B.Sc. (Computer Technology)

Syllabus

AFFILIATED COLLEGES

Program Code: 26K

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 Technology** program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
1	To enhance the broad knowledge in core area related to computer software and hardware technologies
2	To develop and acquire in-depth knowledge in software design and implementation to meet the requirement of corporate
3	To facilitate the graduates to pursuing professional careers or researcher or entrepreneurs in computing technologies
4	To enrich the learners to develop communication, professional skills and to inculcate team spirit
5	To stimulate the graduates to build awareness on social responsibility , ethical practices and human values in-built in the discipline

Program Specific Outcomes (PSOs)	
After the successful completion of B.Sc Computer Technology program, the students are expected to	
1	Ability to apply core area knowledge in computing system in appropriate to the discipline
2	Acquired knowledge in software and hardware skills and implementation challenges in varying techniques
3	Ability to engage in life-long learning and adopt fast changing technology to prepare for professional development
4	Improve to exhibit professionally or team leader or entrepreneur
5	Realize technological advances impart society and the social, ethical difficulties of computer technology and their practice.

Program Outcomes (POs)	
On successful completion of the B.Sc. **Computer Technology** 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 Technology (CBCS PATTERN)

(*For the students admitted from the academic year **2025-2026** and 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: Software Security	4	3	25	75	100	4
III	Skill Based Subject – I : Data Communication and Networks	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 : Ethical Hacking	4	3	25	75	100	4
III	Skill Based Subject Programming Lab – I : Network Lab	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 : Network Security & Management	3	3	25	25	50	2
III	Core Lab - VII : Capstone Project Work Lab *****	3	3	20	30	50	2
IV	Naan Mudhalvan Skill Course ***		-	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	5	3	25	75	100	4
III	Elective – II : Middleware Technologies / Animation Techniques / Computer Installation & Servicing	6	3	25	75	100	3
III	Elective – III : Data Mining / Embedded Systems / Internet of Things (IoT)	6	3	25	75	100	3
III	Skill Based Subject Programming Lab – II : Network Security Lab	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	13 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**	**15 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**	**2 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.

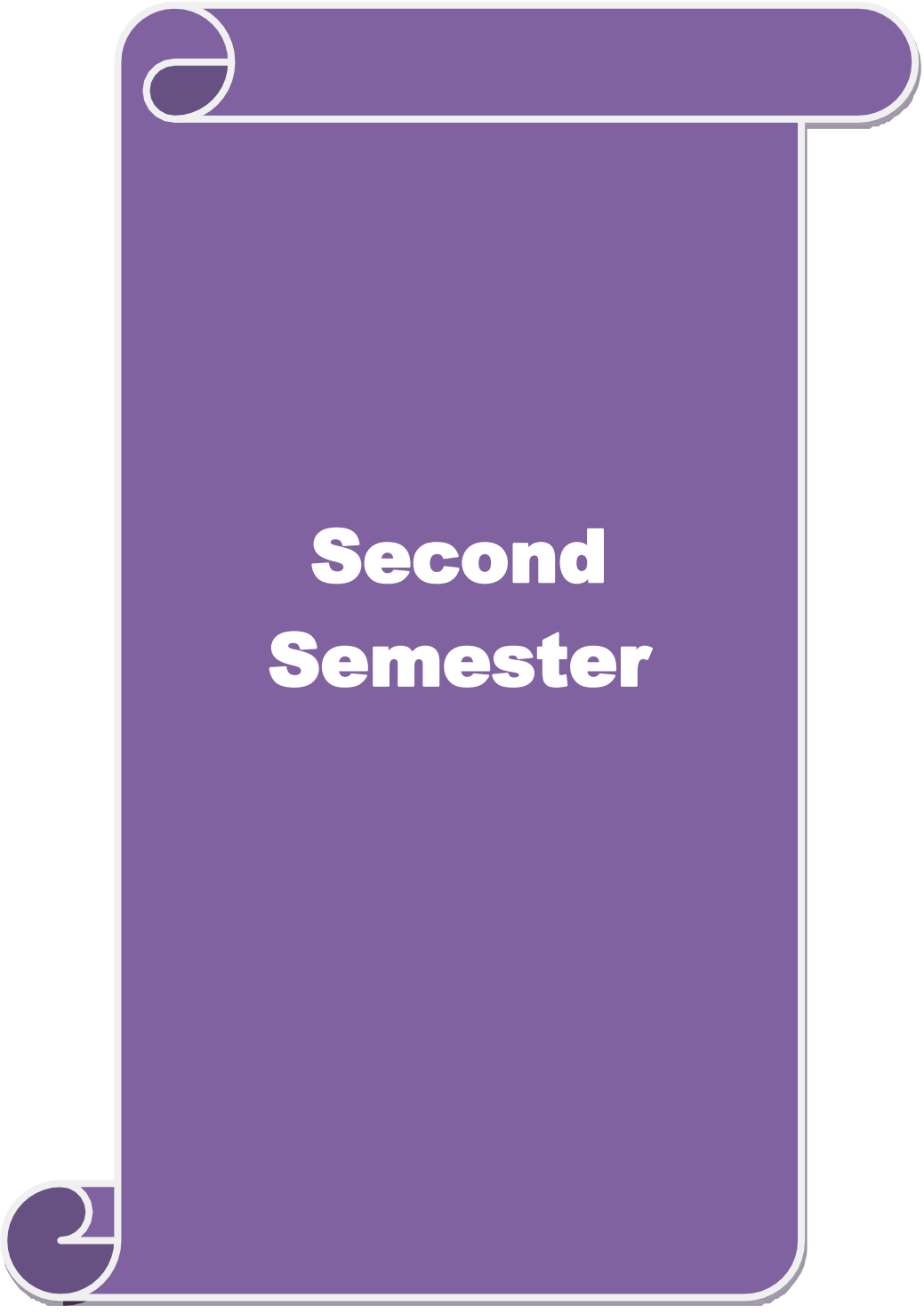
Text Book(s)

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	18 hours

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

Unit:2	BRANCHING AND LOOPING	18 hours

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

Unit:3	ARRAYS AND INTERFACES	18 hours

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

Unit:4	ERROR HANDLING	18 hours

Managing Errors and Exceptions – Applet Programming – Graphics Programming.

Unit:5	MANAGING INPUT / OUTPUT FILES IN JAVA	16 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**	**2 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**

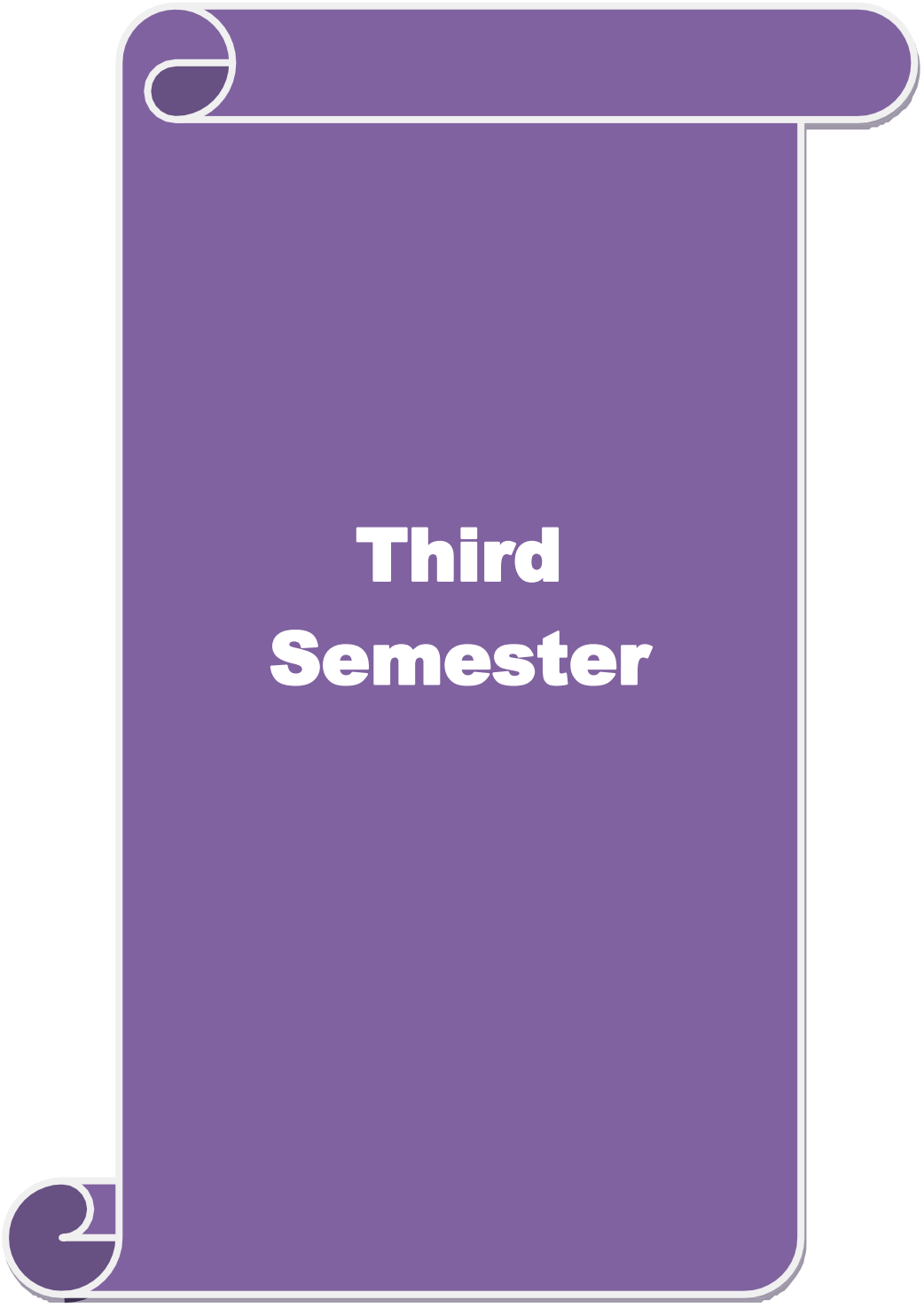
1. Prepare your resume in word and assume that you are studying in final year of your graduation and are eagerly looking for a job. Visit any job portal and upload your resume.
2. Create a flowchart for any program use proper shapes like ellipse, arrows, rectangle, parallelogram and grouping to group 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	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		DATA COMMUNICATION AND NETWORKS	L	T	P	C
Core/Elective/Supportive		Skill Based Subject - 1	3	0	0	3
Pre-requisite		Basic knowledge on computer networking	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to learn about communications and networks, protocols and transmission methods.
2. To understand the transmission methods, media and networking protocols
3. To understand the concept of integrated services digital networking (ISDN)

Expected Course Outcomes:

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

1	Understand the basics of communications and networking	K1
2	Understand and remember the analog and digital transmission methods, mode of transmissions, parallel and serial communications, etc.	K1-K3
3	Understand and analyse the transmission media, network topology and switching techniques.	K4
4	Remember, understand the network protocols and the functions of OSI model	K3
5	Understand the ISDN architecture, interfaces, protocols, ATM cells and layers.	K1-K4

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

Unit:1	INTRODUCTION TO COMMUNICATIONS AND NETWORKING	9 hours

Introduction to communications and Networking : Introduction – Fundamental concepts - Data communications – Protocols- standards - Standards organizations – Signal propagations- Analog and Digital signals- Bandwidth of a signal and a medium – Fourier analysis and the concept of bandwidth of a signal - The data transmission rate and the bandwidth. Information encoding: Introduction – Representing different symbols Minimizing errors- Multimedia – Multimedia and Data compression.

Unit:2	ANALOG AND DIGITAL TRANSMISSION METHODS	9 hours

Analog and digital transmission methods: Introduction - Analog signal, Analog transmission - Digital signal, Digital transmission - Digital signal , Analog transmission - Baud rate and bits per second - Analog signal, Digital (Storage and) transmission – Nyquist Theorem. Modes of data transmission and Multiplexing: Introduction – Parallel and Serial communication - Asynchronous, Synchronous and Isochronous communication - Simplex, Half-duplex and Full-duplex communication – Multiplexing - Types of Multiplexing – FDM versus TDM. Transmission Errors: Detection and correction : Introduction – Error classification – Types of Errors – Error detection.

Unit:3	TRANSMISSION MEDIA	9 hours

Transmission media: Introduction - Guided media - Un Guided media – Shannon capacity. Network topologies, switching and routing algorithms: Introduction – Mesh topology - Star topology - Tree topology - Ring topology - Bus topology - Hybrid topology - Switching basics-

Circuit switching – Packet switching - Message switching - Router and Routing – Factors affecting routing algorithms - Routing algorithm -Approaches to routing.		
Unit:4	**NETWORKING PROTOCOLS AND OSI MODEL**	**9 hours**
Networking protocols and OSI model: Introduction – Protocols in computer communications - The OSI model - OSI layer functions.		
Unit:5	**INTEGRATED SERVICES DIGITAL NETWORKING (ISDN):**	**9 hours**
Integrated services digital networking (ISDN): Introduction – Background of ISDN - ISDN architecture – ISDN interfaces - Functional grouping – Reference points - ISDN protocol architecture – Broadband ISDN (B-ISDN). of ATM – Packet size – Virtual circuits in ATM – ATM cells – Switching – ATM layers – Miscellaneous Topics.		
	Total Lecture hours	**45 hours**

Text Book(s)

1	Data Communications and Networks, Achyut. S. Godbole, Tata McGraw-Hill Publishing Company, 2007.

Reference Books

1	Introduction to Data communications and Networking. W.Tomasi. Pearson education.
2	Computer Networks, L.L.Peterson and B.S.Davie;4th Edition, HEVIBK

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

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

Course Code		Software Security	L	T	P	C
Core/elective/Supportive		Allied : III	4	0	0	4
Pre - requisite		Basic Knowledge about software and hardware	Syllabus Version		2025-26 onwards	

Course Objectives

- To explain the need for software security
- To explain the various types of security attacks and the risks associated.

Expected Course Outcomes

1	Explain the various types of security attacks and its implications	K2
2	Illustrate the concepts of security risk management and security testing	K2
3	Apply the various testing methodologies to evaluate the risks associated.	K3
4	Compare and contrast the implications of good and bad software design	K4
5	Classify the various tools for penetration testing	K4

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

UNIT I	Low Level Attacks	12

Need for Software Security – Memory Based Attacks – Low Level Attacks Against Heap and Stack - Stack Smashing – Format String Attacks – Stale Memory Access Attacks – ROP (Return Oriented Programming) – Malicious Computation Without Code Injection. Defense against Memory Based Attacks – Stack Canaries – Non-Executable Data - Address Space Layout Randomization (ASLR), Memory-Safety Enforcement, Control-Flow Integrity (CFI) –Randomization

UNIT II	Secure Design	12

Isolating the Effects of Untrusted Executable Content - Stack Inspection – Policy Specification Languages – Vulnerability Trends – Buffer Overflow – Code Injection - Generic Network Fault Injection – Local Fault Injection - SQL Injection - Session Hijacking. Secure Design – Threat Modeling and Security Design Principles - Good and Bad Software Design - Web Security Browser Security: Cross-Site Scripting (XSS), Cross-Site Forgery (CSRF) – Database Security –File Security

UNIT III	Security Risk Management	12

Risk Management Life Cycle – Risk Profiling – Risk Exposure Factors – Risk Evaluation and Mitigation – Risk Assessment Techniques – Threat and Vulnerability Management.

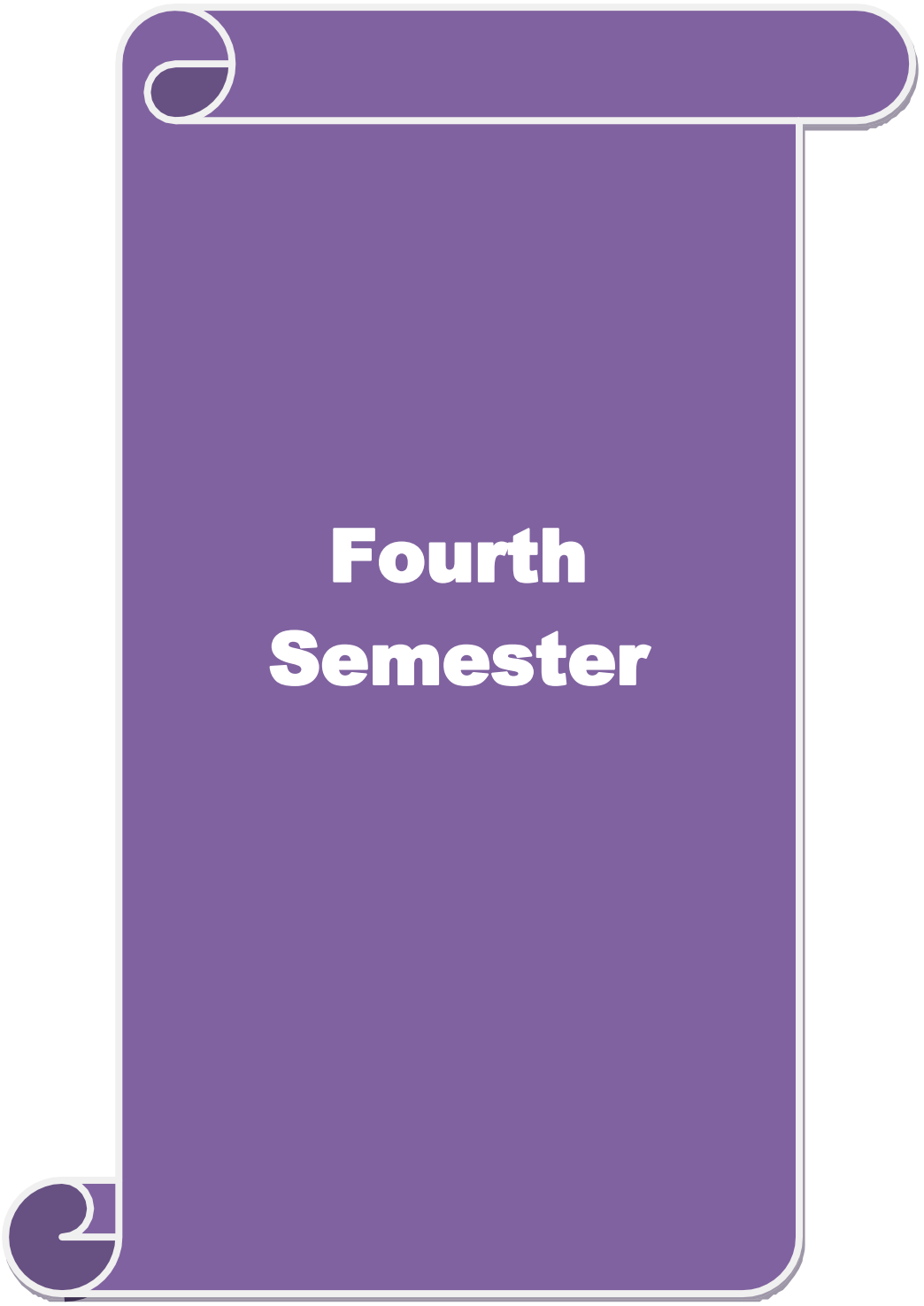
UNIT IV	Security Testing	12

Traditional Software Testing – Comparison - Secure Software Development Life Cycle – Risk Based Security Testing – Prioritizing Security Testing with Threat Modeling – Shades of Analysis: White, Grey and Black Box Testing.

UNIT V	Penetration Testing	12
Advanced Penetration Testing – Planning And Scoping – DNS Groper – DIG (Domain Information Graph) – Enumeration – Remote Exploitation – Web Application Exploitation - Exploits And Clients ide Attacks – Post Exploitation – Bypassing Firewalls and Avoiding Detection - Tools for Penetration Testing		
Total Lecture Hours		**60 Hours**
Text Book(s)		
1	Robert C. Seacord, "Secure Coding in C and C++ (SEI Series in Software Engineering)",Addison-Wesley Professional, 2005.	
2	Jon Erickson , "Hacking: The Art of Exploitation", 2nd Edition, No Starch Press, 2008.	
3	Mike Shema, "Hacking Web Apps: Detecting and Preventing Web Application SecurityProblems", First edition, Syngress Publishing, 2012	
Reference Book(s)		
1	Bryan Sullivan and Vincent Liu, "Web Application Security, A Beginner's Guide", KindleEdition, McGraw Hill, 2012	
2	Evan Wheeler, "Security Risk Management: Building an Information Security RiskManagement Program from the Ground Up", First edition, Syngress Publishing, 2011	
3	Chris Wysopal, Lucas Nelson, Dino Dai Zovi, and Elfriede Dustin, "The Art of SoftwareSecurity Testing: Identifying Software Security Flaws (Symantec Press)", Addison-Wesley Professional, 2006	
4	Lee Allen, "Advanced Penetration Testing for Highly-Secured Environments: The UltimateSecurity Guide (Open Source: Community Experience Distilled)", Kindle Edition, PacktPublishing, 2012	
	Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1	**https://onlinecourses.swayam2.ac.in/aic20_sp06/preview**	
2	**https://onlinecourses.swayam2.ac.in/arp19_ap79/preview**	
Course Designed by :		

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

*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.]

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	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	12 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	10 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	
3	

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 – NETWORK LAB	L	T	P	C
Core/Elective/Supportive		Skill Based Subject 2 (Lab) :1	0	0	3	2
Pre-requisite		Basic knowledge on computer networks	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To provide practical exposure to the students in communication and networking.
2. To learn how to detect errors during the transmission of packets.
3. To enable the students to learn two types of communications
4. To understand the concepts of sockets and to provide practical exposures in developing socket applications.

Expected Course Outcomes:

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

1	Understand the concept of error detections in LRC and CRC techniques and develop programs.	K1, K2
2	Understand and apply types of communications using sockets	K2-K3
3	Understand the concept the communication protocols and create application to illustrate the concepts.	K3
4	Understand the routing protocol, apply the concept and develop applications.	K4-K5
5	Understand, analyse, and apply the concept of Remote procedures using client server applications.	K6

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

Programs	**36 hours**
1. Write a program to Detect Errors using Vertical Redundancy Check (VRC).	
1. Write a program to Detect Errors using Longitudinal Redundancy Check (LRC).	
3. Write a program to Detect Errors using Cyclic Redundancy Check (CRC).	
4. Write a Socket program to implement Asynchronous Communication.	
5. Write a Socket program to implement Isochronous Communication..	
6. Write a program to implement Stop & Wait Protocol.	
7. Write a program to implement Sliding Window Protocol.	
8. Write a program to implement the Shortest Path Routing using Dijkstra algorithm.	
9. Write a Socket Program to Perform file transfer from Server to the Client.	
10. Write a Program to implement Remote Procedure call under Client / Server Environment	
Total Lecture hours	**36 hours**

Text Book(s)

1	Introduction to Data communications and Networking. W.Tomasi. Pearson education.

Reference Books

1	Computer Networks, L.L.Peterson and B.S.Davie;4th Edition, HEVIBK

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

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

Course Code		Ethical Hacking	L	T	P	C
Core/elective/Supportive		Allied : IV	3	0	0	2
Pre - requisite		None	Syllabus Version			2025-26 onwards

Course Objectives

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

Expected Course Outcomes

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

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

UNIT I	Introduction To Hacking	12

Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Foot printing – Information Gathering Methodology – Foot printing Tools – WHOIS Tools – DNS Information Tools– Locating the Network Range – Meta Search Engines

UNIT II	Scanning And Enumeration	10

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

UNIT III	System Hacking	14

Introduction – Cracking Passwords – Password Cracking Websites – Password Guessing –Password Cracking Tools – Password Cracking Countermeasures – Escalating Privileges –Executing Applications – Key loggers and Spyware

UNIT IV	Programming For Security Professionals	12

Programming Fundamentals – C language – HTML – Perl – Windows OS Vulnerabilities – Toolsfor Identifying Vulnerabilities – Countermeasures – Linux OS Vulnerabilities – Tools for IdentifyingVulnerabilities – Countermeasures

UNIT V	Penetration Testing	12

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

Total Lecture Hours	60 Hours

Text Book(s)		
1	EC-Council, “Ethical Hacking and Countermeasures: Attack Phases”, Cengage Learning,2010.	
2	Jon Erickson, “Hacking, 2nd Edition: The Art of Exploitation”, No Starch Press Inc., 2008.	
3	Michael T. Simpson, Kent Backman, James E. Corley, “Hands-On Ethical Hacking andNetwork Defense”, Cengage Learning, 2013.	
Reference Book(s)		
1	Patrick Engebretson, “The Basics of Hacking and Penetration Testing – Ethical Hackingand Penetration Testing Made Easy”, Second Edition, Elsevier, 2013.	
2	RafayBoloch, “Ethical Hacking and Penetration Testing Guide”, CRC Press, 2014	
	Related Online Contents (MOOC, SWAYAM,NPTEL, Websites etc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview	
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview	
Course Designed by :		

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

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

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	
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	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 & 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	3
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	18 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**	**15 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	3
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	3
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	15 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.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	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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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

Course Designed By:

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

Course code		Network Security and Management	L	T	P	C
Core/Elective/Supportive		Skill Based Subject – 3	3	0	0	2
Pre-requisite		Basic knowledge on computer network threats	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to learn security attacks, policies and guidelines.
2. To learn the data encryption methods, hardware security.
3. To understand the intrusion detection systems.
4. To understand the concept of security management, email and internet banking security policies.

Expected Course Outcomes:

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

1	Understand the basic of network security and security infrastructure.	K1
2	Understanding the mechanisms in hardware, software security and database security.	K2-K3
3	Understand the infrastructure and classification of intrusion detection systems and network security.	K4
4	Knowledge on network management standards, network management model, SNMP, security plan and disaster recovery.	K2-K4
5	To inculcate knowledge on Email policy, university email policy and security of internet banking system and also the layered approach to security.	K1-K4

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

Unit:1	INTRODUCTION TO SECURITY MANAGEMENT	9 hours

Introduction: Why Network Security is needed – Management principles – Security principles - Network management - Security attacks – Qualities of a Good Network. Organizational Policy and Security: Security policies, Standards and Guidelines – Information Policy – Security Policy - Physical Security – Social Engineering – Security Procedures – Building a Security Plan. Security Infrastructure: Infrastructure Components – Goals of Security Infrastructure – Design Guidelines – Security Models.

Unit:2	CRYPTOGRAPHY	9 hours

Cryptography: Terminology and background – Data Encryption Methods – Cryptographic Algorithms- Secret Key Cryptography - Public key cryptography – Message Digest – Security Mechanisms – Speech Cryptography. Hardware and Software Security: Hardware security – Smart Card – Biometrics – Virtual Private Networks (VPNs) - Trusted Operating Systems – Pretty Good Privacy (PGP) – Security Protocols.

Unit:3	DATABASE AND NETWORK SECURITY	9 hours

Database Security: Introduction to Database – Characteristics of a Database Approach – Database Security Issues - Database Security – Vendor-Specific Security – Data Warehouse Control and Security. Network Security: Fundamental Concepts – Identification and Authentication – Access Control – A Model for Network Security – Malicious Software – Firewalls.

Unit:4	**NETWORK MANAGEMENT**	**9 hours**
Network Management: Goal of Network Management – Network Management Standards – Network Management Model – Infrastructure for Network Management - Simple Network Management Protocol (SNMP).		
Unit:5	**SECURITY MANAGEMENT**	**7 hours**
Security Management: Security Plan - Security Analysis - Change Management - Disaster Recovery - Systems Security Management - Protecting Storage Media- Protection of System Documentation -Exchanges of Information and Software – Security Requirements of Systems.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**45 hours**

Text Book(s)

1	Network Security and Management, Brijendra Singh, PHI 2007.
2	William Stallings, Cryptography and Network Security Principles and Practices, Fourth edition, PHI Education Asia.

Reference Books

1	Atul Kahate, Cryptography and Network Security, 2 nd Edition, TMH.
2	Behrouz A.Forouzan, Cryptography and Network Security, 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	M	S	L	M	M	M	M	M	L
CO2	S	S	L	S	M	S	S	S	M	L
CO3	M	M	M	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	L	S	S	M	S	S	M	M	M

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

Course Code		Core Lab - 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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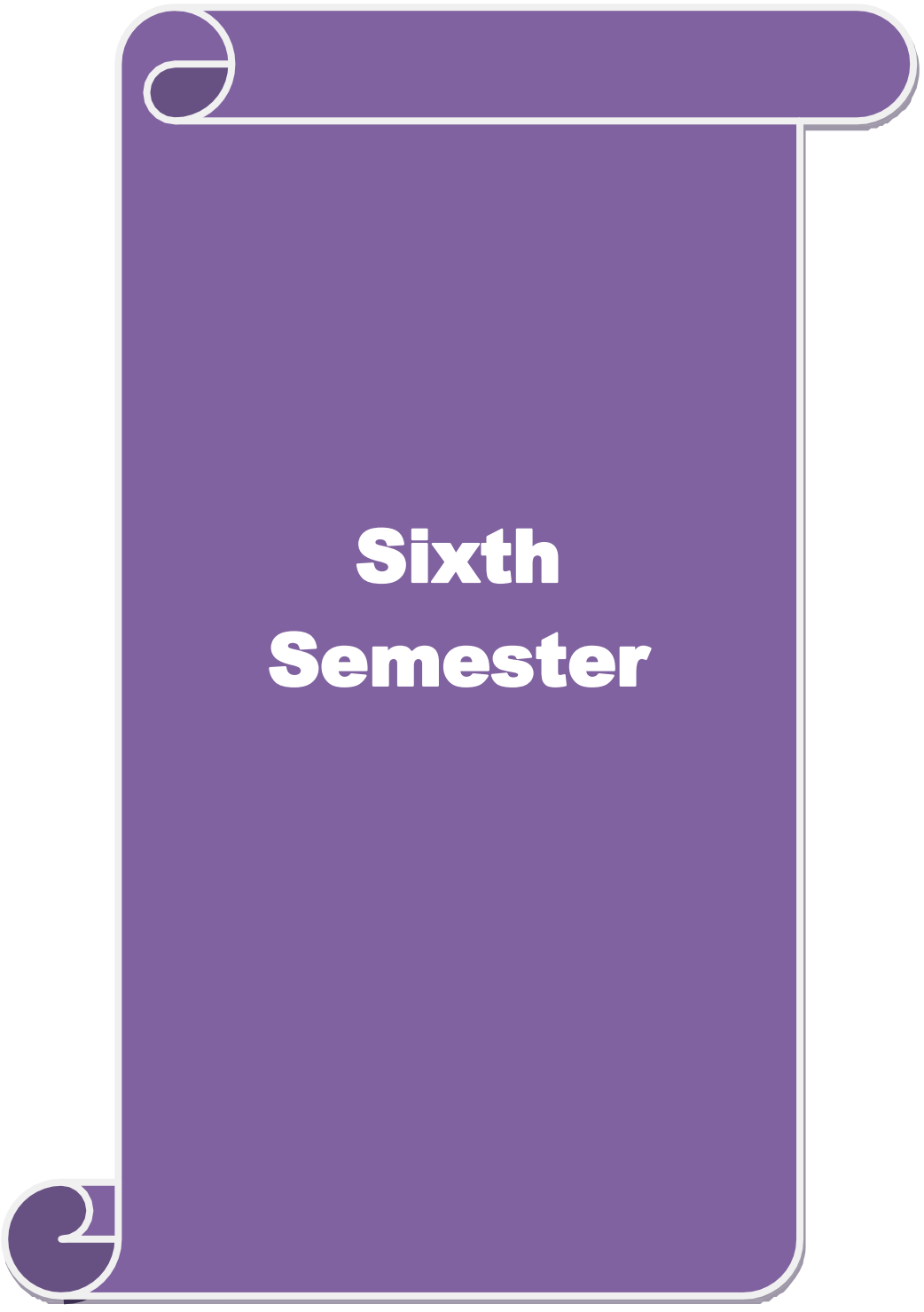
Sixth
Semester

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	12 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**	**15 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**	**3 hours**
Expert lectures, online seminars - webinars		
	Total	**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 graphics and multimedia applications.	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To learn the basic principles of 2-dimensional computer graphics.
2. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
3. Provide an understanding of mapping from a world coordinates to device coordinates, clipping and projections.
4. To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization and business applications.
5. 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 computer graphics.	**K1**
2	Design scan conversion problems using C and C++ programming.	**K2**
3	Apply clipping and filling techniques for modifying an object.	**K3**
4	Understand the concepts of different type of geometric transformation of objects in 2D.	**K4**
5	Understand and develop the practical implementation of modeling, rendering, viewing of objects in 2D	**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.]	
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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
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		MIDDLEWARE TECHNOLOGIES	L	T	P	C
Core/Elective/Supportive		Elective : II	6	0	0	3
Pre-requisite		Basic knowledge on client, server and web application	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To understand the concept of client server architectures
2. To enable the students to learn presentation and data management services.
3. To learn the concept of EJB, ASP.NET architecture and ADO.NET.

Expected Course Outcomes:

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

1	Understand the client server architecture, J2EE architecture, DOTNET architecture and MVC architecture.	**K2**
2	Understand the presentation services JSP and interaction services RMI, CORBA, XML, JAXP, JMS and data management services JDBC.	**K2**
3	Understand the component model EJB and obtain knowledge on entity bean and message driven bean.	**K3**
4	Understand the ASP.NET architecture, web server controls, rich web controls and validation controls, Analyse security management in ASP.NET.	**K2-K4**
5	Knowledge on ADO.NET with ASP.NET for creating web based data centric applications. Also understand web services.	**K2-K4**

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

Unit:1	CLIENT-SERVER ARCHITECTURE	18 hours

Client-Server architecture: 2-tier model – 3-tier model – n-tier model – J2EE architecture – DOTNET architecture – MVC architecture

Unit:2	PRESENTATION SERVICES	18 hours

Presentation services: Servlets – JSP – Interaction services: RMI – CORBA – XML – JAXP - JMS – Data Management services: JDBC

Unit:3	COMPONENT MODEL	18 hours

Component model: EJB: Session Beans: Stateless and Stateful – Entity Beans – CMP and BMP - Message Driven Beans

Unit:4	ASP.NET	18 hours

ASP.NET : Introduction – architecture – ASP.NET Runtime – Internet Information Services – Visual Web Developer Web Server – ASP.NET Parser – Assembly – Page class. Web Server Controls – HTML Controls – AdRotator and Calendar controls – Validation Controls – Security Management.

Unit:5	ASP.NET and ADO.NET	18 hours

ASP.NET and ADO.NET: System.Data.SqlClient and Xml namespaces – Provider objects and Consumer objects – Disconnected data access – GridView FormView. Web Services: Provider –

WSDL – UDDI – SOAP – HTTP – Developing simple web services – Connecting a Web Service to a data source – Developing ASP.NET Clients for Web Services.		
	Total Lecture hours	**90 hours**
Text Book(s)		
1	Justin Couch and Daniel H Steinberg, "J2EE bible", Willey India Pvt. Ltd, New Delhi, 2002.	
2	MridulaParihar et al., ASP.NET Bible,2002 Edition, Hungry Minds Inc, New York, USA. 5.	
3	Bill Evjen, Hanselman, Muhammad, Sivakumar& Rader, Professional ASP.NET 2.0, 2006 Edition, Wiley India(p) Ltd.	
Reference Books		
1	Paul Tremblett, "Instant Enterprise Java Beans", TMH Publishing company, New Delhi, 2001.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1		
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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	M	S	L	S	M	L	M	S	S
CO3	S	S	S	L	S	M	L	M	M	S
CO4	S	S	S	L	S	M	L	M	M	S
CO5	S	S	S	L	S	M	L	M	M	S

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

Course code		ANIMATION TECHNIQUES	L	T	P	C
Core/Elective/Supportive		Elective : II	6	0	0	3
Pre-requisite		Basic knowledge in 2D and 3D animations	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	BASICS	18 hours

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

Unit:2	CREATING ANIMATION IN FLASH	18 hours

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

Unit:3	3D ANIMATION & ITS CONCEPTS	18 hours

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

Unit:4	MOTION CAPTION	18 hours

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

Unit:5	CONCEPT DEVELOPMENT	18 hours

Concept Development –Story Developing –Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets - 3D Animated Movies.

	Total Lecture hours	**90 hours**

Text Book(s)	
1	Principles of Multimedia, Ranjan Parekh, 2007, TMH. (Unit I, Unit V)
2	Multimedia Technologies, Ashok Banerji, Ananda Mohan Ghosh, McGraw Hill Publication
Reference Books	
1	Ze-Nian Li and Mark S.Drew, “Fundamentals of Multimedia”, First Edition, Pearson Education, 2007
2	Prabhat K Andleigh, Kiran Thakrar, “Multimedia systems design”, First Edition, PHI, 2007
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	
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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	M	S	L	S	M	L	M	S	S
CO3	S	S	S	L	M	M	L	M	M	S
CO4	S	S	S	M	S	M	L	M	M	S
CO5	S	S	S	L	S	M	L	M	M	S

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

Course code		COMPUTER INSTALLATION AND SERVICING	L	T	P	C
Core/Elective/Supportive		Elective : II	6	0	0	3
Pre-requisite		Basics of computer software installation and servicing	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to learn basic of computer installation and servicing
2. To study the computer peripherals attached with the system
3. To learn the troubleshooting techniques during failures.

Expected Course Outcomes:

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

1	Understand the basics of PC, functional blocks and memory organization.	**K2**
2	Understand the floppy disk, hard disk drive, MMX.	**K1-K3**
3	Knowledge in input devices monitors and display adapters.	**K1-K3**
4	Knowledge in output devices and PC installation steps.	**K1-K3**
5	Understand the troubleshooting and servicing, data security, communication networking, modem and internet.	**K4**

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

Unit:1	PC SYSTEM	18 hours

PC SYSTEM Personal Computer System - Functional Blocks - System Unit - Display Unit - Keyboard. INSIDE PC Motherboard - BIOS - CMOS-RAM – Motherboard types – Processors – Chipsets – USB. ON-BOARD MEMORY PC_s Memory Organization - Memory packaging - I/O Ports - USB Port.

Unit:2	FLOPPY DISK	18 hours

Floppy Disk Drive and Controller - Hard Disk Drive and Controller, MMX – Multimedia Extensions.

Unit:3	INPUT DEVICES	18 hours

Input Devices - Monitors and Display Adapters.

Unit:4	OUTPUT DEVICES	18 hours

Output Devices DOT Matrix Printer - Printer Controller - Laser Printer – Inkjet Printer. Computer Installation Power supply - PC Installation.

Unit:5	Troubleshooting and servicing	18 hours

Troubleshooting and servicing POST, Trouble shooting the mother board - Trouble shooting the Keyboard - Trouble shooting the disk devices - Trouble shooting the printer. Maintenance Diagnostic Software_s - Data Security. Computers and Communication Networking – Modem - Internet.

	Total Lecture hours	90 hours

Text Book(s)	
1	Computer Installation and Servicing, 2nd Edition, D.Balasubramaniam, Tata McGrawHill, 2005.
Reference Books	
1	D Balasubramanian,"COMPUTER INSTALLATION AND SERVICING", Second edition, Mc-Graw Hills Publication, 2005.
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	M	M	M	S
CO3	S	M	S	M	S	M	L	L	S	S
CO4	S	M	S	L	S	M	L	M	S	M
CO5	S	M	S	L	S	M	L	M	S	S

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

Course code		DATA MINING	L	T	P	C
Core/Elective/Supportive		Elective: III	6	0	0	3
Pre-requisite		Basic knowledge on data, database and statistical functions	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To introduce the concept of data Mining as an important tool for enterprise data management and cutting edge technology for building competitive advantage.
2. To enable students to effectively identify sources of data and process it for data mining
3. To make students well versed in all data mining algorithms, methods of evaluation.
4. To impart knowledge of tools used for data mining
5. To provide knowledge on how to gather and analyze large sets of data to gain useful business understanding.

Expected Course Outcomes:

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

1	Identify data mining tools and techniques in building intelligent machines understand	**K1-K2**
2	Analyze various data mining algorithms in applying in real time applications.	**K2-K4**
3	Demonstrate the data mining algorithms to combinatorial optimization problems	**K2-K3**
4	Illustrate the mining techniques like association, classification and clustering on transactional databases.	**K2-K3**
5	Perform exploratory analysis of the data to be used for mining.	**K3-K6**

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

Unit:1	BASIC DATA MINING TASKS	18 hours

Basic Data Mining Tasks – Data Mining Versus Knowledge Discovery in Data Bases – Data Mining Issues – Data Mining Matrices – Social Implications of Data Mining – Data Mining from Data Base Perspective.

Unit:2	DATA MINING TECHNIQUES	18 hours

Data Mining Techniques – a Statistical Perspective on data mining – Similarity Measures – Decision Trees – Neural Networks – Genetic Algorithms.

Unit:3	CLASSIFICATION	18 hours

Classification: Introduction – Statistical – Based Algorithms – Distance Based Algorithms – Decision Tree – Based Algorithms – Neural Network Based Algorithms – Rule Based Algorithms – Combining Techniques.

Unit:4	CLUSTERING	18 hours

Clustering: Introduction – Similarity and Distance Measures – Outliers – Hierarchical Algorithms. Partitional Algorithms.

Unit:5	ASSOCIATION RULES	18 hours

Association Rules: Introduction - Large Item Sets – Basic Algorithms – Parallel & Distributed

Algorithms – Comparing Approaches – Incremental Rules – Advanced Association Rules Techniques – Measuring the Quality of Rules.		
	Total Lecture hours	**90 hours**
Text Book(s)		
1	Margaret H.Dunbam, Data Mining Introductory and Advanced Topics, Pearson Education – 2003.	
2	Arun K.Pujari, "Data Mining Techniques", Universities Press, 2010.	
Reference Books		
1	Jiawei Han & Micheline Kamber, Data Mining Concepts & Techniques, 2001 Academic Press.	
2	K.P.Soman, Shyam Diwakar, V.Ajay, "Insight into Data Mining – Theory and Practice", Prentice Hall of India, 2009.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
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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	M	S	S	M	S	M	M	L	S	M
CO3	M	S	S	L	M	L	M	M	S	S
CO4	M	M	M	M	M	M	L	L	S	S
CO5	M	S	S	L	S	L	M	M	S	M

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

Course code		**EMBEDDED SYSTEMS**	**L**	**T**	**P**	**C**

Core/Elective/Supportive	Elective: III	6	0	0	3
Pre-requisite	**Basic knowledge in devices and programming skills in C and C++**	**Syllabus Version**	**2025-26 Onwards**		

Course Objectives:

The main objectives of this course are to:

1. To enable the students to learn embedded system concepts and to develop embedded real time applications.
2. To learn the embedded programming in C and C++ to develop applications.
3. To study the embedded programming modeling in single and multiprocessor systems.

Expected Course Outcomes:

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

1	Understand and remember the basic concepts in embedded system and memory organization, DMA.	**K1,K2**
2	Understand the devices, buses for device networks, serial and parallel port device drivers, interrupt servicing mechanism.	**K2,K3**
3	Understand the embedded programming concepts in C and C++, apply to develop embedded application.	**K3**
4	Knowledge on programming in single and multiprocessor system.	**K4**
5	Knowledge in Inter-Process Communication and synchronization of processes, tasks and threads.	**K4**

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

Unit:1	**INTRODUCTION TO EMBEDDED SYSTEM**	**18 hours**

Introduction to Embedded System: An Embedded System – Processor in the System – Other Hardware units – Software embedded into a system – Exemplary embedded system – Embedded system on chip and in VLSI circuit. Processor and Memory organization: Structural units in a processor – Processor selection – Memory devices – Memory selection - Allocation of memory – DMA – Interfacing processor, memories and I/O devices

Unit:2	**DEVICES AND BUSES FOR DEVICE NETWORKS**	**18 hours**

Devices and buses for device networks: I/O devices – Timer and counting devices – Serial communication – Host system. Device drivers and Interrupts servicing mechanism: Device drivers – Parallel port device drivers – Serial port device drivers – Device drivers for IPTD – Interrupt servicing mechanism – Context and the periods for context-switching, deadline and interrupt latency

Unit:3	**PROGRAMMING CONCEPTS AND EMBEDDED PROGRAMMING IN C AND C++**	**18 hours**

Programming concepts and embedded programming in C and C++: Software programming in ALP and C – C program elements – Header and source files and processor directives – Macros and functions – Data types – Data structures – Modifiers – Statements – Loops and pointers – Queues – Stacks – Lists and ordered lists – Embedded programming in C++ - Java – C program compiler and cross compiler – Source code for engineering tools for embedded C / C++ - Optimization of memory needs

Unit:4	**PROGRAM MODELING CONCEPTS IN SINGLE AND MULTI PROCESSOR SYSTEMS**	**18 hours**

Program modeling concepts in single and multi processor systems: Modeling process for software analysis before software implementation – Programming models for event controlled or response time constrained real time programs – Modeling of multiprocessor systems. Software engineering practices: Software algorithm complexity – Software development process life cycle and its models – Software analysis – Software design – Implementation – Testing, Validation and debugging – Software maintenance

Unit:5	**INTER-PROCESS COMMUNICATION AND SYNCHRONIZATION OF PROCESSES, TASKS AND THREADS**	**18 hours**

Inter-process communication and synchronization of processes, tasks and threads: Multiple processor – Problem of sharing data by multiple tasks and routines – Inter process communication. Real time operating systems: Operating system services – I/O subsystem – Network operating systems – Real time and embedded operating systems – Interrupt routine in RTOS environment – RTOS task scheduling – Performance metric in scheduling.

	Total Lecture hours	**90 hours**

Text Book(s)

1	Raj Kamal, ― Embedded Systems – Architecture, Programming and Design, TMH, 2007

Reference Books

1	James K. Peckol, Embedded Systems, John Wiley & Sons, 2019

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

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

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

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

1	To understand the fundamentals of Internet of Things.	**K1**
2	To know the basics of communication protocols and the designing principles of Web connectivity.	**K2**
3	To gain the knowledge of Internet connectivity principles	**K2-K3**
4	Designing and develop smart city in IoT	**K2-K3**
5	Analyzing and evaluate the data received through sensors in IOT.	**K4-K5**

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

Unit:1	INTRODUCTION	18 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	18 hours

Domain specific IoT : 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	18 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	18 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	18 hours

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

	Total Lecture hours	**90 hours**
Text Book(s)		
1	Internet of Things - A hands on Approach Authors: Arshdeep Bahga, Vijay Madisetti Publisher: Universities press.	
Reference Books		
1	Internet of Things - Srinivasa K.G., Siddesh G.M. Hanumantha Raju R. Publisher: Cengage Learning India pvt. Ltd (2018)	
Related Online Contents [MOOC, SWAYAM, NPTEL, 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	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		Network Security Lab	L	T	P	C
Core/Elective/Supportive		Skill based Subject Lab : 4	0	0	3	2
Pre-requisite		Basic knowledge in internet, network security concepts and programming skills	Syllabus Version		2025-26 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To enable the students to learn security attacks, policies and guidelines.
2. To learn and apply the data encryption methods in network security.
3. To understand the intrusion detection systems.
4. To understand the concept of security management, email and internet banking security policies.

Expected Course Outcomes:

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

1	Understand the basic of network security and security infrastructure and develop programs.	K1
2	Understanding and apply the software security and database security.	K2-K3
3	Understand the infrastructure and classification of intrusion detection systems and network security.	K4
4	Knowledge on network management standards, network management model, SNMP, security plan and disaster recovery.	K2-K4
5	To inculcate knowledge on Email policy, university email policy and security of internet banking system and also the layered approach to security.	K1-K4

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

Programs

1. Write a program to encrypt the data using the encryption methods:
   i. Substitution Ciphers
   ii. Transposition Ciphers
2. Write a program to implement DES algorithm.
3. Write a program to implement the Public Key Cryptography using Diffie –Hellman Algorithm.
4. Write a program to implement the Public Key Cryptography using RSA algorithm.
5. Write a program to secure the Database using User Authentication Security.
6. Write a server security program for Dynamic Page Generation.

Text Book(s)

1	Network Security and Management, Brijendra Singh, PHI 2007.
2	William Stallings, Cryptography and Network Security Principles and Practices, Fourth edition, PHI Education Asia.

Reference Books

1	Atul Kahate, Cryptography and Network Security, 2 nd Edition, TMH.

2	Behrouz A.Forouzan, Cryptography and Network Security, 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	M	S	L	M	M	M	M	M	L
CO2	S	S	L	S	M	S	S	S	M	L
CO3	M	M	M	M	S	M	M	L	S	M
CO4	M	S	M	S	S	S	M	S	M	S
CO5	S	L	S	S	M	S	S	M	M	M

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

Annexure

B.Sc. COMPUTER TECHNOLOGY

Syllabus

(With effect from 2025 -2026)

Program Code : 26K

DEPARTMENT OF COMPUTER TECHNOLOGY

Bharathiar University

(A State University, Accredited with "A" Grade by NAAC and 13th Rank among Indian Universities by MHRD-NIRF)

Coimbatore 641 046, INDIA

BHARATHIAR UNIVERSITY: : COIMBATORE 641046
DEPARTMENT OF COMPUTER TECHNOLOGY

MISSION

- ✓ To develop IT professionals with ethical and human values.
- ✓ To organize, connect, create and communicate mathematical ideas effectively, through industry 4.0.
- ✓ To provide a learning environment to enhance innovations, problem solving abilities, leadership potentials, team-spirit and moral tasks.
- ✓ To nurture the research values in the developing areas of Computer Science and interdisciplinary fields.
- ✓ Promote inter-disciplinary research among the faculty and the students to create state of art research facilities.
- ✓ To promote quality and ethics among the students.
- ✓ Motivate the students to acquire entrepreneurial skills to become global leaders.