B.Sc. Computer Science & Applications

Syllabus

AFFILIATED COLLEGES

Program Code: 28D

2025 – 2026 onwards

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

Program Educational Objectives (PEOs)	
The **B. Sc. Computer Science and Applications** program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Graduates of the program will be engaged in the computing profession, and will be engaged in learning, understanding, and applying new ideas and technologies as the field evolves.
PEO2	To Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
PEO3	Possess an attitude and aptitude for research, entrepreneurship and higher studies in the field of Computer Science & Engineering and Information Technology.
PEO4	Able to provide socially acceptable technical solutions to real world problems with the application of modern and appropriate programming techniques.
PEO5	Possess better communication, presentation, time management and team work skills leading to responsible & competent professionals and will be able to address challenges in the field of IT at global level.

Program Specific Outcomes (PSOs)	
After the successful completion of **B.Sc. Computer Science Applications** program, the students are expected to	
PSO1	To impart education with clear knowledge of the fundamentals and applied aspects of Computer Science and engineering.
PSO2	To Design next-generation computer systems, networking devices, search engines, soft computing and intelligent systems, web browsers, and knowledge discovery tools.
PSO3	To expose the students to open Source technologies so that they become familiar with it and can seek appropriate opportunity in trade and industry.
PSO4	Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm
PSO5	To inculcate effective communication skills combined with professional & ethical attitude.

Program Outcomes (POs)	
On successful completion of the B.Sc. **Computer Science Applications** program	
PO1	**Disciplinary knowledge:** Capable to apply the knowledge of mathematics, algorithmic principles and computing fundamentals in the modeling and design of computer based systems of varying complexity.
PO2	**Scientific reasoning/ Problem analysis**: Ability to critically analyze, categorizes, formulate and solve the problems that emerges in the field of computer science.
PO3	**Problem solving:** Able to provide software solutions for complex scientific and business related problems or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations.
PO4	**Environment and sustainability:** Understand the impact of software solutions in environmental and societal context and strive for sustainable development.
PO5	**Modern tool usage:** Use contemporary techniques, skills and tools necessary for integrated solutions.
PO6	**Ethics:** Function effectively with social, cultural and ethical responsibility as an individual or as a team member with positive attitude.
PO7	**Cooperation / Team Work:** Function effectively as member or leader on multidisciplinary teams to accomplish a common objective.
PO8	**Communication Skills:** An ability to communicate effectively with diverse types of audience and also able to prepare and present technical documents to different groups.
PO9	**Self-directed and Life-long Learning:** Graduates will recognize the need for self-motivation to engage in lifelong learning to be in par with changing technology.
PO10	Enhance the research culture and uphold the scientific integrity and objectivity

BHARATHIAR UNIVERSITY: COIMBATORE 641 046

B.Sc. Computer Science and Applications (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 Paper I : Programming Concepts in C	5	3	25	75	100	4
III	Core Lab - I : Programming Lab - C	4	3	20	30	50	2
III	Core Paper - II : Digital Fundamentals and Computer Architecture	5	3	25	75	100	4
III	Allied Paper – I : 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 Paper – III: OOPs with Java Programming	6	3	25	75	100	4
III	Core Lab – II : Programming Lab – Java	5	3	20	30	50	2
III	Core Lab – III : Office Automation and Internet	3	3	20	30	50	2
III	Allied Paper – II : 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 Paper – IV: Data Structures	4	3	25	75	100	4
III	Core Paper – V: RDBMS Programming	5	3	25	75	100	4
III	Core Lab - IV: Programming Lab – RDBMS	3	3	20	30	50	2
III	Allied Paper – III: Computer Networks	4	3	25	75	100	4
III	Skill Based Subject – I :Internet Programming	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	Naan Mudhalvan Skill Course ***			25	25	50	2
IV	Health and Wellness****			100	-	100	1
	Total	**30**		**295**	**505**	**800**	**28**

	Semester IV						
I	Language – IV	6	3	25	75	100	4
II	English – IV	4	3	25	75	100	4
III	Core Paper – VI : Operating System	4	3	25	75	100	4
III	Core Paper – VII : Linux and Shell Programming	4	3	25	75	100	4
III	Core Lab –V: Programming Lab – Linux and Shell Programming	3	3	20	30	50	2
III	Allied – IV : Software Engineering	4	3	25	75	100	4
III	Skill Based Subject Programming Lab – I : Internet Programming	3	3	20	30	50	2
IV	Tamil**/Advanced Tamil* (OR) Non- major elective –II (General Awareness*)	2	3	-	50	50	2
IV	Naan Mudhalvan Skill Course ***		-	25	25	50	2
	Total	**30**		**190**	**510**	**700**	**28**
	Semester V						
III	Core - VIII : Python Programming	6	3	25	75	100	4
III	Core Lab – VI : Programming lab – Python	6	3	20	30	50	2
III	Core – IX : Cyber Security	6	3	25	75	100	4
III	Elective – I : Client Server Computing / Distributed Computing/ Mobile Computing	6	3	25	75	100	3
III	Skill Based Subject – II : Data Analytics	3	3	25	25	50	2
III	Core Lab - VII : Capstone Project Work Lab - Phase I*****	3	3	20	30	50	2
IV	Naan Mudhalvan Skill Course ***	6	-	25	25	50	2
	Total	**30**		**165**	**335**	**500**	**19**
	Semester VI						
III	Core – X : Multimedia and its Applications	5	3	25	75	100	4
III	Core Lab – VIII : Programming Lab - Multimedia	5	3	20	30	50	2
III	Core Lab – IX : Project Work Lab - Final Phase	5	3	25	75	100	4
III	Elective – II : Artificial Intelligence / Business Intelligence/ Computational Intelligence	6	3	25	75	100	3
III	Elective – III : E-Learning/ Machine Learning/ Internet of Things (IoT)	6	3	25	75	100	3
III	Skill Based Subject Programming Lab – II : Data Analytics	3	3	20	30	50	2
V	Extension Activities**	-	-	50	-	50	2
IV	Naan Mudhalvan Skill Course ***		-	25	25	50	2
	Total	**30**		**215**	**385**	**600**	**22**
	Grand Total	**180**		**1175**	**2575**	**3750**	**143**

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	
Core and Allied Theory Paper	100	25	10	75	30	40
Skilled Based Subject Theory Paper	50	25	10	25	10	20
Foundation Course Theory Paper	50	-	-	50	20	20
Health and Wellness	100	100	40	-	-	40
Core Practical Paper and Skill Based Subject Lab Paper	50	20	8	30	12	20
Capstone Project Work Lab	50	20	8	30	12	20
Project Work Lab	100	25	10	75	30	40

INTERNAL MARKS BREAK UP

Core Paper, Allied Subject and Skilled Based Subject (Theory)

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

Practical Paper & Skill Based Subject Lab

Components	Observation	Record	Model Practical	Total
Program 1 and Program 2	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 Paper, Allied Subject 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

Practical Paper & Skill Based Subject Lab Paper

Components	Max. Marks	Aim & Algorithm	Keying	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	4 X 1 = 4
Understand, Apply	K2,K3	B	Paragraph about 2 pages	Either or Pattern (Unit Wise)	5 X 2 = 10
Apply, Analyze	K3,K4	C	Essay type about 4 pages	2 out of 5 questions (Unit Wise)	2 X 8 = 16
				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)


First
Semester

Course code		Programming Concepts in C	L	T	P	C
Core/Elective/Supportive		Core Paper: I	5	0	0	4
Pre-requisite		Students should have basic Computer Knowledge	Syllabus Version		2025-26	

Course Objectives:

The main objectives of this course are to:

1. To impart knowledge about Computer fundamentals
2. To understand the concepts and techniques in C Programming
3. To equip and indulge themselves in problem solving using C

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 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 programs using pointers Arrays and file management	**K3**

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

Unit:1	Fundamentals of Computers & Problem Solving in C	15 hours

Fundamentals of Computers : Introduction – History of Computers-Generations of Computers-Classification of Computers-Basic Anatomy of a Computer System-Input Devices-Processor-Output Devices-Memory Management – Types of Software- Overview of Operating System-Programming Languages-Translator Programs-Problem Solving Techniques - Overview of C.

Unit:2	Overview of C	15 hours

Overview of C - Introduction - Character set - C tokens - keyword & Identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables - Defining Symbolic Constants - Arithmetic, Relational, Logical, Assignment, Conditional, Bitwise, Special, Increment and Decrement operators - Arithmetic Expressions - Evaluation of expression - precedence of arithmetic operators - Type conversion in expression – operator precedence & associativity - Mathematical functions - Reading & Writing a character - Formatted input and output.

Unit:3	Decision Making , Looping and Arrays	15 hours

Decision Making and Branching: Introduction – if, if….else, nesting of if …else statements- else if ladder – The switch statement, The ?: Operator – The goto Statement. Decision Making and Looping: Introduction- The while statement- the do statement – the for statement-jumps in loops. Arrays – Character Arrays and Strings

Unit:4	User-Defined Functions, Structures and Unions	15 hours

User-Defined Functions: Introduction – Need and Elements of User-Defined Functions-Definition-Return Values and their types - Function Calls – Declarations – Category of Functions- Nesting of Functions - Recursion – Passing Arrays and Strings to Functions - The Scope, Visibility and Lifetime of Variables- Multi file Programs. Structures and Unions

Unit:5	**Pointers & File Management**	**12 hours**
Pointers: Introduction-Understanding pointers -Accessing the address of a variable Declaration and Initialization of pointer Variable – Accessing a variable through its pointer Chain of pointers- Pointer Expressions – Pointer Increments and Scale factor- Pointers and Arrays- Pointers and Strings – Array of pointers – Pointers as Function Arguments Functions returning pointers – Pointers to Functions – Pointers and Structures. File Management in C.		
Unit:6	**Contemporary Issues**	**3 hours**
Problem Solving through C Programming - Edureka		
	Total	**75 hours**

Text Book(s)

1	E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, Second Reprint 2008

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.

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 – Coursera

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
CO3	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 Paper : II	5	0	-	4
Pre-requisite		Student should have basic computer knowledge	Syllabus Version		2025-26 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 Gates	15 hours

Number System and Gates Number System and Binary Codes: Decimal, Binary, Octal, Hexadecimal – Binary addition, Multiplication and Division – Floating point representation, Complements of a Binary Number, BCD, Excess3, Gray Code. **Logic Gates** : The Basic Gates – NOR, NAND, XOR Gates.

Unit:2	Combinational and Logic Circuits	15 hours

Combinational and Logic Circuits: Boolean algebra Demorgan's Theroms, Karnaugh map – Canonical form Construction and properties.–Implicants– Don't care combinations - Product of sum, Sum of products Simplifications.

Unit:3	Arithmetic and Sequential Circuits	15 hours

Arithmetic Circuits: Half adder, Full adder, Parallel binary adder, BCD adder, Half subtractor, Full subtractor, Parallel binary subtractor. **Sequential Circuits**: Flip-Flops: RS, D, JK and T – Shift Registers- Decoder- Encoder - Multiplexers – DE multiplexers — Counters – Asynchronous Counter - synchronous Counter.

Unit:4	Input – Output Organization	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 – 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	**75 hours**

Text Book(s)	
1	Digital Electronics Circuits and Systems, V.K. Puri, TMH
2	Computer System Architecture -M. Morris Mano , PHI.
3	Microprocessors and its Applications-Ramesh S. Goankar
Reference Books	
1	Digital Principles and Applications, Albert Paul Malvino, Donald P Leach, TMH, 1996.
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
CO3	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	L	T	P	C
Core/Elective/Supportive		Core Lab: I	0	0	4	2
Pre-requisite		Students should have basic knowledge in C programming and algorithms	Syllabus Version		2025-26 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 & Fibonacci Series **(Program-1,2,3)**	**K1, K2**
2	Apply the concepts to print the Magic square, Sorting the data , Strings, Recursive functions and Pointers **(Program-4,5,6,8,10)**	**K2, K3**
3	Remember the logic used in counting the vowels in a sentence **(Program-7)**	**K1**
4	Apply and Analyze the concepts of Structures and File management **(Program-9,11,12)**	**K3&K4**

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

Programs

1. Write a C program to find the sum, average, standard deviation for a given set of numbers.
2. Write a C program to generate n prime numbers.
3. Write a C program to generate Fibonacci series.
4. Write a C program to print magic square of order n where n > 3 and n is odd.
5. Write a C program to sort the given set of numbers in ascending order.
6. Write a C program to check whether the given string is a palindrome or not using pointers.
7. Write a C program to count the number of Vowels in the given sentence.
8. Write a C program to find the factorial of a given number using recursive function.
9. Write a C program to print the students Mark sheet assuming roll no, name, and marks in 5 subjects in a structure. Create an array of structures and print the mark sheet in the university pattern.
10. Write a function using pointers to add two matrices and to return the resultant matrix to the calling function.
11. Write a C program which receives two filenames as arguments and check whether the file contents are same or not. If same delete the second file
12. Write a program which takes a file as command line argument and copy it to another file. At the end of the second file write the total i) no of chars ii) no. of words and iii) no. of lines.

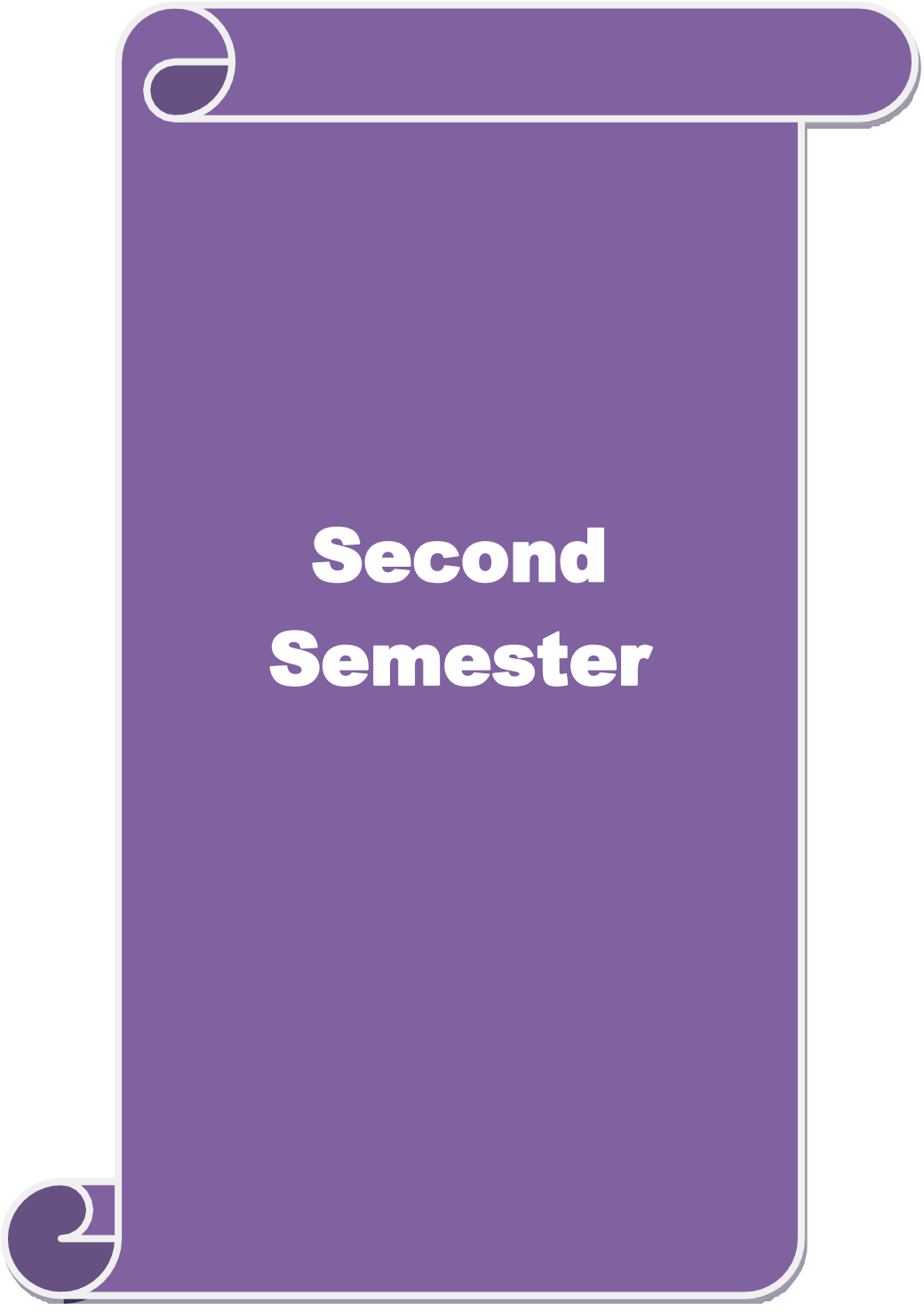
Text Book(s)

1	E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, Second Reprint 2008

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.
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


Second
Semester

Course code		OOPs with Java Programming	L	T	P	C
Core/Elective/Supportive		Core Paper: III	6	0	0	4
Pre-requisite		The objective of the course is to train the students to acquire problem-solving skills through object oriented programming	Syllabus Version		2025-26 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**
4	Develop java programs for applets and graphics programming	**K3**
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	15 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	18 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: II	0	0	5	2
Pre-requisite		Students should know about the OOPs concept and basic knowledge in java theory.	Syllabus Version		2025-26 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 Program for Factorial of a number using command-line arguments.	
2. Write a Java Program to create a switch statement to print the day according to their equivalent number.	
3. Write a java program to sort the array integer elements in descending order.	
4. Write a Java program to implement method overloading.	
5. Write a Java program to implement method overriding.	
6. Write a Java program to implement Abstract class with an abstract method.	
7. Write a program to count the Characters, Digits and Special Characters from the given String.	
8. Write a Java program to implement Vector Operations.	
9. Write a Java Program to implement the concept of Multiple Inheritance using Interfaces.	
10. Write a Java program to implement a Arithmetic and Array Index Out of Bound Exception.	
11. Write a Java Program to create a user define Exception called Pay Out of Bound and throw the Exception.	
12. 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.	
13. Write a Java Applet Program to draw several shapes using Paint method..	
14. Write a Java Program to draw circle, square, ellipse and rectangle at the mouse click positions.	
15. Write a Java Program which open an existing file and append text to that file.	

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/
3	
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
CO3	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;

Course code		Office Automation and Internet	L	T	P	C
Core/Elective/Supportive		Core Lab : III	0	0	3	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**
2	Create and apply various statistical tools available in excel.	**K3,K6**
3	To gain knowledge making effective presentation using power point presentation	**K4**
4	Understand the basic concepts and evaluate the database using excel.	**K5**

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

Programs	**36 hours**

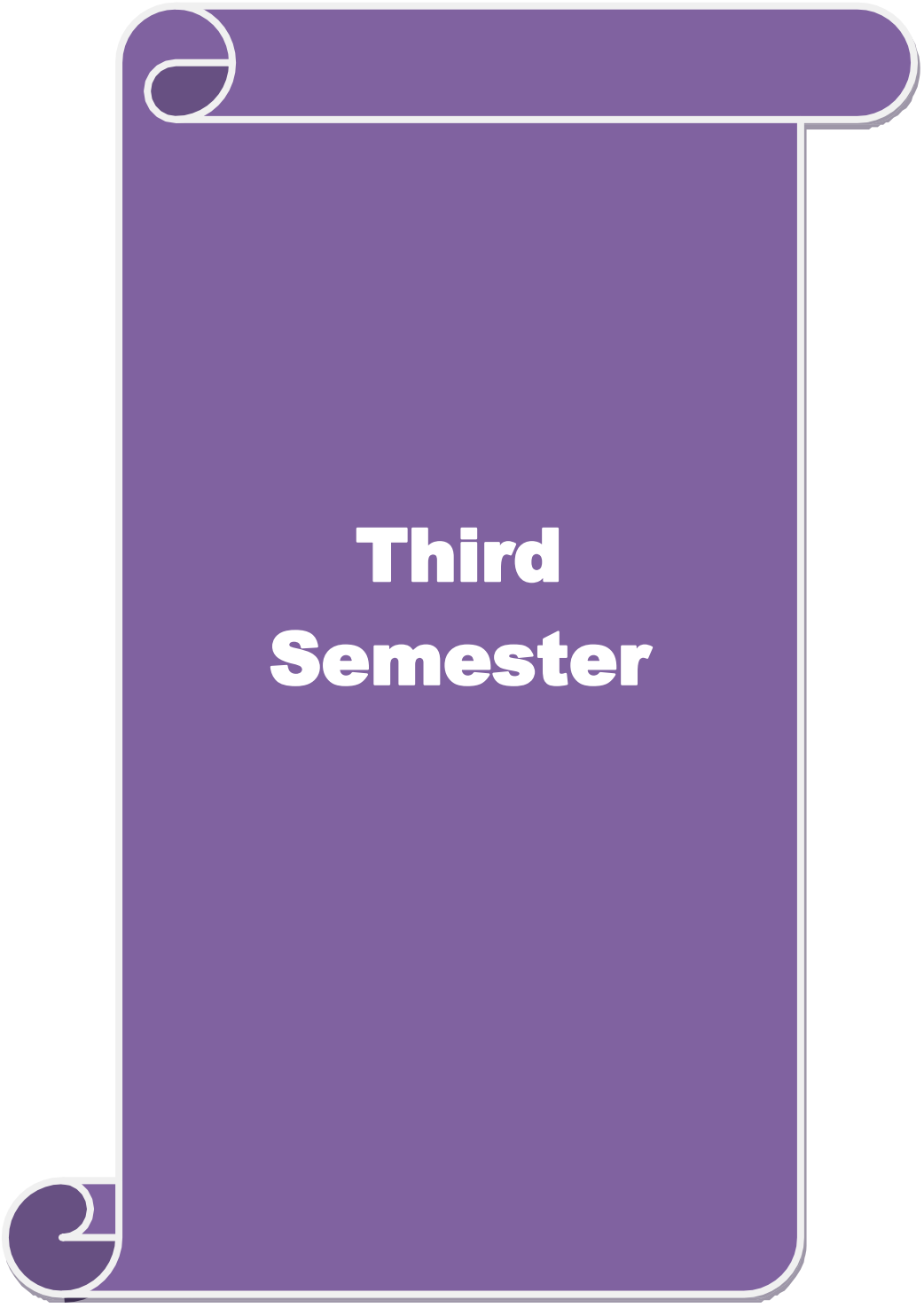
1. Prepare your resume in word and assume that you are studying in final year of your graduation and are eagerly looking for a job. Visit any job portal and upload your resume.
2. Create a flowchart for any program use proper shapes like ellipse, arrows, rectangle, parallelogram and grouping to group 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 using excel sheet.
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
   The first slide must contain the topic of the presentation and name of the presentation.
   a. At least one table,5 bullets,5 numbers, font size, font face, font color.
   b. Use word art to write the heading for each slides. Insert at least one clip-art, one picture, one audio and one video.
   c. Use custom animation option to animate the text, move left to right one line at a time and Use proper transition for the slides.
   d. 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 and share a folder in Google Drive using 'share a link' option and set the permission to access that folder by your friends only.
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.
2	
Reference Books	
1	Sherry Kinkoph Gunter, My Google Apps, 2014.
2	
3	
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

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

Course code		Effective English	L	T	P	C
Core/Elective/ Supportive		Naan Mudhalvan Skill based Course		0	0	2
http://kb.naanmudhalvan.in/images/c/c7/Cambridge_Course_Details.pdf Refer the Content of the Serial. No. 6						


Third
Semester

Course code		Data Structures	L	T	P	C
Core/Elective/Supportive		Core Paper: IV	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

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

Unit:1	INTRODUCTION	12 hours

Introduction of Algorithms, Analysing 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	10 hours
Insertion Sort - Quick Sort - 2 Way 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, 1st Edition

	Reference Books
1	Jean-Paul,Tremblay & Paul G.Sorenson , An Introduction to Data structures with Applications Tata McGraw Hill Company 2008, 2ndEdition.
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	
2	
3	

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 Programming	L	T	P	C
Core/Elective/Supportive		Core Paper: V	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**
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	15 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	15 hours

Oracle9*i*: Overview: Personal Databases – Client/Server Databases – Oracle9i an introduction – SQL *Plus Environment – SQL – Logging into SQL *Plus - SQL *Plus Commands – Errors & Help – Alternate Text Editors - SQL *Plus Worksheet - *i*SQL *Plus. 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	15 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**	**15 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 – SQ L 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/SQL COMPOSITE DATA TYPES**	**13 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, online seminars - webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Database Systems using Oracle, Nilesh Shah, 2nd edition, PHI.
2	E-Book : Diana Lorentz, “Oracle® Database SQL Reference”, ORACLE, Dec, 2005.
3	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, 3rd edition, 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
3	
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	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 : IV	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

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. Implementation of different types of function with suitable examples Number function, Aggregate Function, Character Function, Conversion Function, Date Function
4. Implementation of different types of operators in SQL Arithmetic Operators, Logical Operators, Comparison Operator, Special Operator, Set Operation
5. Implementation of different types of Joins Inner Join, Outer Join, Natural Join etc..
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.

Text Book(s)		
1	E-Book : Bill Pribyl, Steven Feuerstein, "Oracle PL/SQL Programming", O'Reilly Media, Inc., 6th Edition, February 2014.	
Reference Books		
1		
2		
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1		
2		
3		
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		Internet Programming	L	T	P	C
Core/Elective/Supportive		Skill Based Subject: I	3	0	0	2
Pre-requisite		Students should have basic Computer Knowledge	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to learn internet basics, web development using HTML and scripting language to respond the events.
2. To learn the standard notation XML, CSS, DTD and XSD.
3. To study the dynamic web application development using ASP and PHP.

Expected Course Outcomes:

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

1	Understand the basics of internet, internet services, protocols, remote access and transaction.	**K2**
2	Understand the basics of HTML, HTML tags, Tables, Frames and Forms and apply to develop web pages.	**K2,K4**
3	Understand the basics of scripting and apply the java script, VB script and Perl script for developing web pages.	**K2-K4**
4	Knowledge on XML, CSS, XSL, DTD and XSD.	**K4**
5	Knowledge on dynamic web applications, basics of ASP, ASP objects and basics of PHP.	**K2-K4**

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

Unit:1	Internet	9 hours

Basics of Internet communication - Hardware elements associated with internet - Internet Services - Internet Protocols - TCP/IP, UDP and HTTP - other Protocols - Telnet - Gopher - Mail and its types - FTP - Remote access and Transaction - Web Indexes Search Engines.

Unit:2	HTML	9 hours

Introduction to HTML - Tags and Documents - Link documents using Anchor Tags - Images and Pictures - Tables -HTML Forms - Frames - Framesets.

Unit:3	Scripting Language	9 hours

Introduction to Scripting - Java Script - Data types - Operators - Variables - Conditional Statements - Functions -Objects - Document object - Image Object – Event Handling -Introduction to VBScript and Perl Script.

Unit:4	XML	9 hours

Introduction to XML - Well-formed XML - CSS - XSL - Valid XML - DTD - XSD -Introduction to DOM and SAX.

Unit:5	Dynamic Web Applications	7 hours

Introduction to Dynamic web applications -Active Server Page Basics – ASP Object Model - Collections - Introduction to PHP.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars - webinars		
	Total Lecture hours	45 hours

Text Book(s)

1	Deitel & Deitel, Internet and WWW How to Pprogram, Prentice Hall 2000.
2	David Hunter et al., Beginning XML, Wrox Publications 2000.

Reference Books

1	Daniel C.Lynch, Marehall T. Rose. Internet Systems Handbook , Addison Wesley 1993.
2	Thomas Penny, How to do Everything with HTML, McGraw-Hill Education, 2 edition, 2003.

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	M	M	M	M	S	M	S	L
CO3	S	M	S	S	M	M	S	M	M	L
CO3	M	S	S	S	M	M	M	M	M	M
CO4	S	M	M	M	S	M	M	M	S	M
CO5	M	S	S	M	M	M	S	S	S	M

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

Course code		Computer Networks	L	T	P	C
Core/Elective/Supportive		Allied Paper: III	4	0	0	4
Pre-requisite		Students should have the knowledge on computer connectivity and connectivity peripherals.	Syllabus Version		2025-26 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 networks 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 be able to:

1	Remember the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of 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	12 hours

Network Hardware: LAN – WAN – MAN – Wireless – Home Networks. Network Software: Protocol Hierarchies – Design Issues for the Layers – Connection-oriented and connectionless services – Service Primitives – The Relationship of services to Protocols. Reference Models: OSI 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	12 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, Low Earth-orbit Satellites – Satellites versus Fiber.

Unit:3	DATA-LINK LAYER	12 hours
DATA-LINK LAYER: Error Detection and correction – Elementary Data-link Protocols – Sliding Window Protocols.		
Unit:4	**NETWORK LAYER**	**12 hours**
NETWORK LAYSER: Routing algorithms – Congestion Control Algorithms.		
Unit:5	**TRANSPORT AND APPLICATION LAYER**	**10 hours**
TRANSPORT LAYER: Elements of Transport Protocols – Internet Transport Protocols: TCP. APPLICATION LAYER: DNS – E-mail.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**60 hours**

Text Book(s)

1	Computer Networks, Andrew S. 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, Achyut Godbole, 2007, TMH.
2	Computer Networks: Protocols, Standards, and Interfaces, Uyless Black, 2nd ed, PHI
3	

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

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Course Designed By:

Mapping with Programme Outcomes

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

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

Fourth Semester

Course code		Operating Systems	L	T	P	C
Core/Elective/Supportive		Core Paper: VI	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	12 hours

Introduction - Mainframe systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time Systems – Handheld Systems - Hardware Protection - System Components – Operating System Services – System Calls – System Programs

Unit:2	PROCESS AND THREADS	12 hours

Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication. Threads – Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling

Unit:3	SYNCHRONIZATION AND DEADLOCK	12 hours

The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks

Unit:4	VIRTUAL MEMORY AND STORAGE MANAGEMENT	12 hours

Storage Management – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging. Virtual Memory – Demand Paging – Process creation – Page Replacement –Allocation of frames – Thrashing

Unit:5	**FILE MANAGEMENT**	**10 hours**
File Concept – Access Methods – Directory Structure - File System Structure – Allocation Methods – Free-space Management - Disk Structure – Disk Scheduling – Disk Management – Case Study: The Linux System, Windows.		
Unit:6	**CONTEMPORARY ISSUES**	**2 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**60 hours**

Text Book(s)

1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley & Sons (ASIA) Pvt. Ltd, April 2018
2	Harvey M. Deitel, "Operating Systems", Second Edition, Pearson Education Pvt. Ltd, 2002.

Reference Books

1	William Stallings, "Operating System", Prentice Hall of India, 4th Edition, 2003.
2	Pramod Chandra P. Bhatt "An Introduction to Operating Systems, Concepts and Practice", PHI, 2003.
3	Ramez Elmasri, A.G.Carrick and David Levine, "Operating Systems-A Spiral approach",2010

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

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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 Paper : VII	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 and 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.
2	
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Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://spoken-tutorial.org/
2	https://www.tutorialspoint.com/linux/index.htm
3	
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	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 : V	0	0	3	2
Pre-requisite		Students should have the prior basic knowledge in operating system.	Syllabus Version		2025-26 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. Student is given an introduction of Linux shell commands and they will be able to write 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 advance 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

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
   b. current shell, home directory, operating system type, current path setting, current working directory
   c. show CPU information
   d. show memory information
3. Write a shell script to implement the following: pipes, Redirection and tee commands.
4. Write a shell script to implement the filter commands.
5. Write a shell script to sort number in ascending order.
6. Write a shell script to print Fibonacci series.
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.
9. Write a shell script for palindrome checking.
10. Write a shell script to print the multiplication table of the given argument using for loop.

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.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		Lab - Internet Programming	L	T	P	C
Core/Elective/Supportive		Skill Based Subject Programming Lab : I	0	0	3	2
Pre-requisite		Students should have basic knowledge in HTML, XML, Java script and PHP	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 and make them to do elegant applications in PHP using Array class, OOPs concepts, etc.
2. To understand how to develop data centric web application using PHP and SQLite.

Expected Course Outcomes:

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

1	Understand the basics of java script, HTML and XML, programming statements and design web pages.	**K1**
2	Understand and apply the XML programming constructs, DTD and develop applications.	**K2-K6**
3	Understand the world wide web, searching in WWW, telnet and FTP.	**K4**
4	Knowledge on basics of HTML, HTML tags, tables, frames, CSS and next generation HTML	**K2-K6**
5	Knowledge on working database centric application using SQL, SQLite	**K1-K4**

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

Programs

1. Design Simple Web Pages using standard HTML tags like, HEAD, TITLE, BODY.
2. Design HTML web pages, which make use of INPUT, META, SCRIPT, FORM, APPLET, BGSOUND, MAP
3. Using JavaScript's Window and document objects and their properties and various methods like alert(), eval(), Parselnt () etc. methods to give the dynamic functionality to HTML web pages
4. Writing JavaScript snippet which makes use of JavaScript's in-built as well as user defined objects like navigator, Date Array, Event, Number etc.
5. Writing XML web Documents which make use of XML Declaration, Element Declaration, Attribute Declaration
6. Usage of Internal DTD, External DTD, Entity Declaration.
7. Develop a PHP program using controls and functions
8. Develop a PHP program and check message passing mechanism between pages.
9. Develop a PHP program to display student information using MYSQL table.
10. Develop a PHP program to design a college application form using MYSQL table.

Text Book(s)

1	Raymond Greenlaw, Ellen Hepp, Fundamentals of the INTERNET and the World Wide Web, Second Edition , Tata McGraw Hill, 2005
2	Programming PHP, Rasmus Lerdorf and Levin Tatroe, O_Reilly, 2002

Reference Books

1	PHP: The Complete Reference, 2nd Edn, Steve Holzner, TMH 2009.

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

1	https://www.w3resource.com/linux-exercises/

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		Software Engineering	L	T	P	C
Core/Elective/Supportive		Allied Paper: IV	4	0	0	4
Pre-requisite		Basic understanding in software project and system analysis and design concepts	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enhance the basic software engineering methods and practices.
2. To learn the techniques for developing software systems.
3. To understand the object oriented design.
4. To understand software testing approaches

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	SOFTWARE ENGINEERING	10 hours

Software Engineering: A Layered Technology – Software Process – Software Process Models – The Prototyping. Requirement Engineering– Software prototyping - Elements of analysis model – Data modeling – Functional modeling and information flow.

Unit:2	SOFTWARE DESIGN	12 hours

Software design and Software engineering – The Design process – Design principles – Design concepts – Effective modular design –Software Architecture

Unit:3	SOFTWARE TESTING	12 hours

Software testing fundamentals – Test Case Design - White box testing – Basis path testing – Control structure testing – Black box testing. Unit testing – Validation testing – System testing.

Unit:4	SOFTWARE CONFIGURATION MANAGEMENT	12 hours

Software Configuration Management: Definitions and terminology – processes and activities. Software Quality assurance: Definitions – Quality control and Quality assurance – Organization of Structures. Risk Management: Risk Identification – quantification - Monitoring - Mitigation. Software requirements gathering: Steps to be followed – Outputs and Quality Records - Skill sets required – Challenges.

Unit:5	ESTIMATION	12 hours

Estimation: What is Estimation? – When and Why? – Three phases of Estimation – Estimation methodology – Formal models of Size Estimation. Design and Development phases: Reusability - Technology choices – Standards – Portability -User interface issues – Testability - The Effect of Internet on Project Management.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars - webinars

	Total 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.]		
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Course Designed By:		

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

Coursecode		Office Fundamentals	L	T	P	C
Core/Elective/Supportive		Naan Mudhalvan Skill Based Course	0	0	2	2
http://kb.naanmudhalvan.in/Bharathiar_University_(BU) **Refer the Content of the Serial. No. 2**						


Fifth
Semester

Course code		Python Programming	L	T	P	C
Core/Elective/Supportive		Core Paper : VIII	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 explores 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	BASICS OF PYTHON	18 hours

BASICS : Python - Variables - Executing Python from the Command Line - Editing Python Files - Python Reserved Words - Basic Syntax-Comments - Standard Data Types – Relational Operators - Logical Operators - Bit Wise Operators - Simple Input and Output.

Unit:2	CONTROL STATEMENTS	18 hours

CONTROL STATEMENTS: Control Flow and Syntax - Indenting - if Statement - statements and expressions- string operations- Boolean Expressions -while Loop - break and continue - for Loop. LISTS: List-list slices - list methods - list loop – mutability – aliasing - cloning lists - list parameters. TUPLES: Tuple assignment, tuple as return value -Sets – Dictionaries

Unit:3	FUNCTIONS	18 hours

FUNCTIONS: Definition - Passing parameters to a Function - Built-in functions- Variable Number of Arguments - Scope – Type conversion-Type coercion-Passing Functions to a Function - Mapping Functions in a Dictionary – Lambda - Modules - Standard Modules – sys – math – time - dir - help Function.

Unit:4	ERROR HANDLING	18 hours

ERROR HANDLING: Run Time Errors - Exception Model - Exception Hierarchy - Handling Multiple Exceptions - Data Streams - Access Modes Writing - Data to a File Reading - Data From a File - Additional File Methods - Using Pipes as Data Streams - Handling IO Exceptions - Working with Directories.

Unit:5	OBJECT ORIENTED FEATURES	15 hours
OBJECT ORIENTED FEATURES: Classes Principles of Object Orientation - Creating Classes - Instance Methods - File Organization - Special Methods - Class Variables – Inheritance – Polymorphism - Type Identification - Simple Character Matches - Special Characters - Character Classes – Quantifiers - Dot Character - Greedy Matches – Grouping - Matching at Beginning or End - Match Objects – Substituting - Splitting a String - Compiling Regular Expressions.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**90 hours**

	Text Book(s)
1	Mark Summerfield, Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.
2	Martin C. Brown, PYTHON: The Complete Reference, McGraw-Hill, 2001
3	E. Balagurusamy (2017), “Problem Solving and Python Programming”, McGraw-Hill, First Edition.

	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	
2	
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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		Programming Lab – Python	L	T	P	C
Core/Elective/Supportive		Core Lab : IV	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

1. Write a python program to compute GCD of two numbers
2. Write a python program to find the square root of a number (Newton's method)
3. Write a python program to display the multiplication table
4. Write a python program to find the sum of number digits in list
5. Write a python program to perform linear search and binary search
6. Write a python program to perform selection sort and insertion sort
7. Write a python program to perform merge sort
8. Write a python program to make a simple calculator
9. Write a python program to multiply matrices
10. Write a python program using command line arguments (word count)

Text Book(s)

1. Mark Summerfield. —Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.

Reference Books

1. 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	M	M	M	M	M	M	L
CO2	S	S	S	S	S	S	S	M	M	M
CO3	S	S	S	S	S	S	S	M	M	M
CO4	S	S	S	S	S	S	S	M	M	S
CO5	S	S	S	S	S	S	S	M	M	S

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

Course code		Cyber Security	L	T	P	C
Core/Elective/Supportive		Core Paper: IX	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 - Authenticat Access Control and Cryptography - Web—User Side - Browser Attacks - Web Att Targeting Users - Obtaining User or Website Data - Email Attacks

Unit:2	SECURITY IN OPERATING SYSTEM AND 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 COUNTERMEASURES	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 CYBERSPACE	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 - Cyber crime - Cyber Warfare and Home Land Security

Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars - webinars		
	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.]

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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		CLIENT/SERVER COMPUTING	L	T	P	C
Core/Elective/Supportive		Elective: I	6	0	0	4
Pre-requisite		Basic knowledge in computer and computing	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to learn the basics of client/server computing and applications of client/server computing.
2. To understand the connectivity components, software and hardware components of client/server applications.
3. To learn future enabling technologies for client/server computing.

Expected Course Outcomes:

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

1	Understand the basics of client/server applications, advantages and improve performance and reduce the network traffic.	K1-K2
2	Knowledge in client and server role, the networking operating system and the server operating system.	K2
3	Understanding the connectivity components of client/server applications, open system interconnect and WAN technologies.	K2-K3
4	Understanding the software and hardware components of client/server applications.	K2-K3
5	Knowledge in components of client/server applications and future enabling technologies for client/server computing.	K2-K4

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

Unit:1	Client / Server Computing	15 hours

Client / Server Computing – Advantages of Client / Server Computing – Technology Revolution – Connectivity – Ways to improve Performance – How to reduce network Traffic.

Unit:2	Components Of Client / Server Applications – The Client	18 hours

Components of Client / Server Applications – The Client: Role of a Client – Client Services – Request for Service. Components of Client / Server Applications – The Server: The Role of a Server – Server Functionality in Detail – The Network Operating System – What are the Available Platforms – The Server Operating system.

Unit:3	Components of Client / Server Applications – Connectivity	18 hours

Components of Client / Server Applications – Connectivity: Open System Interconnect – Communications Interface Technology – Inter-process communication – WAN Technologies.

Unit:4	Components Of Client / Server Applications	18 hours

Components of Client / Server Applications – Software. Components of Client / Server Applications – Hardware.

Unit:5	**Components of Client / Server Applications**	**18 hours**
Components of Client / Server applications – Service and Support: System Administration. The Future of Client / Server Computing: Enabling Technologies – Transformational Systems.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**90 hours**

Text Book(s)	
1	Client /Server Computing, Patrick Smith, Steve Guenferich, 2nd edition, PHI.
Reference Books	
1	Robert Orfali, Dan Harkey, Jeri Edwards: The Essential Client/Server Survival Guide, 2nd edition, Galgotia Publications.
2	Dewire and Dawana Travis, Client/ Server Computing, TMH.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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Course Designed By:	

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

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

Course code		Distributed Computing	L	T	P	C
Core/Elective/Supportive		Elective: I	6	0	0	4
Pre-requisite		Basic knowledge in databases, client and server	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to learn the concepts and techniques in distributed computing and client server computing.
2. To learn the pros and cons of distributed computing, distributed databases.
3. To familiar with design considerations in distributed computing
4. To understand the client server models and R* projection techniques

Expected Course Outcomes:

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

1	Understand the concepts and techniques in distributed computing and client server computing.	**K1**
2	Understand the pros and cons of distributed processing, databases, challenges.	**K2**
3	Understand the design considerations in distributed computing	**K2**
4	Understand and analyse the client server network model, file server, printer server and email server.	**K3**
5	Understand and obtaining the Knowledge on distributed databases, R* project techniques.	**K2-K4**

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

Unit:1	Introduction to Distributed Systems	15 hours

Distributed Systems: Fully Distributed Processing systems – Networks and interconnection structures – designing a distributed processing g system.

Unit:2	Challenges and Managing Distributed Resources	18 hours

Distributed systems: Pros and Cons of distributed processing – Distributed databases – the challenges of distributed data – loading, factors – managing the distributed resources division of responsibilities.

Unit:3	Design Considerations	18 hours

Design considerations: Communication Line loading – line loading calculations- partitioning and allocation - data flow systems – dimensional analysis- network database design considerations- ration analysis- database decision trees- synchronization of network databases

Unit:4	Client Server Network Model	18 hours

Client server network model: Concept – file server – printer server and e-mail server.

Unit:5	Distributed Databases	18 hours

Distributed databases: An overview, distributed databases- principles of distributed databases – levels of transparency- distributed database design- the R* project techniques problem of heterogeneous distributed databases.

Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**90 hours**

Text Book(s)

1	John A. Sharp, An introduction to distributed and parallel processing, Blackwell Scientific Publication(Unit I & III)
2	Uyless D. Black, Data communication and distributed networks‖(unit II)
3	Joel M.Crichllow , Introduction to distributed & parallel computing (Unit IV)

Reference Books

1	Stefans Ceri, Ginseppe Pelagatti , Distributed database Principles and systems, McGraw Hill
2	

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

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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	L	L	M	L
CO2	S	S	S	M	M	M	M	M	M	L
CO3	S	S	S	M	S	M	L	M	L	L
CO4	S	S	S	S	S	M	M	M	M	M
CO5	S	S	S	S	S	M	S	S	S	M

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

Course code		Mobile Computing	L	T	P	C
Core/Elective/Supportive		Elective: I	6	0	0	4
Pre-requisite		Basic knowledge on mobile technologies	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to study on the emerging technologies in mobile computing.
2. To learn the basics of mobile computing and IVR application
3. To make the students to learn about the architecture of mobile computing
4. To understand the mobile technologies GPRS,CDMA and 3G

Expected Course Outcomes:

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

1	Understand the history of mobile computing, applications, standards and mobile computing architecture.	**K1-K2**
2	Understand the mobile computing techniques related to telephone, access procedures, IVR applications and Voice XML.	**K2**
3	Understand and analyse the emerging technologies Bluetooth, RFID, WiMAX, etc. also GSM.	**K1-K3**
4	Knowledge on GPRS, GPRS network architecture, Data services, applications for GPRS and limitations.	**K4**
5	Knowledge on CDMA and 3G, CDMA Vs GSM, applications of 3G wireless LAN, Architecture, Adhoc and sensor networks and security features.	**K1-K4**

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

Unit:1	Introduction	18 hours

Introduction: Mobility of Bits and Bytes –Wireless The Beginning – Mobile Computing – Dialogue Control – Networks – Middleware and Gateways – Application and services- Developing Mobile Computer Applications – security in mobile computing – Standards _ Why is it necessary – Standard bodies. **Mobile Computing Architecture**: History of computers and Internet – Architecture for mobile computing – Three-tier architecture – Design considerations for mobile computing – Mobile computing through Internet – Making exiting applications mobile enabled

Unit:2	Mobile Computing Through Telephony	18 hours

Mobile Computing Through Telephony: Evaluation of telephony – Multiple access procedures – Mobile computing through telephone – IVR Application .

Unit:3	Emerging Technologies	18 hours

Emerging Technologies: Blue Tooth – RFID – WiMAX – Mobile IP – IPv6 – Java Card. GSM : Global System for mobile communications – GSM Architecture – GSM Entities – Call routing in GSM – PLMN Interfaces – GSM Addresses and Identifiers – Network Aspects in GSM – GSM Frequency allocations – Authentications and Security.

Unit:4	GPRS	18 hours

GPRS: GPRS and packet data network – GPRS network architecture – GPRS network operations– Data services in GPRS – Application for GPRS- Limitations – Billing and Charging. **WAP :** MMS – GPRS Applications

Unit:5	CDMA and 3G	18 hours
CDMA and 3G: Spread spectrum technology – Is 95 – CDMA vs GSM – Wireless Data – Third generation networks – Applications on 3G. **Wireless LAN:** Wireless LAN advantages – IEEE 802.11 standards – Architecture – Mobile in Wireless LAN – Deploying wireless LAN – Mobile adhoc networks and sensor networks – Wireless LAN Security – WiFi vs 3G.		
	Total Lecture hours	**90 hours**

	Text Book(s)
1	MOBILE COMPUTING, Asoke K Talukder , Roopa R Yavagal, TMH, 2005
	Reference Books
1	Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007.
2	Dharma Prakash Agarval, Qing and An Zeng, “Introduction to Wireless and Mobile systems”, Thomson Asia Pvt Ltd, 2005.
3	Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
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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	M
CO3	S	S	S	L	S	L	L	M	M	M
CO4	S	S	S	L	S	L	L	M	M	M
CO5	S	S	S	L	S	M	L	M	S	M

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

Course Code		Data Analytics	L	T	P	C
Core/Elective/Supportive		Skill Based Subject – II	3	0	0	2
Pre - requisite		None	Syllabus version			2025-26 Onwards

Course Objectives

1. To acquire skills in data preparatory and pre-processing steps
2. To understand the mathematical skills in statistics
3. To learn the tools and packages in python for data science
4. To gain understanding in classification and regression model
5. To acquire knowledge in data interpretation and visualization techniques

Course Outcomes

1	Apply the skills of data inspecting and cleansing	**K2**
2	Determine the relationship between data dependencies using statistics	**K2**
3	Understand the can handle data using primary tools used for data science	**K2**
4	Represent the useful information using mathematical skills	**K2**
5	Apply the knowledge for data describing and visualization using tools	**K3**

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

Unit I	**Introduction**	**9 hours**

Need for data science –benefits and uses –facets of data –data science process –setting the research goal –retrieving data –cleansing, integrating and transforming data –exploratory data analysis –build the models –presenting and building applications.

Unit II	**Frequency Data Distributions**	**9 hours**

Frequency distributions –Outliers –relative frequency distributions –cumulative frequency distributions –frequency distributions for nominal data –interpreting distributions –graphs –averages –mode –median –mean –averages for qualitative and ranked data.

Unit III	**Normal Data Distributions**	**9 hours**

Normal distributions –z scores –normal curve problems –finding proportions –finding scores –more about z scores –correlation –scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient.

Unit IV	**Data Handling**	**9 hours**

Basics of Numpy arrays, aggregations, computations on arrays, comparisons, structured arrays, Data manipulation, data indexing and selection, operating on data, missing data, hierarchical indexing, combining datasets – aggregation and grouping, pivot tables.

Unit V	**Data Visualization**	**7 hours**

Visualization with matplotlib, line plots, scatter plots, visualizing errors, density and contour plots, histograms, binnings and density, three dimensional plotting, geographic data.

Unit VI	**Contemporary Issues**	**2 hours**
	Total Lecture Hours	**45 Hours**

Text Book(s)		
1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. 2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. 3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.		
Reference Book(s)		
1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.		
	Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1		
Course Designed by :		

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

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

Course Code		Core Lab - VII : Capstone Project Work	L	T	P	C
Core/Elective/Supportive			0	0	3	2
Pre - requisite		• Students should have a good understanding of software engineering • Student should possess strong analytical skills • Strong coding skills in any one programming	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

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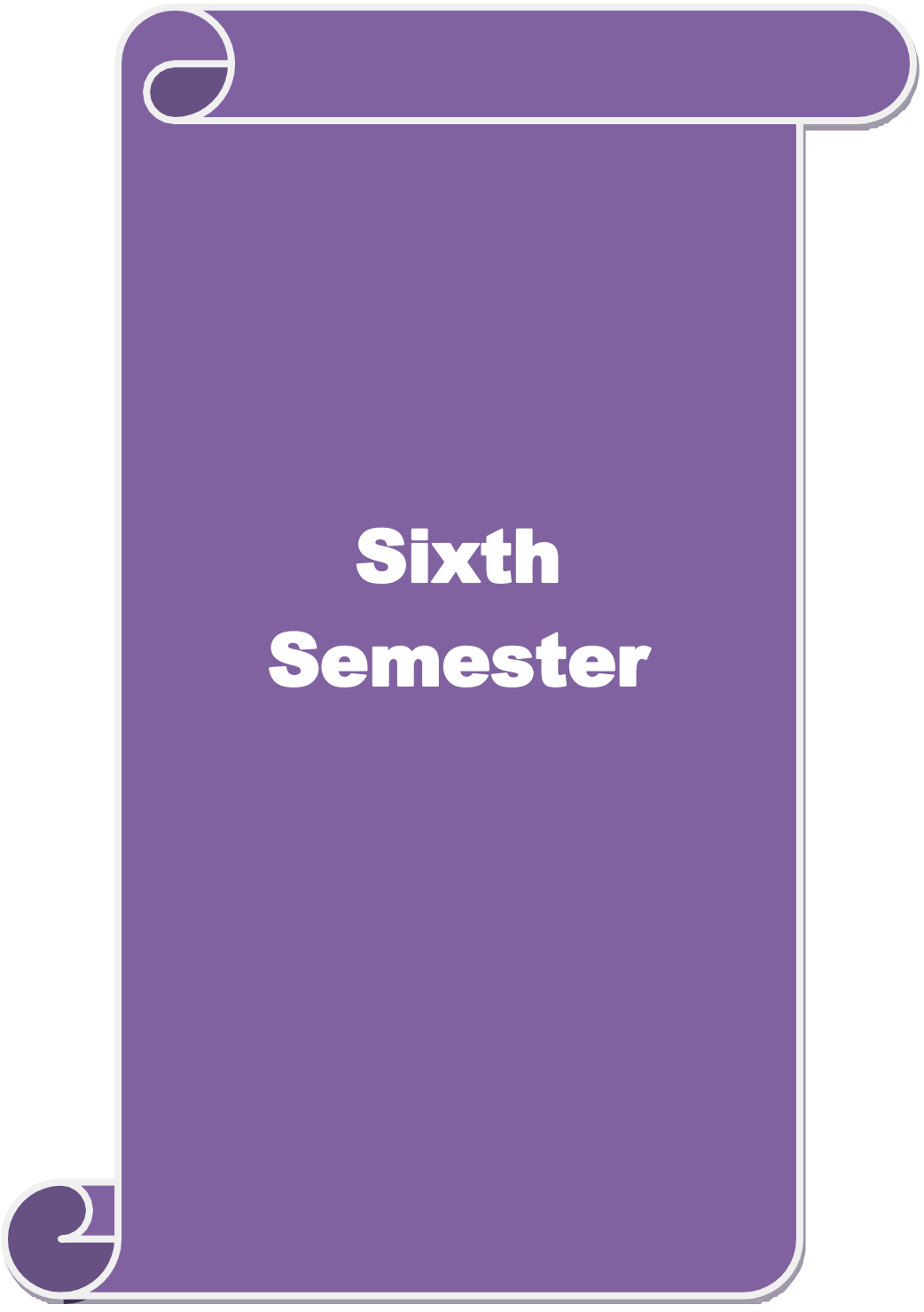
Sixth
Semester

Course code		Multimedia and its Applications	L	T	P	C
Core/Elective/Supportive		Core Paper: X	5	0	0	4
Pre-requisite		Basic knowledge in 2D, 3D and multimedia file formats	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. Design and apply two dimensional graphics and transformations.
2. Design and apply three dimensional graphics and transformations.
3. Apply Illumination, color models and clipping techniques to graphics.
4. Understood Different types of Multimedia File Format.

Expected Course Outcomes:

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

1	Explain applications, principles ,commonly used and techniques of computer graphics and algorithms for Line-Drawing, Circle- Generating and Ellipse-Generating.	**K2**
2	Students will get the concepts of 2D and 3D, Viewing, Curves and surfaces, Hidden Line/surface elimination techniques	**K3**
3	Studies concepts of Multimedia Systems, Text, Audio and Video tools	**K3**
4	Compressing audio and video using MPEG-1 and MPEG-2	**K4**
5	Creates Animation with special effects using algorithms	**K6**

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

Unit:1	INTRODUCTION	15 hours

What is Multimedia? – Introduction to making Multimedia – Macintosh and Windows Production platforms – Basic Software tools. Making Instant Multimedia – Multimedia authoring tools.

Unit:2	TEXT	15 hours

Text: Types of Text – Unicode Standard – Font – Insertion of Text – Text compression – File formats. Image: Image Types – Seeing Color – Color Models – Basic Steps for Image Processing – Scanner – Digital Camera – Interface Standards – Specification of Digital Images – CMS – Device Independent Color Models – Image Processing software – File Formats – Image Output on Monitor and Printer.

Unit:3	AUDIO	15 hours

Audio: Introduction – Acoustics – Nature of Sound Waves – Fundamental Characteristics of Sound – Microphone – Amplifier – Loudspeaker – Audio Mixer – Digital Audio – Synthesizers – MIDI – Basics of Staff Notation – Sound Card – Audio Transmission – Audio File formats and CODECs – Audio Recording Systems – Audio and Multimedia – Voice Recognition and Response - Audio Processing Software.

Unit:4	VIDEO	15 hours

Video: Analog Video Camera – Transmission of Video Signals – Video Signal Formats – Television Broadcasting Standards – PC Video – Video File Formats and CODECs – Video Editing – Video Editing Software.

Unit:5	ANIMATION	13 hours
Animation: Types of Animation – Computer Assisted Animation – Creating Movement – Principles of Animation – Some Techniques of Animation – Animation on the Web – Special Effects – Rendering Algorithms. Compression: MPEG-1 Audio – MPEG-1 Video - MPEG-2Audio – MPEG-2 Video.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
	Total hours	**75 hours**

	Text Book(s)
1	Computer Graphics, Donald Hearn, M.Pauline Baker, 2nd edition, PHI. (UNIT-I: 3.1-3.6,4.1-4.5 & UNIT-II: 5.1-5.4,6.1-6.5)
2	Principles of Multimedia, Ranjan Parekh, 2007, TMH. (UNIT III: 4.1-4.7,5.1-5.16 UNIT-IV: 7.1-7.3,7.8-7.14,7.18-7.20,7.22,7.24,7.26-28 UNIT-V: 9.5-9.10,9.13,9.15,10.10-10.13)

	Reference Books
1	Computer Graphics, Amarendra N Sinha, Arun D Udai, TMH.
2	Multimedia: Making it Work, Tay Vaughan, 7th edition, TMH.

	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
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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	S	S	M
CO2	S	S	S	M	S	M	M	M	S	M
CO3	S	M	M	M	S	M	M	M	S	M
CO4	S	S	S	M	S	M	M	M	S	M
CO5	S	S	S	M	S	M	S	S	S	M

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

Course code		Project Work Lab	L	T	P	C
Core/Elective/Supportive		Core Lab: IX	0	0	5	4
Pre-requisite		Students should have the strong knowledge in any one of the programming languages in this course.	Syllabus Version		2025-26 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 the real 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 a design solution for a set of requirements.	**K3**
2	Test and validate the conformance of the developed prototype against the original 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, compare them 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 PROJECT

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

Sign**ature of the Guide** **Signature of the HOD**

Submitted for the Viva-Voce Examination held on _____

Internal Examiner **External Examiner**

Month – Year

CONTENTS

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										
CO2										
CO3										
CO4										
CO5										

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

Course code		Programming Lab – Multimedia	L	T	P	C
Core/Elective/Supportive		Core Lab : VIII	0	0	5	2
Pre-requisite		Students should have the basic knowledge on multimedia applications.	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To learn the basic principles of graphics.
2. Provide an understanding of how to scan convert the basic to picture definition.
3. To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization and business applications.
4. To comprehend and analyse the fundamentals of animation, virtual reality, underlying technologies, principles and applications.

Expected Course Outcomes:

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

1	Understand the basic concepts of graphics.	**K1**
2	Design scan conversion problems using photoshop.	**K2**
3	Apply clipping and filling techniques for modifying an object.	**K3**
4	Understand the concepts of different type of objects in 2D.	**K4**
5	Understand and develop the practical implementation various options in photoshop.	**K6**

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

Programs

1. Create Sun Flower using Photoshop.
2. Animate Plane flying in the Clouds using Photoshop.
3. Create Plastic Surgery for the Nose using Photoshop.
4. Create See-through text using Photoshop.
5. Create a Web Page using Photoshop.
6. Convert Black and White Photo to Color Photo using Photoshop.
7. Draw a landscape using multiple Layers.
8. Paint a scenery of a park using different tools of Photoshop
9. Pick any picture of a magazine cover page make changes using selection tool.
10. Design a poster for an event and show the difference in resolution and quality for Print and Web.

Text Book(s)	
1	
Reference Books	
1	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	
2	
3	
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	L	L	M	L
CO3	S	S	S	M	M	M	M	M	M	L
CO3	S	S	S	M	S	M	M	M	M	L
CO4	S	S	S	S	S	M	M	M	M	M
CO5	S	S	S	S	S	M	S	S	S	M

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

Course Code		Artificial Intelligence	L	T	P	C
Core/Elective/Supportive		Elective - II	6	0	0	3
Pre- requisite			Syllabus version			2025-26 Onwards

Course Objectives

1. To identify and understand the basics of AI and its search.
2. To identify and understand the basics of AI and its search.
3. To study about the Fuzzy logic systems.
4. Understand and apply the concepts of Neural Network and its functions.
5. Understand the concepts of Artificial Neural Network
6. To study about the Genetic Algorithm

Course Outcomes

1	Describe the fundamentals of artificial intelligence concepts and searching techniques.	K2
2	Develop the fuzzy logic sets and membership function and defuzzification techniques.	K1-K2
3	Understand the concepts of Neural Network and analyze and apply the learning techniques	K4,K6
4	Understand the artificial neural networks and its applications.	K4-K6
5	Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.	K3

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

Unit I	**Introduction**	**18 hours**

Introduction: AI Problems – AI techniques – Criteria for success. Problems, Problem Spaces, Search: State space search – Production Systems – Problem Characteristics – Issues in design of Search.

Unit II	**Heuristic Search Techniques**	**18 hours**

Heuristic Search techniques: Generate and Test – Hill Climbing – Best-Fist,Problem Reduction, Constraint Satisfaction, Means-end analysis.

Unit III	**Knowledge Representation**	**18 hours**

Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – Frame Problem

Unit IV	**Predicate Logic**	**18 hours**

Using Predicate Logic: Representing simple facts in logic – Representing Instance and is a relationships – Computable functions and predicates – Resolution – Natural deduction.

Unit V	**Knowledge Using Rules**	**16 hours**

Representing knowledge using rules: Procedural Vs Declarative knowledge –Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge. Brief explanation of Expert Systems-Definition- Characteristics-architecture- Knowledge Engineering- Expert System Life Cycle-Knowledge Acquisition Strategies- Expert System Tools.

Unit VI	**Contemporary Issues**	**2 hours**

Webinar/Seminar/Guest Lectures

Total Lecture Hours	**90 hours**

TextBook(s)

1. Artificial Intelligence, Elaine Rich and Kelvin Knight, TMH, 2nd Edn, 1991.(chapters 1-6).

Reference Book(s)

1. Artificial Intelligence A Modern Approach, Stuart Russell & Peter Norvig, 2nd Edition Perason.
2. Artificial Intelligence, George F Luger, 4th Edition, Pearson, 2002.
3. Foundations of Artificial Intelligent and Expert Systems, V S Janaki Raman, K Sarukesi, P Gopalakrishnan, MacMillan India limited.

Related Online Contents(MOOC, SWAYAM, NPTEL,Websites etc)		
1		
2		
Course Designed by :		

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

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

Course code		BUSINESS INTELLIGENCE	L	T	P	C
Core/Elective/Supportive		Elective - II	6	0	0	3
Pre-requisite		Basic knowledge in data, data base and information	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

3. To enable the students to learn business intelligence concepts, data warehouses, data mining techniques for CRM.
4. To learn about text mining and web mining and its applications.

Expected Course Outcomes:

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

1	Understand the basics of business intelligence, business decisions, data warehouses and its architecture, KDD process.	**K2**
2	Understand the applications of data mining in business, data mining techniques for CRM, text mining and web mining.	**K2,K3**
3	Knowledge in business intelligence, application in various domains and best practices.	**K3**
4	Understand the knowledge management, its architecture, approaches and tools.	**K3**
5	Knowledge in Web analytics and business intelligence, eCRM and case studies in web analytics.	**K4**

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

Unit:1	INTRODUCTION TO BUSINESS INTELLIGENCE	18 hours

Introduction to business intelligence and business decisions – Data warehouses and its role in Business Intelligence – Creating a corporate data warehouse – Data Warehousing architecture – OLAP vs. OLTP - ETL process – Tools for Data Warehousing – Data Mining – KDD Process

Unit:2	APPLICATIONS	18 hours

Applications of Data Mining in Business – Data Mining Techniques for CRM – Text Mining in BI - Web Mining – Mining e-commerce data – Enterprise Information Management - Executive Information Systems

Unit:3	BUSINESS INTELLIGENCE	18 hours

Business Intelligence – Function, Process, Services & Tools - Application in different domains – Operational BI - Customizing BI – Managing BI projects vs. Traditional IS projects – Managing BI projects – Best Practices in BI Strategy

Unit:4	KNOWLEDGE MANAGEMENT	18 hours

Knowledge Management – Definition – Data Vs. Information Vs. Knowledge – The ten key principle of KM – Knowledge Management Architecture – Knowledge Management Vs. Knowledge Processing – KM approaches – KM Tools – KM Infrastructure – KM models - KM Strategies

Unit:5	ANALYTICS	18 hours

Web Analytics and Business Intelligence – eCRM - Case Study: Web Trends – Boeing – EverBank – China Eastern

	Total Lecture hours	**90 hours**
Text Book(s)		
1	Business Intelligence in the Digital Economy - Opportunities, Limitations and Risks, M.Raisinghani, Idea Group Publications, 2004	
2	Introduction to Data Mining and its Applications, Sumathy, Sivanandam, Springer Verlag, 2006	
Reference Books		
1	Knowledge Management and Business Innovation, Yogesh Malhotra, Idea Group, 2001	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1		
2		
3		
Course Designed By:		

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

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

Course Code		Computational Intelligence	L	T	P	C
Core/Elective/Supportive		Elective - II	6	0	0	3
Pre- requisite			Syllabu sversion		2025-26 Onwards	

Course Objectives

1. To identify and understand the basics of AI and its search.
2. To study about the Fuzzy logic systems.
3. Understand and apply the concepts of Neural Network and its functions.
4. Understand the concepts of Artificial Neural Network
5. To study about the Genetic Algorithm

Course Outcomes

1	Describe the fundamentals of artificial intelligence concepts and searching techniques.	**K2**
2	Develop the fuzzy logic sets and membership function and defuzzification techniques.	**K1-K2**
3	Understand the concepts of Neural Network and analyze and apply the learning techniques	**K4,K6**
4	Understand the artificial neural networks and its applications.	**K4-K6**
5	Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.	**K3**

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

Unit I	**AI**	**18 hours**

Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.

Unit II	**Fuzzy Logic Systems**	**18 hours**

Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – fuzzy rule-based classifier.

Unit III	**Neural Networks**	**18 hours**

Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self-Organizing Map, Recent Applications

Unit IV	**Artificial Neural Networks**	**18 hours**

Artificial Neural Networks: Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.

Unit V	**Genetic Algorithm**	**16 hours**

Genetic Algorithm: Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm

Unit VI	**Contemporary Issues**	**2 hours**

Webinar/Seminar/Guest Lectures

Total Lecture Hours	**90 hours**

TextBook(s)	
1.S.N. Sivanandam and S.N. Deepa, ―Principles of Soft Computing, 2nd Edition, Wiley India Pvt. Ltd. 2.Stuart Russell and Peter Norvig, ―Artificial Intelligence - A Modern Approach, 2nd Edition, Pearson Education in Asia. 3.S. Rajasekaran, G. A. Vijayalakshmi, ―Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, PHI.	
Reference Book(s)	
1.F. Martin, Mc neill, and Ellen Thro, ―Fuzzy Logic: A Practical approach, AP Professional, 2000. Chin Teng Lin, C. S. George Lee, Neuro-Fuzzy Systems, PHI 2.Chin Teng Lin, C. S. George Lee, Neuro-Fuzzy Systems, PHI.	
Related Online Contents(MOOC, SWAYAM, NPTEL,Websites etc)	
1	https://www.javatpoint.com/artificial-intelligence-tutorial
2	https://www.w3schools.com/ai/
Course Designed by :	

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

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

Course Code		E-Learning	L	T	P	C
Core/elective/Supportive		Elective - III	6	0	0	3
Pre - requisite		None	Syllabus version		2025-26 Onwards	

Course Objectives

1. To learn the various E-learning approaches and Components.
2. To understand the key elements of Design Thinking.
3. To explore the models for E-learning courseware development.
4. To design E-learning courses using Authoring tools.
5. To analyze various E-learning solutions for design and development

Expected Course Outcomes

1	Distinguish the phases of activities in models of E-learning	K2
2	Analyze appropriate E-Learning instructional methods and delivery strategies	K4
3	Apply appropriate E-learning Authoring tools	K3
4	Create interactive and evaluate E-Learning courseware	K5-K6

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

UNIT I	Introduction	18 hours

Introduction to E- Learning - Need for E-Learning – Types of E-Learning – Components of E-Learning – Synchronous and Asynchronous Modes of Learning – Quality of E-Learning – Blended Learning: Activities, Team and Technology – Work Flow to Produce and Deliver E-Learning Content. Design Thinking: Introduction – Actionable Strategy – Act to Learn – Leading Teams to Win

UNIT II	Designing E-Learning Content / Course	18 hours

Design Models of E-Learning – Identifying and Organizing E-Learning Course Content: Needs Analysis –Analyzing the Target Audience – Identifying Course Content - Defining Learning Objectives – Defining the Course Sequence – Defining Instructional Methods – Defining Evaluation and Delivery Strategies – Case Study.

UNIT III	Creating Interactive E- Content	18 hours

Preparing content: Tips for Content Development and Language Style – Creating storyboards: Structure of an interactive Multimedia E-lesson – Techniques for presenting Multimedia content – Integrating multimedia elements -Developing Practice and Assessment Tests – Courseware Development – Authoring tools – Types of Authoring Tools – Selecting an Authoring Tool.

UNIT IV	Learning Platforms	18 hours

Types of Learning Platforms – Proprietary vs. Open – Introduction Learning Management System (LMS) – Content management System – CMS vs LMS – LMS solutions – Functional Areas of LMS.

UNIT V	Course Delivery and Evaluation	18 hours

Components of an Instructor Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-learning Methods and Delivery Formats – Using Communication Tools for E-learning – Course Evaluation.

Total Lecture Hours	90 hours

Text Book(s)

1. Clark, R. C., & Mayer, R. E. (2016). E-Learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning. John Wiley & Sons.
2. Means, B., Toyama, Y., Murphy, R, "Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies", 2010.
3. Crews, T. B., Sheth, S. N., Horne, T. M, "Understanding the Learning Personalities of Successful Online Students. Educause Review", 2014.

Reference Book(s)

1. Johnny Schneider, "Understanding Design Thinking, Lean and Agile", 2017.
2. Horton William, e-Learning by Design, Publisher : Pfeiffer, 2011.
3. Madhuri Dubey, "Effective E-learning Design, Development and Delivery", University Press 2011.

4. Arshavskiy, M. Instructional design for Elearning: Essential guide to creating successful Elearning courses. CreateSpace.,2013		
	Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1		
2		
Course Designed by :		

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

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

Course Code	Machine Learning	L	T	P	C
Core/elective/Supportive	Elective - III	6	0	0	3
Pre - requisite	None	Syllabus version			2025-26 Onwards

Course Objectives

- To explain about the basics of machine learning

Expected Course Outcomes

1	Understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.	K2
2	Understanding of the strengths and weaknesses of many popular machine learning approaches.	K2
3	Explain about the concepts of computational learning theory and dimensionality Reduction	K2
4	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.	K3

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

UNITI	Introduction to Learning	18 hours

Algorithmic models of learning, Learning classifiers, functions, relations, grammars, probabilistic models, value functions, behaviors and programs for experience. Bayesian, maximum some posterior, and minimum description length frameworks.

UNIT II	Learning Models	18 hours

Parameter Estimation, sufficient statistics, decision trees, neural networks, support vector machines, Bayesian networks, bag of words classifiers, N-gram models; Markov and Hidden Markov models, probabilistic relational models, association rules, nearest neighbor classifiers, locally weighted regression, ensemble classifiers.

UNIT III	Computational Learning	18 hours

Computational Learning theory, mistake bound analysis, sample complexity analysis, VC dimension, Occam learning, accuracy and confidence boosting, Dimensionality reduction: Principal component Analysis, feature selection and visualization.

UNIT IV	Unsupervised Learning	18 hours

Unsupervised Learning: Clustering, mixture models, k-means clustering, hierarchical clustering, distributional clustering, Reinforcement learning; Learning from heterogeneous, distributed, data and knowledge.

UNIT V	Learning Applications	18 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.

	Total Lecture Hours	90 hours

Text Book(s)

1. Bishop, C. (2006). Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.

Reference Book(s)	
1	Russel, S. And Norving, P. (2003). Artificial Intelligence: A Modern Approach. 2nd Edition, New York: Prentice-Hall.
2	Baldi, P., Frasconi, P., Smyth, P. (2002). Bioinformatics: A Machine Learning Approach. Cambridge, MA: MIT Press.
3	Baldi, P., Frasconi, P., Smyth, P. (2003). Modeling the Internet and the Web – Probabilistic Methods and Algorithms. New York: Wiley.
4	Bishop, C.M. Neural Networks for pattern recognition. New York: Oxford University press (1995).
5	Hastie, T., Tibshirani, R., and Friedman, J. (2001). The elements of Statistical Learning – Data mining, Inference, and Prediction, Berlin: Springer- Verlag.
6	Cohen, P.R. (1995) Empirical Methods in Artificial Intelligence. Cambridge, MA: MIT Press.
7	Cowell, R.G., Dawid, A.P., Lauritzen, S.L., and Spiegelhalter. D.J. (1999). Graphical Models and Expert Syatems. Berlin: Springer.
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	**M**	**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**	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

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

Course code		Internet of Things (IoT)	L	T	P	C
Core/Elective/Supportive		Elective : III	5	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.

Unit:2	IOT and M2M	15 hours

Domain specific Iots : Home Automation - cities - Environment - Energy - retail - logistics - Agriculture - Industry Health and life style. IoT and M2M - Difference between IoT and M2M - SDN and NFV for lot.

Unit:3	IOT SPECIFICATION	15 hours

IoT systems management - SNMP - YANG – NETOPEER. 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 - Device and component Integrators - Application Development.

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 - Linux on Raspberry Pi - Raspberry Pi interfaces.

Unit:5	IOT AND CLOUD COMPUTING	13 hours

Python Web application frame work - Amazon web services for IoT- Case Studies illustrating IoT Design. Home Automation-Environment-Agriculture-IoT Primer.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars – webinars

	Total Lecture hours	75 hours

Text Book(s)	
1	Internet of Things - A hands on Approach Authors: Arshdeep Bahga, Vijay Madisetti Publisher: Universities press.
2	Basics of Internet of Things, Dr S Prasath, Immortal Publications Pvt. Ltd 2025.
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, Websites etc.]	
1	
2	
3	
Course Designed By:	

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

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

Course Code		Data Analytics Lab	L	T	P	C
Core/Elective/Skill		Skill Based Subject Programming Lab – II	0	0	3	2
Pre - requisite		None	Syllabu sversion		2025-26 Onwards	

Course Objectives

1. Understand the Programming Language.
2. To prepare data for data analysis through understanding its distribution.
3. Exposure on data processing using excel
4. To acquire knowledge in plotting using visualization tools.
5. To understand and implement classification and regression model.

Course Outcomes

1	Understand the basic concepts and techniques of Machine Learning.	K2
2	Explain the regression methods, classification methods, clustering methods.	K1
3	Apply the inference and learning algorithms for the hidden Markov model.	K3
4	Demonstrate Dimensionality reduction Techniques	K4
5	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.	K5

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

List of Programs

1. Study of Basic function in Excel
2. Working with Range Names and Tables
3. Cleaning Data with Text Functions
4. Cleaning Data containing Data Values
5. Working with VLOOKUP functions and Pivot Table.
6. Demonstration of Data Visualization in Excel.
7. Importing Data from External Source Using Excel
8. Creating a data model
9. Create a dashboard for a given requirement
10. Implement a data analytics for the real time data set

Total Lecture Hours	**90 Hours**

Text Book(s)

Reference Book(s)

Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)

Course Designed by :

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

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