goals and Strategies through Audio-visual Language Texts CO2 Synthesize complex concepts and present them in creative writing CO3 Develop MTI Reduction/Neutral Accent through Classroom Sessions & Practice CO4 Determine their role in achieving team success through defining strategies for effective communication with different people CO5 Realize their potentials as human beings and conduct themselves properly in the ways of world. CO6 Acquire satisfactory competency in use of Quantitative aptitude and Logical Reasoning
7	**Course Description**	The course takes the learnings 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			
	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	Precis	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, Dipthongs and Tripthongs	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 E	**Gauging MTI Reduction Effectiveness through Free Speech**	
	Topic 1	Jam sessions	CO3
	Topic 2	Extempore	
	Topic 3	Situation-based Role Play	

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	Unit F	**Leadership and Management Skills**	
	Topic 1	Innovative Leadership and Design Thinking	CO4
	Topic 2	Ethics and Integrity	CO4
	Unit F	**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	*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%	*N/A*
10	Texts & References | Library Links	● Wren, P.C.&Martin H. *High English Grammar and Composition*, S.Chand& Company Ltd, New Delhi. ● Blum, M. Rosen. *How to Build Better Vocabulary*. London: Bloomsbury Publication ● Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge University Press. The Luncheon by W.Somerset Maugham - http://mistera.co.nf/files/sm_luncheon.pdf	

PO and PSO mapping with level of strength for Course Name: Communicative English-II

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	-	-

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Syllabus for Data Structures Using C

School:	Sharda School of Engineering & Technology		
Programme:	Computer Science & Applications.		
Branch:	B. Sc. [Information Technology], Academic Year: 2023-24		
Batch	2023-2026		
Semester:	II		
1	**Course Code**	BOL226	
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**	• To Develop arrays-based program to implement matrix • To write Programmeto implement stacks and queues • Perform operation on various data structures like trees and graphs	
6	**Course Outcomes**	By the end of this course, the student will be able to: CO-1 Apply the basic operations on arrays (K2) CO-2 Construct complex programs like matrix implementations on arrays (K2) CO-3 Apply the concept of stacks and queues in real life problem solving (K3) CO-4. Apply the concepts of data structure, like linked list to solve complex problems (K4) CO-5. Solving the real-life problems based on trees (K5) CO-6 Implementing the graphs and apply graph concept in computer networks (K6)	
7	**Course Description**	An introduction design and implement data structures. Design and develop various program in lab like programs on stacks and queues, program on linked list like singly linked list and doubly linked list, program on trees and graphs.	
8	**Outline syllabus**		CO Mapping
	Unit 1	**Programs based on arrays**	
		Write programs to implement the matrix operations	CO1, CO6
	Unit 2	**Programs based on stacks and queues**	

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		Programs to implement the stacks and queues operations	CO2, CO6	
Unit 3		**Programs based on linked list, searching and sorting**		
		Programs to implement the linked list, searching and sorting	CO3, CO6	
Unit 4		**Programs based on Trees**		
		Program to implement the trees like insertion, deletion of a node including tree traversal	CO4, CO6	
Unit 5		**Programs based on Graphs**		
		Program 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 programs 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)

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
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*

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Syllabus for Operating Systems and Unix shell Programming Lab

School:	**Sharda School of Engineering & Technology**	
Programme	**Computer Science & Applications.**	
Branch:	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester:	**II**	
1	Course Code	BOL155	
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	On completion of this course the student should be able to: 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. CO2: To accomplish typical personal, office, technical, and software development tasks. CO3: To Analyze system performance and network activities. Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files. CO4: Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines. CO5:Analyze various utilities to structure the Linux Program CO6:Implement the Unix utilities to successfully write a program	
7	Course Description	This courses introduces Unix Operating System	

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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,	
	B	Execution of shell scripts.	CO1, CO2, CO3,	
	C	Using command line arguments, loops , condition	CO1, CO2, CO3,	
	Mode of	Jury/Practical/Viva		
	Weightage Distribution	CA	CE (Viva)	ETE		
		25%	25%	50%		
	Text book/s*	1. Sumitabha Das, "Unix Concepts and Applications",		
	Other	1. Unix Shell programming by Stephen G. Kochan and		

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PO and PSO mapping with level of strength for Course Name Operating Systems Using unix shell programming Lab (Course Code: BOL155)

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
BOL155_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
BOL155	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*

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Syllabus for Design Thinking and Creative Learning Lab

School	Sharda School of Engineering & Technology
Department	Computer Science & Applications.
Program	B. Sc. [Information Technology], Academic Year: 2023-24
Batch	2023-2026
Semester	II

1	Course Code	**VOC102**	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	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	After the completion of this course, students will be able to: **CO1:** Explain the basics concepts of Design Thinking **CO2:** Design solutions as per needs and Translate customer needs into product specifications **CO3:** To apply product development concepts to the service environment. **CO4:** Learning to Design the Architecture of a product. **CO5:** To apply environmental design concepts to the life cycle of a product. **CO6:** To apply Design Thinking approach to various examples and real life	
7	Course Description	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.	

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 recognise 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.	CO5, CO6
	B	Learn how to choose and implement a product development approach that's right for your project (staged, spiral, or agile).	

Mode of examination	Practical			
Weightage Distribution	CA	CE (Viva)	ETE	
	25%	25%	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) and Programme Specific Outcomes(PSO)
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**

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

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TERM-III

Syllabus: Object Oriented Programming in Java

School:	**Sharda School of Engineering & Technology**	
Department:	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology] [2023-24]**	
Batch	**2023-26**	
Semester:	**III**	
1	**Course Code**	**BCO156**	
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 programs. 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	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	Theory		

Weightage Distribution	CA	MTE	ETE
	25%	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	

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CO and PO Mapping

Sl. No.	Course Outcome (CO)	Programme Outcomes(PO) and Programme Specific Outcomes(PSO)
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.	P01, PO2, PO3, PO4, PO10, PSO1
4.	CO4: Analyze Exception and Error in java programs.	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 BCO156)

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
BCO 156 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
BCO156	Object Oriented Programming Using Java	2.2	2.67	2	2.75	3	2	0	2	0	2	2	1.5

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Syllabus for Principles of Database Management Systems

School	**Sharda School of Engineering & Technology**		
Department	**Computer Science & Applications**		
Program	**B. Sc. [Information Technology] [2023-24]**		
Batch	**2023-26**		
Semester	**III**		
1	Course Code	BCO154	
2	Course Title	Principles of Database Management Systems	
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:** 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: Database Management Systems (Course Code: BCO154)

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
BCO154/ **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***

Syllabus for Computational Methods

School	Sharda School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
Batch	2023-2026	
Semester	III	
1	Course Code	BCO222	
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: Computational Methods**		**CO Mapping**
	Unit 1	**Differential Calculus:**	
	A	Successive differentiation, Leibritiz 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	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	CO5	
	C	Eigen Values and Eigen Vectors, Quadratic Forms.	CO5, CO6	
Mode of	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) & ProgrammeSpecific 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 Computational Methods

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
BCO222	Computational Methods	2.5	2.6	2.5	3	2	2	2	2.5	2	2.2	2	3

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

Syllabus for Introduction to Blockchain Technology

School	Sharda School of Engineering & Technology		
Department	Computer Science & Applications		
Program	B. Sc. [Information Technology], Academic Year: 2023-24		
Batch	2023-2026		
Semester	III		
1	Course Code	BCO330		
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	By the end of the course, students will be able to: 1. Understand how blockchain systems work, 2. To securely interact with them, 3. Design, build, and deploy smart contracts and distributed applications, 4. Integrate ideas from blockchain technology into their own projects		
6	Course Outcomes	At the end of this course, students will be able to: CO1: Define principles of Blockchain networks, distributed ledger, and the layered architecture of blockchain CO2: Demonstrate an understanding of key terms related to cryptocurrencies CO3: Evaluate the differences among key consensus algorithms CO4: Evaluate the Ethereum and Hyperledger Fabric blockchain frameworks and their applications in enterprise contexts CO5: Apply the knowledge of smart contracts to design and develop simple programs using the Solidity programming language and Remix IDE CO6: Evaluate the benefits and challenges of using blockchain technology in various domains and identify potential use cases		
7	Course Description	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.

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	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}. 2. J.A.Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOl 9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048) . (serious beginning of discussions related to formal models for bitcoin protocols). 3. R. Pass et al, Analysis of Blockchain protocol in Asynchronous networks, EUROCRYPT 2017, (eprint.iacr.org/2016/454) . A significant progress and consolidation of several principles). 4. R.Pass et al, Fruitchain, a fair blockchain, PODC 2017 (eprint.iacr.org/2016/916).			

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & ProgrammeSpecific 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 programs 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
BCO330 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	-	3	3	3
	AVG	3.00	2.83	2.50	2.33	2.00	2.00	2.00	2.00	-	3.00	2.50	3.00

Strength of Correlation

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

Syllabus for Cyber Analytics

School:	SHARDA SCHOOL OF ENGINEERING & TECHNOLOGY	
Department	Computer Science & Applications	
Programme:	B. Sc. [Information Technology], Academic Year: 2023-24	
Batch:	2023-2026	
Semester	III	
1	Course Code	**BCO331**	
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 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	After the completion of this course, students will be able to: *CO1: Explain* the broad set of technical, social & political aspects of Computer Security. *CO2: Describe* the operational and psychology security Aspects. *CO3: Explain* Authentication Methods and Intrusion detection system. *CO4: Describe* the Cyber Crime Strategy analysis. *CO5: Apply* the Concepts of Cyber Crime and Digital Forensics in Real Time Scenarios. *CO6: Develop* and Utilize cyber analytics data to inform and support strategic decision-making in online marketing campaigns.
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 Technologyassets.

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	CurrentThreats 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.

PO and PSO mapping with level of strength for Course Name Cyber Analytics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
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	3	2	3	3	1	-	1	3	2	2	2	2
CO6	2	2	3	--	3	--	3	--	2	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	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
BCO331	**Cyber Analytics**	2.6	2.3	2.8	2.8	1.6	--	2	2	2	2	2.5	2.3

Strength of Correlation

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

School:	School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
Batch	2023-2026	
Semester:	III	
1	Course Code	**VOC201**
2	Course Title	Augmented Reality Application Development
3	Credits	2
4	Contact Hours	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 student will be able to: CO1: *Describe* the basic concepts and different applications of Augmented Reality. CO2: *Explain* how AR systems work and list the applications of AR. CO3: *Apply* the concept of AR in unity game engine to develop various applications. CO4: *Compare* and understand the working of various state of the art AR devices CO5: *Assess* different AR techniques for application development CO6: *Plan* 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: *Describe* the basic concepts and different applications of Augmented Reality.	PO1, PO2, PO5, PO8, PSO1, POS2
2.	CO2: *Explain* how AR systems work and list the applications of AR.	PO1, PO2, PO3, PO4, PO8, PSO1, PSO2
3.	CO3: *Apply* the concept of AR in unity game engine to develop various applications.	PO1, PO3, PO4, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2
4.	CO4: *Compare* and understand the working of various state of the art AR devices	PO1, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PSO1, PSO2
5.	CO5: *Assess* different AR techniques for application development	PO1, PO2, PO3, PO4, PO5, PO6, PO10, PSO1, PSO2
6.	CO6: *Plan* 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	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO1	PSO2
VOC 201_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	2	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*

Syllabus for Logical Skills Building and Soft Skills

	School	**Sharda School of Engineering & Technology**
	Department	**Computer Science & Applications**
	Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**
	Batch	**2023-2026**
	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 program, 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 1st phase of employability enhancement and skill building activity exercise.
6	Course Outcomes	After completion of this course, students will be able to: CO1: Ascertain a competency level through Building Essential Language and Life Skills CO2: Build positive emotional competence in self and learn GOAL Setting and SMART Goals techniques CO3: Apply positive thinking, goal setting and success-focused attitudes, time Management, which would help them in their academic as well as professional career CO4: Acquire satisfactory competency in use of aptitude, logical and analytical reasoning
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

	Unit 1	**BELLS (Building Essential Language and Life Skills)**	**CO Mapping**
	A	*Know Yourself*: 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	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 CA-25%; CE-25%; ESE-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	-	-	-	1	3	-	-
CO2		-	-	-	-	1	-	-	-	1	3	-	-
CO3		-	-	-	-	1	-	-	-	1	3	-	-
CO4		-	-	-	-	-	-	-	-	1	2	-	-
CO5		1	-	-	-	-	-	-	-	1	2	-	-
CO6		1	-	-	-	-	-	-	-	1	2	-	-

Syllabus for Object Oriented Programming Using Java Lab

School:	**Sharda School of Engineering & Technology**
Department	**Computer Science & Applications**
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**
Batch	**2023-2026**
Semester:	**III**

1	Course Code	BOL156	
2	Course Title	Object Oriented Programming Using Java Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory/Elective	
5	Course Objective	To 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 Programs 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 programs 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 program execution**	
		Installing jdk, setting path,Installation and uses of IDE, Writing Java programs, program execution,JVM, JVM for other operating systems, .class files	CO1
	Unit 2	**Programming revisited**	
		Programs on different data types, promotion rules in expressions, narrowing & type casting, logical-bit wise-arithmetic operators,Programs using if .. else, switch .. case statements, for, while, do .. while loop control structures, break and continue Programs using command line arguments, taking input from keyboard, Arrays in Java, nested control structures	CO2, CO3
	Unit 3	**class , object and constructor**	

		Programs to define classes, defining data members & member function, create objects, accessing members of a class through objects, Programs to define constructors, initializing instance variables, method overloading, constructor overloading.			CO2, CO3, CO6
	Unit 4	**Inheritance, package and Interface**			
		Programs 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**			
		Programs to use try.. catch.. finally for exception handling, throw user defined exceptions, uses of throws, nested try catch, rethrowing exceptions, Programs 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	CE (Viva)	ETE	
		25%	25%	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 BOL156)

	CO's	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO1	PSO2	
	CO1	1			2	2					2	1	1	
	CO2	2			2	2					2	2	2	
	CO3	2	3	3	3	2					2	2	3	
BOL156_ Introduction to OOP using Java Lab	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	
BOL156	**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*

1. WAP in Java for method overriding
2. WAP in Java to find the factorial of a given number.
3. WAP in Java to show run time polymorphism (up casting)
4. WAP in Java for access specifiers (all four)
5. WAP in Java to implement the single dimension array
6. WAP in Java to copy the elements from one array to another array
7. WAP in Java to perform the addition and multiplication in 2-D array
8. WAP in Java to print the duplicate elements of an array.
9. WAP in Java to find the sum of each row and each column of a matrix
10. WAP in Java to sort the elements of an array in ascending/ descending order using Bubble Sort and Insertion sort.
11. WAP in Java for simple inheritance
12. WAP in Java for Final keyword
13. WAP in Java for super keyword
14. WAP in Java to create package (user defined)
15. WAP in Java for abstract method, class

16. WAP in Java for interface
17. WAP in Java multiple inheritance
18. WAP in Java for exception handling by using try, catch and finally
19. WAP in Java for throw and throws exception
20. WAP in Java to throw your own exceptions
21. WAP in Java to reading and writing through console class.
22. WAP in Java how to create thread using Thread Class.
23. WAP in Java how to create thread using runnable interface.
24. WAP in Java to implement the multithreading.
25. WAP in Java to implement the concept of Priorities in threads.

Syllabus for Principles of Database Management System Lab

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**III**	

1	Course Code	BOL154
2	Course Title	Principles of Database Management System Lab
3	Credits	1
4	Contact	0-0-2
	Course Status	Compulsory
5	Course Objective	● To Develop efficient SQL programs 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	By the end of this course, the student will be able to: CO1: Understand the basic concept of SQL commands in DBMS. (K2) CO2: Demonstrate various DDL Commands used to create and alter a table. (K2) CO3: Experiment with operations using Data Manipulation Language statements like Insert, Update and Delete. (K3) CO4: Examine data to apply various grouping clauses and aggregate functions. (K4) CO5: Evaluate the queries using the concepts like sub-queries, JOINS, Views, Cursors, Triggers. (K5) CO6: Develop project based on various SQL commands. (K6)
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.		

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: BOL154)

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
BOL154 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*

School	**Sharda School of Engineering & Technology**	
Department	Computer Science & Applications	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**III**	
1	Course Code	VOC201
2	Course Title	Augmented Reality Application Development Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	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 student will be able to: CO1: *Develop* an AR Book application that will detect multiple image targets. CO2: *Create* an interactive business card using AR Virtual Buttons. CO3: *Develop* an application based on 3D object tracking and superimposing CO4: *Learn* and implement tracking of cylindrical objects, marker based and non-marker-based AR Applications CO5: *Assess* different AR techniques for application development CO6: *Plan* future challenge and opportunity of augmented reality application development
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 Book Application**	
		1. Set-up a license key and introduction of AR environment	CO1

		2. Customizing – HOUSE image, Sun Images, Ship Image Aero Plane target, face detection etc	CO2
		3. Building the APK files of AR Book App.	CO2
	Unit 2	**Virtual Button & Augmented Reality Business Card**	
		1. Create multiple virtual buttons, which show case – CV, Achievement, Participation, experience.	CO2, CO4
		2. Setting Up License Key for AR Virtual Button and building the apk file for AR Virtual Button app	CO2, CO4
		3. Registering multiple Virtual Buttons and building the apk file for AR Business Card application	CO2, CO4
	Unit 3	**Superimposition Based Augmented Reality & Object Tracking**	
		1. Creating Interactive and animated car features.	CO3
		2. Generating License Key Creating a Superimposing a CAR 3D Model on top of a Real Toy Car.	CO3
		3. Building the AR Object Tracking app.	CO3
	Unit 4	**Cylindrical Object Tracking**	
		1. Creating a Cylinder Target Database	CO5
		2. Projecting Plane 3D Models surrounding the Cylinder Target	CO4, CO5
		3. Projecting Cloud 3D Models	CO5
	Unit 5	**Cylindrical Object Tracking**	
		1. Adding Earth & Terrain Model lsand	CO6

		2. Animating the Game Objects			CO6
		3. Building the AR Cylindrical Target Project.			CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	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: *Develop* an AR Book application that will detect multiple image targets.	PO1, PO2, PO5, PO8, PSO1, POS2
2.	CO2: *Create* an interactive business card using AR Virtual Buttons.	PO1, PO2, PO3, PO4, PO8, PSO1, PSO2
3.	CO3: *Develop* an application based on 3D object tracking and superimposing	PO1, PO3, PO4, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2
4.	CO4: *Learn* and implement tracking of cylindrical objects, marker based and non-marker-based AR Applications	PO1, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PSO1, PSO2
5.	CO5: *Assess* different AR techniques for application development	PO1, PO2, PO3, PO4, PO5, PO6, PO10, PSO1, PSO2
6.	CO6: *Plan* future challenge and opportunity of augmented reality application development	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	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO1	PSO2
VOC 201_ Augmented Reality Application Development Lab	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	2	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 Lab	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*

Syllabus: Research Based Learning -1

School	Sharda School of Engineering & Technology		
Department	Computer Science & Applications		
Programme	B. Sc. [Information Technology], Academic Year: 2023-24		
Batch	2023-2026		
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 revie 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	CE (Viva)	ETE
	25%	25%	50%

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) and Programme Specific Objective(PSO)
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 revie 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 RBL001)

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	-	-

CO/PO Mapping

(1/2/3 indicates strength of correlation)   3-Strong, 2-Medium, 1-Low

TERM-IV

Syllabus for Design and Analysis of Algorithm

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**IV**	
1	Course Code	**BCO224**
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	After completion of this course, the student shall be able to : **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.
7	Course Description	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.

8	Outline syllabus		CO Mapping
Unit 1	**Introduction**		
A	Algorithm design paradigms-Explanation of all 5 paradigms, motivation for algorithm design, concept of algorithmic efficiency with examples. 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.		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, Dijkastra'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 Information Technologyproblems. 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	1. Sahni et al., "Fundamentals of Computer Algorithms", Galgotia Publication. 2. 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.	**CO1Analyze** the asymptotic performance of algorithms	PO1, PO2, PO3, PO4, PO9, PSO1, PSO2
2.	**CO2Describe** 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

PO and PSO mapping with level of strength for Course Name: Design and Analysis of Algorithm (Course Code: BCO224)

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
BCO224	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*

Syllabus for Computer Networks and Data Communication

	School	Sharda School of Engineering & Technology	
	Department	Computer Science & Applications	
	Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
	Batch	2023-2026	
	Semester	IV	
1	Course Code	**BCO221**	
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	**Students will be able to:** **CO1:** Classify the basic network infrastructure to learn the overall function of networking systems and transmission mediums. **CO2:** Demonstrate analog and digital transmission techniques. **CO3:** Apply knowledge of switching and error detection and correction. **CO4:** Illustrate the network layer and transport layer including IP Addressing, routing, TCP and UDP services. **CO5:** Explain the functionality of application layer. **CO6:** Outline the cryptography and network security.	
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		

CO 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 (BCO221)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
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 for Application based Programming in Python

School	Sharda School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
Batch	2023-2026	
Semester	IV	
1	Course Code	**BCO220**
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**	**CO1**
	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**	**CO2, CO3**

	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**	CO4
	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**	CO5
	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	Theory	

Weightage Distribution	CA	MTE	ETE	
	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 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

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
BCO220	Application based Programming in Python	3	3	3	3	1			1		1.5	1.5	1.5

Syllabus for Social Media Analytics

School	Sharda School of Engineering & Technology		
Department	Computer Science & Applications		
Programme	B. Sc. [Information Technology], Academic Year: 2023-24		
Batch	2023-2026		
Semester	IV		
1	Course Code	**BCO403**	
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.	

PO and PSO mapping with level of strength for Course Name: Social Media Analytics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
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	3	2	3	3	1	-	1	3	2	2	2	2
CO6	2	2	3	--	3	--	3	--	2	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	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
BCO403	**Social Media Analytics**	2.6	2.3	2.8	2.8	1.6	--	2	2	2	2	2.5	2.3

Strength of Correlation

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

Syllabus: Quantitative and Qualitative Aptitude Skill Building

	School	Sharda School of Engineering & Technology		
	Department	Computer Science & Applications		
	Programme	B. Sc. [Information Technology], Academic Year: 2023-24		
	Batch	2023-2026		
	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 program, 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 2nd phase of employability enhancement and skill building activity exercise.	
6	Course Outcomes		After completion of this course, students will be able to: CO1: Develop and deliver the effective presentations to interpret the deeper meaning of life. CO2: Improve listening skills so as to understand complex business communication in a variety of global English accents through proper pronunciation CO3: Demonstrate a good understanding of effective business writing and telephone handling Skills CO4: Acquire higher level competency in use of aptitude, logical and analytical reasoning CO5: Develop higher level strategic thinking and diverse mathematical concepts through building number puzzles CO6: Demonstrate higher level quantitative aptitude tools for making business decisions	
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 2nd level of quant, aptitude and reasoning abilities	
8		Outline syllabus – **ARP210**		
	Unit 1	**Communicate to Conquer**		CO MAPPING
	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 Program			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*	

PO and PSO mapping with level of strength for Course Name Quantitative and Qualitative Aptitude Skill Building (Course Code APR212)

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 for Data Warehousing and Data Mining

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**IV**	
1	Course Code	BCO402
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	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	MTE	ETE
	25%	25%	50%

Text book/s*	1. J.Han,M. Kamber, J. Pei "*Data Mining Concepts and Techniques*",Edition:3 , Morgan Kaufmann
Other References	1. M.H. Dunham, *Data Mining Introductory and Advanced Topics*, Pearson Education. 2. Adriaans, *Data Mining*, Pearson Education 3. VikramPudi& P. Radhakrishnan, "Data Mining", Oxford University Press

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & ProgrammeSpecific 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

CO and PO Mapping

PO and PSO mapping with level of strength for Course Name DWDM (Course Code BCO402)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
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	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO 2
BCO402	2.5	2.5	2.5	3	2.3	2	2	2	3	2.6	2	2.3

Syllabus: Design and Analysis of Algorithm Lab

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**IV**	
1	Course Code	**BOL224**
2	Course Title	Design and Analysis of Algorithm 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 teach student about the techniques for designing algorithms and provide an ability to compare and analyze various algorithms.
6	Course Outcomes	After completion of this course, the student shall be able to : CO1: Apply and analyze the complexity of certain divide and conquer algorithms. CO2: Apply and analyze the complexity of certain greedy algorithms. greedy, dynamic programming and backtracking CO3: Apply and analyze the complexity of certain dynamic programming algorithms. CO4: Establish the classes P, NP, and NP-Complete problems and be able to prove that a certain problem is NP-Complete. CO5: Analyze the working of string-matching algorithms. CO6: Analyze the criteria and specifications appropriate to new problems, and choose the appropriate algorithmic design technique for their solution.
7	Course Description	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.
8	Outline syllabus	CO Mapping
	Unit 1	**Introduction**

	A	WAP to demonstrate difference between linear search and binary search.	CO1
	B	WAP to demonstrate the concept of a) Insertion Sort, b) Merge sort, c) quick sort	CO1
	C	WAP to search min and max element out of an array.	CO1
Unit 2		**Greedy Methods**	
	A	WAP to implement Kruskal's algorithm to find the minimum spanning tree from a given undirected graph. WAP to implement Prim's algorithm to find the minimum spanning tree from a given undirected graph.	CO2
	B	WAP to demonstrate concept of Fractional Knapsack Problem	CO2
	C	WAP to implement Dijkastra's algorithm to find the single source shortest path. WAP to implement Bellman Ford Algorithm to find the single source shortest path.	CO2
Unit 3		**Dynamic programming**	
	A	WAP to implement Matrix Chain Multiplication problem,	CO2, CO3
	B	WAP to demonstrate concept of 0 – 1 Knapsack Problem.	CO2, CO3
	C	WAP to demonstrate the concept of Longest Common Subsequence(LCS)	CO2, CO3
Unit 4		**Advanced data structures**	
	A	WAP to demonstrate concept of Red Black Trees along with insertion.	CO1,CO2,CO3, CO4
	B	WAP to demonstrate concept of height balanced B-Trees.	CO1,CO2,CO3, CO4
	C	WAP to demonstrate concept of graph traversal algorithms BFS and DFS.	CO1,CO2,CO3, CO4
Unit 5		**Selected topics**	
	A	WAP to demonstrate concept of Naïve String Matching.	CO4, CO5, CO6
	B	WAP to demonstrate concept of Rabin Karp algorithm for string matching.	CO4, CO5, CO6
	C	WAP to demonstrate concept of approx. vertex cover algorithm.	CO4, CO5, CO6
Mode of examination	Practical/Jury/Viva		
	CA	CE(Viva) ESE	

	Weightage Distribution	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	1. Sahni et al., "Fundamentals of Computer Algorithms", Galgotia Publication. 2. Hopcroft A., "The Design and Analysis Computer Algorithms", Addison Wesley				

References	
Text book	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. "Introduction to Algorithms", 3/e, TMH
Other References	1. Sahni et al., "Fundamentals of Computer Algorithms", Galgotia Publication. 2. Hopcroft A., "The Design and Analysis Computer Algorithms", Addison Wesley
Software	Turbo C/Python/Java

PO and PSO mapping with level of strength for Course Name Design and Analysis of Algorithm Lab

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
BOL224	Design and Analysis of Algorithm Lab	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*

Syllabus for Application based Programming in Python lab

School	Sharda School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
Batch	2023-2026	
Semester	IV	
1	Course Code	**BOL220**
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**	**CO1,CO2**
	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'	

B	3.	Demonstration of type casting.	
	4.	Demonstrate different in-built string functions.	
	5.	Program to implement all conditional statements	
C	6.	Program to implement different control structures	
Unit 2		**List, Tuple , Dictionaries and Functions**	**CO3**
A	1.	Program to implement operations on lists	
	2.	Program to implement operations on Dictionaries.	
B	3.	Program to implement operations on Tuple	
	4.	Program to implement Exception Handling	
C	5.	Program to use different functions	
	6.	Write a python program 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**	**CO4**
A	1.	Program to use object oriented concepts like inheritance, overloading polymorphism etc.	
	2.	Program for file handling	
B	3.	Write a Python program to demonstrate working of classes and objects.	
		Write a Python program to demonstrate class method & static method	
C	4.	Write a Python program to demonstrate constructors.	
	5.	Write a program 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. Program to use modules and package 2. Program to implement searching and sorting	
	B	3. Write a python program to create a package (Engg), sub - package(years),modules (sem) and create staff and student function to module.	
	C	Write a python program to create a package (college),sub -package (alldept),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	o WAP to implement unsupervised machine learning algorithms such as **K-means clustering** o **KNN (k-nearest neighbors)** o **Hierarchal clustering**	
	C	Create a website using Djengo framework.	
	Mode of examination	Practical/Viva	

	Weightage Distribution	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
BOL220	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*

Syllabus: Research Based Learning -2

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
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 revie 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	CE (Viva)	ETE
		25%	25%	50%

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) and Programme Specific Outcomes(PSO)
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)

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		-

(1/2/3 indicates strength of correlation)   3-Strong, 2-Medium, 1-Low

TERM-V

Syllabus for Web Technologies

School	**Sharda School of Engineering & Technology**	
Department	Computer Science & Applications	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**V**	
1	Course Code	BCO321
2	Course Title	Web Technologies
3	Credits	4
4	Contact Hours	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	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 Information TechnologyPerspective", 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

Syllabus for Introduction to R

School	Sharda School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
Batch	2023-2026	
Semester	V	
1	Course Code.	BCO225
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	Upon successful completion of this course, student will be able to: CO1: Demonstrate R programming using Decision statements, Loops and Functions. (K3) CO2: Apply functions to improve readability of programs. (K3) CO3: Select and construct programs using different data structures available in R. (K1, K3) CO4: Summarize data using descriptive statistics and perform distribution analysis. (K2, K4) CO5: Design visualizations of data using different types of graphs and plots. (K5) CO6: Estimate data using complex statistical testing. (K6)
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, 2nd Edition. Wiley. 2. Crawley, M.J. (2012): The R Book, 2nd 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 programs	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
3.	CO3. Select and construct programs 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 (Course Code BCO225)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
BCO225 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
BCO225	Introduction to R Programming	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*

Syllabus for Software Engineering and Quality Assurance

School	**Sharda School of Engineering & Technology**		
Department	**Computer Science & Applications**		
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**		
Batch	**2023-2026**		
Semester	**V**		
1	Course Code	**BCO322**	
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	The objective of this course is to provide 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	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.	
7	Course Description	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.	
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	Theory/Jury/Viva		
Weightage Distribution	CA	MTE	ETE
	25%	25%	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 BCO322)

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
BCO322 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
BCO322	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 for Research Methodology

School	Sharda School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
Batch	2023-2026	
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	CO1

		The meaning of methodology (structured definition and examples)	
	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*	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	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)**

Syllabus for Web Technology Lab

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**V**	
1	Course Code	BOL321
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 program to display list of items in different styles.	CO1

C	Write an HTML program 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 program 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 programs 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, Orcale. Perform basic DDL operation on it.	CO5	
B	Perform the basic operation like Insert, update, delete and select	CO5, CO6	
C	Write an HTML program to design an entry form of student details and send it to store at database server like MYSQL, Oracle etc.	CO6	
Mode of	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 BOL321)

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
BOL321	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

Strength of Correlation:
1-**Slight (Low)**
2-**Moderate (Medium)**
3-**Substantial (High)**

Syllabus for Introduction to R Lab

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**V**	
1 Course Code.	BOL225	
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	Upon successful completion of this course, student will be able to: CO1: Demonstrate R programming using Decision statements, Loops and Functions. (K3) CO2: Apply functions to improve readability of programs. (K3) CO3: Select and construct programs using different data structures available in R. (K1, K3) CO4: Summarize data using descriptive statistics and perform distribution analysis. (K2, K4) CO5: Design visualizations of data using different types of graphs and plots. (K5) CO6: Estimate data using complex statistical testing. (K6)	
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 Program to make simple calculate. P2. Write a R program to demonstrate the usage of different types of operators. P3. Write a R program to find whether a given year is leap year or not. P4. Write a R program to calculate factorial of a given number.	CO1, CO2
Unit 2	**Data Structures in R**	

A	P5. Write R programs to create vector using c, rep, paste and seq functions. P6. Write a R program to find transpose of a given matrix. P7. Write R programs to create and manipulate data frames.	CO3, CO2, CO6
UNIT 3	**Descriptive Statistics**	
A	P8. Write a R Program to print summary statistics of a given dataset. P9. Write a R Program to perform Shapiro Wilk Test, Kolmogorov Smirnov test. P10. Write a R program to plot quantile quantile plots.	CO4
Unit 4	**Data Visualization in R**	
A	P11. Write R programs 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 programs to implement Student t and Mann Whitney Test. P13. Write a R program to perform correlation analysis of a given dataset. P14. Write a R program to implement ANOVA technique.	CO6
Mode of examination	Theory	

Weightage Distribution	CA	CE(Viva)	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, 2nd Edition. Wiley. 2. Crawley, M.J. (2012): The R Book, 2nd 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 programs	PO1, PO2, PO3, PO4, PO8, PO10, PSO1
3.	CO3. Select and construct programs 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 Lab (Course Code: BOL225)

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
BOL225 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	PS O 1	PSO 2
BOL225	**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*

Syllabus for Research Based Learning 3

School	Sharda School of Engineering & Technology
Department	Computer Science & Applications
Programme	B. Sc. [Information Technology], Academic Year: 2023-24
Batch	2023-2026
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, PSO1,PSO2,PSO3
2.	CO2: Design a Hypothesis.	PO1, PO2, PO3,PO4,PO5, PO7, PO8, PO9, PSO1,PSO2,PSO3
3.	CO3: Develop the solution by using different aspects of Research Methodology.	PO1, PO2, PO3,PO4,PO5, PO6, PO8, PO9, 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 ,PSO1,PSO2,PSO3
5.	CO5: Analyze and make use of modern methods for solving real word problems.	PO1, PO2, PO5, PO6, PO7, PO8, PO9, 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, PSO1,PSO3

PO and PSO mapping with level of strength for Course Name Research Based Learning -3 (Course Code RBL003)

COs	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	**B. Sc. [Information Technology], Academic Year: 2023-24**
Batch	**2023-2026**
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	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	MTE	ETE	
	25%	25%	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	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

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 fir engineering solution based on a systems approach.	PO1,PO2,PO3,PO4,PO5,PO7,PO8,PO9, PSO1,PSC
3.	CO3. Develop teamwork and apply prior acquir 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

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

Syllabus for Dot Net Framework Using C#

School	**Sharda School of Engineering & Technology**		
Department	**Computer Science & Applications**		
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**		
Batch	**2023-2026**		
Semester	**VI**		
1	**Course Code**	BCO606	
2	**Course Title**	**Dot Net framework using C#**	
3	**Credits**	**3**	
4	**Contact Hours (L-T-P)**	**3-0-1**	
	Course Status	Program 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: Uunderstand 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	Theory	

Weightage Distribution	CA		MTE	ETE	
	25%		25%	50%	

Text book/s*	
	1 Balagurusamy," Programming with C#", (TMH)
	2 Shibi Parikkar, " C# with .Net Frame Work" , Firewall
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)	Programme Objective(PO) and Programme Educational Objective(PEO)
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.	P01, 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
Dot Net framework using C# (Course Code - BCO606)

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
BCO606 Dot Net framework 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
BCO606	Dot Net framework using C#	2.2	2.67	2	2.75	3	2	0	2	0	2	2	1.5

Syllabus for Machine Learning

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**VI**	

1	Course Code	BCO368	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	Students will be able to: **CO1:** Compare AI and non-AI solutions. Basics of machine learning and differentiation with AI **CO2:** To Apply machine learning on labelled and unlabelled data. **CO3:** To explore the concept of machine learning for various problem solving in AI **CO4:** Classify supervised and unsupervised learning and knowledge representation and introduction to fuzzy logic **CO5:** Learning extension in the form of deep learning concepts. **CO6:** Practical implementation on various types of data of Machine Leaning algorithms	
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), Hierarchal 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	
	CA	MTE	ETE

	Weightage Distribution	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 Leaning algorithms	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name: 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	PSO2
Machine Learning (BCO368)	**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	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
BCO368	**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*

Syllabus for Cloud Computing

School	Sharda School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
Batch	2023-2026	
Semester	VI	
1	Course Code	BCO190	Course Name: Cloud Computing
2	Course Title	**Cloud Computing**	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objective	1. Provide students with an overview of the fundamental concepts of Cloud Computing. 2. Gain insight into the challenges and limitations Models of cloud computing. 3. To learn the various technologies of the cloud computing paradigm and learn about recent advances in Cloud Computing and enabling technologies. 4. Prepare students for research in the area of cloud Computing risks and cloud security challenges.	
6	Course Outcomes	At the end of the course, students will have achieved the following learning objectives. CO 1. Define the basics of cloud and recall the Information Technologyconcepts which are helpful in understanding on demand service architecture. CO 2. Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory CO 3. Apply and Manage Virtualization and Workflow to use the cloud in file systems and applications. CO 4. Categorize and Characterize between Infrastructure services, deployment models, and governance in cloud computing 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. CO 6. Elaborate the design concept and formulate to build the solution using cloud service providers.	
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**	
	A. Types of Computing, Grid computing, distributed computing, Client-server computing, Introduction to distributed systems,	CO1, CO2, CO3
	B. Cloud Computing definition, Roots of Cloud Computing, Layers and Types of Clouds	
	C. Infrastructure as a Service Providers, Platform as a Service Providers	
Unit 2	**Understanding Abstraction and Virtualization**	
	A. Introduction to Virtual Machines, The Anatomy of Cloud Infrastructures,	CO1, CO2,CO3
	B. Management of Virtual Machines for Cloud Infrastructures, Understanding The Logical	
	C. Design, Secure Distributed Data Storage in Cloud Computing.	
Unit 3	**Cloud Computing Services and Applications**	
A	A. Introduction of CometCloud, Aneka and CloudSim, Integration of Private and Public Clouds.	CO2,CO3,CO4
	B. Introduction of Enterprises Demand and Cloud Computing, Dynamic ICT Services,	
	C. Scientific Application for Cloud Environments, Classification of Scientific	
Unit 4	**Cloud Computing Risk and Performance Issues**	
A	A. Model for Federated Cloud Computing, Security Considerations.	CO3, CO4,CO5
	B. HPC in the Cloud: Performance-related Issues, Game Hosting on Cloud Resources,	
	C. Legal Issues in Cloud Computing(PCI DSS), Data Privacy and Security Issues	
Unit 5	**AWS, MS Azure and Google Cloud Services**	
A	A. AWS Services:Elastic Compute Cloud, Identity and Access Management, Simple Storage Service	CO4,CO5, CO6
	B. MS Azure Services:Azure Virtual Machine, SQL Server on Virtual Machines, Azure SQL Database,	
	C. Google Cloud: Compute Engine,Migrate for Compute Engine	
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 Information Technologyconcepts 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

PO and PSO mapping with level of strength for Course Name: Cloud Computing

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
BCO190 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
BCO190	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*

Syllabus for Information Security and Cyber Laws

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**VI**	
1	Course Code	BCO604
2	Course Title	Information Security and Cyber Laws
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Elective
5	Course Objective	Enable learner to understand, explore, and acquire a critical understanding Cyber Law. Give learners in depth knowledge of Information TechnologyAct and legal frame work of Right to Privacy, Data Security, Data Protection and tools
6	Course Outcomes	• On successful completion of this module students will be able to • CO1: Develop competencies for dealing with frauds and deceptions (confidence tricks, scams) and other cybercrimes for example, child pornography etc. that are taking place via the Internet • CO2: Explore the legal and policy developments in various countries to regulate Cyberspace • CO3: Formulate various security measures for cyber-attacks. • CO4: Apply the principles in real life situations. • CO5: Identify various Cybercrimes and take necessary actions. CO6: Assess the various online activities.
7	Course Description	This course introduces aspects of cyber security, encompassing the principles, to analyze the data, identify the problems, and choose the relevant countermeasures to apply.

8	Outline syllabus		CO Mapping
	Unit 1	Introduction to Cyber Security	
	A	Understanding Computers, Internet and Cyber Laws, information security legal liabilities,	CO1, CO2
	B	intellectual property, defamation, privacy concerns, censorship, cyber fraud, e – commerce law,	CO5, CO6, CO3
	C	insurance law, the clash of laws, cyber law dispute resolution, the law of linking, cyber crime	CO6, CO4, CO2

Unit 2	Intellectual rights	
A	Protection of Intellectual Property Rights in CyberSpace in India,	CO1,CO2. CO3
B	Compensation and Adjudication of Violations of Provisions of It Act and Judicial Review, Some important Offeneces under the CyberSpace Law and the Internet in India,	CO4,CO5,CO6
C	Other Offences under the Information TechnologyAct in India	CO1,CO6, CO3, CO4
Unit 3	Role of Evidences and Rules	
A	The Role of Electronic Evidence and the Miscellaneous Provisions of the IT Act,	CO1,CO2, CO4
B	Legal Aspects of Electronic Records/Digital Signatures,	CO6, CO3,CO1
C	The Rules and Regulations of Certifying Authorities in India	CO3,CO4,CO6,CO5
Unit 4	Cyber Space Laws	
A	International Efforts Related to CyberSpace Laws,	CO1,CO2, CO6
B	Fundamental Jurisdiction Principles Under International Law, Classic U.S. Jurisdiction	CO2,CO4,CO6
C	Principles, Council of Europe convention on cyber crimes	CO1,CO3,CO5
Unit 5	Tools	
A	Cyber Check, TrueBack,	CO1,CO2, CO6
B	Hasher, EmailTracer	CO1.CO2,CO6,CO5
C	Pasco, Nmap, BinText	CO2,CO3,CO5
Mode of examination	Theory	

Weightage Distribution	CA	MTE	ETE	
	25%	25%	50%	

Text book/s*	1. Cyber Law and IT Protection, Chander Harish Handbook of Information Security, HosseinBidgol	
Other References		

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	CO1: Develop competencies for dealing with frauds and deceptions (confidence tricks, scams) and other cybercrimes for example, child pornography etc. that are taking place via the Internet	PO1,PO2,PO3,PO7,PO10,PSO1
2.	CO2: Explore the legal and policy developments in various countries to regulate Cyberspace	PO1,PO2,PO6,PO7,PO8,PO10, PSO1, PSO2
3	CO3: Formulate various security measures for cyber-attacks.	PO1, PO2, PO6, PO7, PO8, PO10, PSO1, PSO2
4	CO4: Apply the principles in real life situations.	PO1, PO2, PO3, PO4, PO5, PO10, PSO1
5	CO5: Identify various Cybercrimes and take necessary actions.	PO1, PO2, PO3,PO4, PO5,PO6,PO7, PO9,PO10, PSO1, PSO2
6	CO6: Assess the various online activities.	PO1, PO2,PO3,PO4,PO5,PO7 ,PO9,PO10, PSO1

PO and PSO mapping with level of strength for Course Name Information Security and Cyber Laws (Course Code)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO1	PSO2
BCO604 Information Security and Cyber Laws	CO1	2	2	3				3			3	2	
	CO2	3	3				2	2	3		3	3	2
	CO3	2	2				2	2	2		2	3	3
	CO4	2	2	2	3	3					3	2	
	CO5	2	2	2	2	2	2	2		2	2	2	3
	CO6	3	2		2	2		3		3	2	2	

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

Course Code	Course Name	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO1	PSO2
BCO604	Information Security and Cyber Laws	2.3	2.1	2.3	2.3	2.3	2	2.4	2.5	2.5	2.4	2.3	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*

Syllabus for Big Data Analytics

School	Sharda School of Engineering & Technology	
Department	Computer Science & Applications	
Programme	B. Sc. [Information Technology], Academic Year: 2023-24	
Batch	2023-2026	
Semester	VI	
1	Course Code	BCO605	Course Name
2	Course Title	Big Data Analytics	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	Understand the Big Data Platform and its Use cases • Provide an overview of Apache Hadoop • Provide HDFS Concepts and Interfacing with HDFS • Understand Map Reduce Jobs • Provide hands on Hodoop Eco System • Apply analytics on Structured, Unstructured Data. • Exposure to Data Analytics with	
6	Course Outcomes	The students will be able to: **CO1:** Identify Big Data and its Business Implications. **CO2**: List the components of Hadoop and Hadoop Eco-System **CO3**: Access and Process Data on Distributed File System **CO4**: Manage Job Execution in Hadoop Environment **CO5**: Develop Big Data Solutions using Hadoop Eco System **CO6**: Develop big data handling applications for end user	
7	Course Description	This course provides a comprehensive introduction to big data, covering concepts, tools, and techniques for processing and analyzing large datasets. Students will learn about data storage and retrieval, data preprocessing, data mining, and data visualization. They will gain hands-on experience with popular big data frameworks such as Hadoop and Spark, as well as programming languages like Python and R. The course will also explore the ethical and legal considerations surrounding big data, including privacy and security issues. By the end of the course, students will be equipped with the skills to tackle real-world big data challenges and make data-driven decisions.	

8	Outline syllabus		CO Mapping
	Unit 1	**INTRODUCTION TO BIG DATA AND HADOOP**	
	A	Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop	CO1, CO2
	B	Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming,	CO1, CO2
	C	Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.	CO1, CO2
	Unit 2	**HDFS(Hadoop Distributed File System)**	
	A	The Design of HDFS, HDFS Concepts, Command Line Interface	CO1, CO2,CO4
	B	Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives,	CO1, CO2,CO4
	C	Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures..	CO1, CO2,CO4
	Unit 3	**Map Reduce**	
	A	Anatomy of a Map Reduce Job Run, Failures, Job Scheduling	CO1,CO2,CO3
	B	Shuffle and Sort, Task Execution,	CO1,CO2,CO3
	C	Map Reduce Types and Formats, Map Reduce Features.	CO4
	Unit 4	**Hadoop Eco System**	
	A	**Pig** : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.	CO1,CO2,CO3
	B	**Hive**: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.	CO1,CO2,CO3
	C	**Hbase :** HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction	CO1,CO2,CO3
	Unit 5	**Data Analytics with R:**	
	A	Introduction, Supervised Learning, Unsupervised Learning,	CO1,CO2,CO3
	B	Collaborative Filtering	CO1,CO2,CO3
	C	Big Data Analytics with BigR.	CO1,CO2,CO3
	Mode of examination	Theory	
	Weightage Distribution	CA	MTE	ETE	
		25%	25%	50%	

	Text book/s*	1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.	
		2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015	
	Other References	1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.	
		2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)	
		3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.	
		4. Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.	

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) & Programme Specific Outcomes (PSO)
1.	**CO1** Identify Big Data and its Business Implications.	PO1,PO2,PO3,PO4,PSO1
2.	**CO2:** List the components of Hadoop and Hadoop Eco-System	PO1, PO3, PO4, PSO2
3.	**CO3:** Access and Process Data on Distributed File System	PO2,PO3,PO4,PSO3
4.	**CO4:** Manage Job Execution in Hadoop Environment	PO7, PO10,PO11, PSO5
5	**CO5:** Develop Big Data Solutions using Hadoop Eco System	PO4,PO8
6.	**CO6:** Develop big data handling applications for end user	PO4,PO8

PO and PSO mapping with level of strength for Course Name Big Data Analytics (BCO605)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
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	3	2	3	3	1	-	1	3	2	2	2	2
CO6	3	2	3	3	1	-	1	3	2	2	2	2

Syllabus for Dot Net framework using C# Lab

School	**Sharda School of Engineering & Technology**	
Department	**Computer Science & Applications**	
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch	**2023-2026**	
Semester	**VI**	
1	**Course Code**	**BOL606**
2	**Course Title**	**Dot Net framework using C# Lab**
3	**Credits**	**1**
4	**Contact Hours (L-T-P)**	**0-0-2**
	Course Status	Program 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# Programs. 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 program execution**	
		Installing Visual-Studio, uses of IDE, Writing C# programs, program execution, Programs on different data types, promotion rules in expressions, narrowing & type casting, logical-bit wise-arithmetic operators.	CO1, CO2

		Programming revisited	
Unit 2		Programs using if .. else, switch .. case statements, for, while, do. while loop control structures, break and continue Programs using command line arguments, taking input from keyboard, Arrays, nested control structures.	CO2, CO6
		class, object and constructor	
Unit 3		Programs to define classes, defining data members & member function, create objects, accessing members of a class through objects, Programs to define constructors, initializing instance variables, method overloading, constructor overloading.	CO3, CO6
		Inheritance, package, Interface, Exception and Multithreading	
Unit 4		Programs 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. Programs to define Thread, achieving multithreading using Thread class.	CO4, CO6
		ASP.NET, Validation and ADO.NET	
Unit 5		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.	CO5, CO6

Mode of examination	Lab/Viva		

Weightage Distribution	CA	MTE	ETE
	25%	25%	50%

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)

CO and PO Mapping

Sl. No.	Course Outcome (CO)	Programme Outcome(PO) and Propgramme Educational Objectives(PEO)
1.	CO1: Demonstrate C# environment and executing C# Programs.	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.	P01, 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 (BOL606)

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
BOL606 Dot Net framework 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
BOL606	Dot Net framework using C# Lab	2.2	2.67	2	2.75	3	2	0	2	0	2	2	1.5

List of Programs

Write a Simple Program to print your name in C#
Write a program to print the given string by using the Write and Write Line Method.
Write a program how to read the values form console given by the user using Read Line Method
Write a program to make a function (addition of Two numbers) in Single Class
Write a program 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 program to make a function in first class and call a function into second class by declare static method of first class
Write a program to print the element of collections (like. Array) by using For each Loop.
Write a program to print the element of an Array by using For each Loop and inputs given by the user.
Write a program to print the tables from 1 to 10 by using the 2- Dimensional Array
Write a program to implements the methods and properties on Array (like: Get Length(),Get Value Get Length(),,Copy To(),Reverse(),Length)
Write a program to print the elements by using Jagged Array with For each Loop.
Write a program to print the elements by using the Array List Class and inputs given by the user.

Write a program to implements the methods and properties on Array List. (like: Add(),Clear(),Insert(),Remove(),Sort(), Count, Capacity).	
Write a program to display the given string by using Immutable String (String Class).	
Write a program to implements the methods and properties on string (like: Compare(),Compare To(), Concat(),Trim(),Insert()).	
Write a program to display the given sting by using Mutable String (String Builder Class).	
Write a program to implements the methods and properties on String Builder (like: Compare(),Compare To(),Concat(),Trim(),Insert()).	
Write a program 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 program to calculate the Area of Circle by using the Parameterized Constructor and inputs given by the user (Length, Width).	
Write a program to calculate the Area of Rectangle and perimeter by using the Constructor Overloaded and inputs given by the user (Length, Width)	
Write a program 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 program 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 program 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 program to create a class and make a function for Multiplication for two numbers and overload the existing function then display the output.	
Write a program how the unary minus operator is overloaded	
Write a program how the binary plus operator is overloaded on addition of two complex numbers.	
Write a program to create a class and make the function Display and override the existing Function by using the Virtual and Override keywords.	
Write a program how a delegate is created and used in program.	
Write a program to Create the Multicast delegate by call the several methods in one call.	
Write a program to simulate a calculator by using the delegate	
Write a program to create the two event handler of an event and implement by the delegate.	
Write a program to handle an arithmetic exception by using try and multiple catch blocks.	
Write a program to handle an arithmetic exception by using try and finally block.	
Write a program how to create a thread and starts it running	
Write a program how to create the multiple thread in a program	

Write a program how to manage the priority of threads	
Write a program to implement the methods of thread (like: Wait (), Suspend (), Resume (), Abort ()).	
Write a program to connect the SQL Database by using the ADO.Net	
Write a program to connect the Ms Access by using the ADO.Net	
Write a program to illustrate the concept of Connected Mode by using ADO.Net	
Write a program to illustrate the concept of Dis-connected Mode by using ADO.Net	
Write a program 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 for Machine Learning Lab

School		**Sharda School of Engineering & Technology**
Department		**Computer Science & Applications**
Programme		**B. Sc. [Information Technology], Academic Year: 2023-24**
Batch		**2023-2026**
Semester		**VI**
School		**Sharda School of Engineering & Technology**
1	Course Code	**BOL368**
2	Course Title	Machine Learning Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Status	Compulsory
5	Course Objective	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 ● 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 To develop a working model of real life problem base on machine learning
6	Course Outcomes	After the completion of this course, students will be able to: CO-1. To develop basic understanding of data structures required for machine learning. CO-2. To process the data for various statistical and probability calculation form mathematical base. CO-3. To extends data structure for implementation of supervised learning. CO-4. To extend implementation from the point of view of unsupervised machine learning . CO-5. Select Machine learning based applications. CO-6. To develop the artificial intelligence and machine learning approach for the project implementation .
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, , PSO1, PSO2
4.	CO4: Make use of: Machine learning algorithms in various application domains of AI.	PO1, PO2, PO3, PO4, PO5, PSO1, PSO2
5	CO5: Select Artificial Intelligent based applications.	PO1, PO2, PO3, PO4, PO5, PO9, PO10, PSO1, PSO2
6	CO6: Develop independent (or in a small group) research and communicate it effectively.	PO1, PO2, PO3, PO4, PO5, PO9, PO10, PSO1, PSO2

PO and PSO mapping with level of strength of Course Machine Learning lab (BOL368)

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
BOL368 MAchine Learning Lab	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
BOL368	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 program 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 program 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 program 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.

Syllabus for Research Based Learning-4

School		**Sharda School of Engineering & Technology**	
Department		**Computer Science & Applications**	
Programme		**B. Sc. [Information Technology], Academic Year: 2023-24**	
Batch		**2023-2026**	
Semester		**VI**	
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) and Programme Specific Outcome(PSO)
1.	CO1: Identify and formulate problem statement.	PO1, PO2, PO4,PO6, PO8,PO9, PO10PSO1,PSO2,PSO3
2.	CO2: Design a Hypothesis.	PO1, PO2, PO3,PO4,PO5, PO7, PO8, PO9, PSO1,PSO2,PSO3
3.	CO3: Develop the solution by using different aspects of Research Methodology.	PO1, PO2, PO3,PO4,PO5, PO6, PO8, PO9, 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, PSO1,PSO2,PSO3
5.	CO5: Analyze and make use of modern methods for solving real word problems.	PO1, PO2, PO5, PO6, PO7, PO8, PO9, 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, PSO1,PSO3

PO and PSO mapping with level of strength for Course Name: Research Based Learning 4(RBL004)

COs	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

Syllabus for Community Connect

School	**Sharda School of Engineering & Technology**		
Department	**Computer Science & Applications**		
Programme	**B. Sc. [Information Technology], Academic Year: 2023-24**		
Batch	**2023-2026**		
Semester	**VI**		
School	**Sharda School of Engineering & Technology**		
1	Course Code	INC003	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	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. 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. 3. This type of live project work will help our students to connect their class-room learning with practical issues/problems in the society.	
6	Course Outcomes	Students will be able to: 1. **CO1: Students develop awareness** of the social, health, and environmental challenges faced by the community 2. **C02: Students are more appreciative** of socio-economic realities beyond textbooks and classrooms 3. **CO3: Students learn to apply their knowledge** through research, awareness creation, and services for community benefit 4. **CO4: Students are able to carry** out community-based projects with sincerity, teamwork and timely delivery 5. **CO5: Students learn to respectfully engage** with communities with purposive intent to contribute to society and sustainable development 6. **C06: 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	CE	ETE	
		25%	25%	50%	

CO and PO Mapping

S. No.	Course Outcome	Programme Outcomes (PO) and Programme Educational Objectives(PEO)
1.	**CO1: Students develop awareness** of the social, health, and environmental challenges faced by the community	PO2, PO3, PO4, PO6, PO8, PO9, PO10,
2.	**C02: Students are more appreciative** of socio-economic realities beyond textbooks and classrooms	PO1, PO2, PO3, PO4, PO6, PO8, PO9, PO10,
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, 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, 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, PSO1, PSO2, PSO3
6.	**C06: Students are able to document and present** their community project findings in an academically robust manner	PO1, PO2, PO4, PO5, PO9, PO10, , PSO2, PSO3

PO and PSO mapping with level of strength for Course Name: Community Connect (INC003)

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 attainted	1	2.3	1.7	2.3	1	2.5	0.5	1.3	1.7	2	0.3	0.8

CO/PO Mapping
(1/2/3 indicates strength of correlation)   3-Strong, 2-Medium, 1-Low