B.C.A.

Syllabus

AFFILIATED COLLEGES

Programme Code: 32A

2025 – 2026

BHARATHIAR UNIVERSITY

(A State University, Accredited with "A++" Grade by NAAC, Ranked 21st among Indian Universities by MHRD-NIRF)

Coimbatore - 641 046, Tamil Nadu, India

Programme Educational Objective (PEOs) The **B.C.A** programme describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Graduates will excel in professional careers or higher education by acquiring knowledge in computer applications, programming, and emerging technologies.
PEO2	Graduates will demonstrate lifelong learning and continuous professional development in evolving computing technologies.
PEO3	Graduates will apply theoretical and practical skills in solving real-world problems through software and system development.
PEO4	Graduates will exhibit strong communication, ethical values, teamwork, and leadership qualities in their profession.
PEO5	Graduates will contribute to societal and national development using their computing knowledge and skills with a sense of responsibility.

Programme Specific Outcome (PSOs) After the successful completion of **B.C.A** programme, the students are expected to	
PSO1	Apply programming concepts and practices using languages like C, C++, Java, Python, and R for designing software applications.
PSO2	Use databases, web technologies, and open-source tools to build scalable and secure applications.
PSO3	Demonstrate skills in data analysis, AI, machine learning, and data mining techniques for decision-making.
PSO4	Develop professional skills in software project development, documentation, and deployment using modern tools and platforms.
PSO5	Exhibit ability in interdisciplinary application of computer science to real-life and industrial problems.

Programme Outcome(POs) On successful completion of the **B.C.A** programme	
PO1	Apply knowledge of computing fundamentals, programming, and domain knowledge to solve complex computing problems.
PO2	Identify and analyze well-defined computing problems and formulate solutions using programming and analytical skills.
PO3	Design and implement efficient software solutions to meet desired needs using structured and object-oriented programming.
PO4	Use current techniques, skills, and tools necessary for computing practice, including emerging platforms like R, Python, and AI tools.
PO5	Apply ethical principles and commit to professional ethics and responsibilities in software practices.
PO6	Communicate effectively with the computing community and with society at large in writing, speaking, and through documentation.
PO7	Function effectively as an individual and as a member or leader in diverse teams.
PO8	Apply project management principles to plan and complete projects effectively within the stipulated time.
PO9	Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in computing.
PO10	Understand societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional computing practice.

BHARATHIAR UNIVERSITY: COIMBATORE 641046

B.C.A. (CBCS PATTERN)

(*For the students admitted from the academic year 2025-2026 onwards*)

Scheme of Examination

Part	Title of the Course	Hours /Week	Examination				Credits
			Duration In Hours	Maximum Marks			
				CIA	CEE	Total	
	Semester I						
I	Language-I	6	3	25	75	100	4
II	English-I	4	3	25	75	100	4
III	Core 1: Programming Concepts with C and C++	5	3	25	75	100	4
III	Core 2: Digital Fundamentals and Computer Architecture	5	3	25	75	100	4
III	Core Lab 1: Programming Lab – C and C++	4	3	20	30	50	2
III	Allied 1: Mathematical Structures for Computer Science	4	3	25	75	100	4
IV	Environmental Studies*	2	3	-	50	50	2
	Total	**30**		**145**	**455**	**600**	**24**
	Semester II						
I	Language–II	6	3	25	75	100	4
II	English–II	4	3	25	25	50	2
III	Core 3: Java Programming	6	3	25	75	100	4
III	Core Lab 2: Programming Lab - Java	4	3	20	30	50	2
III	Core Lab 3: Office Automation and Internet	4	3	20	30	50	2
III	Allied 2: Discrete Mathematics	4	3	25	75	100	4
IV	Value Education – Human Rights*	2	3	-	50	50	2
IV	Naan Mudhalvan –Skill Course***	-		25	25	50	2
	Total	**30**		**165**	**385**	**550**	**22**
	Semester III						
I	Language–III	6	3	25	75	100	4
II	English–III	4	3	25	75	100	4
III	Core 4: Data Structures	4	3	25	75	100	4
III	Core 5: RDBMS	5	3	25	75	100	4
III	Core Lab 4: Programming Lab – RDBMS	3	3	20	30	50	2
III	Allied 3: Animation Techniques	4	3	25	75	100	4
III	Skill based Subject 1: Web Application Development	3	3	25	25	50	2
IV	Tamil**/ Advanced Tamil* (OR)Non- major elective-I (Yoga for Human Excellence) */ Women's Rights*	1	3	-	50	50	1
IV	Health and Wellness****	-		100	-	100	1
IV	Naan Mudhalvan –Skill Course***	-		25	25	50	2
	Total	**30**		**295**	**505**	**800**	**28**

Part	Title of the Course	Hours /Week	Examination				Credits
			Duration In Hours	Maximum Marks			
				CIA	CEE	Total	
	Semester IV						
I	Language – IV	6	3	25	75	100	4
II	English – IV	4	3	25	75	100	4
III	Core 6: Operating System	4	3	25	75	100	4
III	Core 7: Linux and Shell Programming	4	3	25	75	100	4
III	Core Lab 5: Programming Lab – Linux and Shell Programming	3	3	20	30	50	2
III	Allied 4 : Software Engineering	4	3	25	75	100	4
III	Skill based Subject 2: Programming Lab - Web Application Development	3	3	20	30	50	2
IV	Tamil**/Advanced Tamil* (OR) Non-major elective-II (General Awareness*)	2	3	-	50	50	2
IV	Naan Muthalvan – Skill Course***	-	-	25	25	50	2
	Total	**30**		**190**	**510**	**700**	**28**
	Semester V						
III	Core 8: Python Programming	6	3	25	75	100	4
III	Core 9: Cyber Security	6	3	25	75	100	4
III	Core Lab 6: Programming Lab –Python	6	3	20	30	50	2
III	Elective–I	6	3	25	75	100	3
III	Skill based Subject 3: Artificial Intelligence and Machine Learning	3	3	25	25	50	2
III	Core Lab 7: Capstone Project Work Lab - Phase I *****	3	3	20	30	50	2
IV	Naan Muthalvan – Skill Course***	-	-	25	25	50	2
	Total	**30**		**165**	**335**	**500**	**19**
	Semester VI						
III	Core 10: Data Mining and R Programming	5	3	25	75	100	4
III	Core 11: Project Work Lab- Final Phase	5	3	25	75	100	4
III	Core Lab 7: Programming Lab-Data Mining Using R	5	3	20	30	50	2
III	Elective–II	6	3	25	75	100	3
III	Elective–III	6	3	25	75	100	3
III	Skill Based Subject 4: Artificial Intelligence and Machine Learning Lab using Python	3	3	20	30	50	2
V	Extension Activities**	-	-	50	-	50	2
IV	Naan Muthalvan–Skill Course***	-	-	25	25	50	2
	Total	**30**		**215**	**385**	**600**	**22**
	Grand Total			**1175**	**2575**	**3750**	**143**

The following list of electives are suggested for Elective 1, Elective 2, and Elective 3 as Open Choices in V and VI semesters.

S.No	Elective Papers (V and VI semesters)
1.	Big Data Analytics
2.	Internet of Things
3.	Cloud Computing
4.	Block chain Technology
5.	Augmented Reality and Virtual Reality
6.	Robotics Process Automation
7.	Computer Networks
8.	Mobile Application Development
9.	PHP Programming
10.	Embedded Systems
11.	Digital Marketing
12.	Natural Language Processing

GUIDELINES FOR EVALUATION

 # Govt. - (Non-Autonomous Colleges), $ Aided – (Non-Autonomous Colleges), @ Self-Financing (Non –Autonomous).
Evaluation of the candidates shall be made through internal and. external marks

Paper Type	Total Marks	Internal		External		Overall Passing Minimum for Total Marks (Internal +External)
		Maximum Marks	Passing Minimum for Internal	Maximum Marks	Passing Minimum for External	
Part III: Core/ Allied Theory	100	25	10	75	30	40
Part III: Core Practical Lab	50	20	8	30	12	20
Part III: Capstone Project Work Lab	50	20	8	30	12	20
Part III: Project Work Lab	100	25	10	75	30	40
Part IV: Skilled Based Subject Theory	50	25	10	25	10	20
Part IV: Skill Based Subject Lab	50	20	8	30	12	20
Part IV: Foundation Course Theory	50	-	-	50	20	20
Part IV: Health and Wellness	100	100	40	-	-	40

INTERNAL MARKS BREAK UP

Core, Allied and Skilled Based Subject -Theory

Components	CIA I	CIA II	Model	Attendance	Assignment & Seminar	Total
Marks	5	5	10	2	3	25

Core Lab & Skill Based Subject Lab – Practical

Components	Observation	Record	Model Practical	Total
Program(s)	5	5	10	20

Project

Components	Topic Selection	First and Second Review	Mock Viva Presentation	Report	Total
Capstone Project Work Lab	5	5	5	5	20
Project Work Lab	5	10	5	5	25

Internal Examination Question Paper Pattern

Core, Allied and Skilled Based Subject -Theory Duration: 2 Hours

Blooms Classification	Knowledge Level	Section	Type	No. of Questions to be answered	Marks
Remember, Understand	K1,K2	A	Objective type, questions, fill in the blanks, true or false, expand the following	All questions	4 X 1 = 4
Understand, Apply	K2,K3	B	Paragraph about 3 pages	All question either or pattern unit wise	5 X 2 = 10
Apply, Analyze	K3,K4	C	Essay type about 5 pages	2 out of 5 questions	2 X 8 = 16
				Total	**30**

UNIVERSITY EXTERNAL MARKS BREAK UP

Core Lab & Skill Based Subject Lab – Practical

Components	Max. Marks	Aim & Algorithm	Typing	Output	Record	Total	Passing Minimum External
Program 1	10	4	4	2	10	30	12
Program 2	10	4	4	2			

Project

Components	Report	Presentation	Viva-voce	Total	Passing Minimum External
Capstone Project Work Lab	15	10	5	30	12
Project Work Lab	40	20	15	75	40

University Examination Question Paper Pattern

Core Paper & Allied Paper (Theory) Duration: 3 Hours

Blooms Classification	Knowledge Level	Section	Type	No. of Questions to be answered	Marks
Remember, Understand	K1,K2	A	Objective type questions, fill in the blanks, true or false, expand the following	All questions	10 X 1 = 10
Understand, Apply	K2,K3	B	Paragraph about 3 pages	Either or Pattern (Unit Wise)	5 X 5 = 25
Apply, Analyze	K3,K4	C	Essay type about 5 pages	Either or Pattern (Unit Wise)	5 X 8 = 40
				Total	**75**

Skill Based Subject Paper (Theory) Duration: 3 Hours

Blooms Classification	Knowledge Level	Section	Type	No. of Questions to be answered	Marks
Remember, Understand	K1,K2	A	Objective type questions	All questions	6 X 1 = 6
Understand, Apply	K2,K3	B	Paragraph about 2 pages	Either or Pattern (Unit Wise)	3 X 3 = 9
Apply, Analyze	K3,K4	C	Essay type about 4 pages	2 out of 5 questions (Unit Wise)	2 X 5 = 10
				Total	**25**

Foundation Course Paper (Theory) Duration: 3 Hours

Section	Type	No. of Questions to be answered	Marks
A	Essay type about 5 pages	5 out of 10 questions	5 X 10 = 50
		Total	**50**

Note

*	No Continuous Internal Assessment (CIA), University Examinations Only.
**	No University Examinations, Continuous Internal Assessment (CIA) Only.
***	Naan Mudhalvan – Skill courses- external marks (CEE) will be assessed by Industry and internal will be offered by respective course teacher.
****	No University Examinations, Continuous Internal Assessment (CIA) Only will be handled by Department of Physical Education (PD)
*****	Summer Internship / Industrial Training during the Summer Vacation in II Year, IV Semester for 30 hours. The capstone project report to be prepared and it should be submitted during viva-voce. (Refer Project Guidelines)

Semester I

Course code		Programming Concepts with C and C++	L	T	P	C
Core/Elective/Supportive		Core 1	5	0	-	4
Pre-requisite		Students should have basic Computer Knowledge	Syllabus Version		2025-2026 onwards	

Course Objectives:

The main objectives of this course are to:

1. To apprehend the syntax and semantics of the C and C++ programming
2. To choose appropriate branching and looping structures to solve the problem.
3. To understand the concept of functions, arrays, pointers and structures
4. To design and create new applications by interconnecting many classes and reusing the code
5. To develop applications using pointers and file operations.
6. To implement the C and C++ concepts for real time applications

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Learn about the Computer fundamentals and the Problem solving	**K2**
2	Understand the basic concepts of C and C++programming	**K2**
3	Describe the reason why different decision making and loop constructs are available for iteration in C	**K3**
4	Demonstrate the concept of User defined functions, Recursions, Scope and Lifetime of Variables, Structures and Unions	**K4**
5	Develop C and C++ programs using pointers Arrays and file management	**K3**

K1-Remember; **K2**-Understand; **K3**-Apply;**K4**-Analyze; **K5**-Evaluate;**K6**-Create

Unit:1	Program Development and Introduction to C	18 hours

Program Development Lifecycle – Program Design – Structured Programming - Overview of C – Constant, Variables and Data types – Operators and Expressions - Decision Making Branching and Looping-Arrays: Types.

Unit:2	Pointers and Structures	18 hours

User-Defined Functions: Declaration, Function calls, Recursion – Structures and Unions: Defining structure, defining structure variables, Accessing Structure members, Union– Pointers: Introduction-Accessing the address of a variable, Declaration and Initialization of pointer Variables, Accessing a variable through pointer.

Unit:3	OOPS and C++ Basics	18 hours

Key Concepts of Object Oriented Programming – Classes and Objects: Declaring Objects, Access Specifiers and their functions, Defining member functions, Inline function, Friend Function, Static function, Overloading member functions.– Constructors and Destructors: Introduction, Constructors and Destructors , Parameterized copy constructor, Overloading unary-binary operators, Rules for overloading operators - Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchical, Hybrid– Virtual base Classes – Abstract Classes.

Unit:4	**Pointers and Runtime Polymorphism**	**18 hours**
Pointers – Declaration – Pointer to Class , Object – this pointer – Pointers to derived classes and Base classes – Memory models – new and delete operators – dynamic object – Binding, Polymorphism and Virtual Functions: Virtual Function, Pure Virtual Functions.		
Unit:5	**Files**	**15 hours**
File stream classes – file modes – Sequential access Files – Random Access Operation – Class Templates, Function templates – Strings: Declaring and Initializing string objects, String Attributes, Miscellaneous functions. Exception Handling- try, throw and catch.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars (Evolution to Modern C and C++)		
	Total Lecture hours	**90 hours**

Text Book(s)	
1	Stewart Venit, Introduction To Programming Concepts And Design, Dream tech Press, 2001.
2	E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, Second Reprint 2008.
3	Ashok N Kamthane, Object-Oriented Programming with Ansi And Turbo C++, Pearson Education, 2003.
Reference Books	
	E. Balagurusamy, Object-Oriented Programming with C++, TMH, 1998.
* 2	Kernighan Brian W. and Ritchie Dennis, C Programming Language 2nd Edition, Person Education 1988.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onlinecourses.nptel.ac.in/noc21_cs02/preview Introduction to Programming in C – NPTEL
2	https://www.edureka.co/cpp-programming-course
3	https://onlinecourses.nptel.ac.in/noc21_cs02/preview
Course Designed By:	

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	S	M	S	L
CO2	S	M	S	M	M	L	S	L	S	L
CO3	S	S	S	M	M	M	S	M	S	M
CO4	S	S	S	M	S	M	S	M	S	M
CO5	S	S	S	M	M	M	S	M	S	M

*S-Strong; M-Medium; L-Low

Course code		Digital Fundamentals and Computer Architecture	L	T	P	C
Core/Elective/Supportive		Core 2	5	0	-	4
Pre-requisite		Students should have basic computer knowledge	Syllabus Version	2025-2026 Onwards		

Course Objectives:

On successful completion of this subject the students should have Knowledge on

1. To familiarize with different number systems and digital arithmetic & logic circuits
2. To understand the concepts of Combinational Logic and Sequential Circuits
3. To impart the knowledge of buses, I/O devices, flip flops, Memory and bus structure.
4. To understand the concepts of memory hierarchy and memory organization
5. To understand the various types of microprocessor architecture

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Learn the basic structure of number system methods like binary, octal and hexadecimal and understand the arithmetic and logical operations are performed by computers.	K3
2	Define the functions to simplify the Boolean equations using logic gates.	K1
3	Understand various data transfer techniques in digital computer and control unit operations.	K2
4	Compare the functions of the memory organization	K4
5	Analyze architectures and computational designs concepts related to architecture organization and addressing modes	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Number System and Arithmetic circuits	15 hours

Number System and Binary Codes: Decimal, Binary, Octal, Hexadecimal – Binary addition, Multiplication, Division – Floating point representation, Complements, BCD, Excess3, Gray Code. Arithmetic Circuits: Half adder, Full adder, Parallel binary adder, BCD adder, Half subtractor, Full subtractor, Parallel binary subtractor - Digital Logic: The Basic Gates – NOR, NAND, XOR Gates.

Unit:2	Combinational Logic and Sequential Circuits	15 hours

Combinational Logic Circuits: Boolean algebra – Karnaugh map – Canonical form Construction and properties – Implementations – Don't care combinations - Product of sum, Sum of products, Simplifications. Sequential circuits: Flip-Flops: RS, D, JK, and T - Multiplexers – Demultiplexers – Decoder Encoder – Shift Registers-Counters.

Unit:3	Input – Output Organization and Data Transfer	15 hours

Input – Output Organization: Input – output interface – I/O Bus and Interface – I/O Bus Versus Memory Bus – Isolated Versus Memory – Mapped I/O – Example of I/O Interface. Asynchronous data transfer: Strobe Control and Handshaking – Asynchronous Serial Transfer Asynchronous Communication Interface, First-In, First-Out Buffer--Modes of Transfer- Programmed I/O, Interrupt-initiated I/O.

Unit:4	**Priority Interrupt**	**15 hours**
Priority Interrupt: Daisy- Chaining Priority, Parallel Priority Interrupt. Direct Memory Access: DMA Controller, DMA Transfer. Input – Output Processor: CPU-IOP Communication.		

Unit:5	**Memory Organization**	**13 hours**
Memory Organization: Memory Hierarchy – Main Memory- Associative memory: Hardware Organization, Match Logic, Read Operation, Write Operation. Cache Memory: Associative, Direct, Set-associative Mapping – Writing into Cache Initialization. Virtual Memory: Address Space and Memory Space, Address Mapping Using Pages, Associative Memory, Page Table, Page Replacement.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Digital principles and applications, Albert Paul Malvino, Donald P Leach, TMH, 1996.
2	Computer System Architecture -M. Morris Mano , PHI.
3	Computer System Architecture-Designing for performance , W.Stallings ,Prentice Hall of India 2002
Reference Books	
1	Digital Electronics Circuits and Systems, V.K. Puri, TMH.
2	Computer Architecture, M. Carter, Schaum‘s outline series, TMH.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/106/103/106103068/
2	http://www.nptelvideos.in/2012/12/digital-computer-organization.html
3	http://brittunculi.com/foca/materials/FOCA-Chapters-01-07-review-handout.pdf
Course Designed By:	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	M	S	M	M	L
CO2	S	M	S	M	M	S	M	M	M	L
CO3	S	S	S	M	S	S	S	M	M	M
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		Programming Lab –C and C++	L	T	P	C
Core/Elective/Supportive		Core Lab:1	0	0	4	2
Prerequisite		Students should have basic knowledge in C and C++ programming and algorithms	Syllabus Version		2025-2026 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To practice the Basic concepts, Branching and Looping Statements and Strings in C programming
2. To implement and gain knowledge in Arrays, functions, Structures, Pointers and File handling

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Remember and Understand the logic for a given problem and to generate Prime numbers, magic square, student mark sheet using structures and array	**K1, K2**
2	Apply the concepts to print the matrix addition, Palindrome or not, merging files using pointers	**K3, K4**
3	Define the different programming paradigm such as procedure oriented and object Oriented.	**K1**
4	Identify the concepts of inheritance and its types and develop applications using overloading features	**K3&K4**

K1-Remember; **K2**-Understand; **K3**-Apply;**K4**-Analyze;**K5** -Evaluate; **K6** -Create

Programs	**36 hours**

1. Write a C program to find out all the prime numbers between two given numbers and the sum of all prime numbers within this range
2. Write a C program to print Floyd's Triangle pattern.
3. Write a C program by using function to add two matrices and return the resultant matrix to the calling function.
4. Write a C program to check whether the given string is a palindrome or not using pointers.
5. Write a C program to find the length of a string using Pointer.
6. Write a C++ Program to create a class ARITHMETIC which consists of a FLOAT and an INTEGER variable. Write member functions ADD (), SUB (), MUL (), DIV () to perform addition, subtraction, multiplication, division respectively. Write a member function to get and display values.
7. Write a C++ Program to create a class STRING. Write a member function to initialize, get and display stings. Overload the operators ++ and == to concatenate two Strings and to compare two strings respectively.

8. Write a C++ Program to perform complex and real number addition using Function Overloading and display result using Operator overloading.
9. Write a C++ Program to create class, which consists of EMPLOYEE Detail like E_Number, E_Name, Department, Basic_Salary and Grade. Write a member function to get and display them. Derive a class PAY from the above class and write a member function to calculate DA, HRA and PF based on input percentage applicable over Basic_Salary and display the net pay.
10. Write a C++ Program to create a class SHAPE which consists of two VIRTUAL FUNCTIONS Calculate_Area() and Calculate_Perimeter() to calculate area and perimeter of various figures. Derive three classes SQUARE, RECTANGLE, TRIANGE from class Shape and Calculate Area and Perimeter of each class separately and display the result.

Text Book(s)

1	E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, Second Reprint 2008
2	Ashok N Kamthane, Object-Oriented Programming with Ansi And Turbo C++, Pearson Education, 2003.

Reference Books

1	Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson, 2002.
2	Henry Mullish & Hubert L.Cooper: The Sprit of C, Jaico, 1996.
3	E. Balagurusamy, Object-Oriented Programming with C++, TMH, 1998.
4	Maria Litvin & Gray Litvin, C++ for you, Vikas publication, 2002.
5	John R Hubbard, Programming with C, 2nd Edition, TMH publication, 2002.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	Introduction to Programming in C–NPTEL
2	Problem solving through Programming in C– SWAYAM
3	C for Everyone: Programming Fundamentals–Course

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	L	M	S	S	S	L
CO3	S	S	S	M	L	M	S	S	S	M
CO3	S	S	S	L	L	M	S	S	S	L
CO4	S	S	S	M	L	M	S	S	S	M

*S-Strong;M-Medium;L-Low

Semester II

Course code		Java Programming	L	T	P	C
Core/Elective/Supportive		Core 3	6	0	0	4
Pre-requisite		Students Should have the basic understanding of oops concept.	Syllabus Version		2025-2026 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To expose the students with the introduction to OOPs and advantages of object oriented programming.
2. The concepts of OOPs make it easy to represent real world entities.
3. The course introduces the concepts of converting the real time problems into objects and methods and their interaction with one another to attain a solution.
4. Simultaneously it provides the syntax of programming language Java for solving the real world problems.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	The competence and the development of small to medium sized application programs that demonstrate professionally acceptable coding	**K1-K2**
2	Demonstrate the concept of object oriented programming through Java	**K2-K4**
3	Apply the concept of Inheritance, Modularity, Concurrency, Exceptions handling and data persistence to develop java program	**K3,K5**
4	Develop java programs for applets and graphics programming	**K3,K6**
5	Understand the fundamental concepts of AWT controls, layouts and events	**K1-K2**

K1 – Remember; **K2** – Understand; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate; **K6** – Create

Unit:1	FUNDAMENTALS OF OBJECT-ORIENTED PROGRAMMING	18 hours

Object-Oriented Paradigm – Basic Concepts of Object-Oriented Programming – Benefits of Object-Oriented Programming –Application of Object-Oriented Programming. Java Evolution: History – Features – How Java differs from C and C++ – Java and Internet – Java and www –Web Browsers. Overview of Java: simple Java program – Structure – Java Tokens – Statements – Java Virtual Machine.

Unit:2	BRANCHING AND LOOPING	18 hours

Constants, Variables, Data Types – Operators and Expressions – Decision Making and Branching: if, if...else, nested if, switch, ? : Operator – Decision Making and Looping: while, do, for – Jumps in Loops – Labeled Loops – Classes, Objects and Methods.

Unit:3	ARRAYS AND INTERFACES	18 hours

Arrays, Strings and Vectors – Interfaces: Multiple Inheritance – Packages: Putting Classes together – Multithreaded Programming.

Unit:4	ERROR HANDLING	18 hours
Managing Errors and Exceptions – Applet Programming – Graphics Programming.		

Unit:5	MANAGING INPUT / OUTPUT FILES IN JAVA	15 hours
Concepts of Streams- Stream Classes – Byte Stream classes – Character stream classes – Using streams – I/O Classes – File Class – I/O exceptions – Creation of files – Reading / Writing characters, Byte-Handling Primitive data Types – Random Access Files.		

Unit:6	Contemporary Issues	3 hours
Expert lectures, online seminars – webinars		

	Total Lecture hours	90 hours

Text Book(s)

1	Programming with Java – A Primer – E. Balagurusamy, 5th Edition, TMH.
2	Herbert Schildt , Java: The Complete Reference, McGraw Hill Education, Oracle Press 10th Edition, 2018
3	Programming with Java – A Primer – E. Balagurusamy, 3rd Edition, TMH.

Reference Books

1	The Complete Reference Java 2 – Patrick Naughton & Hebert Schildt, 3rd Edition, TMH
2	Programming with Java – John R. Hubbard, 2nd Edition, TMH.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	www.spoken-tutorial.org
2	www.nptel.ac.in
3	https://www.w3schools.in/java-tutorial/

Course Designed By:

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	L	S	M	M	M
CO2	S	S	S	M	S	L	S	M	M	M
CO3	S	S	S	M	S	M	S	S	M	M
CO4	S	S	S	M	S	M	M	S	M	M
CO5	S	S	S	M	S	M	S	S	M	M

*S-Strong; M-Medium; L-Low

Course code		Programming Lab – JAVA	L	T	P	C
Core/Elective/Supportive		Core Lab 2	0	0	4	2
Pre-requisite		Students should know about the OOPs concept and basic knowledge in java theory.	Syllabus Version		2025-2026 Onwards	

Course Objectives:

The main objectives of this course are to:

1. The main objective of JAVA Programming Lab is to provide the students a strong foundation on programming concepts and its applications through hands-on training.
2. To practice the Basic concepts, Branching and Looping Statements and Strings in C programming
3. To implement and gain knowledge in Arrays, functions, Structures, Pointers and File handling

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concepts of Java Programming with emphasis on ethics and principles of professional coding	**K1, K2**
2	Demonstrate the creation of objects, classes and methods and the concepts of constructor, methods overloading, Arrays, branching and looping	**K2**
3	Create data files and Design a page using AWT controls and Mouse Events in Java programming Implement the concepts of code reusability and debugging.	**K2, K3**
4	Develop applications using Strings, Interfaces and Packages and applets	**K3**
5	Construct Java programs using Multithreaded Programming and Exception Handling	**K3**

K1 – Remember; **K2** – Understand; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate; **K6** – Create

Programs	**36 hours**

1. Write a Java Applications to extract a portion of a character string and print the extracted string.
2. Write a Java Program to implement the concept of multiple inheritance using Interfaces.
3. Write a Java Program to create an Exception called payout-of-bounds and throw the exception.
4. Write a Java Program to implement the concept of multithreading with the use of any three multiplication tables and assign three different priorities to them.
5. Write an applet to draw several shapes in the created windows.
6. Write a Java Program to create a frame with four text fields name, street, city and pin code with suitable tables. Also add a button called my details. When the button is clicked its corresponding values are to be appeared in the text fields using awt or swing packages.
7. Write a Java Program to create a student management using user defined package.
8. Write a Java Program using any control statement(s).
   a) To find the day of a week.
   b) To check the given number is Armstrong number or not.
9. Write a Java Program to implement abstract class and abstract method.

10. Write a Java Program to create frames which respond to the mouse clicks. For each events with mouse such as mouse up, mouse down, etc., the corresponding message to be displayed.		
11. Write a Java Program to draw circle, square, ellipse and rectangle at the mouse click positions.		
12. Write a Java Program which open an existing file and append text to that file.		
	Total Lecture hours	**36 hours**
Text Book(s)		
1	Programming with Java – A Primer – E. Balagurusamy, 5th Edition, TMH.	
2	Herbert Schildt , Java: The Complete Reference, McGraw Hill Education, Oracle Press 10th Edition, 2018	
3	Programming with Java – A Primer – E. Balagurusamy, 3rd Edition, TMH.	
Reference Books		
1	The Complete Reference Java 2 – Patrick Naughton & Hebert Schildt, 3rd Edition, TMH	
2	Programming with Java – John R. Hubbard, 2nd Edition, TMH.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.w3resource.com/java-exercises/	
2	https://www.udemy.com/introduction-to-java-programming/	
Course Designed By:		

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	L	S	S	S	M	M	L
CO2	S	S	S	L	S	M	S	M	M	L
CO3	S	S	S	M	S	M	S	M	M	L
CO4	S	S	S	M	S	M	S	S	M	S
CO5	S	S	S	M	S	S	S	S	M	S

*S-Strong; M-Medium; L-Low

Course code		Office Automation and Internet	L	T	P	C
Core/Elective/Supportive		Core Lab 3	0	0	4	2
Pre-requisite		Basic Knowledge of Office Automation Tools	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Acquire and apply the computer applications in different aspects.
2. Get an insight knowledge on office automation.
3. Know the database maintenance in every type of applications.
4. Get the knowledge in effective power point presentation.
5. Impart knowledge and essential skills necessary to use the internet.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the fundamentals of Internet and the Web concepts	**K2,K1**
2	Create and apply various statistical tools available in excel.	**K3,K6**
3	To gain knowledge making effective presentation using power point presentation	**K4,K2**
4	Understand the basic concepts and evaluate the database using excel.	**K5**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

List of Programs	**36 hours**

1. Prepare your resume in word and assume that you are studying in final year of your Graduation and are eagerly looking for a job. Visit any job portal and upload your resume.
2. Create a flowchart for any program use proper shapes like ellipse, arrows, rectangle, parallelogram and grouping to group all the parts of the flowchart into one single object.
3. Create a simple mathematical calculations using formulas in excel sheet.
4. Prepare students mark list for your class and calculate Total, Average, Result and Ranking by using arithmetic, logical functions and sorting.
5. Create different types of charts for a range in students mark list using excel sheet.
6. Create a power-point presentation with minimum 10 slides
   a) The first slide must contain the topic of the presentation and name of the presentation.
   b) At least one table, 5 bullets, 5 numbers, font size, font face, font color.
   c) Use word art to write the heading for each slides. Insert at least one clip-art, one picture, one audio and one video.
   d) Use custom animation option to animate the text, move left to right one line at a time and Use proper transition for the slides.
   e) Last slide must contain thank you.
7. Open your inbox in the Gmail account created, check the mail received from your peer from other college inviting you for his college fest, and download the invitation. Reply to the mail with a thank you note for the invite and forward the mail to other friends.
8. Create your own Google classroom and invite all your friends through email id. Post study material in Google classroom using Google drive. Create a separate folder for every subject and upload all unit wise E-Content Materials.

9. Create a google registration form with appropriate headings, caption, logo, pictures and relevant mandatory fields (using radio buttons, check box etc.,) and share the link through email and watsapp. Submit the registration report.
10. Create poster for Department Seminar or Conference using any open source tools.

Text Book(s)	
1	Ian Lamont, Google Drive & Docs in 30 Minutes, 2nd Edition.
Reference Books	
1	Sherry Kinkoph Gunter, My Google Apps, 2014.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.youtube.com/watch?v=NzPNk44tdlQ
2	https://www.youtube.com/watch?v=PKuBtQuFa-8
4	https://www.youtube.com/watch?v=hGER1hP58ZE
Course Designed By:	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	S	S	S	M	M	S	L
CO2	S	M	S	S	S	S	S	S	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	M	S	S	S	S	M	S

*S-Strong;M-Medium;L-Low

Semester III

Course code		Data Structures	L	T	P	C
Core/Elective/Supportive		Core 4	4	0	0	4
Pre-requisite		Basic understanding of Data Storage, retrieval and algorithms.	Syllabus Version			2025-26 Onwards

Course Objectives:

The main objectives of this course are to:

1. To introduce the fundamental concept of data structures
2. To emphasize the importance of data structures in developing and implementing efficient algorithms.
3. Understand the need for Data Structures when building application
4. Ability to calculate and measure efficiency of code
5. Improve programming logic skills.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concepts of data structures and algorithms	**K1-K2**
2	Construct and analyze of stack and queue operations with illustrations	**K2-K4**
3	Enhance the knowledge of Linked List and dynamic storage management.	**K2-K3**
4	Demonstrate the concept of trees and its applications	**K2-K3**
5	Design and implement various sorting and searching algorithms for applications and understand the concept of file organizations	**K1-K4,K6**

K1–Remember;**K2** –Understand;**K3** –Apply;**K4**– Analyze;**K5**– Evaluate; **K6**–Create

Unit:1	INTRODUCTION	10 hours

Introduction of Algorithms, Analyzing Algorithms. Arrays: Sparse Matrices–Representation of Arrays. Stacks and Queues. Fundamentals–Evaluation of Expression Infix to Postfix Conversion – Multiple Stacks and Queues

Unit:2	LINKED LIST	12 hours

Linked List: Singly Linked List – Linked Stacks and Queues – Polynomial Addition- More on Linked Lists – Sparse Matrices – Doubly Linked List and Dynamic – Storage Management – Garbage Collection and Compaction.

Unit:3	TREES	12 hours

Basic Terminology – Binary Trees – Binary Tree Representations – Binary Trees-Traversal-More On Binary Trees – Threaded Binary Trees – Binary Tree. Representation of Trees – Counting Binary Trees. Graphs: Terminology and Representations-Traversals, Connected Components and Spanning Trees, Shortest Paths and Transitive Closure

Unit:4	**EXTERNAL SORTING**	**12 hours**
Storage Devices–Sorting with Disks: K-Way Merging–Sorting with Tapes Symbol Tables: Static Tree Tables–Dynamic Tree Tables–Hash Tables: Hashing Functions–Overflow Handling.		
Unit:5	**INTERNAL SORTING**	**12 hours**
Insertion Sort–Quicksort–2Way Merge Sort–Heap Sort–Shell Sort–Sorting on Several Keys. Files: Files, Queries and Sequential organizations–Index Techniques –File Organizations.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars –webinars		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Ellis Horowitz, Sartaj Shani, Data Structures, Galgotia Publication.
2	Ellis Horowitz, Sartaj Shani, Sanguthevar Rajasekaran, Computer Algorithms, Galgotia Publication.
3	S.Lovelyn Rose,R.Venkatesan, Data Structures, Wiley India Private Limited,2015,Edition-1.
Reference Books	
1	Jean-Paul, Tremblay & Paul G.Sorenson , An Introduction to Data structures with Applications Tata Mc Graw Hill Company 2008, 2nd Edition.
2	Samanta.D, Classic Data Structure Prentice Hall of India Pvt Ltd 2007,9th Edition
3	Seymour Lipschutz, Data Structures McGraw Hill Publications,2014,1st Edition
Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://opendatastructures.org
2	https://www.geeksforgeeks.org/dsa/data-structures/
Course Designed By:	

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	M	S	M	M	M
CO2	S	S	S	M	M	M	M	M	M	M
CO3	S	S	S	M	S	M	M	M	S	S
CO4	S	S	S	M	S	S	S	S	M	M
CO5	S	S	S	M	M	S	S	M	M	S

*S-Strong;M-Medium;L-Low

Course code		RDBMS	L	T	P	C
Core/Elective/ Supportive	Core 5		5	0	0	4
Pre-requisite	Basic knowledge about the data, table and database in computers		Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. The course describes the data, organizing the data in database, database administration.
2. To grasp the different issues involved in the design of a database system.
3. To study the physical and logical database designs and database modeling like relational, Hierarchical, network models, database security, integrity and normalization.
4. It also gives introduction to SQL language to retrieve the data from the database with suitable application development.
5. Provide strong foundation of database concepts and to introduce students to application development in DBMS.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concepts of Relational Data Model, Entity-Relationship Model and process of Normalization	**K1-K2**
2	Understand and construct database using Structured Query Language (SQL) in Oracle9i environment.	**K1-K3**
3	Learn basics of PL/SQL and develop programs using Cursors, Exceptions, Procedures and Functions.	**K1-K4**
4	Understand and use built –in functions and enhance the knowledge of handling multiple tables	**K1-K3,K6**
5	Attain a good practical skill of managing and retrieving of data using Data Manipulation Language(DML)	**K2-K4**

K1–Remember;**K2** –Understand;**K3** –Apply;**K4**– Analyze;**K5**– Evaluate; **K6**–Create

Unit:1	DATABASE CONCEPTS	12 hours

Database Concepts: A Relational approach: Database – Relationships – DBMS – Relational Data Model – Integrity Rules – Theoretical Relational Languages. Database Design: Data Modeling and Normalization: Data Modeling – Dependency – Database Design – Normal forms – Dependency Diagrams– De–normalization– Another Example of Normalization.

Unit:2	ORACLE9i	12 hours

Oracle11g: overview – Introduction to Relational Database, Oracle 11g an introduction – Introducing the Structured Query Language (SQL), Using SQL * Plus, Starting SQL * Plus, SQL * Plus from the Command line, SQL Developer. Oracle Tables: DDL: Naming Rules and conventions – Data Types – Constraints – Creating Oracle Table – Displaying Table Information – Altering an Existing Table – Dropping, Renaming, Truncating Table – Table Types– Spooling – Error codes.

Unit:3	WORKING WITH TABLE	12 hours
Working with Table :Data Management and Retrieval: DML–adding a new Row / Record– Customized Prompts–Updating and Deleting an Existing Rows/Records –retrieving Data from Table – Arithmetic Operations – restricting Data with WHERE clause – Sorting – Revisiting Substitution Variables – DEFINE command – CASE structure. Functions and Grouping: Built-in functions–Grouping Data. Multiple Tables: Joins and Set operations: Join–Set operations.		
Unit:4	**PL/SQL**	**12 hours**
PL/SQL: A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types–Other Data Types–Declaration–Assignment operation–Bind variables–Substitution Variables–Printing– Arithmetic Operators. Control Structures and Embedded SQL: Control Structures–Nested Blocks–SQL in PL/SQL–Data Manipulation–Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit & Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause –Cursor with Parameters –Cursor Variables – Exceptions – Types of Exceptions.		
Unit:5	**PL/SQLCOMPOSITE DATA TYPES**	**10 hours**
PL/SQL Composite Data Types: Records–Tables–arrays. Named Blocks: Procedures–Functions Packages –Triggers–Data Dictionary Views.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, on line seminars –webinars		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Database System using Oracle, Nileshshah, 2 Edition , PHI.
2	Oracle Database 11g SQL Master SQL and PL/SQL in the Oracle Database , Oracle Press – Jason price
3	E-Book: Diana Lorentz, “Oracle® Database SQL Reference”, ORACLE, Dec, 2005.
4	E-Book: Bill Pribyl, Steven Feuerstein, “Oracle PL/SQL Programming”,O’Reilly Media, Inc.,6th Edition, February 2014.
Reference Books	
1	Database Management Systems, Majumdar&Bhattacharya,2007,TMH.
2	Database Management Systems, Gerald V. Post, 3rdedition,TMH.
Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://www.digimat.in/nptel/courses/video/106105175/L01.html
2	https://www.tutorialspoint.com/oracle_sql/index.htm

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	M	M	M	L
CO2	S	S	S	M	S	M	M	M	M	L
CO3	S	S	S	S	S	S	S	S	M	M
CO4	S	S	S	S	S	M	S	S	M	L
CO5	S	S	S	S	S	M	S	S	M	L

*S-Strong;M-Medium;L-Low

Course code		Programming Lab – RDBMS	L	T	P	C
Core/Elective/Supportive		Core Lab 4	0	0	3	2
Pre-requisite		Students should have the theoretical knowledge in visual basic and oops concept.	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To introduce database system concepts
2. To learn SQL for data definition, manipulation and querying a database
3. To learn relational database design
4. To learn transaction concepts and serializability of schedules

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts of database.	**K2**
2	Learn and apply the knowledge of database methods.	**K3**
3	Analyze queries in SQL to create, manipulate and query the database	**K4**
4	Evaluate the conceptual and normalization to design relational database.	**K5**
5	Create PL/SQL and develop programs using Cursors, Exceptions, Procedures and Functions	**K6**

K1 – Remember; **K2** – Understand; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate; **K6** – Create

Programs	**36 hours**

1. Implementation of DDL commands of SQL with suitable examples Create table, Alter table, Drop Table
2. Implementation of DML commands of SQL with suitable examples Insert, Update, Delete
3. Write a PL/SQL to insert a student record using procedure.
4. Write a PL/SQL to count number of employees in a department using function.
5. Write a PL/SQL to fetch selective records using cursors.
6. Creating Database /Table Space
   Managing Users: Create User, Delete User Managing roles:-Grant, Revoke.
7. Create a table for Employee details with Employee Number as primary key and following fields: Name, Designation, Gender, Age, Date of Joining and Salary. Insert at least ten rows and perform various queries using any one Comparison, Logical, Set, Sorting and Grouping Operators.
8. Write a PL/SQL to update the rate field by 20% more than the current rate in inventory table which has the following fields: Prono, ProName and Rate. After updating the table a new field (Alter) called for Number of item and place for values for the new field without using PL/SQL block.
9. Write a PL/SQL program to implement the concept of Triggers
10. Write a PL/SQL program to implement the concept Procedures.

	Total Lecture hours	**36 hours**
Text Book(s)		
1	E-Book : Bill Pribyl, Steven Feuerstein, "Oracle PL/SQL Programming", O'Reilly Media, Inc., 6th Edition, February 2014.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.geeksforgeeks.org/dbms/dbms/	
2	https://www.scribd.com/document/391576696/RDBMS-Lab-Assignment	
Course Designed By:		

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	L	M	L	S	M	M	L
CO3	S	S	S	L	M	M	S	M	S	L
CO3	S	S	S	M	S	M	S	S	S	M
CO4	S	S	S	M	S	M	S	S	M	M
CO5	S	S	S	S	S	S	S	S	S	M

*S-Strong;M-Medium;L-Low

Course code		ANIMATION TECHNIQUES	L	T	P	C
Core/Elective/Supportive		Allied 3	4	0	0	4
Pre-requisite		Basic knowledge in 2D and 3D animations	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To learn the animation and its uses, types and techniques of animation.
2. To enable the students to learn 3D animation in FLASH.
3. To understand the concept of motion in 3D animation
4. To make the student to create 3D animated movies.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basics of animation, need of animations, types of animation, techniques of animation and special effects.	**K2**
2	Understand and apply animations in flash, working with time time-line and frame based animations, tween-based animations and layers.	**K3**
3	Knowledge on working with time-line, frame-based and tween-based animation.	**K3**
4	Understanding the motion caption, software to capture the motion.	**K4**
5	Apply the animation concepts and concept development to develop or create 3D animated movies.	**K4-K6**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	BASICS	9 hours

What is meant by Animation – Why we need Animation – History of Animation – Uses of Animation – Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects - Creating Animation.

Unit:2	CREATING ANIMATION IN FLASH	9 hours

Creating Animation in Flash: Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers – Action script.

Unit:3	3D ANIMATION & ITS CONCEPTS	9 hours

3D Animation & its Concepts – Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

Unit:4	MOTION CAPTION	9 hours

Motion Caption – Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

Unit:5	CONCEPT DEVELOPMENT	7 hours
Concept Development –Story Developing –Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets - 3D Animated Movies.		
	Total Lecture hours	**45 hours**

	Text Book(s)
1	Principles of Multimedia, Ranjan Parekh, 2007, TMH. (Unit I, Unit V)
2	Multimedia Technologies, Ashok Banerji, Ananda Mohan Ghosh, McGraw Hill Publication
3	The Animator's Survival Kit – Richard Williams Faber & Faber, Expanded Edition,Core Animation Concepts (All Units)
	Reference Books
1	Ze-Nian Li and Mark S.Drew, "Fundamentals of Multimedia", First Edition, Pearson Education, 2007
2	Prabhat K Andleigh, Kiran Thakrar, "Multimedia systems design", First Edition, PHI, 2007
	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/courses/106/105/106105174
2	https://www.coursera.org/learn/3d-animation
3	https://www.youtube.com/results?search_query=flash+animation+tutorial
	Course Designed By:

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	L	S	M	L	M	S	S
CO2	S	M	S	L	S	M	L	M	S	S
CO3	S	S	S	L	M	M	L	M	M	S
CO4	S	S	S	M	S	M	L	M	M	S
CO5	S	S	S	L	S	M	L	M	M	S

*S-Strong; M-Medium; L-Low

Course code		Web Application Development	L	T	P	C
Core/Elective/Supportive		Skill based Subject 1	3	0	0	2
Pre-requisite		Students should have basic knowledge on internet and world wide web.	Syllabus Version			2025-26 Onwards

Course Objectives:

The main objectives of this course are to:

1. To enhance the knowledge of students in web programming
2. To learn about the scripting languages HTML and its elements
3. To understand concept of DHTML to integrate dynamic web pages
4. To understand XML, CSS and XSL for formatting the web pages

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concepts of Internet, WWW, browsers and Email and Protocols.	**K1**
2	Understand and apply the HTML,HTML elements and formatting styles	**K1- K3**
3	Knowledge on creating tables, forms and DHTML	**K3**
4	Understand the structure of XML document, DTD and Schema	**K1- K3**
5	Knowledge on working with SML, Stylesheet sand XSL	**K1- K4**

K1–Remember;**K2** –Understand;**K3** –Apply;**K4**– Analyze;**K5**– Evaluate; **K6**–Create

Unit:1	Introduction to Web Technologies & HTML	10 hours

Introduction to Web and Internet: WWW, HTTP, URL, Web Browsers, Web Servers-Static vs Dynamic websites-HTML Basics: HTML Syntax and Structure-Tags, Attributes, Elements-Text Formatting, Lists, Links, Tables, Frames, Forms, Images, Audio, Video.

Unit:2	Styling with CSS	12hours

Introduction to CSS: Syntax, Selectors, Properties-Inline, Internal, and External CSS-Box Model, Margins, Padding, Borders-Layout Techniques: Positioning, Float, Flexbox, Grid-Styling Forms and Tables.

Unit:3	Client-Side Scripting with JavaScript	12 hours

Basics of JavaScript: Variables, Data Types, Operators-Functions, Conditional Statements, Loops-DOM Manipulation: Selecting Elements, Event Handling-Form Validation.

Unit:4	Server-Side Scripting with PHP	12 hours

Introduction to PHP: Syntax, Variables, Data Types, Operators-Conditional Statements, Loops.

Unit:5	PHP and MySQL Integration	12 hours

Functions-Handling Forms with PHP-Working with Files (Read/Write).Database Basics: Connecting PHP with MySQL-Using MySQL / PDO.

Unit:6	Contemporary Issues	2 hours

Building Simple Web Applications-Login System, Feedback Form with Database, etc.

	Total Lecture hours	60 hours

Text Book(s)	
1	**"HTML, CSS, and JavaScript All in One"** – Robin Nixon
2	**"Learning PHP, MySQL & JavaScript"** – Robin Nixon
3	**"PHP & MySQL: Server-side Web Development"** – Jon Duckett
Reference Books	
1	World Wide Web Design with HTML, C.Xavier, 2007, TMH.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.coursera.org
2	https://www.edx.org
3	https://www.freecodecamp.org/
Course Designed By:	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	M	S	M	S	L
CO2	L	M	S	M	M	L	S	L	S	L
CO3	S	S	L	M	M	M	S	M	S	M
CO4	S	M	S	M	S	M	S	M	S	M
CO5	M	S	S	M	M	M	S	M	S	M

*S-Strong;M-Medium;L-Low

Semester IV

Course code		Operating Systems	L	T	P	C
Core/Elective/Supportive		Core 6	4	0	0	4
Pre-requisite		Students Should have the basic knowledge in computer.	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To understand the processing of programs on a computer system to design and implementation of language processor.
2. To enhance the ability of program generation through expansion and gain knowledge about Code optimization using software tools.
3. Students will gain knowledge of basic operating system concepts.
4. To have an in-depth understanding of process concepts, deadlock and memory management.
5. To provide an exposure to scheduling algorithms, devices and information management.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Know the program generation and program execution activities in detail	K1
2	Understand the concepts of Macro Expansions and Gain the knowledge of Editing processes	K2-K3
3	Remember the basic concepts of operating system	K1
4	Understand the concepts like interrupts, deadlock , memory management and file management	K2
5	Analyze the need for scheduling algorithms and implement different algorithms used for representation, scheduling, and allocation in DOS and UNIX operating system.	K1-K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	OPERATING SYSTEM	10 hours

What is Operating Systems Do - Computer-System Organization-Computer - System Architecture - Operating-System Structure - Operating-System Services - User and Operating-System Interface- System Calls - Types of System Calls- System Programs.

Unit:2	PROCESS AND THREADS	12 hours

Process Concept - Process Scheduling-Operations on Processes - Interprocess Communication- Communication in Client Server Systems. Threads: Overview- Multicore Programming Multithreading Models -Thread Libraries – Implicit Threading- Threading Issues.

Unit:3	PROCESS SYNCHRONIZATION AND CPU SCHEDULING	12 hours

Process Synchronization – Background - Synchronization Hardware - Mutex Locks – Semaphores. CPU Scheduling - Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Thread Scheduling - Multiple-Processor Scheduling - Real-Time CPU Scheduling

Unit:4	DEADLOCKS AND MAIN MEMORY	12 hours

Deadlocks - System Model - Deadlock Characterization - Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.

Main Memory - Background - Swapping – Contiguous Memory Allocation - Segmentation - Paging – Structure of the Page Table.

Unit:5	**VIRTUAL MEMORY AND STORAGE MANAGEMENT**	**12 hours**
Virtual Memory - Background – Demand Paging – Page Replacement. Storage Management: Overview of Mass-Storage Structure - Disk Structure - Disk Attachment – Disk Scheduling – Disk Management - Swap-Space Management - RAID Structure		
Unit:6	**Contemporary Issues**	**2 hours**
Rise of **cloud-native OS environments** like **Google Fuchsia**, **Azure Sphere**, and **AWS Firecracker**. Expert lectures, online seminars - webinars		
	Total Lecture hours	**60 hours**

Text Book(s)

1	Abraham Silberschatz, Peter B. Galvin and Greg Gagne, "Operating System Concepts", Ninth Edition, John Wiley and Sons Inc 2012.
2	Leland L.Beck, System Software: An Introduction to Systems Programming, Pearson, Third Edition.
3	H.M. Deitel, Operating Systems, 2nd Edition, Perason, 2003.

Reference Books

1	Achy8ut S. Godbole, Operating Systems, TMH, 2002.
2	John J. Donovan, Systems Programming, TMH, 1991.
3	D.M. Dhamdhere, Systems Programming and Operating Systems, 2nd Revised Edition, TMH.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://nptel.ac.in/courses/106/108/106108101/
2	https://www.tutorialspoint.com/operating_system/index.htm

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	M	M	M	L
CO2	S	S	S	S	S	M	M	M	S	L
CO3	S	M	M	M	S	M	S	S	S	L
CO4	S	S	S	M	S	S	S	M	M	M
CO5	S	S	S	M	S	S	S	M	M	M

*S-Strong; M-Medium; L-Low

Course code		Linux and Shell Programming	L	T	P	C
Core/Elective/Supportive		Core 7	4	0	0	4
Pre-requisite		Before starting the course students should have the basic knowledge about operating system and C programming.	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Linux is a multi-user and multi-tasking operating system and after learning the concepts of an operating system
2. Student will be able to write simple shell programming using Linux utilities, pipes and filters.
3. The file system, process management and memory management are discussed.
4. Various commands used by Linux shell is also discussed which makes the users to interact with each other.
5. Bourne shell programming is dealt in depth which can be used to develop applications.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Describe the architecture and features of Linux Operating System and distinguish it from other Operating System.	K1
2	Develop Linux utilities to perform File processing, Directory handling, User Management and display system configuration	K2-K3
3	Develop shell scripts using pipes, redirection, filters and Pipes	K2
4	Apply and change the ownership and file permissions using advance Unix commands.	K3
5	Build Regular expression to perform pattern matching using utilities and implement shell scripts for real time applications.	K3-K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION	10 hours

Introduction to LINUX Operating System: Introduction - The LINUX Operating System - Basic commands in Linux.

Unit:2	MANAGING FILES AND DIRECTORIES	12 hours

Managing Files and Directories: Introduction – Directory Commands in LINUX – File Commands in LINUX. Creating files using the vi editor: Text editors – The vi editor. Managing Documents: Locating files in LINUX – Standard files – Redirection – Filters – Pipes.

Unit:3	SHELL SCRIPTS	12 hours

Securing files in LINUX: File access permissions – viewing File access permissions – Changing File access permissions. Automating Tasks using Shell Scripts: Introduction – Variables- Local and Global Shell variables – Command Substitution.

Unit:4	CONDITIONAL EXECUTION IN SHELL SCRIPTS	12 hours

Using Conditional Execution in Shell Scripts: Conditional Execution – The case…esac Construct. Managing repetitive tasks using Shell Scripts: Using Iteration in Shell Scripts – The while construct – until construct – for construct – break and continue commands – Simple Programs using Shell Scripts

Unit:5	KERNEL & SYSTEM RECOVERY	12 hours

Linux Kernel- Kernel Components- compiling a kernel- Customizing a kernel – system startup- Customizing the boot process-System Recovery

Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Operating System LINUX, NIIT, PHI, 2006, Eastern Economy Edition.
2	N.B. Venkateswarlu , Introduction to Linux: Installation and Programming, BS Publications, 2008, 1st Edition
Reference Books	
1	Richard Petersen, Linux: The Complete Reference, Sixth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, Edition 2008.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://www.tutorialspoint.com/unix/shell_scripting.htm
2.	https://nptel.ac.in/courses/117/104/117104115/

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	M	M	S	M	M	M	M	L
CO2	S	S	S	M	S	M	M	M	M	L
CO3	S	S	S	M	S	M	S	S	S	M
CO4	S	S	S	M	S	M	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong;M-Medium;L-Low

Course code		Programming Lab–LINUX and SHELL Programming	L	T	P	C
Core/Elective/Supportive		Core Lab 5	0	0	3	2
Pre-requisite		Students should have prior basic knowledge in operating systems.	Syllabus Version		2025-2026 onwards	

Course Objectives:

The main objectives of this course are to:

1. Describe the architecture and features of Linux Operating System
2. To create programs in the Linux environment using Linux utilities and commands.
3. Students are given an introductory Linux shell command and they will be able to write their own shell scripts.
4. Shell programming is dealt in depth which can be used to develop applications.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Develop Linux utilities to perform File processing, Directory handling and User Management	**K1, K2**
2	Understand and develop shell scripts using pipes, redirection, filters, Pipes and display system configuration	**K2-K3**
3	Develop simple shell scripts applicable to file access permission network Administration	**K3**
4	Apply and change the ownership and file permissions using advanced Unix commands.	**K4-K5**
5	Create shell scripts for real time applications.	**K6**

K1–Remember;**K2** –Understand;**K3** –Apply;**K4**– Analyze;**K5**– Evaluate; **K6**–Create

Programs	**36 hours**

1.Write a shell script to stimulate the file commands: rm, cp, cat, mv, cmp, wc, split, diff.

2.Write a shell script to show the following system configuration:

a. currently logged user and his log name current shell, home directory, Operating System type, current Path setting, current working directory
b. show currently logged number of users, show all available shells
c. show CPU information like processor type ,speed
d. show memory information

3.Write a Shell Script to implement the following: pipes, Redirection and tee commands.

4.Write a shell script for displaying current date, username, file listing and directories by getting user choice.

5.Write a shell script to implement the filter commands.

6.Write a shell script to remove the files which have file size as zero bytes.

7. Write a shell script to find the sum of the individual digits of a given number.

8.Write a shell script to find the greatest among the given set of numbers using command line arguments.

9.Write a shell script for palindrome checking.

10. Write a shell script to print the multiplication table of the event argument using a for loop.

	Total Lecture hours	**36 hours**

Text Book(s)	
1	Operating System LINUX,NIIT,PHI,2006,Eastern Economy Edition.
2	N.B. Venkateswarlu , Introduction to Linux: Installation and Programming, BS Publications,2008, 1st Edition
Reference Books	
1	Richard Petersen, Linux: The Complete Reference, Sixth Edition, Tata McGraw- Hill Publishing Company Limited, New Delhi, Edition 2008.
Related Online Contents[MOOC,SWAYAM,NPTEL,Websitesetc.]	
1	https://www.w3resource.com/linux-exercises/
2	http://spoken-tutorial.org/
Course Designed By:	

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	M	S	M	M	M
CO3	S	S	S	M	S	M	S	S	M	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong;M-Medium;L-Low

Course code		Software Engineering	L	T	P	C
Core/Elective/Supportive		Allied 4	4	0	0	4
Pre-requisite		Basic understanding in software project and system analysis and design concepts	Syllabus Version		2025-2026 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Understand the fundamentals of software engineering and the software development lifecycle.
2. Analyze and model user requirements using structured and object-oriented techniques.
3. Design software solutions applying appropriate architectural, design, and coding principles.
4. Apply systematic software development practices, including planning, testing, quality assurance, and maintenance.
5. Use modern tools and techniques for software project management and development.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understanding the basics of software engineering, planning a software project.	**K1-K2**
2	Obtain the knowledge in software cost estimation and techniques.	**K2-K3**
3	Knowledge on software requirements specification, formal specification techniques, and software design.	**K3**
4	Understanding the design notation, techniques, structured coding techniques, standards and guidelines.	**K4**
5	Knowledge on verification and validation techniques, software maintenance and configuration management.	**K2-K4**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION TO SOFTWARE ENGINEERING	10 hours

Introduction to Software Engineering: Definitions – Size Factors – Quality and Productivity Factors. Planning a Software Project: Planning the Development Process – Planning an Organizational Structure.

Unit:2	SOFTWARE COST ESTIMATION	12 hours

Software Cost Estimation: Software cost Factors – Software Cost Estimation Techniques – Staffing-Level Estimation – Estimating Software Estimation Costs.

Unit:3	SOFTWARE REQUIREMENTS	12 hours

Software Requirements Definition: The Software Requirements specification –Formal Specification Techniques. Software Design: Fundamental Design Concepts – Modules and Modularization Criteria.

Unit:4	DESIGN NOTATIONS	12 hours

Design Notations – Design Techniques. Implementation Issues: Structured Coding Techniques – Coding Style – Standards and Guidelines – Documentation Guidelines.

Unit:5	**VERIFICATION AND VALIDATION TECHNIQUES**	**12 hours**

Verification and Validation Techniques: Quality Assurance – Walkthroughs and Inspections – Unit Testing and Debugging – System Testing. Software Maintenance: Enhancing Maintainability during Development – Managerial Aspects of Software Maintenance – Configuration Management.

Unit:6	**Contemporary Issues**	**2 hours**

Expert lectures, online seminars – webinars(Agile vs. DevOps Integration)

	Total Lecture hours	**60 hours**

Text Book(s)

1	Software Engineering Concepts, Richard Fairley, 1997, TMH. (UNIT-I: 1.1-1.3, 2.3-2.4 UNIT-II: 3.1-3.4 UNIT III: 4.1-4.2, 5.1-5.2 UNIT-IV: 5.3-5.4, 6.1-6.4 UNIT-V: 8.1-8.2, 8.5-8.6, 9.1-9.3)

Reference Books

1	Software Engineering for Internet Applications, Eve Anderson, Philip Greenspun, Andrew Grumet, 2006, PHI.
2	Software Engineering Project Management – 2nd Edition, Wiley India.
3	Software Quality Engineering, Jeff Tian, Student Edition, 2006, Wiley India.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://nptel.ac.in/courses/106105087
2	https://www.coursera.org/learn/software-processes
3	https://www.geeksforgeeks.org/software-engineering/

Course Designed By:

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	L	L	L	S	S
CO2	M	S	S	M	S	M	L	L	S	S
CO3	S	M	M	L	S	M	M	M	S	S
CO4	M	S	S	M	S	L	M	L	S	S
CO5	S	S	S	L	S	L	M	L	M	M

*S-Strong; M-Medium; L-Low

Course code		Programming Lab –Web Application Development	L	T	P	C
Core/Elective/Supportive		Skill Based Subject 2	0	0	3	2
Pre-requisite		Basic knowledge of the internet and basic html.	Syllabus Version	2025-2026 onwards		

Course Objectives:

The main objectives of this course are to:

1. To gain knowledge about how to develop web applications
2. To create web applications using HTML
3. To create web applications using HTML with Style sheets
4. To design interactive web sites with all the features given in Web programming

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the problems and create applications in basics of web programming	**K2-K4,K6**
2	Understand and develop Web pages with formatting styles.	**K2-K3**
3	Apply the features in HTML to present the details given	**K3**
4	Analyze the problem, apply the concept for developing applications	**K4-K5**
5	Create websites of real time applications	**K6**

K1–Remember; **K2**–Understand; **K3**–Apply; **K4**–Analyze; **K5**–Evaluate; **K6**–Create

Programs	**36hours**

1. Create a personal profile webpage using HTML - Use headings, paragraphs, images, links, and lists.
2. Create a timetable layout using HTML tables.
3. Design a student registration form-Include text boxes, radio buttons, checkboxes, drop-down lists.
4. Apply CSS to enhance the above personal profile webpage with External CSS to style fonts, colors, layout and Use classes and IDs to style individual elements
5. Validate user input in a form using java script. check for empty fields, email format, password length and display error messages dynamically without page reload.
6. Create an interactive To-Do list using java script. Add new items dynamically and Delete or mark items as completed.
7. Process an HTML form using PHP. Capture user input (e.g., contact form or feedback) and display submitted data back to the user.

8. Write and read data from a file using PHP. Save form submissions to a text file and Read and display contents on a new page.	
9. Create a user registration and login system. Store user credentials in a MySQL database and Implement login form validation and redirection after login.	
10. Develop a complete dynamic web application Online Feedback System (or) Event Registration Portal (or) Online Quiz.	
	Total Lecture hours **36 hours**
Text Book(s)	
1	Internet and Web Design, ITL Education, Macmillan India Ltd.
2	HTML and XML an Introduction, NIIT, Prentice Hall of India Pvt.Ltd
Reference Books	
1	World Wide Web Design with HTML, C.Xavier, 2007,TMH.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.w3schools.com/
2	https://www.freecodecamp.org/
Course Designed By:	

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	M	L	M	M	M
CO3	L	S	M	M	S	M	S	S	M	M
CO3	S	M	S	S	M	S	S	M	S	S
CO4	M	S	S	S	M	S	M	S	S	L
CO5	S	M	L	S	S	M	S	S	M	S

*S-Strong; M-Medium;L-Low

Semester V

Course code		Python Programming	L	T	P	C
Core/Elective/Supportive		Core 8	6	0	0	4
Pre-requisite		Knowledge on logic of the programs and oops Concept.	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To introduce the fundamentals of Python Programming.
2. To teach about the concept of Functions in Python.
3. To impart the knowledge of Lists, Tuples, Files and Directories.
4. To learn about dictionaries in python.
5. To explore the object-oriented programming, Graphical programming aspects of python with help of built in modules.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Remembering the concept of operators, data types, looping statements in Python Programming.	**K1**
2	Understanding the concepts of Input / Output operations in file.	**K2**
3	Applying the concept of functions and exception handling	**K3**
4	Analyzing the structures of list, tuples and maintaining dictionaries	**K4**
5	Demonstrate significant experience with python program development environment	**K4-K6**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Python Basics and Control Structures	18 hours

Python Overview, Installation, IDLE-Identifiers, Keywords, Comments-Variables, Data Types, Operators-Statements and Expressions-String & Boolean Expressions-Input from Keyboard-Control Flow: if, if-else, elif- Iteration and Loop Control :while, for, break, continue, pass.

Unit:2	Functions and Modular Programming	18 hours

Built-in and User-defined Functions- Parameters and Arguments- Return Statement-Anonymous (Lambda) Functions- Recursive Functions-Writing Python Scripts .

Unit:3	Strings, Lists, Tuples, and Dictionaries	18 hours

String Operations and Methods- List Creation, Indexing, Methods- Tuples – Properties and Use cases-Dictionaries – Key -Value Pairs, Operations- Iteration using Sequences

Unit:4	File Handling and Exceptions	82 hours

Reading/Writing Text Files- Directory Operations-Exception Handling – try, except, else, finally Exception with Arguments- User-defined Exceptions.

Unit:5	Object-Oriented Programming in Python	15 hours

Principles of OOP- Defining Classes and Creating Objects- Passing Objects to Functions- Returning Objects- Class Attributes and Methods- Inheritance- Method Overriding-Data Encapsulation- Data Hiding.

Unit:6	Contemporary Issues	3 hours

Vulnerabilities in third-party packages ,Expert lectures, online seminars - webinars

	Total Lecture hours	**90 hours**
Text Book(s)		
1	**E. Balagurusamy** – Introduction to Computing and Problem Solving Using Python, McGraw Hill	
2	Martin C. Brown - PYTHON: The Complete Reference, McGraw-Hill, 2001	
3	Ashok Namdev Kamthane, Amit Ashok Kamthane - Programming and Problem Solving with Python, McGraw Hill	
Reference Books		
1	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016	
2	Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011	
3	Wesley J Chun, Core Python Applications Programming, Prentice Hall, 2012.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://docs.python.org/3/	
2	https://nptel.ac.in/courses/106/106/106106182/	
3	https://www.coursera.org/specializations/python	
Course Designed By:		

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	L	S	M	L	M	S	S
CO2	S	S	S	L	S	M	L	M	S	S
CO3	S	S	S	L	S	M	L	M	S	S
CO4	S	S	S	L	S	M	L	M	S	S
CO5	S	S	S	L	S	M	L	M	S	S

*S-Strong; M-Medium; L-Low

Course code		Cyber Security	L	T	P	C
Core/Elective/Supportive		Core 9	6	0	0	4
Pre-requisite		Basic knowledge in Internet and data crimes.	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Students should be able to understand.
2. The transformation between threat, risk, attack and vulnerability.
3. How threats materialize into attacks.
4. To find information about threats, vulnerabilities and attacks.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the broad set of technical, social & Cyber Security.	**K2**
2	Understand the security design of operating system.	**K3**
3	Recognize & analyze the importance of Data mining & Big data concepts.	**K1-K4**
4	Implement the methods and techniques to develop projects.	**K4**
5	To improve the Problem-solving skills, Research, Innovation/creativity	**K5**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	INTRODUCTION TO CYBER SECURITY	18 hours

Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authenticate Access Control and Cryptography - Web—User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks.

Unit:2	SECURITY IN OPERATING SYSTEM & NETWORKS	18 hours

Security in Operating Systems - Security in the Design of Operating Systems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

Unit:3	DEFENCES: SECURITY COUNTER MEASURES	18 hours

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

Unit:4	PRIVACY IN CYBER SPACE	18 hours

Privacy Concepts -Privacy Principles and Policies -Authentication and Privacy - Data Mining Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies- Where the Field Is Headed.

Unit:5	MANAGEMENT AND INCIDENTS	15 hours

Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cybercrime - Cyber Warfare and Home Land Security.

Unit:6	Contemporary Issues	3 hours

Expert lectures, online seminars – webinars, case studies (AI-Powered Cyber Attacks, Cyber laws).

	Total Lecture hours	90 hours

Text Book(s)	
1	Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015
2	George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
Reference Books	
1	Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
2	Nelson Phillips and Enfinger Steuart, ―Computer Forensics and Investigations¦, Cengage Learning, New Delhi, 2009
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://csrc.nist.gov
2	https://owasp.org
3	https://www.eccouncil.org
Course Designed By:	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	L	M	M	M	M	M	L
CO2	S	S	S	M	M	M	S	S	M	L
CO3	S	S	S	S	S	M	S	S	S	M
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		Programming Lab – Python	L	T	P	C
Core/Elective/Supportive		Core Lab 6	0	0	6	2
Pre-requisite		Basic knowledge of Programming Concepts	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To write, test and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples and dictionaries.
5. Read and write data from/to files in Python.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Write, test and debug simple Python programs. Read and write data from files in Python	K2
2	Implement Python programs with conditionals and loops.	K3
3	Develop Python programs step-wise by defining functions and calling them.	K4
4	Use Python lists, tuples, dictionaries for representing compound data.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Programs	**36 hours**

1. Write a python program for Student Grade Calculator using Functions.
2. Write a python program to find the square root of a number (Newton's method)
3. Write a python program to check if a given string is Palindrome or not.
4. Write a python program for Menu-Driven Calculator using Loops and Functions
5. Write a python program to perform linear search .
6. Write a python program to perform the following on a list: Find max, min, sort and Count frequency of elements.
7. Write a python program to perform merge sort.
8. Write a python program to create a Class and Object for Employee Details using two methods input () and display ().
9. Write a python program to multiply two matrices.
10. Write a python program using command line arguments (word count)

Text Book(s)

1.**E. Balagurusamy** – Introduction to Computing and Problem Solving Using Python, McGraw Hill

Reference Books

2. Martin C. Brown, —PYTHON: The Complete Reference, McGraw-Hill, 2001

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

Course Designed By:

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	M	M	M	M	M	L
CO2	S	S	S	M	M	M	S	S	M	L
CO3	S	S	S	S	S	M	S	S	S	M
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		Artificial Intelligence and Machine Learning	L	T	P	C
Core/Elective/ Supportive		Skill based Subject –3	3	0	0	2
Pre-requisite		Basic knowledge in Artificial Intelligence and Machine Learning	Syllabus Version		2025-2026 onwards	

Course Objectives:

The main objectives of this course are to:

1. Comprehensive understanding of Artificial Intelligence (AI) and Machine Learning (ML)
2. Exploration of AI concepts, characteristics of intelligent agents, and problem-solving approaches.
3. Fundamentals of machine learning, encompassing various learning paradigms such as supervised and unsupervised learning.
4. Robust understanding of AI and ML principles and their applications in solving real-world problems.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	A strong foundation in core AI concepts	K1
2	The ability to apply AI& ML techniques to solve problems	K2- K3
3	An understanding of the limitations and ethical considerations of these technologies.	K4
4	Understand the basic concepts of AI and Machine Learning.	K3
5	To inculcate knowledge on AI and Machine Learning concepts in turn gives a road map to design a new application.	K1- K4

K1–Remember;**K2** –Understand;**K3** –Apply;**K4**– Analyze;**K5**– Evaluate; **K6**–Create

Unit:1	Introduction to Artificial Intelligence	9 hours

What is AI?-Intelligent Agents: Structure of Agents-Problem Solving by searching: Problem Solving Agents, Example Problems, Search Algorithms, Uninformed and Informed Strategies.

Unit:2	CSP and Knowledge Representation	12 hours

Defining CSP problems, Backtracking search for CSPs. Logical Agents: Knowledge Based Agents, Propositional Logic – A very simple logic– First order Logic-Syntax and Semantics of First order Logic. Automated Planning: Hierarical Planning. Probabilistic Reasoning- Representing Knowledge in uncertain domain.

Unit:3	Introduction to Machine Learning	15 hours

What Is Machine Learning? Examples of Machine Learning Applications: Learning Associations, Classifications Regression, Unsupervised Learning, Reinforcement Learning, Notes, Relevant Resources. Learning a Class from Examples, Vapnik-Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm.

Unit:4	Estimation	15 hours
Unsupervised Learning: Introduction, Types of Unsupervised Learning. Clustering: Introduction, Mixture Densities, k-Means Clustering, Hierarchical Clustering, Choosing the number of clusters.		
Unit:5	**Learning Applications**	**15 hours**
Selected applications in data mining, automated knowledge acquisition, pattern recognition, program synthesis, text and language processing, internet-based information systems, human computer interaction, semantic web, and bioinformatics and computational biology.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars –webinars, critical AI issues, including ethics, governance.		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Prentice Hall, 2020.
2	Christopher M. Bishop, "Pattern Recognition and Machine Learning", 2nd Edition, Springer, 2006
3	Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005.
Reference Books	
1	Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
2	Andreas C. Müller & Sarah Guido, "Introduction to Machine Learning with Python A Guide for Data Scientists", O' Reilly book, 2017
3	Tom M. Mitchell, "Machine Learning", 1st Edition, McGraw-Hill., 1997
Related Online Contents [MOOC, SWAYAM, NPTEL,Websites etc.]	
1	https://g.co/kgs/rzXdVPa
2	https://web.dev/explore/ai
3	https://swayam-plus.swayam2.ac.in/ai-for-all-courses
Course Designed By:	

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	L	M	M	M	M	M	L
CO2	S	S	L	S	M	S	S	S	M	L
CO3	M	M	M	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	L	S	S	M	S	S	M	M	M

*S-Strong; M-Medium; L-Low

Course Code		Core Lab - 7 : Capstone Project Work	L	T	P	C
Core/Elective/Supportive		Core	0	0	3	2
Pre - requisite		• Academic Background • Domain Knowledge	Syllabus version		2025-26 Onwards	

Course Objectives

- To understand and select the task based on their core skills.
- To get the knowledge about analytical skill for solving the selected task.
- To get confidence for implementing the task and solving the real time problems.

Expected Course Outcomes

On the successful completion of the course, student will be able to:

1	Illustrate a real world problem and identify the list of project requirements	**K3**
2	Judge the features of the project including forms, databases and reports	**K5**
2	Design code to meet the input requirements and to achieve the required output	**K6**
3	Compose a project report incorporating the features of the project	**K6**

K1 – Remember K2 – Understand K3 – Apply K4 - Analyze K5 – Evaluate K6 - Create

Aim of the project work

1. The aim of the project work is to acquire practical knowledge on the implementation of the programming concepts studied.
2. Each student should carry out individually one project work and it may be a work using the software packages that they have learned or the implementation of concepts from the papers studied or implementation of any innovative idea focusing on application oriented concepts.
3. The project work should be compulsorily done in the college only under the supervision of the department staff concerned.

Selection of Tools

No restrictions shall be placed on the students in the choice of platform/tools/languages to be utilized for their project work, though open source is strongly recommended, wherever possible. No value shall be placed on the use of tools in the evaluation of the project.

Viva Voce

1. Viva-Voce will be conducted at the end of the semester by both Internal (Respective Guides) and External Examiners, after duly verifying the project report in the college, for a total of 50 marks.
2. Internal Mark Split up (20 marks) : Title Selection – 5 marks, Problem Identification – 5 marks Review I and Review II -10 marks
3. External Mark Split up (30 marks) : Project report 15 marks, Viva PPT Presentation 5 marks and 10 Marks for Viva Voce.

Capstone Project Work Format

PROJECT WORK

TITLE OF THE DISSERTATION

Bonafide Work Done by

STUDENT NAME REG. NO.

Project report submitted in partial fulfillment of the requirements for the award of
<Name of the Degree>

of Bharathiar University, Coimbatore-46.

College Logo

Signature of the Guide

Signature of the HOD

Submitted for the Viva-Voce Examination held on _____

Internal Examiner

External Examiner

Month – Year

CONTENTS

Capstone Project Work Format

RK

PROJECT WORK

TITLE OF THE DISSERTATION

Bonafide Work Done by

STUDENT NAME

REG. NO.

Project report submitted in partial fulfillment of the requirements for the award of
<Name of the Degree>

of Bharathiar University, Coimbatore-46.

College Logo

Signature of the Guide

Signature of the HOD

Submitted for the Viva-Voce Examination held on _____

Internal Examiner

External Examiner

Month – Year

CONTENTS

Semester VI

Course code		Data Mining and R Programming	L	T	P	C
Core/Elective/ Supportive		Core 10	5	0	0	4
Pre-requisite		Basic knowledge of databases and statistical functions	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Introduce the fundamental concepts and techniques of data mining and knowledge discovery.
2. Explore various data mining algorithms including classification, clustering, and association rule mining.
3. Develop the ability to apply appropriate data mining methods to solve real-world problems.
4. Familiarize students with recent trends, tools, and ethical considerations in data mining applications.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Explain the basic principles, tasks, and challenges of data mining.	**K1-K2**
2	Apply suitable data mining techniques such as classification, clustering, and association rules to real-world datasets.	**K3**
3	Analyze the results of data mining models using appropriate performance metrics.	**K4**
4	Evaluate and compare the efficiency of different data mining algorithms.	**K5**
5	Demonstrate awareness of emerging trends and ethical issues in data mining.	**K6**

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate;**K6**–Create

Unit:1	Basic data mining tasks & techniques	14 hours

Basic Data Mining Tasks: Data Mining Versus Knowledge Discovery in Data Bases – Data Mining Issues – Data Mining Metrics – Social Implications of Data Mining – Data Mining from Data Base Perspective – Data Mining Techniques: A Statistical Perspective on Data Mining–Similarity Measures–Decision Trees– Neural Networks– Genetic Algorithms.

Unit:2	Classification & clustering	13 hours

Classification: Introduction–Statistical based Algorithms–Distance based Algorithms–Neural Network based Algorithms– Combining Techniques. Clustering: Introduction–Similarity and Distance Measures–Outliers -Hierarchical Algorithms. Partitional Algorithms-Minimum spanning tree,K-Means Clustering.

Unit:3	Association rules	15 hours

Association Rules: Introduction-Large Item Sets–Basic Algorithms–Comparing Approaches–Incremental Rules–Advanced Association Rules Techniques: Generalized Association Rules, Multiple Level Association Rules. Measuring the Quality of Rules.

Unit:4	Introduction to R and Basics	15 hours

Introduction to R: What is R? – Why R? – Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started. R Data Types and Variables– R Operators-R Decision Making and Looping statements.

Unit:5	**R-Function and strings**	**15 hours**
R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower().Algorithms–Comparing Approaches–Incremental Rules–Advanced Association Rules Techniques–Measuring the Quality of Rules.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert Lectures, Online Seminars–Webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Margaret H.Dunbam, Data Mining Introductory and Advanced Topics, Pearson Education –2003.
2	ArunK.Pujari, “Data Mining Techniques”, Universities Press, 2010.
3	Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN: 978-93-5260-455-5. 2. 3. Tutorials Point (I) simply easy learning,
4	Seema Acharya, Data Analytics using R, McGraw-Hill Education (India), 2018, ISBN: 978-93-5260-524-8.

Reference Books	
1	Jinweihan, Micheline Kambler, Jian Pie, Data Mining: Concepts and Techniques”, Morgan Kaufman Publishers, New Delhi, Third Edition, 2012.
2	K.P.Soman, Shyam Diwakar, V.Ajay, “Insight into Data Mining–Theory and Practice”, Prentice Hall of India, 2009.

Related Online Contents [MOOC, SWAYAM, NPTEL,Websites etc.]

1	https://www.w3schools.com/r/?utm_source
2	https://www.rdatamining.com/resources/free-online-courses?utm_source
3	https://r4ds.had.co.nz/?utm_source

Course Designed By:

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	M	S	M	S	L
CO2	L	M	S	M	M	L	S	L	S	L
CO3	S	S	L	M	M	M	S	M	S	M
CO4	S	M	S	M	S	M	S	M	S	M
CO5	M	S	S	M	M	M	S	M	S	M

*S-Strong; M-Medium; L-Low

Course code		Project Work Lab – Final Phase	L	T	P	C
Core/Elective/ Supportive		Core 11	0	0	5	4
Pre-requisite		Students should have the strong knowledge in any one of the programming languages in this course.	Syllabus Version		2025-2026 onwards	

Course Objectives:

The main objectives of this course are to:

1. To understand and select the task based on their core skills.
2. To get the knowledge about analytical skill for solving the selected task.
3. To get confidence for implementing the task and solving there all-time problems.
4. Express technical and behavioral ideas and thought in oral settings.
5. Prepare and conduct oral presentations

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Formulate a real world problem and develop its requirements develop design solution for a set of requirements.	**K3**
2	Test and validate the conformance of the developed prototype against the originals requirements of the problem.	**K5**
3	Work as a responsible member and possibly a leader of a team in developing software solutions.	**K3**
4	Express technical ideas, strategies and methodologies in written form. Self-learn new tools, algorithms and techniques that contribute to the software solution of the project.	**K1 - K4**
5	Generate Alternative Solutions,comparethem and select the optimum one.	**K6**

K1–Remember;**K2** –Understand;**K3** –Apply;**K4**– Analyze;**K5**– Evaluate; **K6**–Create

AIM OF THE PROJECT WORK

1. The aim of the project work is to acquire practical knowledge on the implementation of the programming concepts studied.
2. Each student should carry out individually one project work and it may be a work using the software packages that they have learned or the implementation of concepts from the papers studied or implementation of any innovative idea focusing on application oriented concepts.
3. The project work should be compulsorily done in the college only under the supervision of the department staff concerned.
4. The project work with 2 new modules to be designed, implemented and it should be completed.

Viva Voce

1. Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) and External Examiners, after duly verifying the **Annexure Report** available in the College, for a total of 100 marks at the last day of the practical session.
2. Out of 100 marks, 60 marks for project report, 20 marks for presentation and 20 marks for Viva Voce.

Project Report Format

PROJECT WORK

TITLE OF THE DISSERTATION

Bonafide Work Done by
STUDENT NAME
REG.NO.

Dissertation submitted in partial fulfillment of the requirements for the award of

<Name of the Degree>

of Bharathiar University,Coimbatore-46**.**

College Logo

Signature of the Guide Signature of the HOD

Submitted for the Viva-Voce Examination held on _____

Internal Examiner External Examiner

Month–Year

CONTENTS

3.2.4 DFD integration with all module if applicable

3.3 Input Design

3.3.1 Sample Input

3.4 Output Design

3.4.1 Sample Output

3.4.2 Screens and Reports

3.5 Data Base Design

3.5.1 Table Design

3.6 Source Code

3.6.1 Sample Code

Chapter IV System Testing and Implementation

4.1 System Testing

4.2 System Implementation

Chapter V Conclusion

5.1 Conclusion

5.2 Scope for the Future

Bibliography

Course Designed By:

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	M	M	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	M	M	S	S	S	S	S
CO4	S	S	S	M	S	S	S	S	S	S
CO5	S	S	S	M	S	S	S	S	S	S

*S-Strong;M-Medium;L-Low

Course code		Programming Lab - Data Mining Using R	L	T	P	C
Core/Elective/Supportive		Core Lab 7	0	0	5	2
Pre-requisite		Basic knowledge of Data Mining algorithms and R programming	Syllabus Version		2025-2026 onwards	

Course Objectives:

The main objectives of this course are:

1. To familiarize students with data handling, exploration, and visualization using R programming.
2. To provide practical exposure to key data preprocessing techniques essential for data mining.
3. To implement and analyze major data mining algorithms such as clustering, classification, regression, and association rule mining.
4. To develop problem-solving skills through real-world data analytics scenarios and result interpretation.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1	Import, explore, and visualize datasets using R programming tools.	K1,K2
2	Apply appropriate data preprocessing techniques to enhance data quality and ensure suitability for analysis.	K2,K3
3	Implement and evaluate clustering algorithms such as K-Means and Hierarchical Clustering.	K3, K4
4	Build classification and regression models using K-NN, Decision Trees, Linear and Logistic Regression.	K5,K6
5	Discover association rules using the Apriori algorithm and interpret the patterns.	K4, K5

K1-Remember; **K2** -Understand; **K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create

LIST OF PROGRAMS

Develop R programs for the following:

1. To import and explore structured datasets in R
2. To perform Exploratory Data Analysis using summary statistics and visualizations.
3. To identify and handle Missing Values in a Dataset
4. To perform classification using Naïve Bayes algorithm and measure model performance.
5. To implement knapsack problem using Genetic Algorithm.
6. To apply K-Nearest Neighbors algorithm and assess results using accuracy and confusion matrix

7. To apply K-Means clustering and visualize cluster assignments on a dataset.
8. To perform hierarchical clustering and represent the cluster structure with a dendrogram.
9. To perform association rule mining using Apriori algorithm.
10. To implement and evaluate a linear regression model on a numerical dataset.

Total Lecture hours	**36 hours**

Text Books

1	Margaret H.Dunham, "Data Mining: Introductory and Advanced Topics", Pearson education,2003.
2	Jeeva Jose, "Beginner's Guide for Data Analysis using R Programming", Khanna Publishing House, 2018.

Reference Books

1	Yanchang Zhao**, "**R and Data Mining: Examples and Case Studies", Academic Press, 2013.
2	G. Sudhamathy, C. Jothi Venkateswaran**, "**R Programming. An Approach to Data Analytics", MJP Publishers, 2019.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

Mapping with Programme Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	M	S	M	S	L
CO2	L	M	S	M	M	L	S	L	S	L
CO3	S	S	L	M	M	M	S	M	S	M
CO4	S	M	S	M	S	M	S	M	S	M
CO5	M	S	S	M	M	M	S	M	S	M

*S-Strong;M-Medium;L-Low

Course code		**Artificial Intelligence and Machine Learning Lab using Python**	**L**	**T**	**P**	**C**
Core/Elective/Supportive		**Skill Based Subject 4**	0	0	3	2
Pre-requisite		Basic knowledge of Data Mining algorithms and R programming	Syllabus Version		2025-26 onwards	

Course Objectives:

The main objectives of this course are:

1. To familiarize students with data handling, exploration, and visualization using R programming.
2. To provide practical exposure to key data preprocessing techniques essential for data mining.
3. To implement and analyze major data mining algorithms such as clustering, classification, regression, and association rule mining.
4. To develop problem-solving skills through real-world data analytics scenarios and result interpretation.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1	Import, explore, and visualize datasets using R programming tools.	K1,K2
2	Apply appropriate data preprocessing techniques to enhance data quality and ensure suitability for analysis.	K2,K3
3	Implement and evaluate clustering algorithms such as K-Means and Hierarchical Clustering.	K3, K4
4	Build classification and regression models using K-NN, Decision Trees, Linear and Logistic Regression.	K5,K6
5	Discover association rules using the Apriori algorithm and interpret the patterns.	K4, K5

K1-Remember;**K2** -Understand; **K3**-Apply;**K4** -Analyze; **K5**-Evaluate; **K6** -Create

LIST OF PROGRAMS

1. Create and load different datasets using Python.
2. Write a python program to compute Mean, Median, Mode, Variance and Standard Deviation using Datasets
3. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
4. Create a simple AI bot.
5. Implement Naive Bayes Theorem to Classify the English Text using python
6. Talking AI using text to speech.
7. Guess the number game using AI logic from user input.
8. Write a python to Predict of house prices based on size using Linear Regression
9. Detect Age and Gender Prediction using images.
10. Develop a classifier to identify spam emails based on email content and sender information. (Use a publicly available spam email dataset).

Total Lecture hours	**75 hours**

Text Books

1	MargaretH.Dunham,"DataMining:IntroductoryandAdvancedTopics",Pearson education,2003.
2	Jeeva Jose, "Beginner's Guide for Data Analysis using R Programming", Khanna Publishing House, 2018

Reference Books

1	Yanchang Zhao**, "**R and Data Mining: Examples and Case Studies", Academic Press, 2013
2	G. Sudhamathy, C. Jothi Venkateswaran**, "**R Programming. An Approach to Data Analytics",MJP Publishers, 2019.

Related Online Contents[MOOC, SWAYAM, NPTEL,Website setc.]

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	S	M	S	L
CO2	L	M	S	M	M	L	S	L	S	L
CO3	S	S	L	M	M	M	S	M	S	M
CO4	S	M	S	M	S	M	S	M	S	M
CO5	M	S	S	M	M	M	S	M	S	M

*S-Strong;M-Medium;L-Low

Elective Papers (V and VI semesters)

Course code		**Internet of Things(IoT)**	**L**	**T**	**P**	**C**
Core/ Elective/ Supportive		**Elective**	**6**	**0**	**0**	**3**
Pre-requisite		Students should have the basic understanding of logical circuits and hardware architecture.	**Syllabus Version**		**2025-26 onwards**	

Course Objectives:

The main objectives of this course are to:

1. To learn the concepts of IoT and its protocols.
2. To learn how to analysis the data in IoT.
3. To develop IoT infrastructure for popular applications.
4. To report about the IoT privacy, security and vulnerabilities solution

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	To Understand The Fundamentals of Internet of Things.	**K1**
2	To know the basics of communication protocols and the designing principles of Web connectivity.	**K2**
3	To gain the knowledge of Internet connectivity principles	**K2-K3**
4	Designing And Develop Smart City in IoT	**K2-K3**
5	Analyzing and evaluate the data received through sensors in IOT.	**K4-K5**

K1-Remember; **K2**-Understand; **K3**-Apply;**K4**-Analyze;**K5** -Evaluate; **K6** -Create

Unit:1	**Introduction**	**15 hours**

Introduction - Definition & characteristics of IoT - physical design of IoT - logical design of IoT -IoT enabling Technologies - IoT levels & Deployment templates. Domain specific IoTs : Home Automation - cities - Environment - Energy - retail - logistics - Agriculture - Industry -Health and life style.

Unit:2	**IOT and M2M**	**12 hours**

IoT and M2M-Difference between IoT and M2M -SDN and NFV for lot- IoT systems management - SNMP -YANG-Netopeer

Unit:3	**IOT specification**	**15 hours**

IoT platforms design Methodology - purpose and specification - process specification - Domain model specification- Information model specification- Service specification- IoT level specification- functional view specification- operational view specification

Unit:4	**Logical design using python**	**15 hours**

Logical design using python - Installing python - type conversions - control flow - functions -modules - File handling - classes. IoT physical devices and End points, building blocks of IoT device-Raspberry Pi.

Unit:5	**IoT and cloud computing**	**15hours**
IoT physical servers & cloud computing- WAMP- Xively cloud for IoT-python Web application frame work- Amazon web services for IoT.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars –webinars , Regulatory and Legal Challenges		
	Total Lecture hours	**75 hours**
Text Book(s)		
1.	Internet of Things - A hands on Approach Authors: Arshdeep Bahga, Vijay Madisetti Publisher: Universities press.	
Reference Books		
1.	Internet of Things - Srinivasa K.G., Siddesh G.M. Hanumantha Raju R. Publisher: Cengage Learning India pvt. Ltd (2018)	
Related Online Contents[MOOC,SWAYAM,NPTEL,Websitesetc.]		
1	ibm.com/topics/iotS	
2	https://thingsboard.io/	
Course Designed By:		

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	L	M	M	M	M	M	L
CO2	S	S	L	M	M	S	S	M	M	L
CO3	M	M	S	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	L	S	M	M	S	S	M	S	M

*S-Strong;M-Medium;L-Low

Course code		Computer Networks	L	T	P	C
Core/ Elective/ Supportive		Elective	6	0	0	3
Pre- requisite		Students should have the knowledge on computer connectivity and connectivity peripherals.	Syllabus Version	2025-2026 onwards		

Course Objectives:

The main objectives of this course are to:

1. To identify various components in a data communication system and understand state-of-the-art in network protocols, architectures and applications.
2. To enable students through the concepts of computer networks, different models and their involvement in each stage of network communication.
3. To educate the concepts of terminology and concepts of the OSI reference model and the TCP/IP reference model and protocols such as TCP, UDP and IP.
4. To be familiar with the concepts of protocols, network interfaces, and design performance issues in local area works and wide area networks.
5. Introduce the student to a network routing for IP networks and how a collision occurs and how to solve it and how a frame is created and character count of each frame.

Expected Course Outcomes:

On the successful completion of the course, student will beable to:

1	Remember the organization of computer networks, factors influencing computer network development and there reasons for having variety of different type sof networks.	**K1**
2	Understand Internet structure and can see how standard problems are solved and the use of cryptography and network security.	**K2**
3	Apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.	**K3**
4	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies	**K4**
5	Knowledge about different computer networks, reference models and the functions of each layer in the models	**K2- K4**

K1–Remember;**K2** –Understand;**K3** –Apply;**K4**– Analyze;**K5**– Evaluate; **K6**–Create

Unit:1	BASICS OF NETWORKS AND OSI MODEL	15 hours

Network Hardware: LAN – WAN – MAN – Wireless – Home Networks. Network Software: Protocol Hierarchies – Design Issues for the Layers – Connection-oriented and connection less services – Service Primitives – The Relationship of services to Protocols. Reference Models: SI Reference Model–TCP/IP reference Model–Comparison of OSI and TCP/IP–Critique of OSI and protocols–Critique of the TCP/IP Reference model.

Unit:2	PHYSICAL LAYER	15 hours

PHYSICAL LAYER – Guided Transmission Media: Magnetic Media – Twisted Pair – Coaxial Cable – Fiber Optics. Wireless Transmission: Electromagnetic Spectrum – Radio Transmission-Microwave Transmission–Infrared and Millimeter Waves– Light Waves. Communication Satellites: Geostationary, Medium-Earth Orbit,LowEarth-orbit Satellites– Satellites versus Fiber.

Unit:3	**DATA-LINK LAYER**	**15 hours**
DATA-LINK LAYER: Error Detection and correction – Elementary Data-link Protocols – Sliding Window Protocols. MEDIUM-ACCESS CONTROL SUB LAYER: Multiple Access Protocols – Ethernet– Wireless LANs– Broadband Wireless– Bluetooth.		
Unit:4	**NETWORK LAYER**	**15 hours**
NETWORK LAYER: Routing algorithms– Congestion Control Algorithms. TRANSPORT LAYER: Elements of Transport Protocols–Internet Transport Protocols: TCP.		
Unit:5	**APPLICATION LAYER**	**12 hours**
APPLICATION LAYER: DNS–E-mail. NETWORK SECURITY : Cryptography–Symmetric Key Algorithms– Public Key Algorithms– Digital Signatures.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars –webinars		
	Total Lecture hours	**75 hours**
Text Book(s)		
1	Computer Networks,AndrewS.Tanenbaum,4th edition,PHI.(UNIT-I:1.2-1.4 UNIT-II:2.2-2.4 UNIT-III:4.2-4.6 UNIT-IV:5.2,5.3,6.2,6.5 UNIT-V:7.1,7.2,8.1-8.4)	
Reference Books		
1	Data Communication and Networks, AchyutGodbole,2007,TMH.	
2	Computer Networks: Protocols,Standards,and Interfaces, UylessBlack,2nd ed,PHI	
Related Online Contents [MOOC,SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/106/101/106101092/	
2	https://www.coursera.org/learn/computer-networking	
Course Designed By:		

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	M	S	M	S	L
CO2	L	M	S	M	M	L	S	L	S	L
CO3	S	S	L	M	M	M	S	M	S	M
CO4	S	M	S	M	S	M	S	M	S	M
CO5	M	S	S	M	M	M	S	M	S	M

*S-Strong;M-Medium;L-Low

Course code		**CLOUD COMPUTING**	**L**	**T**	**P**	**C**
Core/Elective/Supportive		**Elective**	6	0	0	3
Pre-requisite		Basics of Cloud & Its Applications	**Syllabus**		**2025-26 Onwards**	

Course Objectives:

The main objectives of this course are to:

1. Gain knowledge on cloud computing, cloud services, architectures and applications.
2. Enable the students to learn the basics of cloud computing with real-time usage.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts of Cloud and its services, pros and cons	K1,K2
2	Collaborate Cloud for Event & Project Management and day to day applications	K3
3	Collaborate on Corporation & Schedules and task management	K2,K3
4	Analyze on cloud in – Word Processing, Spread Sheets, Presentations Analyze cloud in social networks	K2,K4
5	Explore Web-Based Communication Tools, collaborating via blogs and wikis	K5

K1-Remember; **K2**-Understand; **K3**-Apply;**K4**-Analyze;**K5** -Evaluate; **K6** -Create

Unit: I	**Introduction**	**15**

Understanding Cloud Computing: An introduction to Cloud Computing, History, Working of Cloud Computing, Companies in the Cloud, pros and cons, benefits. Developing Cloud services: Pros and Cons of Cloud Service Development, Types of Cloud Service Development, Discovering Cloud Services Development Services and Tools.

Unit: II	**Cloud computing for every one**	**15**

Cloud Computing for the Family: Centralizing email communications, Centralizing email communications, collaborating on schedules, Grocery lists, To-Do lists, Budgets, contact lists projects and sharing family photos. Cloud Computing for the Community: Communicating Across the Community, Collaborating on Schedules, Collaborating on Group Projects and Events.

Unit: III	**Cloud services**	**15**

Cloud Computing for the Corporation: Collaborating on Reports, Marketing Materials, Expense Reports, Budgets, Financial Statements, Presentations, Presenting on the Road Collaborating on calendars. Schedules and task management: Exploring Online Calendar Applications, exploring on line scheduling, planning and Task Management.

Unit: IV	**Using cloud services**	**15**

Collaborating on event management: Understanding Event Management Applications, Exploring Event Management Applications. Collaborating on word processing: Working of web-based word processing, exploring web based word processors. Collaborating on spreadsheets: Working of web-based Spreadsheets, exploring web based spreadsheets. Collaborating on presentations: preparing presentation online, Evaluating web-based presentation applications.

Unit: V	Cloud computing	13
Collaborating via Web-Based Communication Tools: Evaluating web mail services, Evaluating instant messaging services, Evaluating web conference tools. Collaborating via Social Networks and Groupware: Creating groups on social networks, Evaluating online groupware, collaborating via blogs and wikis: Evaluating Blogs for collaboration, Evaluating Wikis for collaboration.		
Unit: VI	**Contemporary Issues**	**2**
Expert lectures, online seminars –webinars		
	Total Lecture hours	**75 Hours**

TextBooks	
1	MichaelMiller,"Cloud Computing",PearsonEducation,NewDelhi,2009.
ReferenceBooks	
1	AnthonyT.Velte,"CloudComputing:APracticalApproach",1stEdition,TataMcGrawHill Education Private Limited, 2009.
RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]	
1	https://nptel.ac.in/courses/106/105/106105167/
2	https://www.tutorialspoint.com/cloud_computing/index.html
3	https://www.javatpoint.com/cloud-computing-tutorial

Course Designed By:

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**S**	**S**	**S**	**S**	**S**	**M**	**M**	**M**	**M**	**M**
CO2	**S**	**S**	**S**	**S**	**S**	**M**	**M**	**M**	**M**	**M**
CO3	**S**	**S**	**S**	**S**	**S**	**M**	**M**	**M**	**M**	**M**
CO4	**S**	**S**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**

*S-Strong;M-Medium;L-Low

Course Code		BLOCK CHAIN TECHNOLOGY	L	T	P	C
Core/Elective/Supportive		Elective	6	0	0	3
Pre – requisite		Computer Science Basics, Networking	Syllabus version		2025-26 Onwards	

Course Objectives

To understand how block chain systems work, where they are used, their limitations, and how they affect organizations and society now and in the future.

Course Outcomes

1	Demonstrate the basics of Block chain concepts using modern tools/technologies.	K1,K2
2	Analyze the role of block chain applications in different domains including cyber security.	K4
3	To interact with a block chain system by sending and reading transactions	K3-K5
4	Analyze the application of specific block chain architecture for a given problem	K4

K1 – Remember K2 – Understand K3 – Apply K4- Analyze K5 – Evaluate K6- Create

Unit I	BLOCKCHAIN CONCEPTS	09

Blockchain -Blockchain Application Example: Escrow -Blockchain Stack -From Web 2.0 to the Next Generation Decentralized Web Domain Specific Blockchain Applications - Blockchain Benefits & Challenges.

Unit II	BLOCK CHAIN COMPONENTS & APPLICATION TEMPLATES	09

Blockchain Application Templates: Blockchain Application Components- Design Methodology for Blockchain Applications- Blockchain Application Templates.

Blockchain Components & Applications-Setting up Ethereum Development Tools -Ethereum Clients - Ethereum Languages - TestRPC -Mist Ethereum Wallet-MetaMask -Web3 JavaScript API -Truffle - Ethereum Accounts - Keypairs - Working with EOA Accounts - Working with Contract Accounts

Unit III	Smart Contracts	09

Structure of a Contract - Setting up and Interacting with a Contract using Geth Client - Setting up and Interacting with a Contract using Mist Wallet - Smart Contract Examples - Smart Contract Patterns

Unit IV	DECENTRALIZED & CASE STUDIES	09

Implementing Dapps -Case Studies- Crowdfunding- Event Registration- Document Verification- Call Option- Interest Rate Swap - Industrial loT - Machine MaintenancE- Solar Charging Stations.

Unit V	CONCEPT OF MINING & SWARM	09

Mining -Consensus on Blockchain Network - Block Validation -Setting up Mining Node -State Storage in Ethereum . **Swarm** - Swarm Architecture and Concepts -Incentive Mechanisms in Swarm -Swarm Setup- Working with Swarm.

Total Lecture Hours	**45 Hours**

Text Book(s)

1.Block chain Applications -A Hands-On Approach Arshdeep Bahga • Vijay Madisetti

Reference Book(s)

1. Dr. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger", Yellow paper, 2014.
2. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, "A survey of attacks on Ethereum smart contracts", 2016.

Related documents(MOOC,SWAYAM,Websites etc.,)

1. https://onlinecourses.nptel.ac.in/noc22_cs44/preview
2. https://onlinecourses.swayam2.ac.in/aic21_ge01/preview

Course Designed By:

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	M	S	M	S	L
CO2	L	M	S	M	M	L	S	L	S	L
CO3	S	S	L	M	M	M	S	M	S	M
CO4	S	M	S	M	S	M	S	M	S	M
CO5	M	S	S	M	M	M	S	M	S	M

*S-Strong;M-Medium;L-Low

Course code		AUGMENTED REALITY &VIRTUAL REALITY (Reference Book Chapters)	L	T	P	C
Core/Elective/Supportive		ELECTIVE	6	0	0	3
Pre-requisite		Basic Computer Science, 3D Graphics & Animation	Syllabus version		2025-2026 onwards	

Course Objectives:

The main objectives of this course are to:

1. To understand the importance of augmented reality in Industry 4.0 with real-time examples
2. To describe the history and recent developments of AR
3. To provide the need on emerging technologies AR and VR
4. To discuss the revolution and impact of AR
5. To understand the applications of AR and VR

Unit:1	Introduction to Augmented Reality	12-- hours

History of AR (4-4.2.1) - Augmented reality characteristics (1-1.1.1) – Difference between Augmented Reality and Virtual Reality (1-1.1.2) – AR technological components (1-1.2.1.1) – Technologies used in AR– Feature Extraction (1-1.2.2) – Hardware components (1-1.3) – AR devices (1-1.3.3) – Importance of AR (2-2.2.1) - Real world uses of AR – AR types (2-2.2.2) – Software tools available for AR (1-1.5)

Unit:2	Need of technologies for Augmented Reality	12-- hours

Hardware technology (5-5.4) – virtual scenes (5-5.4) – 3D objects (5-5.4) – AR components (5-5.4.1) – Display (5-5.4.2) – HMD – Eyeglasses (5-5.4.4) – Contact Lenses(5-5.4.5) – significance of AR(5- 5.5) – AR powered devices (7-7.4)– AR application development drawbacks (7-7.4) – Compatibility – Performance (7-7.4) – AR libraries (7-7.6) – Motion tracking (7-7.7) – Environmental understanding – Anchors (7-7.8)

Unit:3	Technology Integration and Implementation of AR	12-- hours

Technology use and integration in industrial settings (5-5.6) – Assistive training to faculty members (5-5.7) – Planning and administration for implementation (5-5.8) – AR implications (5-5.8.1) – Practical data – AR labs (5-5.8.2) – Platforms to form AR content (5-5.10.2) – Coordinated utilization of AR applications – Hands-on preparation (5-5.11)

Unit:4	Augmented Reality and Virtual Reality for Micro Learning	12-- hours

Micro learning techniques (5-5.11 [9]) – Utilizing VR for learning – VR for Practical online assessment (5-5.11 [9 A])– VR info graphics (5-5.11)– Virtual case considerations (5-5.11) - Utilizing AR for learning (4-4.4) – Accessible learning (5-5.12) – sensible data (5-5.12) – elevated learner engagement (5-5.12) - VR technology (2-2.3) – Components of VR (2-2.3.1) – VR Hardware (2-2.3.2) – VR applications (2-2.3.3) – Civil Engineering (2-2.3.3) – Real Estate (2-2.3.3) – Biology and Medicine (2- 2.3.3) – Virtual Mall (2-2.3.3) – VR in Education (2-2.3.3) – Virtual Laboratory – Factory Planning – Automobile Industry (2-2.3.3)

Unit:5	Tools and Applications of Augmented Reality	12-- hours
Tools available for Augmented Reality and Recognition (1-1.5) – Software Tools (1-1.5.1) – Google Poly – Unity – software approaches – recognition types (1-1.5.2) – native software solutions (1-1.5.2.1)		

– ARKit (7-7.6) – ARCore (7-7.6, 7.10.3) – software development kit - Cloud services - AR business applications (1-1.4) – weather prediction (1-1.4.2) – market prediction (1-1.4.3) – smart cities (1-4.4) - AR application for Education (4-4.3) - AR application for Healthcare sector (8-8.3) – Agriculture – Civil Engineering – Architecture – Archaeology – Crime and Security (2-2.2.7) – Games (6-6.2) – IoT (8-8.3.3) – Use cases (7-7.9) – Social Media (7-7.9.1) – Gaming (7-7.9.2) – Education (7-7.9.3) – Healthcare (7-7.9.4) – Shopping and Business (7-7.9.5)

	Total Lecture hours	**60-- hours**

Reference Book	
1	Kaliraj P, Devi T, (2021). Innovating with Augmented Reality: Applications in Education and Industry (P. Kaliraj, Ed.) (1st ed.). Auerbach Publications. https://doi.org/10.1201/9781003175896
Course Designed by:	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	M	M	S	M	S	L
CO2	L	M	S	M	M	L	S	L	S	L
CO3	S	S	L	M	M	M	S	M	S	M
CO4	S	M	S	M	S	M	S	M	S	M
CO5	M	S	S	M	M	M	S	M	S	M

*S-Strong;M-Medium;L-Low

Course code		PHP & Scripting Languages	L	T	P	C
Core/Elective/Supportive		Elective	6	0	0	3
Pre-requisite		Basic knowledge on HTML and CSS and OOPs concept.	Syllabus Version		2025-2026 onwards	

Course Objectives:

The main objectives of this course are to:

1. To understand the scripting languages used while developing web applications
2. To enable students to learn VB script and Java script for implementing event procedures.
3. To familiar SSI and Cookies and plugins
4. To learn about the server side scripting language to build web applications
5. To enable the students to learn how to build applications in PHP with database.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basics of .VB script and Java script	**K1**
2	Understand the I/O handling, data validation, Activex control and validation	**K2**
3	Understand and remember the java script objects, form validations, cookies and plugins	**K2**
4	Understand the sever side scripting language basics	**K3**
5	Knowledge on PHP objects, cookies, connecting remote files, and database connections	**K2-K4**

K1 – Remember; **K2** – Understand; **K3** – Apply; **K4** – Analyze; **K5** – Evaluate; **K6** – Create

Unit:1	Introduction to .NET Framework	15 hours

VB Script and Java Script: Language structure – control structure – Procedures and functions – Error handling.

Unit:2	File I/O, Object Oriented Concepts and Message Queues	15 hours

VB Script: Input & Output – Data Validation –Integration with Forms – Activex Control & Scripting

Unit:3	VB.NET IDE and Controls	15 hours

Java Script: Form Validation – SSI and Cookies – Frames and Windows – MIME Types – Plugins

Unit:4	VB.NET & ASP.NET	15 hours

PHP: Server side scripting Language: Basic syntax – Types – Variables – Constants – Expressions – Operators – Control Structures.

Unit:5	Web Services	12 hours

PHP: Functions – Classes and Objects – HTML forms – HTTP authentication with PHP – Cookies – Handling file uploads – Using remote files – Connection handling – Database Connections.

Unit:6	Contemporary Issues	3 hours

Expert lectures, online seminars – webinars

	Total Lecture hours	**75 hours**
Text Book(s)		
1	Christopher J.Goddard, Mark White, Mastering VB Script, Galgotia Publications, New Delhi.	
2	Lee Purcell, Mary Jane Mara, The ABCs of Javascript.	
Reference Books		
1	Steven Holzner, PHP: The Complete Reference.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.tutorialspoint.com/php/	
2	https://phptherightway.com/	
Course Designed By:		

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	L	M	M	M	M	M	L
CO2	S	S	L	M	M	S	S	M	M	L
CO3	M	M	S	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	L	S	M	M	S	S	M	S	M

*S-Strong;M-Medium;L-Low

Course Code		Big Data Analytics	L	T	P	C
Core/elective/Supportive		Elective	6	0	0	3
Pre- requisite		Essential computer Languages	Syllabus version			2025-2026 onwards

Course Objectives

- To introduce the concept of Bigdata analytics
- Data Processing and Analysis
- Real-world Applications

Expected Course Outcomes

1	Understand the key issues in big data management and its associated applications in Intelligent business and scientific computing.	K2
2	Understand the concepts of Hadoop Distributed file system and Hadoop filesystem interfaces.	K2
3	Illustrate the concepts of PIG and HIVE	K2
4	Identify the characteristics of datasets and compare the trivial data and big data for Various applications.	K3

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

UNIT I	Introduction to Data	17

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop,Analysing Data with Unix tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Info sphere Big Insights and Big Sheets.

UNIT II	Introduction to HDFS	19

HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives,HadoopI/O:Compression, Serialization, Avro and File-Based Data structures.

UNIT III	Jobs & Tasks	17

MapReduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling,Shuffle and Sort,Task Execution,Map Reduce Types and Formats, Map Reduce Features.

UNIT IV	Hadoop Eco System Pig	18

Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase :HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. BigSQL:Introduction

UNIT V	Data Analytics with R Machine Learning	19

Data Analytics with R Machine Learning:Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
Total Lecture Hours		**90**

TEXT BOOK(S)

1)	MichaelBerthold,DavidJ.Hand,"IntelligentDataAnalysis",Springer,2007.
2)	JayLiebowitz,"BigData and Business Analytics"AuerbachPublications,CRCpress(2013)
3)	TomPlunkett,MarkHornick,"UsingRtoUnlocktheValueofBigData:BigDataAnalytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media(2013),Oracle press.
4)	Anand Rajaramanand JefreyDavidUlman, "Mining of Massive Datasets",Cambridge University Press, 2012.
Reference Book(s)	
1	BillFranks,"TamingtheBigDataTidalWave:FindingOpportunitiesinHugeDataStreams withAdvancedAnalytics",JohnWiley&sons,2012.
2	GlenJ.Myat, "MakingSense ofData", JohnWiley& Sons,2007
3	PeteWarden,"BigDataGlossary",O"Reily,2011.
4	MichaelMineli,MicheleChambers,AmbigaDhiraj,"BigData,BigAnalytics:Emerging Business Intelligence and AnalyticTrends forToday's Businesses",WileyPublications,2013.
5	ArvindSathi,"BigData Analytics: Disruptive Technologies for Changing the Game",MC Press,2012
6	PaulZikopoulos,DirkDeRoos,KrishnanParasuraman,ThomasDeutsch,JamesGiles,DavidCorigan,"HarnessthePowerofBigDataTheIBMBigDataPlatform",TataMcGraw Hill Publications,2012
	RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)
1	**https://onlinecourses.swayam2.ac.in/aic20_sp06/preview**
2	**https://onlinecourses.swayam2.ac.in/arp19_ap79/preview**

Course Designed by :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO2	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO3	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO4	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO5	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

*S-Strong;M-Medium;L-Low

Course Code		Embedded Systems	L	T	P	C
Core/elective/Supportive		Elective	6	0	0	3
Pre- requisite		Digital Logic Design	Syllabus version		2025-2026 onwards	

Course Objectives

- Introduce the fundamentals of embedded systems, including hardware and software components, real-time constraints, and design methodologies.
- Develop an understanding of microcontrollers, their architectures, and interfacing techniques used in embedded applications.
- Enable students to write embedded C programs for microcontrollers and perform peripheral

Expected Course Outcomes

1	Understand the fundamental concepts of embedded systems, including architecture, components, and classification.	**K2**
2	Analyze the role of microcontrollers and their architecture, especially the ARM/8051 family, in embedded system design.	**K2**
3	Write and debug embedded C programs for basic input/output and control functionalities	**K4**
		K5

K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create

UNIT I	Introduction to Embedded Systems	15

ExamplesofEmbeddedSystems–TypicalHardware–Memory–Microprocessors–Busses–DirectMemoryAccess– Introductionto8051Microcontroller –Architecture-Instruction set – Programming.

UNIT II	Microprocessors	16

Microprocessor Architecture–Interrupt Basics– The Shared-Data problem–Interrupt Latency-Round–Robin Architecture - Round–Robin with Interrupts Architecture - Function-Queue Scheduling Architecture– Real-Time Operating Systems Architecture– Selection of Architecture.

UNIT III	Tasks&Semaphores	14

TasksandTaskStates–TasksandData–SemaphoresandSharedData–SemaphoreProblems–Semaphore variants.

UNIT IV	Message Queues& RTOS	15

MessageQueues–Mailboxes–Pipes–TimerFunctions–Events–MemoryManagement–InterruptRoutinesinRTOSEnvironment.RTOSdesign–Principles–EncapsulationSemaphoresandQueues–Hard Real-Time SchedulingConsiderations–Saving Memory Space– Saving Power.

UNIT V	Host &Target Machines	15

Host and Target Machines–Linker/Locator for Embedded Software-Getting Embedded Software in to theTarget System.Testing on your Host Machine –Instruction Set Simulators–Laboratory Tools Used for Debugging.

Unit:6	Contemporary Issues	3 hours
Expert lectures, online seminars – webinars		

Total Lecture Hours	75 Hours

Text Book(s)	
1	The 8051 Microcontroller Architecture, Programming& Applications,KennethJ. Ayala, Penram International.
2	An Embedded Software Primer,DavidE.Simon,PearsonEducation,2005.

Reference Book(s)	
1	Embedded Systems:Architecture,ProgrammingandDesign,RajKamal,TataMcGraw-Hill Education,2008
	Related Online Contents(MOOC,SWAYAM,NPTEL,Websitesetc)
1	**https://onlinecourses.swayam2.ac.in/aic20_sp06/preview**
2	**https://onlinecourses.swayam2.ac.in/arp19_ap79/preview**

CourseDesignedby :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	M	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L

*S-Strong;M-Medium;L-Low

Course Code		Natural Language Processing	L	T	P	C
Core/elective/Supportive		Elective	6	0	0	3
Pre - requisite		Machine Learning, Python	Syllabus version		2025-2026 Onwards	

Course Objectives

- To introduce the fundamental concepts and techniques of natural language processing (NLP)

Expected Course Outcomes

1	Understand the fundamental concepts and techniques of natural language processing (NLP)	K2
2	Understanding of the models and algorithms in the field of NLP.	K2
3	Demonstrate the computational properties of natural languages and the commonly used algorithms for processing linguistic information.	K2
4	Understanding semantics and pragmatics of languages for processing	K2

K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create

UNIT I	Introduction to NLP	15

Introduction: application of NLP techniques and key issues- MT grammer checkers- dictation – document generation- NL interfaces- Natural language processing key issues- the different analysis level used for NLP: morpho-lexical-syntactic-semantic-pragmatic-markup(TEI, UNICODE)-finite state automata- Recursive and augmented transition networks- open problems

UNIT II	Lexical Level	15

Lexical level: error tolerant lexical processing(spelling error correction)-transducers for the design of morphologic analyzers features-towards syntax: part-of-speech tagging(BRILL,HMM)- efficient representations for linguistic resources(lexica, grammars,….) tries and finite state automata.

UNIT III	Syntactic Level	15

Syntactic level: grammars (eg. formal/Chomsky hierarchy,DCSGs, systematic case, unification, stochastic)- parsing (top-down ,bottom up, char(early algorithm),CYK algorithm)- automated estimation of probabilistic model parameters(inside-outside algorithm)- data oriented parsing- grammar formalisms and treebanks- efficient pasting for context-free grammars(CFGs)-statistical parsing and probabilistic CFGs(PCFGs)-lexicalized PCFGse.

UNIT IV	Semantic Level	15

Semantic level: logical forms- ambiguity resolution- semantic network and parsers- procedural semantics- Montague semantics- vector space approaches- distributional semantics-lexical semantics and word sense disambiguation-compositional semantics semantic role labeling and sematic parsing

UNIT V	Pragmatic LEvel	15

Pragmatic level: knowledge representation- reasoning- plan/goal recognition –speech acts/intentions – belief models- discourse- reference. Natural language generation: content determination – sentence planning- surface realization, subjectivity and sentiment analysis.

Unit:6	Contemporary Issues	3 hours

Expert lectures, online seminars – webinars

Total Lecture Hours	75 Hours

Text Book(s)	
1	Daniel J and James H. Martin, ‖speech and language processing‖ an introduction to natural language processing, computational linguistcs& speech recognition ‖prentice hall,2009.
Reference Book(s)	
1	Lan H Written and Elbef,Mark A.Hall,‖ data mining: practical machine learning tools and Techiniques ‖,Morgan Kaufmann,2013
	Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)
1	**https://onlinecourses.swayam2.ac.in/aic20_sp06/preview**
2	**https://onlinecourses.swayam2.ac.in/arp19_ap79/preview**
Course Designed by :	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO2	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO3	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
CO4	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

S-Strong; M-Medium; L-Low

Course Code		Ethical Hacking	L	T	P	C
Core/Elective/Supportive		Elective	6	0	0	3
Pre - requisite		Networking Concepts	Syllabus version		2025-2026 Onwards	

Course Objectives

- To introduce the concepts of security and carious kinds of attacks
- To explain about system hacking and penetration testing

Expected Course Outcomes

1	Explain the importance of security and various types of attacks	K2
2	Understand the concepts of scanning and system hacking	K2
3	Explain about penetration testing and its methodology	K2
4	Identify the various programming languages used by security professional	K4

K1 – Remember K2 – Understand K3 – apply K4- Analyze K5 – evaluate K6- Create

UNIT I	**Introduction To Hacking**	**15**

Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Foot printing – Information Gathering Methodology – Foot printing Tools –DNS Information Tools-Meta Search Engines.

UNIT II	**Scanning And Enumeration**	**15**

Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction to Enumeration – Enumeration Techniques and Procedure.

UNIT III	**System Hacking**	**15**

Introduction – Cracking Passwords – Password Cracking Websites – Password Guessing –Password Cracking Tools – Password Cracking Countermeasures - Keyloggers and Spyware.

UNIT IV	**Programming For Security Professionals**	**15**

HTML–Perl – Windows OS Vulnerabilities – Tools for Identifying Vulnerabilities Countermeasures

UNIT V	**Penetration Testing**	**15**

Introduction – Security Assessments – Types of Penetration Testing- Phases of Penetration Testing– Tools – Choosing Different Types of Pen-Test Tools.

Unit:6	**Contemporary Issues**	**3 hours**

Expert lectures, online seminars – webinars

Total Lecture Hours	**75 Hours**

Text Book(s)

1	EC-Council, ―Ethical Hacking and Countermeasures: Attack Phases‖, Cengage Learning,2010.
2	Jon Erickson, ―Hacking, 2nd Edition: The Art of Exploitation‖, No Starch Press Inc., 2008.
3	Michael T. Simpson, Kent Backman, James E. Corley, ―Hands-On Ethical Hacking and Network Defense‖, Cengage Learning, 2013.

Reference Book(s)

1	Patrick Engebretson, ―The Basics of Hacking and Penetration Testing – Ethical Hacking and Penetration Testing Made Easy‖, Second Edition, Elsevier, 2013.
2	Rafay Boloch, ―Ethical Hacking and Penetration Testing Guide‖, CRC Press, 2014

	Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview	
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview	
Course Designed by :		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	L	L	L	L	L	L	L	L

S-Strong; M-Medium; L-Low

Course Code	DIGITAL MARKETING	L	T	P	C
Core/Elective/Supportive	Elective	6	-	-	3
Pre-requisite	Analytical Thinking		Syllabus Version	2025-2026 onwards	

Course Objectives:

The main objectives of this course are to:

1. Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media
2. Learn and develop, evaluate, and execute a comprehensive digital marketing strategy and plan
3. Learn how to measure digital marketing efforts and calculate ROI
4. Explore the latest digital ad technologies

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1	Define and explain various terminologies associated with Digital Marketing.	K1, K2
2	Apply the knowledge of Digital marketing concepts.	K2, K3
3	Construct an appropriate marketing model.	K2, K3
4	Analyze role and importance of digital marketing in a rapidly changing business landscape.	K3
5	Implement the key elements of a digital marketing strategy.	K2

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Unit:1	**INTRODUCTION TO DIGITAL MARKETING**	**9 hours**

Digital marketing, Marketing v/s Sales, comparison between digital and traditional marketing, Benefits of Digital marketing, Digital marketing platforms and Strategies, Defining Marketing Goals, Latest Digital marketing trends, Case studies of Digital Campaigns.

Unit:2	**SEARCH ENGINE OPTIMIZATION(SEO)**	**9 hours**

Components of Search Engines, SEO Keyword Planning, Meta Tags and Meta Description, Website Content Optimization, Back Link Strategies, Internal and External Links, Optimizing Site Structure Keywords in Blog and Articles, On Page SEO, Off Page SEO, Local SEO, Mobile SEO, Ecommerce SEO, optimizing with Google Algorithms, Using Web Master Tool, Measuring SEO Effectiveness.

Unit:3	**SOCIAL MEDIA MARKETING (SMM)**	**10 hours**

Introduction to social Media Marketing, Benefits of using SMM, Social Media Statistics, Social Media Strategy, Facebook Marketing, Word Press blog creation, Twitter marketing, LinkedIn Marketing, Google plus marketing, Social Media Analytical Tools.

Unit:4	**SEARCH ENGINE MARKETING (SEM)**	**10 hours**

Hough transforms and other simple object recognition methods, shape correspondence and shape matching, Principal component analysis, Shape priors for recognition. Image Understanding-Pattern recognition methods-HMM, GMM and EM

Unit:5	APPLICATION	10 hours
Google Analytics, Online Reputation Management, E-Mail Marketing, Affiliate Marketing, Social Media Analytics, Ad designing		

Unit:6	Contemporary Issues		3 hours
Expert lectures, online seminars – webinars			

	Total Lecture hours	48 hours
	Text Book(s)	
1	Ryan Deiss and Russ Hennes berry, “Digital Marketing forDummies",2017	
2	Puneet singh bhatia, “Fundamentals of DigitalMarketing”,2017	

References

1) Introduction to Programmatic Advertising ByDominikKosorin,2016
2) Blogging: A Practical Guide to Plan Your Blog: Start Your Profitable Home- Based Business with a Successful Blog by Jo and DaleReardon,2015
3) Email Persuasion: Captivate and Engage Your Audience, Build Authority and Generate More Sales With Email Marketing By IanBrodie,2013
4) Social Media Marketing All-In-One for Dummies By Jan Zimmerman and Deborah Ng,2017

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	M	S	M	M	S	M	M
CO2	M	S	S	S	S	L	M	S	M	M
CO3	S	S	M	M	S	L	S	M	M	S
CO4	M	M	S	S	M	M	M	M	M	M
	M	M	M	M	M	M	M	L	L	L

*S-Strong; M-Medium; L-Low