B.Sc. Computer Science

Syllabus

AFFILIATED COLLEGES

Program Code: 22K

2023 – 2024 onwards

BHARATHIAR UNIVERSITY

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

Coimbatore - 641 046, Tamil Nadu, India

Program Educational Objectives (PEOs)	
The **B. Sc. Computer Science** program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	To enrich knowledge in core areas related to the field of computer science and mathematics.
PEO2	To provide opportunities for acquiring in-depth knowledge in Industry 4.0/5.0 tools and techniques and there by design and implement software projects to meet customer's business objectives.
PEO3	To enable graduates to pursue higher education leading to Master and Research Degrees or have a successful career in industries associated with Computer Science or as entrepreneurs
PEO4	To enhance communicative skills and inculcate team spirit through professional activities, skills in handling complex problems in data analysis and research project to make them a better team player.
PEO5	To embed human values and professional ethics in the young minds and contribute towards nation building.
PEO9	To develop project

Program Specific Outcomes (PSOs)	
After the successful completion of **B.Sc. Computer Science** program, the students are expected to	
PSO1	Impart the fundamental principles and methods of Computer Science to a wide range of applications.
PSO2	Develop and deploy applications of varying complexity using the acquired knowledge in various programming languages, data structures and algorithms, database and networking skills.
PSO3	To investigate, analyze complex problems by the application of suitable mathematical and research tools, to design Information Technology products and solutions
PSO4	To identify and utilize the state-of-the-art tools and techniques in the design and development of software products and solutions.
PSO5	Ability to identify, interpret, analyze and design solutions using appropriate algorithms of varying complexities in the field of information and communication technology.

Program Outcomes (POs)	
On successful completion of the B.Sc. **Computer Science** 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::COIMBATORE641046

B.Sc. Computer Science (CBCS PATTERN)

(*For the students admitted from the academic year**2023-2026 Batch***)

Scheme of Examination

Part	Title of the Course	Hours/ Week	Examination				Credits
			Duration In Hours	Maximum Marks			
				CIA	CEE	Total	
	SemesterI						
I	Language-I	4	3	25	75	100	4
II	English-I	4	3	25	75	100	4
III	Core1:Computing Fundamentals and C Programming	5	3	25	75	100	4
III	Core2:Digital Fundamentals and Computer Architecture	5	3	25	75	100	4
III	CoreLab1: Programming Lab-C	5	3	25	75	100	4
III	Allied1:Mathematical Structures for Computer Science	5	3	25	75	100	4
IV	Environmental Studies*	2	3	-	50	50	2
	Total	**30**		**150**	**500**	**650**	**26**
	SemesterII						
I	Language–II	4	3	25	75	100	4
II	English–II **&**	4	3	12	38	50	2
	Naan Muthalvan –Skill Course Effective English http://kb.naanmudhalvan.in/images/c/c7/Cambridge_Course_Details.pdf	2		12	38	50	2
III	Core3:C++ Programming	5	3	25	75	100	4
III	CoreLab2: Programming Lab-C++	5	3	20	30	50	2
III	CoreLab3:Internet Basics	3	3	20	30	50	2
III	Allied2:Discrete Mathematics	5	3	25	75	100	4
IV	Value Education– Human Rights*	2	3	-	50	50	2
	Total	**30**		**139**	**411**	**550**	**22**
	SemesterIII						
I	Language – III	4	3	25	75	100	4
II	English – III **&**	4	3	25	75	100	4
III	Core4:Data Structures	4	3	25	75	100	4
III	Core5:Java Programming	4	3	25	75	100	4
III	CoreLab4:Programming Lab –Java	3	3	20	30	50	2
III	Allied3:Computer Based Optimization Techniques **&**	5	3	12	38	50	2
III	Skill based Subject1: Software Engineering And Software Project Management	4	3	30	45	75	3
IV	Tamil**/ Advanced Tamil*(OR)Non-major elective-I(Yoga for Human Excellence)*/ Women's Rights*	2	3	-	50	50	2
	Total	**30**		**162**	**463**	**625**	**25**
	SemesterIV						
I	Language – IV	4	3	25	75	100	4
II	English – IV **&**	4	3	12	38	50	2
III	Core6: System Software and Operating System	4	3	25	75	100	4
III	Core7:Linux and Shell Programming	4	3	25	75	100	3
III	CoreLab 5:Linux and Shell P rogramming Lab	3	3	20	30	50	2

	NaanMuthalvan– Skill Course Office Fundamentals - Lab http://kb.naanmudhalvan.in/Bharathiar_University_(BU)	2		20	30	50	2
III	Allied4:Business Accounting **&**	4	3	12	38	50	2
III	Skill based Subject 2 Lab: Software Project Management-Lab	3	3	20	30	50	2
IV	Tamil**/Advanced Tamil* (OR) Non-major elective-II(General Awareness*)	2	3	-	50	50	2
	Total	**30**		**159**	**441**	**600**	**23**

	SemesterV						
III	Core 8:RDBMS & Oracle	6	3	25	75	100	4
III	Core 9:Visual Basic	6	3	25	75	100	4
III	Core 6:Programming Lab –VB&Oracle	6	3	30	45	75	4
III	Elective - I PYTHON Programming/Computer Networks/ Organizational Behavior	6	3	25	75	100	4
III	Skill based Subject 3: Software Testing	6	3	30	45	75	3
	Total	**30**		**135**	**315**	**450**	**19**
	SemesterVI						
III	Core10:Graphics & Multimedia	5	3	25	75	100	4
III	Core11:Project Work Lab%%	5	3	25	75	100	4
III	CoreLab7: Programming Lab –Graphics &Multimedia	5	3	30	45	75	3
III	Elective–II:Network Security and Cryptography / Artificial Intelligence and Expert Systems / Web Technology	5	3	25	75	100	4
III	Elective–III:Data Mining/Open Source Software/ Internet of Things (IoT)	5	3	25	75	100	4
III	Skill Based Subject 4(Lab): Software Testing Lab	3	3	20	30	50	2
	Naan Muthalvan –Skill Course Cyber Security @ http://kb.naanmudhalvan.in/images/7/71/Cybersecurity.pdf (or) Machine Learning # http://kb.naanmudhalvan.in/images/1/19/PBL_Google.pdf (or) Android APP Development **$** http://kb.naanmudhalvan.in/images/0/08/Android_App_Dev.pdf	2		12 (or) 20	38 (or) 30	50	2
V	Extension Activities**		-	50	-	50	2
	Total	**30**		**212/ 220**	**413/ 405**	**625**	**25**
	GrandTotal			**962/ 970**	**2538 / 2530**	**3500**	**140**

- *No Continuous Internal Assessment(CIA),University Examinations Only.
- **No University Examinations, Continuous Internal Assessment(CIA) Only.
- # Govt –Non-Autonomous Colleges, **$** Aided– Non-Autonomous Colleges, @ Self-Financing Colleges **(**Non–Autonomous) (For theory : CIA – 12, CEE – 38; For Practical : CIA – 20, CEE 30).


First
Semester

Course code		Computing Fundamentals and C Programming	L	T	P	C
Core/Elective/Supportive		Core Paper: 1	4	0	0	4
Pre-requisite		Students should have basic Computer Knowledge	Syllabus Version	2023-24 Onwards		

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	12 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**	**3 hours**
Problem Solving through C Programming - Edureka		
	Total Lecture hours	**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 : 2	4	0	-	4
Pre-requisite		Student should have basic computer knowledge	Syllabus Version		2023-24 Onwards	

Course Objectives:

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

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

Expected Course Outcomes:

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

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

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

Unit:1	Number System and Arithmetic circuits	12 hours

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

Unit:2	Combinational Logic and Sequential Circuits	14 hours

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

Unit:3	Input – Output Organization and Data Transfer	12 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:4	Memory Organization	10 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:5	**Case Studies**	**6 hours**
CASE STUDY: Pin out diagram, Architecture, Organization and addressing modes of 80286-80386-80486-Introduction to microcontrollers.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**56 hours**

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

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	M	S	M	M	L
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: 1	0	0	3	4
Pre-requisite		Students should have basic knowledge in C programming and algorithms	Syllabus Version		2023-24 Onward	

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	**36 hours**
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.	
	Total Lecture hours **36 hours**

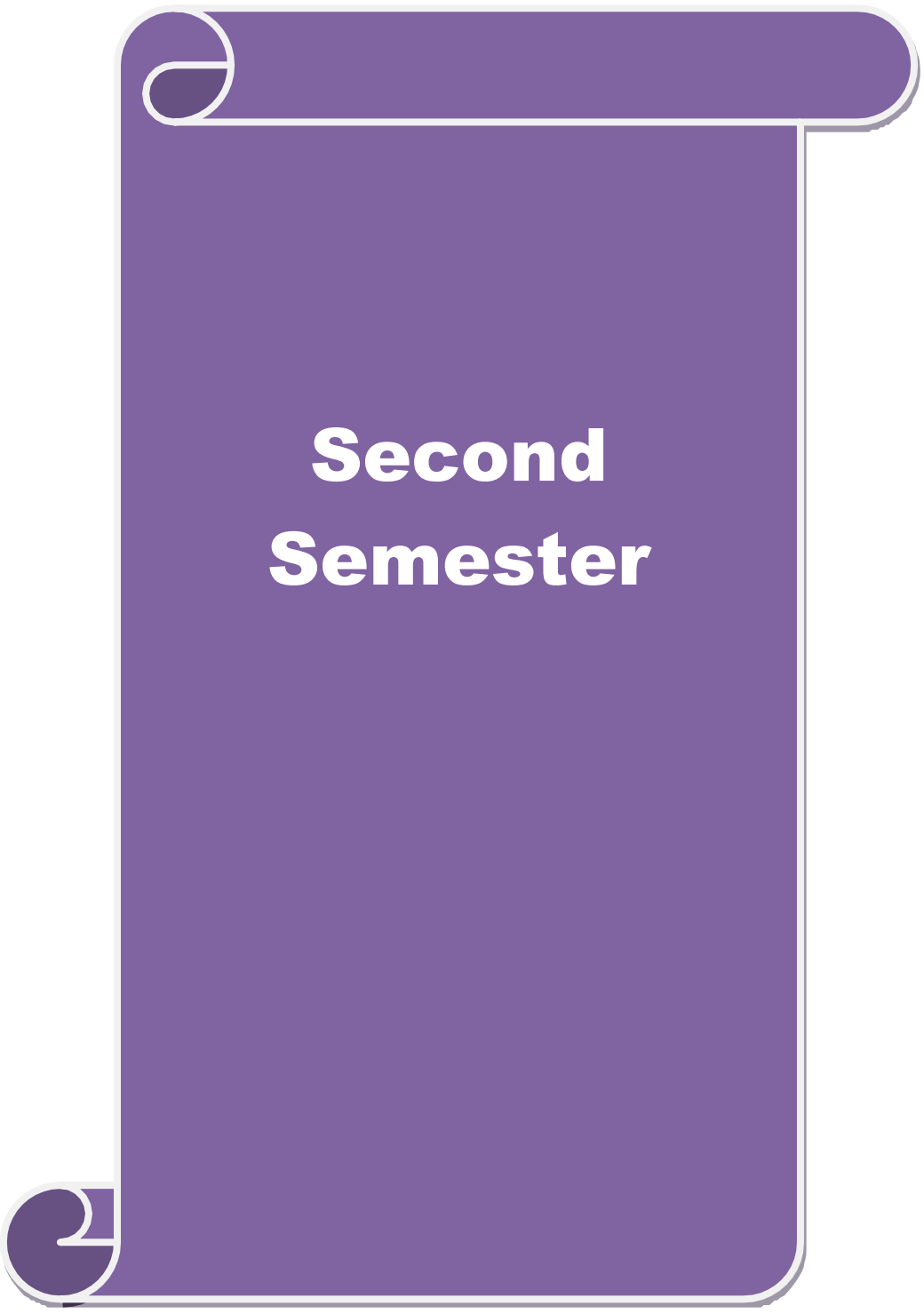
Text Book(s)

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 – 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		C++ PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core: 3	5	0	0	4
Pre-requisite		Before starting this course one should have a basic understanding of computer programs and computer programming language. If you know the concepts of C programming it will be much easier to understand this course	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. Impart knowledge of object oriented programming concepts and implement them in C++
2. Enable to differentiate procedure oriented and object-oriented concepts.
3. Equip with the knowledge of concept of Inheritance so that learner understands the need of inheritance.
4. Explain the importance of data hiding in object oriented programming

Expected Course Outcomes:

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

1	Define the different programming paradigm such as procedure oriented and object oriented programming methodology and conceptualize elements of OO methodology	K1
2	Illustrate and model real world objects and map it into programming objects for a legacy system.	K2
3	Identify the concepts of inheritance and its types and develop applications using overloading features.	K3
4	Discover the usage of pointers with classes	K4
5	Explain the usage of Files, templates and understand the importance of exception Handling	K5

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

Unit:1	INTRODUCTION TO C++	10 hours

Key concepts of Object-Oriented Programming –Advantages – Object Oriented Languages – I/O in C++ - C++ Declarations. Control Structures: - Decision Making and Statements: If.. Else, jump, goto, break, continue, Switch case statements - Loops in C++: for, while, do - functions in C++ - inline functions – Function Overloading..

Unit:2	CLASSES AND OBJECTS	10 hours

Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – Bit fields and classes – Constructor and destructor with static members.

Unit:3	OPERATOR OVERLOADING	12 hours

Overloading unary, binary operators – Overloading Friend functions – type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid, Multi path

inheritance – Virtual base Classes – Abstract Classes.		
Unit:4	**POINTERS**	**13 hours**
Declaration – Pointer to Class , Object – this pointer – Pointers to derived classes and Base classes – Arrays – Characteristics – array of classes – Memory models – new and delete operators – dynamic object – Binding, Polymorphism and Virtual Functions.		
Unit:5	**FILES**	**13 hours**
File stream classes – file modes – Sequential Read / Write operations – Binary and ASCII Files – Random Access Operation – Templates – Exception Handling - String – Declaring and Initializing string objects – String Attributes – Miscellaneous functions .		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Ashok N Kamthane, Object-Oriented Programming with Ansi And Turbo C++, Pearson Education, 2003.
Reference Books	
1	E. Balagurusamy, Object-Oriented Programming with C++, TMH, 1998.
2	Maria Litvin & Gray Litvin, C++ for you, Vikas publication, 2002.
3	John R Hubbard, Programming with C, 2nd Edition, TMH publication, 2002.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.spoken-tutorial.org
2	https://www.tutorialspoint.com/cplusplus/index.htm
3	https://www.w3schools.com/cpp/
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		PROGRAMMING LAB - C++	L	T	P	C
Core/Elective/ Supportive		Core Lab : 2	0	0	4	4
Pre-requisite		Basic understanding of computer programs and computer programming language like C.	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. Impart knowledge of object oriented programming concepts and implement them in C++
2. Enable to differentiate procedure oriented and object-oriented concepts.
3. Equip with the knowledge of concept of Inheritance so that learner understands the need of inheritance.
4. Explain the importance of data hiding in object oriented programming

Expected Course Outcomes:

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

1	Define the different programming paradigm such as procedure oriented and object oriented programming methodology and conceptualize elements of OO methodology	K1
2	Illustrate and model real world objects and map it into programming objects for a legacy system.	K2
3	Identify the concepts of inheritance and its types and develop applications using overloading features.	K3
4	Discover the usage of pointers with classes	K4
5	Explain the usage of Files, templates and understand the importance of exception Handling	K5

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

Programs	**36 hours**

1. Write a C++ Program to create a class to implement the data structure STACK. Write a constructor to initialize the TOP of the STACK. Write a member function PUSH() to insert an element and member function POP() to delete an element check for overflow and underflow conditions..
2. Write a C++ Program to create a class ARITHMETIC which consists of a FLOAT and an INTEGER variable. Write member functions ADD (), SUB(), MUL(), DIV() to perform addition, subtraction, multiplication, division respectively. Write a member function to get and display values.
3. Write a C++ Program to read an integer number and find the sum of all the digits until it reduces to a single digit using constructors, destructors and inline member functions.
4. Write a C++ Program to create a class FLOAT that contains one float data member. Overload all the four Arithmetic operators so that they operate on the object FLOAT
5. Write a C++ Program to create a class STRING. Write a Member Function to initialize, get and display stings. Overload the operators ++ and == to concatenate two Strings and to compare two strings respectively.
6. Write a C++ Program to create class, which consists of EMPLOYEE Detail like E_Number, E_Name, Department, Basic, Salary, Grade. Write a member function to get and display them. Derive a class PAY from the above class and write a member function to calculate DA, HRA and

PF depending on the grade.
7. Write a C++ Program to create a class SHAPE which consists of two VIRTUAL FUNCTIONS Calculate_Area() and Calculate_Perimeter() to calculate area and perimeter of various figures. Derive three classes SQUARE, RECTANGLE, TRIANGE from class Shape and Calculate Area and Perimeter of each class separately and display the result.
8. Write a C++ Program to create two classes each class consists of two private variables, a integer and a float variable. Write member functions to get and display them. Write a FRIEND Function common to both classes, which takes the object of above two classes as arguments and the integer and float values of both objects separately and display the result.
9. Write a C++ Program using Function Overloading to read two Matrices of different Data Types such as integers and floating point numbers. Find out the sum of the above two matrices separately and display the sum of these arrays individually.
10. Write a C++ Program to check whether the given string is a palindrome or not using Pointers
11. Write a C++ Program to create a File and to display the contents of that file with line numbers.
12. Write a C++ Program to merge two files into a single file.

Text Book(s)	
1	Ashok N Kamthane, Object-Oriented Programming with Ansi And Turbo C++, Pearson Education, 2003.
Reference Books	
1	E. Balagurusamy, Object-Oriented Programming with C++, TMH, 1998.
2	Maria Litvin & Gray Litvin, C++ for you, Vikas publication, 2002.
3	John R Hubbard, Programming with C, 2nd Edition, TMH publication, 2002.
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	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		Internet Basics	L	T	P	C
Core/Elective/ Supportive		Core Lab : 3	0	0	2	2
Pre-requisite		Knowledge of WINDOWS Operating Systems	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. Introduce the fundamentals of Internet and the Web functions.
2. Impart knowledge and essential skills necessary to use the internet and its various components.
3. Find, evaluate, and use online information resources.
4. Use Google Apps for education effectively.

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	Explain the usage of internet concepts and analyze its components.	K2
3	Identify and apply the online information resources	K3
4	Inspect and utilize the appropriate Google Apps for education effectively	K3, K4

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

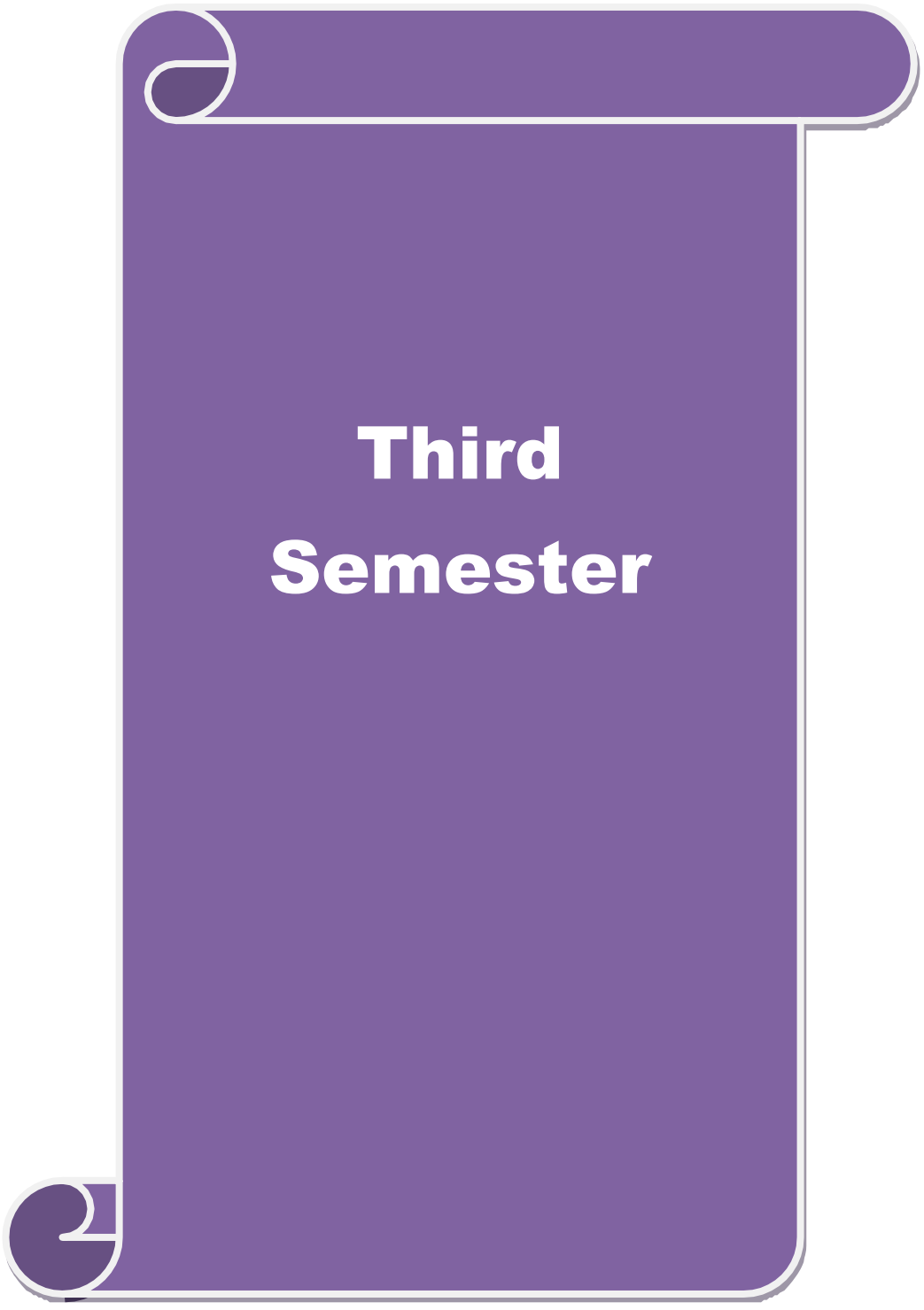
Programs	**36 hours**

1. Create an email account in Gmail. Using the account created compose a mail to invite other college students for your college fest, enclose the invitation as attachment and send the mail to at least 50 recipients. Use CC and BCC options accordingly
2. 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.
3. 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.
4. Create a meeting using Google calendar and share meeting id to the attendees. Transfer the ownership to the Manager once the meeting id is generated.
5. Create a label and upload bulk contacts using import option in Google Contacts
6. 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.
7. 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.
8. Create one-page story in your mother tongue by using voice recognition facility of Google Docs.
9. Create a registration form for your Department Seminar or Conference using Google Forms.
10. Create a question paper with multiple choice types of questions for a subject of your choice, using Google Forms.
11. Create a Google form with minimum 25 questions to conduct a quiz and generate a

certificate after submission.	
12. Create a meet using Google Calendar and record the meet using Google Meet.	
13. Create a Google slides for a topic and share the same with your friends.	
14. Create template for a seminar certificate using Google Slides.	
15. Create a sheet to illustrate simple mathematical calculations using Google Sheets.	
16. Create student's internal mark statement and share the Google sheets via link.	
17. Create different types of charts for a range in CIA mark statement using Google Sheets.	
18. Create a mark statement in Google Sheets and download it as PDF, .xls and .csv files	
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


Third
Semester

Course code		Data Structures	L	T	P	C
Core/Elective/ Supportive		Core: 4	3	0	0	4
Pre-requisite		Basic understanding of Data storage, retrieval and algorithms.	Syllabus Version		2023-24 Onward	

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	9 hours

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

Unit:2	LINKED LIST	8 hours

Linked List: Singly Linked List - Polynomial Addition - Doubly Linked List and Dynamic – Storage Management - Garbage Collection and Compaction.

Unit:3	TREES	10 hours

Basic Terminology - Binary Trees - Binary Tree Representations – Binary Trees-Traversal. Graphs: Terminology and Representations-Traversals - Shortest Paths.

Unit:4	SYMBOL TABLE	9 hours

Symbol Tables: Static Tree Tables - Dynamic Tree Tables - Hash Tables: Hashing Functions - Overflow Handling.

Unit:5	**INTERNAL SORTING**	**7 hours**
Insertion Sort - Quick Sort - 2 Way Merge Sort - Heap Sort.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**45 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	
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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	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		Java Programming	L	T	P	C
Core/Elective/Supportive		Core: 5	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		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	FUNDAMENTALS OF OBJECT-ORIENTED PROGRAMMING	15 hours

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

Unit:2	BRANCHING AND LOOPING	12 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	15 hours

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

Unit:4	**ERROR HANDLING**	**15 hours**
Managing Errors and Exceptions – Applet Programming – Graphics Programming.		
Unit:5	**MANAGING INPUT / OUTPUT FILES IN JAVA**	**15 hours**
Concepts of Streams- Stream Classes – Byte Stream classes – Character stream classes – Using streams – I/O Classes – File Class – I/O exceptions – Creation of files – Reading / Writing characters, Byte-Handling Primitive data Types – Random Access Files.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**75 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: 4	0	0	5	4
Pre-requisite		Students should know about the OOPs concept and basic knowledge in java theory.	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

3. 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.
4. To practice the Basic concepts, Branching and Looping Statements and Strings in C programming
5. To implement and gain knowledge in Arrays, functions, Structures, Pointers and File handling

Expected Course Outcomes:

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

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

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

Programs	**36 hours**

1. Write a Java Applications to extract a portion of a character string and print the extracted string.
2. Write a Java Program to implement the concept of multiple inheritance using Interfaces.
3. Write a Java Program to create an Exception called payout-of-bounds and throw the exception.
4. Write a Java Program to implement the concept of multithreading with the use of any three multiplication tables and assign three different priorities to them.
5. Write a Java Program to draw several shapes in the created windows.
6. Write a Java Program to create a frame with four text fields name, street, city and pin code with suitable tables. Also add a button called my details. When the button is clicked its corresponding values are to be appeared in the text fields.
7. Write a Java Program to demonstrate the Multiple Selection List-box.
8. Write a Java Program to create a frame with three text fields for name, age and qualification and a text field for multiple line for address
9. Write a Java Program to create Menu Bars and pull down menus.
10. Write a Java Program to create frames which respond to the mouse clicks. For each events with mouse such as mouse up, mouse down, etc., the corresponding message to be

displayed.		
11. Write a Java Program to draw circle, square, ellipse and rectangle at the mouse click positions.		
12. Write a Java Program which open an existing file and append text to that file.		
	Total Lecture hours	**36 hours**

Text Book(s)	
1	Programming with Java – A Primer – E. Balagurusamy, 5th Edition, TMH.
2	Herbert Schildt , Java: The Complete Reference, McGraw Hill Education, Oracle Press 10th Edition, 2018
3	Programming with Java – A Primer – E. Balagurusamy, 3rd Edition, TMH.
Reference Books	
1	The Complete Reference Java 2 – Patrick Naughton & Hebert Schildt, 3rd Edition, TMH
2	Programming with Java – John R. Hubbard, 2nd Edition, TMH.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.w3resource.com/java-exercises/
2	https://www.udemy.com/introduction-to-java-programming/
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; L-Low

Course code		Software Engineering and Software Project Management	L	T	P	C
Core/Elective/ Supportive		Skill based Subject - 1	5	0	0	3
Pre-requisite		Basic knowledge on the Software Development Life Cycle.	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

1	Understand the basic concepts of software engineering	K1
2	Apply the software engineering models in developing software applications	K2-K3
3	Implement the object oriented design in various projects	K4
4	Knowledge on how to do a software project with in-depth analysis.	K3
5	To inculcate knowledge on Software engineering concepts in turn gives a roadmap to design a new software project.	K1-K4

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

Unit:1	SOFTWARE ENGINEERING	15 hours

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

Unit:2	SOFTWARE DESIGN	12 hours

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

Unit:3	SOFTWARE TESTING	15 hours

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

Unit:4	SOFTWARE CONFIGURATION MANAGEMENT	15 hours

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

Unit:5	ESTIMATION	15 hours

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

Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Book(s)

1	Roger S. Pressman: Software Engineering, Tata McGraw Hill, V Edition.
2	Gopalaswamy Ramesh, Managing Global Software Projects, Tata McGraw Hill, New Delhi, 2002.
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.]

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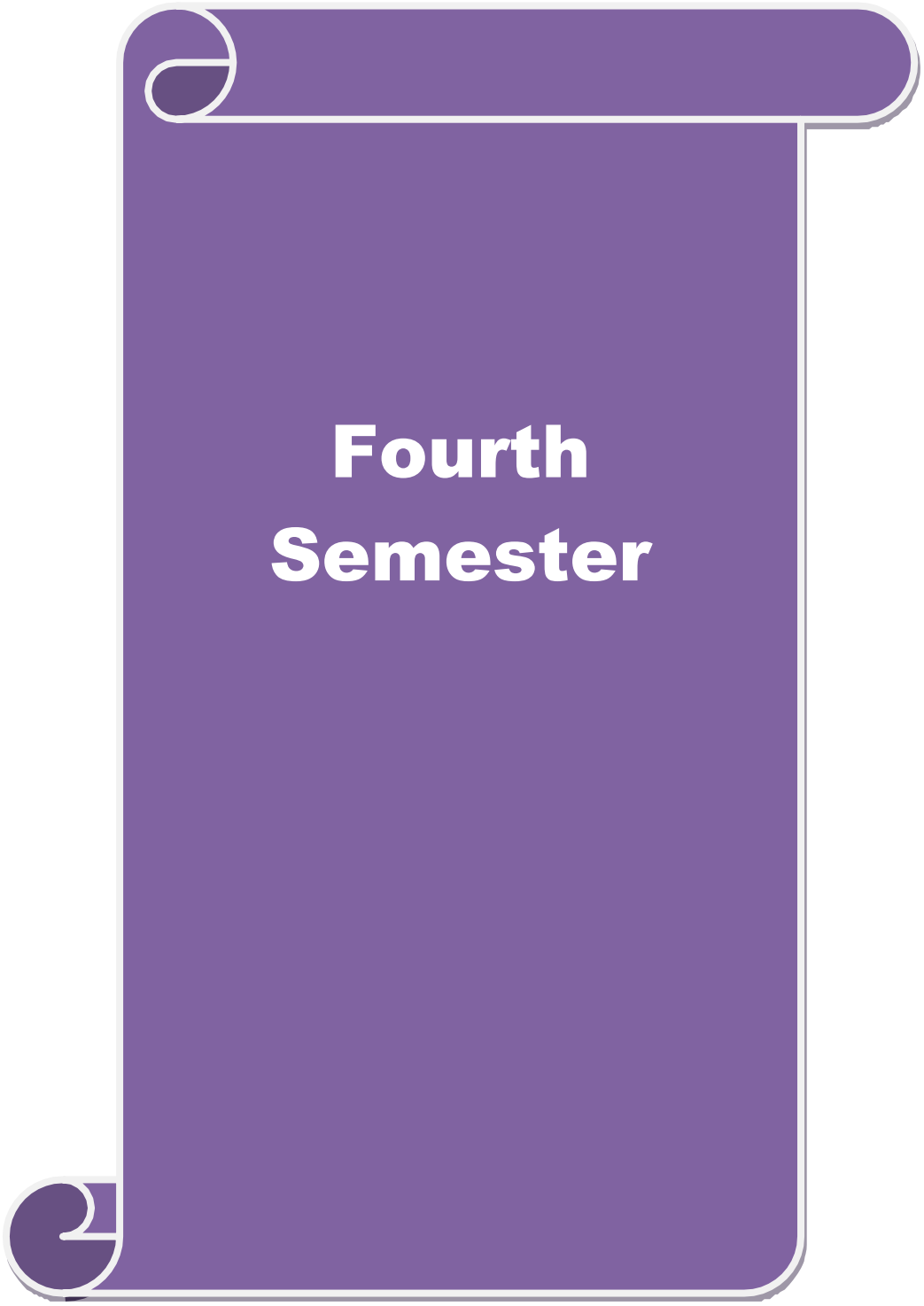
3	

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

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


Fourth
Semester

Course code		System Software and Operating Systems	L	T	P	C
Core/Elective/ Supportive		Core : 6	6	0	0	4
Pre-requisite		Students Should have the basic knowledge in computer.	Syllabus Version		2023-24 Onward	

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	INTRODUCTION TO SYSTEM SOFTWARE	12 hours

Introduction–System Software and machine architecture. Loader and Linkers: Basic Loader Functions - Machine dependent loader features –Machine independent loader features - Loader design options

Unit:2	MACHINE AND COMPILER	15 hours

Machine dependent compiler features - Intermediate form of the program - Machine dependent code optimization - Machine independent compiler features - Compiler design options - Division into passes – Interpreters – p-code compilers - Compiler-compilers.

Unit:3	OPERATING SYSTEM	15 hours

What is an Operating System? – Process Concepts: Definition of Process - Process States - Process States Transition – Interrupt Processing – Interrupt Classes - Storage Management: Real Storage: Real Storage Management Strategies – Contiguous versus Non-contiguous storage allocation – Single User Contiguous Storage allocation- Fixed partition multiprogramming – Variable partition multiprogramming.

Unit:4	**VIRTUAL STORAGE**	**15 hours**
Virtual Storage: Virtual Storage Management Strategies – Page Replacement Strategies – Working Sets – Demand Paging – Page Size. Processor Management: Job and Processor Scheduling: Preemptive Vs Non-preemptive scheduling – Priorities – Deadline scheduling.		
Unit:5	**DEVICE AND INFORMATION MANAGEMENT**	**15 hours**
Device and Information Management Disk Performance Optimization: Operation of moving head disk storage – Need for disk scheduling – Seek Optimization – File and Database Systems: File System – Functions – Organization – Allocating and freeing space – File descriptor – Access control matrix.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Leland L.Beck, System Software: An Introduction to Systems Programming, Pearson, Third Edition.
2	H.M. Deitel, Operating Systems, 2nd Edition, Perason, 2003.

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

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	
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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 : 7	6	0	0	4
Pre-requisite		Before starting the course students should have the basic knowledge about operating system and C programming.	Syllabus Version		2023-24 Onward	

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.

Unit:2	MANAGING FILES AND DIRECTORIES	15 hours

Managing Files and Directories: Introduction – Directory Commands in LINUX – File Commands in LINUX.

Unit:3	VI EDITOR	15 hours

Creating files using the vi editor: Text editors – The vi editor. Managing Documents: Locating files in LINUX – Standard files – Redirection – Filters – Pipes.

Unit:4	SECURING FILES	15 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:5	CONDITIONAL EXECUTION IN SHELL SCRIPTS	15 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:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**75 hours**

Text Book(s)

1	Operating System LINUX, NIIT, PHI, 2006, Eastern Economy Edition.
2	N.B. Venkateswarlu , Introduction to Linux: Installation and Programming, BS Publications, 2008, 1st Edition

Reference Books

1	Richard Petersen, Linux: The Complete Reference, Sixth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, Edition 2008.

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

1	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: 5	0	0	6	4
Pre-requisite		Students should have the prior basic knowledge in operating system.	Syllabus Version		2023-24 Onward	

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	**36 hours**

1. Write a shell script to stimulate the file commands: rm, cp, cat, mv, cmp, wc, split, diff.
2. Write a shell script to show the following system configuration :
   a. currently logged user and his log name
   b. current shell , home directory , Operating System type , current Path setting , current working directory
   c. show currently logged number of users, show all available shells
   d. show CPU information like processor type , speed
   e. show memory information
3. Write a Shell Script to implement the following: pipes, Redirection and tee commands.
4. Write a shell script for displaying current date, user name, file listing and directories by getting user choice.
5. Write a shell script to implement the filter commands.
6. Write a shell script to remove the files which has file size as zero bytes.
7. Write a shell script to find the sum of the individual digits of a given number.
8. Write a shell script to find the greatest among the given set of numbers using command line arguments.
9. Write a shell script for palindrome checking.
10. Write a shell script to print the multiplication table of the given argument using for loop.

	Total Lecture hours	**36 hours**
Text Book(s)		
1	Operating System LINUX, NIIT, PHI, 2006, Eastern Economy Edition.	
2	N.B. Venkateswarlu , Introduction to Linux: Installation and Programming, BS Publications, 2008, 1st Edition	
Reference Books		
1	Richard Petersen, Linux: The Complete Reference, Sixth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, Edition 2008.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.w3resource.com/linux-exercises/	
2	http://spoken-tutorial.org/	
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	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 – Software Project Management	L	T	P	C
Core/Elective/Supportive		Skill Based Subject 2 (Lab) :1	0	0	4	3
Pre-requisite		Basic knowledge in SDLC and managing of software projects	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. To gain knowledge about how to develop project plan
2. To create requirement analysis and specification for software applications.
3. Student is given an introduction of various phases of software development life cycle models.
4. To analyze the steps are to be implemented using SDLC to develop applications.

Expected Course Outcomes:

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

1	Prepare a Project Plan with requirement analysis and specification.	**K1, K2**
2	Understand and develop cost estimation model for real time applications.	**K2-K3**
3	Implement the concepts of checkpoints in design phase	**K3**
4	Analyze the Development phase of the database and text area of the applications.	**K4-K5**
5	Create SDLC for real time applications.	**K6**

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

Programs	**36 hours**
1. Preparation of Project Management Plan.	
2. Using any of the CASE tools, Practice requirement analysis and specification for different firms.	
3. Case study of cost estimation models.	
4. Practice object oriented design principles for implementation.	
5. Practice function oriented design.	
6. Practice creating software documentation for the Analysis phase of software development life cycle for a real time application.	
7. Practice creating software documentation for the Development phase of software development life cycle for a real time application.	
8. Practice creating software documentation for the Implementation phase of software development life cycle for a real time application.	
9. Practice creating software documentation for the Testing phase of software development life cycle for a real time application.	
10. Simulate a tool for path testing principles.	
11. Simulate a tool for testing based on control structures.	
12. Simulate a tool that reflects black box testing concepts	
Total Lecture hours	**36 hours**

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

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


Fifth
Semester

Course code		RDBMS & Oracle	L	T	P	C
Core/Elective/ Supportive		Core : 8	6	0	0	4
Pre-requisite		Basic knowledge about the data, table and database in computers	Syllabus Version		2023-24 Onward	

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**	**12 hours**
PL/SQL Composite Data Types: Records – Tables – arrays. Named Blocks: Procedures – Functions – Packages –Triggers –Data Dictionary Views.		
Unit:6	**Contemporary Issues**	**3 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
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		Visual Basic	L	T	P	C
Core/Elective/ Supportive		Core : 9	6	0	0	4
Pre-requisite		Knowledge in programming language and oops concept.	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. The main aim of the course is to cover visual basic programming skills required for modern software development.
2. To study the advantages of Controls available with visual basic.
3. To gain a basic understanding of database access and management using data controls.
4. To facilitate the learner to carry out project works using the tools available in VB and MS Access.

Expected Course Outcomes:

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

1	Demonstrate fundamental skills in utilizing the tools of a visual environment such as command, menus and toolbars.	**K1**
2	Implement SDI and MDI applications using forms, dialogs and other types of GUI components.	**K2**
3	Understand the connectivity between VB with MS-ACCESS database.	**K3**
4	Implement the methods and techniques to develop projects.	**K4**
5	Attain a good practical skill of managing ODBC and Data Access Objects	**K2-K4**

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

Unit:1	INTRODUCTION TO VB	15 hours

Getting Started with VB6, Programming Environment, working with Forms, Developing an application, Variables, Data types and Modules, procedures and control structures, arrays. Working with Controls: Creating and using controls, working with control arrays.

Unit:2	MENUS IN VB	15 hours

Menus, Mouse events and Dialog boxes: Mouse events, Dialog boxes, MDI and Flex grid: MDI, Using the Flex grid control.

Unit:3	ODBC AND DATA ACCESS OBJECTS	15 hours

ODBC and Data Access Objects: Data Access Options, ODBC, Remote data objects, ActiveX EXE and ActiveX DLL: Introduction, Creating an ActiveX EXE Component, Creating ActiveX DLL Component.

Unit:4	OBJECT LINKING AND EMBEDDING	15 hours

Object Linking and Embedding: OLE fundamentals, Using OLE Container Control, Using OLE Automation objects, OLE Drag and Drop, File and File System Control: File System Controls, Accessing Files.

Unit:5	CONTROLS IN VB	12 hours

Additional controls in VB: sstab control, setting properties at runtime, adding controls to tab, list control, tabstrip control, MS Flexgrid control, Why ADO, Establishing a reference, Crystal and

Data reports.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**75 hours**

Text Book(s)

1	Visual Basic 6.0 Programming, Content Development Group, TMH, 8th reprint, 2007. **(Unit I to Unit IV)**
2	Programming with Visual Basic 6.0, Mohammed Azam, Vikas Publishing House, Fourth Reprint, 2006. **(Unit V)**

Reference Books

1	Gray Cornell (2003), "Visual Basic 6 from ground up" TMH, New Delhi, 1st Edition,
2	Deitel and Deitel, T.R.Nieto (1998), "Visual Basic 6 - How to Program", Pearson Education. First Edition.

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		Programming Lab – VB & Oracle	L	T	P	C
Core/Elective/Supportive		Core Lab : 6	0	0	6	4
Pre-requisite		Students should have the theoretical knowledge in visual basic and oops concept.	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. To develop applications using Graphical User Interface tools.
2. To understand the design concepts.
3. To design and build database systems and demonstrate their competence.
4. To create requirement analysis and specification for software applications.

Expected Course Outcomes:

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

1	Understand the concepts of Visual Basic.	**K1**
2	Learn the advantages of Controls in VB	**K2**
3	Design and develop the event- driven applications using Visual Basic framework.	**K3**
4	Apply the knowledge of database methods.	**K4**
5	Learn basics of PL/SQL and develop programs using Cursors, Exceptions, Procedures and Functions	**K6**

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

Programs	**36 hours**

1. Construction of an Arithmetic Calculator (Simple).
2. Writing simple programs using loops and decision-making statements.
   a. Generate Fibonacci series.
   b. Find the sum of N numbers.
3. Write a program to create a menu and MDI Forms.
4. Write a program to display files in a directory using DriveListBox, DirListBox and FileListBox control and open, edit and save text file using Rich text box control.
5. Write a program to illustrate Common Dialog Control and to open, edit and save text file.
6. Write a program to implement animation using timers.
7. Write a simple VB program to accept a number as input and convert it into
   a. Binary b. Octal c. Hexa-decimal
8. 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.
9. 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.
10. Write a PL/SQL program to implement the concept of Triggers

11. Write a PL/SQL program to implement the concept “Procedures”.		
12. Write a VB program to manipulate the student mark list with oracle database connectivity program.		
	Total Lecture hours	**36 hours**

Text Book(s)	
1	Visual Basic 6.0 Programming, Content Development Group, TMH, 8th reprint, 2007. **(Unit I to Unit IV)**
2	Programming with Visual Basic 6.0, Mohammed Azam, Vikas Publishing House, Fourth Reprint, 2006. **(Unit V)**
3	E-Book : Bill Pribyl, Steven Feuerstein, “Oracle PL/SQL Programming”, O’Reilly Media, Inc., 6th Edition, February 2014.
Reference Books	
1	Gray Cornell (2003), ”Visual Basic 6 from ground up” TMH, New Delhi, 1st Edition,
2	Deitel and Deitel, T.R.Nieto (1998), “Visual Basic 6 – How to Program”, Pearson Education. First Edition.
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	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		PYTHON Programming	L	T	P	C
Core/Elective/ Supportive		Elective : I	6	0	0	4
Pre-requisite		Knowledge on logic of the programs and oops concept.	Syllabus Version		2023-24 Onward	

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	10 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	10 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	10 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	12 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**	**12 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	**55 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	
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Course Designed By:

Mapping with Programme Outcomes

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

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

Course code		Computer Networks	L	T	P	C
Core/Elective/ Supportive		Elective : I	6	0	0	4
Pre-requisite		Students should have the knowledge on computer connectivity and connectivity peripherals.	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	BASICS OF NETWORKS AND OSI MODEL	15 hours

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

Unit:2	PHYSICAL LAYER	15 hours

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

Unit:3	DATA-LINK LAYER	15 hours
DATA-LINK LAYER: Error Detection and correction – Elementary Data-link Protocols – Sliding Window Protocols. MEDIUM-ACCESS CONTROL SUB LAYER: Multiple Access Protocols – Ethernet – Wireless LANs - Broadband Wireless – Bluetooth.		
Unit:4	**NETWORK LAYER**	**15 hours**
NETWORK LAYER: Routing algorithms – Congestion Control Algorithms. TRANSPORT LAYER: Elements of Transport Protocols – Internet Transport Protocols: TCP.		
Unit:5	**APPLICATION LAYER**	**12 hours**
APPLICATION LAYER: DNS – E-mail. NETWORK SECURITY: Cryptography – Symmetric Key Algorithms – Public Key Algorithms – Digital Signatures.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Computer Networks, Andrew S. Tanenbaum, 4th edition, PHI. *(UNIT-I:1.2-1.4 UNIT-II:2.2-2.4 UNIT-III:4.2-4.6 UNIT-IV:5.2,5.3,6.2,6.5 UNIT-V:7.1,7.2,8.1-8.4)*
Reference Books	
1	Data Communication and Networks, Achyut Godbole, 2007, TMH.
2	Computer Networks: Protocols, Standards, and Interfaces, Uyless Black, 2nd ed, PHI
3	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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Course Designed By:	

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

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

Course code		Organizational Behaviour	L	T	P	C
Core/Elective/ Supportive		Elective : I	6	0	0	4
Pre-requisite		Basic knowledge in human behavior skills	Syllabus		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. To help the students to develop cognizance of the importance of human behaviour.
2. To enable students to describe how people behave under different conditions and understand why people behave as they do.
3. To provide the students to analyses specific strategic human resources demands for future action.
4. To enable students to synthesize related information and evaluate options for the most logical and optimal solution such that they would be able to predict and control human behaviour and improve results.

Expected Course Outcomes:

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

1	Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization.	**K1**
2	Develop Managerial skills for Individual Behaviors.	**K2**
3	Analyze the complexities associated with management of the group behavior in the organization. Analyze how to manage the Stress during a job.	**K3**
4	Develop an Organizational Behaviour model for any type of Organization.	**K3**
5	Analyze the Common biases and eradication in Decision Making Process.	**K4**

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

Unit:1	INTRODUCTION	15 hours

Introduction to Organizational Behavior –Related Disciplines – Theoretical Framework – Organizational Approaches – Modern Organizational Scenario: Impact of Globalization

Unit:2	INDIVIDUAL BEHAVIOR	15 hours

Individual Behavior – Perception – Process – Changes - Personality and Attitudes – Job Satisfaction

Unit:3	MOTIVATION	15 hours

Motivation: Needs, Content and Process: Motivation: Content Theories -ghh– Process Theories – Contemporary Theories – Motivation Applied – Job Design and Goal setting. Leadership – Background – Process- Styles – Activities – Skills

Unit:4	GROUP	15 hours

Group Dynamics – The nature of Informal Organizations – Formal Groups – Interactive conflict: Interpersonal conflict – Inter-group behavior and conflict – Negotiation Skills: Going beyond conflict management – Traditional Negotiation Approaches - Contemporary negotiation skills.

Unit:5	COMMUNICATION	12 hours
Communication – Role and background – Interpersonal communication – Informal communication- The Decision Making process – Participative Decision making techniques – Organization design – culture – Organization change and development		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Fred Luthans, Organizational Behavior, 9th Edition, McGraw Hill Irwin, 2002.
2	John W. Newstorm and Keith Davis, Organizational Behavior, 10th Edition.

Reference Books	
1	Robbins, S. P., & Judge, T. (2013). Organizational behavior (15th ed.). Boston: Pearson.
2	Newstrom J. W., & Davis, K. (2011). Human behavior at work (12th ed.). Tata McGraw Hill

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

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

Course code		Software Testing	L	T	P	C
Core/Elective/ Supportive		Skill based Subject : 3	6	0	0	3
Pre-requisite		Basic knowledge in software project and SDLC	Syllabus		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. To study fundamental concepts in software testing
2. To discuss various software testing issues and solutions in software unit test, integration and system testing.
3. To expose the advanced software testing topics, such as object-oriented software testing methods.
4. List a range of different software testing techniques and strategies and be able to apply specific automated unit testing method to the projects.

Expected Course Outcomes:

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

1	Explain the basic concepts and the processes that lead to software testing	**K2**
2	Design test cases from the given requirements using Black box testing techniques	**K3**
3	Identify the test cases from Source code by means of white box testing techniques	**K3**
4	Know about user acceptance testing and generate test cases for it	**K4**
5	Examine the test adequacy criteria to complete the testing process	**K4**

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

Unit:1	SOFTWARE DEVELOPMENT LIFE CYCLE MODELS	15 hours

Software Development Life Cycle models: Phases of Software project – Quality, Quality Assurance, Quality control – Testing, Verification and Validation – Process Model to represent Different Phases - Life Cycle models. White-Box Testing: Static Testing – Structural Testing – Challenges in White-Box Testing.

Unit:2	BLACK-BOX TESTING	15 hours

Black-Box Testing: What is Black-Box Testing? - Why Black-Box Testing? – When to do Black-Box Testing? – How to do Black-Box Testing? – Challenges in White Box Testing - Integration Testing: Integration Testing as Type of Testing – Integration Testing as a Phase f Testing – Scenario Testing – Defect Bash.

Unit:3	SYSTEM AND ACCEPTANCE TESTING	15 hours

System and Acceptance Testing: system Testing Overview – Why System testing is done? – Functional versus Non-functional Testing - Functional testing - Non-functional Testing – Acceptance Testing – Summary of Testing Phases.

Unit:4	PERFORMANCE TESTING	15 hours

Factors governing Performance Testing – Methodology of Performance Testing – tools for Performance Testing – Process for Performance Testing – Challenges. Regression Testing: What is Regression Testing? – Types of Regression Testing – When to do Regression Testing – How to do Regression Testing – Best Practices in Regression Testing.

Unit:5	TEST PLANNING, MANAGEMENT, EXECUTION AND REPORTING	12 hours
Test Planning, Management, Execution and Reporting: Test Planning – Test Management – Test Process – Test Reporting –Best Practices. Test Metrics and Measurements: Project Metrics – Progress Metrics – Productivity Metrics – Release Metrics.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars - webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Software Testing Principles and Practices, Srinivasan Desikan & Gopalswamy Ramesh, 2006, Pearson Education. *(UNIT-I: 2.1-2.5, 3.1-3.4 UNIT-II: 4.1-4.4, 5.1-5.5 UNIT III: 6 .1-6.7 (UNIT IV: 7.1-7.6, 8.1-8.5 UNIT-V: 15.1-15.6, 17.4-17.7)*
2	Limaye M.G., "Software Testing Principles, Techniques and Tools", Second Reprint, TMH Publishers, 2010.
3	Aditya P.Mathur, "Foundations of Software Testing", 2nd Edition, Pearson Education, 2013.
Reference Books	
1	Effective Methods of Software Testing, William E. Perry, 3rd ed, Wiley India.
2	Software Testing, Renu Rajani, Pradeep Oak, 2007, TMH.
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	M
CO3	S	S	S	L	S	M	L	M	S	S
CO4	S	M	S	L	S	M	L	M	S	M
CO5	S	S	S	L	S	M	L	M	S	S

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


Sixth
Semester

Course code		Graphics & Multimedia	L	T	P	C
Core/Elective/ Supportive		Core: 10	5	0	0	4
Pre-requisite		Basic knowledge in 2D, 3D and multimedia file formats	Syllabus Version		2023-24 Onward	

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	OUTPUT PRIMITIVES	15 hours

Output Primitives: Points and Lines – Line-Drawing algorithms – Loading frame Buffer – Line function – Circle-Generating algorithms – Ellipse-generating algorithms. Attributes of Output Primitives: Line Attributes – Curve attributes – Color and Grayscale Levels – Area-fill attributes – Character Attributes.

Unit:2	2D GEOMETRIC TRANSFORMATIONS	15 hours

2D Geometric Transformations: Basic Transformations – Matrix Representations – Composite Transformations – Other Transformations. 2D Viewing: The Viewing Pipeline – Viewing Co-ordinate Reference Frame – Window-to-Viewport Co-ordinate Transformation - 2D Viewing Functions – Clipping Operations.

Unit:3	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:4	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:5	**VIDEO AND ANIMATION**	**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. 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 Lecture hours	**75 hours**

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

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

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	

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: 11	0	0	5	8
Pre-requisite		Students should have the strong knowledge in any one of the programming languages in this course.	Syllabus Version		2023-24 Onward	

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.

VivaVoce

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.

1. Out of 100 marks, 25 marks for CIA and 75 for CEE (50 evaluation of project report + 25 Viva Voce).

Project Report Format

PROJECT WORK

TITLE OF THE DISSERTATION

Bonafide Work Done by

STUDENT NAME

REG. NO.

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

<Name of the Degree>

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

College Logo

Signature of the Guide Signature of the HOD

Submitted for the Viva-Voce Examination held on _____

Internal Examiner External Examiner

Month – Year

CONTENTS

Proposed System
Features

3. System Design and Development

File Design
Input Design
Output Design
Database Design
System Development
Description of Modules (Detailed explanation about the project work)

4. Testing and Implementation

5. Conclusion

Bibliography

Appendices

A. Data Flow Diagram
B. Table Structure
C. Sample Coding
D. Sample Input
E. Sample Output

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 – Graphics & Multimedia	L	T	P	C
Core/Elective/Supportive		Core Lab : 7	0	0	6	4
Pre-requisite		Students should have the basic knowledge on C and C++ to do computer graphics and multimedia applications.	Syllabus Version		2023-24 Onward	

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	**36 hours**
Graphics	

1. Write a program to rotate an image.
2. Write a program to drop each word of a sentence one by one from the top.
3. Write a program to drop a line using DDA Algorithm.
4. Write a program to move a car with sound effect.
5. Write a program to bounce a ball and move it with sound effect.
6. Write a program to test whether a given pixel is inside or outside or on a polygon.

Multimedia

7. Create Sun Flower using Photoshop.
8. Animate Plane flying in the Clouds using Photoshop.
9. Create Plastic Surgery for the Nose using Photoshop.
10. Create See-through text using Photoshop.
11. Create a Web Page using Photoshop.
12. Convert Black and White Photo to Color Photo using Photoshop.

	Total Lecture hours	**36 hours**

Text Book(s)	
1	Computer Graphics, Donald Hearn, M.Pauline Baker, 2nd edition, PHI.
2	Principles of Multimedia, Ranjan Parekh, 2007, TMH.
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	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		Network Security and Cryptography	L	T	P	C
Core/Elective/ Supportive		Elective: II	5	0	0	4
Pre-requisite		Basic knowledge on security threats in networking	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. To learn the need for network security and security approaches.
2. To inculcate the concept of transferring authentic data along the network with several methods and algorithms.
3. To enrich the knowledge on different types of Internet Security Protocols.

Expected Course Outcomes:

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

1	Remember the basic concept of Cryptography and various types of attacks.	**K1**
2	Understand about various types of protocols for Internet Security.	**K2**
3	Implement various algorithms for Cryptography	**K3**
4	Review Firewall and IP security	**K4**
5	To be familiar with network security threats and countermeasure	**K3-K5**

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

Unit:1	SERVICE MECHANISM	15 hours

Service mechanism and attacks – The OSI security architecture – A model for network security – symmetric Cipher model – Substitution techniques – transposition techniques – simplified des – block chipper principles – the strength of des – block chipper design principles and modes of operation.

Unit:2	TYPES OF DES	12 hours

Triple des-blow fish – RCS Advanced Symmetric Block Ciphers –RC4 stream Cipher confidentially using symmetric encryption – introduction to number theory – public – key cryptography and RSA.

Unit:3	KEY MANAGEMENT	15 hours

Key management – Diffle Hellman key exchange – message authentication and hash function – hash algorithm – digital signature and authentication protocols – digital signature standard.

Unit:4	AUTHENTICATION	15 hours

Authentication application – pretty good privacy – S/MIME – ip security – web security considerations –secure socket layer transport layer security –secure electronic transaction.

Unit:5	INTRUDERS	15 hours

Intruders –intrusion detection – password management –viruses and related threats – virus countermeasures – fire wall design principles – trusted systems

Unit:6	Contemporary Issues	3 hours

Expert lectures, online seminars – webinars

	Total Lecture hours	75 hours

Text Book(s)	
1	William Stallings, Cryptography and Network Security Principles and Practices, Fourth edition, PHI Education Asia
Reference Books	
1	Atul Kahate, Cryptography and Network Security, 2nd Edition, TMH.
2	Behrouz A.Forouzan, Cryptography and Network Security, TMH.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	
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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	L	L	L	S	S
CO2	S	M	S	L	S	L	M	L	S	S
CO3	S	S	S	L	S	L	M	L	S	S
CO4	S	M	S	L	S	L	M	L	S	S
CO5	S	S	S	L	S	L	M	L	S	S

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

Course code		Artificial Intelligence and Expert Systems	L	T	P	C
Core/Elective/ Supportive		Elective: II	5	0	0	4
Pre-requisite		Basic knowledge on knowledge representation, reasoning and problem solving skills	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. To understand the basic concepts of Artificial Intelligence and identify the AI problems and domains.
2. To provide search techniques to solve the problems.
3. To represent and access the domain specific knowledge.
4. Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems

Expected Course Outcomes:

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

1	Understand the nature of AI problems and task domains of AI.	**K1**
2	Apply the appropriate search procedures to solve the problems by using best algorithms.	**K2**
3	Analyze and select the suitable knowledge representation method.	**K3**
4	Manipulate the acquired knowledge and infer new knowledge.	**K4**
5	Demonstrate the development of AI systems by encoding the knowledge.	**K5**

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

Unit:1	INTRODUCTION	15 hours

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

Unit:2	HEURISTIC SEARCH TECHNIQUES	12 hours

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

Unit:3	KNOWLEDGE REPRESENTATION	15 hours

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

Unit:4	PREDICATE LOGIC	15 hours

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

Unit:5	REPRESENTING KNOWLEDGE USING RULES	15 hours

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

Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Artificial Intelligence, Elaine Rich and Kelvin Knight, TMH, 2nd Edn, 1991
2	Artificial Intelligence A Modern Approach, Stuart Russell & Peter Norvig, 2nd Edition Perason.
Reference Books	
1	Artificial Intelligence, George F Luger, 4th Edition, Pearson, 2002.
2	Foundations of Artificial Intelligent and Expert Systems, V S Janaki Raman, K Sarukesi, P Gopalakrishnan, MacMillan India limited.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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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	L	S	S
CO2	S	S	S	L	S	L	L	L	S	S
CO3	S	S	S	L	S	L	L	L	S	S
CO4	S	S	S	L	S	L	L	L	S	S
CO5	S	S	S	L	S	L	L	L	S	S

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

Course code		Web Technology	L	T	P	C
Core/Elective/ Supportive		Elective: II	5	0	0	4
Pre-requisite		Basic knowledge in web server, browser and web application	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. On completion of this course, a student will be familiar with client server architecture and able to develop a web application using java technologies.
1. Students will gain the skills and project-based experience needed for entry into web application and development careers
3. Understand best technologies for solving web client/server problems
4. Use Java script for dynamic effects and to validate form input entry
5. Analyze to Use appropriate client-side or Server-side applications

Expected Course Outcomes:

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

1	Understand and analyse the TCP/IP basics.	K1
2	Understand Domain server name, FTP, TFTP, basics of WWW, web browser architecture.	K2
3	Knowledge of Microsoft and java technologies, dynamic web pages, DHTML, ASP and JSP.	K2-K3
4	Understanding active web pages, Java Applet, Java bean, CORBA, RMI and EDI architecture	K2-K3
5	Knowledge on XML, XML parser, WAP	K4-K6

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

Unit:1	TCP/IP	15 hours

TCP/IP: TCP/IP Basics – Why IP address – Logical Address - TCP/IP Example- The concept of IP address – Basics of TCP – Features of TCP – Relationship between TCP and IP – Ports and Sockets – Active Open and Passive Open - TCP Connections – What makes TCP reliable? – TCP Packet format - Persistent TCP connections – UDP – Differences between TCP and UDP.

Unit:2	DNS	12 hours

DNS – E-mail – FTP – TFTP – History of WWW – Basics of WWW and Browsing - Local information on the internet – HTML – Web Browser Architecture – Web Pages and Multimedia – Remote Login (TELNET).

Unit:3	INTRODUCTION TO WEB TECHNOLOGY	15 hours

Introduction to Web Technology: Web pages – Tiers – Concept of a Tier – Comparison of Microsoft and Java Technologies – Web Pages – Static Web Pages – Plug-ins – Frames – Forms. Dynamic Web Pages: Need – Magic of Dynamic Web Pages – Overview of Dynamic Web Page Technologies – Overview of DHTML – Common Gateway Interface – ASP – ASP Technology – ASP Example – Modern Trends in ASP – Java and JVM – Java Servlets – Java Server Pages.

Unit:4	ACTIVE WEB PAGES	15 hours
Active Web Pages: Active Web Pages in better solution – Java Applets – Why are Active Web Pages Powerful? – Lifecycle of Java Applets – ActiveX Controls – Java Beans. Middleware and Component-Based E-Commerce Architectures: CORBA – Java Remote Method Invocation – DCOM. EDI: Overview – Origins of EDI – Understanding of EDI – Data Exchange Standards – EDI Architecture – Significance of EDI – Financial EDI – EDI and internet.		
Unit:5	**XML**	**15 hours**
XML: SGML – Basics of XML – XML Parsers – Need for a standard. WAP: Limitations of Mobile devices – Emergence of WAP – WAP Architecture – WAP Stack – Concerns about WAP and its future – Alternatives to WAP.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Book(s)

1	Web Technologies: TCP/IP to Internet Applications Architectures – Achyut S Godbole & Atul Kahate, 2007, TMH. *(UNIT-I: 3.1-3.5,4.1-4.12 UNIT-II: 5.1-5.4,6.1-6.7 UNIT III:8.1-8.1,9.1-9.13 UNIT IV: 10.1-10.7,15.1-15.3,16.1-16.8 UNIT-V: 17.1-17.4,18.1-18.6)*

Reference Books

1	Internet and Web Technologies, Rajkamal, TMH.
2	TCP/IP Protocol Suite, Behrouz A. Forouzan, 3rd 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	L	S	L	L	L	S	S
CO2	S	S	S	M	S	M	L	L	S	S
CO3	S	S	S	L	S	M	M	M	S	S
CO4	S	S	S	M	S	L	M	L	S	S
CO5	S	S	S	L	S	L	M	L	S	S

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

Course code		Data Mining	L	T	P	C
Core/Elective/ Supportive		Elective: III	5	0	0	4
Pre-requisite		Basic knowledge on data, database, and statistical functions	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

2. 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	15 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	12 hours

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

Unit:3	CLASSIFICATION	15 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	15 hours

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

Unit:5	ASSOCIATION RULES	15 hours

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

Algorithms – Comparing Approaches – Incremental Rules – – Measuring the Quality of Rules.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Margaret H.Dunbam, Data Mining Introductory and Advanced Topics, Pearson Education – 2003.
2	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		Open Source Software	L	T	P	C
Core/Elective/ Supportive		Elective: III	5	0	0	4
Pre-requisite		Basic understanding in scripting language and SQL	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. To expose students to free open source software environment and introduce them to use open source packages.
2. Demonstrate different open source technology like Linux, PHP & MySQL with different packages.
3. To understand open source software practices and tools.
4. To use the open source software in operating systems, Programming and web framework in approaching real time applications.

Expected Course Outcomes:

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

1	Understand the significance of open source practices and guidelines.	**K2**
2	Manipulate open source databases based on user requirements	**K3**
3	Implement web programming with PHP	**K3**
4	Integrate open source web frameworks in an application	**K4**
5	Write desktop and web applications with Python	**K6**

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

Unit:1	INTRODUCTION TO OPEN SOURCE	15 hours

Introduction to open sources – Need of open sources – advantages of open sources –application of open sources. Open source operating systems: LINUX: Introduction – general overview –Kernel mode and user mode –process – advanced concepts –scheduling – personalities – cloning – signals – development with Linux.

Unit:2	MYSQL	12 hours

MySQL: Introduction – setting up account – starting, terminating and writing your own SQL programs-record selection Technology – working with strings – Date and Time – sorting Query results – generating summary –working with meta data –using sequences – MySQL and Web.

Unit:3	PHP	15 hours

PHP: Introduction –programming in web environment –variables- constants – data types – operators – statements – functions – arrays – OOP – string manipulations and regular expression – file handling and data storage – PHP and SQL database – PHP and LDAP – PHP connectivity – sending and receiving E-mails – debugging and error handling – security –templates.

Unit:4	PYTHON	15 hours

Syntax and style – Python objects – numbers – sequences – strings – lists and tuples – dictionaries – conditional loops –files – input and output – errors and exceptions – functions – modules – classes and OOP – execution environment.

Unit:5	**PERL**	**15 hours**
Pert backgrounder – pert overview – pearl parsing rules – variables and data – statements and control structures – subroutines -packages and modules – working with files – data manipulation.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	The Linux Kernel Book, Remy Card, Eric and Frank Mevel, Wiley Publications 2003.
2	MySQL Bible, Steve Suchring, John Wiley 2002.

Reference Books	
1	Programming PHP, Rasmus Lerdorf and Levin Tatroe, O_Reilly, 2002
2	Core Python Programming, Wesley J. Chun, Prentice Hall, 200
3	Perl: The Complete Reference, 2nd Edn, Martin C. Brown, TMH , 2009
4	MySQL: The Complete Reference, 2nd Edn, Vikram Vaswani, TMH, 2009
5	PHP: The Complete Reference, 2nd Edn, Steve Holzner, TMH 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	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	5	0	0	4
Pre-requisite		Students should have the basic understanding of logical circuits and hardware architecture.	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	INTRODUCTION	15 hours

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

Unit:2	IOT and M2M	12 hours

IoT and M2M - Deference between Iot and M2M - SDN and NFV for lot - IoT systems management - SNMP - YANG - NETOPEER

Unit:3	IOT SPECIFICATION	15 hours

IoT platforms design Methodology - purpose and specification - process specification - Domain model specification - Information model specification - Service specification - IoT level specification - functional view specification - operational view specification - Device and component Integrators - Application Development.

Unit:4	LOGICAL DESIGN USING PYTHON	15 hours

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

Unit:5	IOT AND CLOUD COMPUTING	15 hours

IoT physical servers & cloud computing - WAMP - Xively cloud for IoT - python Web application frame work - Amazon web services for IoT.

Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**
Text Book(s)		
1	Internet of Things - A hands on Approach Authors: Arshdeep Bahga, Vijay Madisetti Publisher: Universities press.	
Reference Books		
1	Internet of Things - Srinivasa K.G., Siddesh G.M. Hanumantha Raju R. Publisher: Cengage Learning India pvt. Ltd (2018)	
Related Online Contents [MOOC, SWAYAM, NPTEL, 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		Programming Lab – Software Testing	L	T	P	C
Core/Elective/Supportive		Skill based Subject Lab : 4	0	0	4	3
Pre-requisite		Basic knowledge on software project development in SDLC	Syllabus Version		2023-24 Onward	

Course Objectives:

The main objectives of this course are to:

1. To gain knowledge about recording the test case in different modes.
2. To design and construct the test cases using Test Script Language.
3. To learn about GUI objects and bitmap objects

Expected Course Outcomes:

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

1	Understand the importance of software quality/software testing and apply software testing techniques for information systems development.	**K1**
2	Generate test cases from software requirements using various test processes for continuous quality improvement.	**K2**
3	Understand flow graphs and apply path testing.	**K3**
4	Apply software testing techniques in commercial environments and assess the adequacy of test suites using control flow, data flow and program mutation.	**K4**
5	Identify the inputs and deliverables of the testing process and work together as a team in preparing a report	**K6**

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

Programs	**36 hours**

Write at least 10 TEST CASES for the following programs. Test cases can be for Input data, Conditional expressions, control transfer, output, etc. Run-Test-Debug- until all the test cases are in success status. Marks distribution as follows:

1. List of Test Descriptions (at least 10) for the Program. (20%)
2. Test Cases (40%)
3. Program with all test case results success (30%)
4. Record (10%)

TEST CASE EXAMPLE:

Test -Id	Test Description	Test Steps	Expected Output	Actual Output	Status
TC-01	Acceptance of 10 digit input data	Input 10 Digit Number	Accepting 10 digit number	Accepted 10 digit number	Success
TC-02	Non- acceptance of character data	Input a character data X	Character X should not be accepted	Accepting Character data	Failure

Modify PIC X(10) into PIC 9(10) and then run program for Test-id TC-02 again

Test -Id	Test Description	Test Steps	Expected Output	Actual Output	Status
TC-02	Non- acceptance of character data	Input a character data X	Character X should not be accepted	Character data not accepted	Success
TC-03	Digit sum of 10 digit is in single digit	Output data	Single digit sum	Single digit Sum	Success

1. Test the C program: Finding the sum of individual digits of a 10-digit number until a single digit is produced.
2. Test the C Program: Accept the inputs student name, marks in five subjects and declare the result as PASS if the student gets minimum 40 in each subject; otherwise declare the result as FAIL.
3. Test the C program: Program for generating n prime numbers
4. Test the C program: Sort and store the elements of two arrays of integers into the third list.
5. Test the C program: Experiment the operations of a stack using array implementation.
6. Test the C program: Menu-driven option for queue operations like add, remove and display.
7. Test the C++ program: Palindrome string checking program (using pointers)

	Total Lecture hours	**36 hours**

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	M	M	S	M	S	M	M	M	S	S
CO3	S	S	M	M	S	M	M	L	S	M
CO3	S	S	S	S	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