B. Sc. (Computer Technology)

Syllabus

AFFILIATED COLLEGES

Program Code: 26K

2023– 2026 BATCH

BHARATHIAR UNIVERSITY

(A State University, Accredited with "A" Grade by NAAC,
Ranked 13th among Indian Universities by MHRD-NIRF,
World Ranking : Times - 801-1000, Shanghai - 901-1000, URAP - 982)

Coimbatore - 641 046, Tamil Nadu, India

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

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

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

BHARATHIAR UNIVERSITY::COIMBATORE 641 046

B. Sc. Computer Technology (CBCS PATTERN)

(*For the students admitted from the academic year **2023-2024** and onwards*)

Scheme of Examination

Part	Title of the Course	Hours/ Week	Examination				Credits
			Duration in Hours	Maximum Marks			
				CIA	CEE	Total	
	Semester I						
I	Language - I	4	3	25	75	100	4
II	English - I	4	3	25	75	100	4
III	Core Paper 1: Computing Fundamentals and C Programming	5	3	25	75	100	4
III	Core Paper 2: Digital Fundamentalsand Computer Architecture	5	3	25	75	100	4
III	Core Practical – 1: Programming Lab - C	5	3	25	75	100	4
III	Allied 1: Paper I Mathematical Structures for ComputerScience	5	3	25	75	100	4
IV	Environmental Studies*	2	3	-	50	50	2
	Total	**30**		**150**	**500**	**650**	**26**
	Semester II						
I	Language – II	4	3	25	75	100	4
II	English – II	4	3	12	38	50	2
	Naan Mudhalvan Courses Effective English & http://kb.naanmudhalvan.in/images/c/c7/Cambridge_Course_Details.pdf	2		12	38	50	2
III	Core 3: C++ Programming	5	3	25	75	100	4
III	Core Lab 2: Programming Lab - C++	5	3	20	30	50	2
III	Core Lab 3: Internet Basics Lab	3	3	20	30	50	2
III	Allied 2: Discrete Mathematics	5	3	25	75	100	4
IV	Value Education – Human Rights*	2	3	-	50	50	2
	Total	**30**		**139**	**411**	**550**	**22**
	Semester III						
I	Language – III	4	3	25	75	100	4
II	English – III	4	3	25	75	100	4
III	Core 4: Data Structures	4	3	25	75	100	4
III	Core 5: Java Programming	4	3	25	75	100	4
III	Core Lab 4: Programming Lab - Java	3	3	20	30	50	2
III	Allied 3: E-Commerce	5	3	12	38	50	2
III	Skill based Subject1: Data Communication & Networks	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**
	Semester IV						
I	Language – IV	4	3	25	75	100	4
II	English – IV	**4**	**3**	**12**	**38**	**50**	**2**
III	Core 6: System Software andOperating System	4	3	25	75	100	**4**
III	Core 7: Linux and ShellProgramming	4	3	25	75	100	3
III	Core 5: Linux and ShellProgramming Lab	3	3	20	30	50	2

	Naan Mudhalvan Courses Office Fundamentals – Lab*** http://kb.naanmudhalvan.in/Bharathiar_University_(BU)	2	-	20	30	50	2
III	Allied 4: Business Accounting	4	3	12	38	50	2
III	Skill based Subject 2 Lab: Network 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**
	Semester V						
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 Mobile Computing / Distributed Computing/ PYTHON Programming	6	3	25	75	100	4
III	Skill based Subject 3: Network Security & Management	6	3	30	45	75	3
	Total	**30**		**135**	**315**	**450**	**19**
	Semester VI						
III	Core 10: Graphics &Multimedia	5	3	25	75	100	4
III	Core 11: Project Work Lab %%	5	3	25	75	100	4
	Naan Mudhalvan–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
III	Core Lab 7: Programming Lab – Graphics & Multimedia	5	3	30	45	75	3
III	Elective – II : Middleware Technologies / Animation Techniques / Computer Installation & Servicing	5	3	25	75	100	4
III	Elective – III : Data Mining / Embedded Systems / Internet of Things (IoT)	5	3	25	75	100	4
III	Skill Based Subject 4 (Lab): Network Security Lab	3	3	20	30	50	2
V	Extension Activities**	-	-	50	-	50	2
	Total	**30**		**212 / 220**	**413 / 405**	**625**	**25**
	Grand Total			**962**	**2538**	**3500**	**140**

Note:

*	No Continuous Internal Assessment (CIA), University Examinations Only.
**	No University Examinations, Continuous Internal Assessment (CIA) Only.
***	Naan Mudhalvan – Skill courses- external marks **(CEE)** will be assessed by Industry and internal will be offered by respective course teacher.

Govt – (Non-Autonomous Colleges), $ Aided – (Non-Autonomous Colleges), @ Self - Financing (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	5	0	0	4
Pre-requisite		Students should have basic Computer Knowledge	Syllabus Version		2021-22 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
CO2	S	M	S	M	M	L	S	L	S	L
CO3	S	S	S	M	M	M	S	M	S	M
CO4	S	S	S	M	S	M	S	M	S	M
CO5	S	S	S	M	M	M	S	M	S	M

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

Course code		Digital Fundamentals and Computer Architecture	L	T	P	C
Core/Elective/Supportive		Core Paper : 2	5	0	-	4
Pre-requisite		Student should have basic computer knowledge	Syllabus Version	2021-22 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
CO2	S	M	S	M	M	S	M	M	M	L
CO3	S	S	S	M	S	S	S	M	M	M
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

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

Course code		Programming Lab – C	L	T	P	C
Core/Elective/Supportive		Core Lab: 1	0	0	5	4
Pre-requisite		Students should have basic knowledge on C programming and algorithms	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

1	Remember and Understand the logic for a given problem and to generate Prime numbers & Fibonacci Series **(Program-1,2,3)**	**K1, K2**
2	Apply the concepts to print the Magic square, Sorting the data , Strings, Recursive functions and Pointers **(Program-4,5,6,8,10)**	**K2, K3**
3	Remember the logic used in counting the vowels in a sentence **(Program-7)**	**K1**
4	Apply and Analyze the concepts of Structures and File management **(Program-9,11,12)**	**3&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

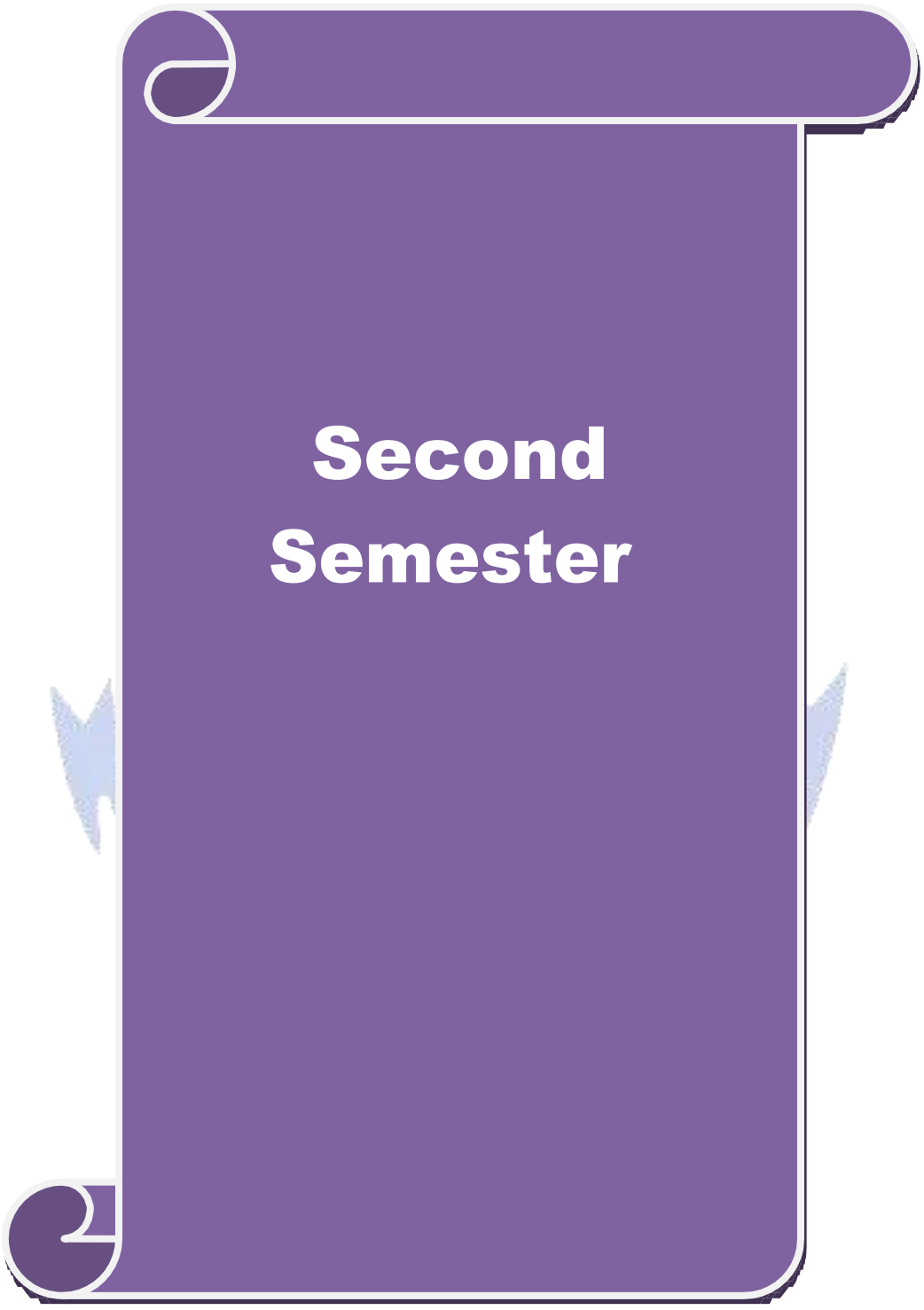
Reference Books

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		2021-22 Onwards	

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	5	4
Pre-requisite		Basic understanding of computer programs and computer programming language like C.	Syllabus Version		2021-22 Onwards	

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.]	
1	
2	
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	3	2
Pre-requisite		Knowledge of WINDOWS Operating Systems	Syllabus Version		2021-22 Onwards	

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	

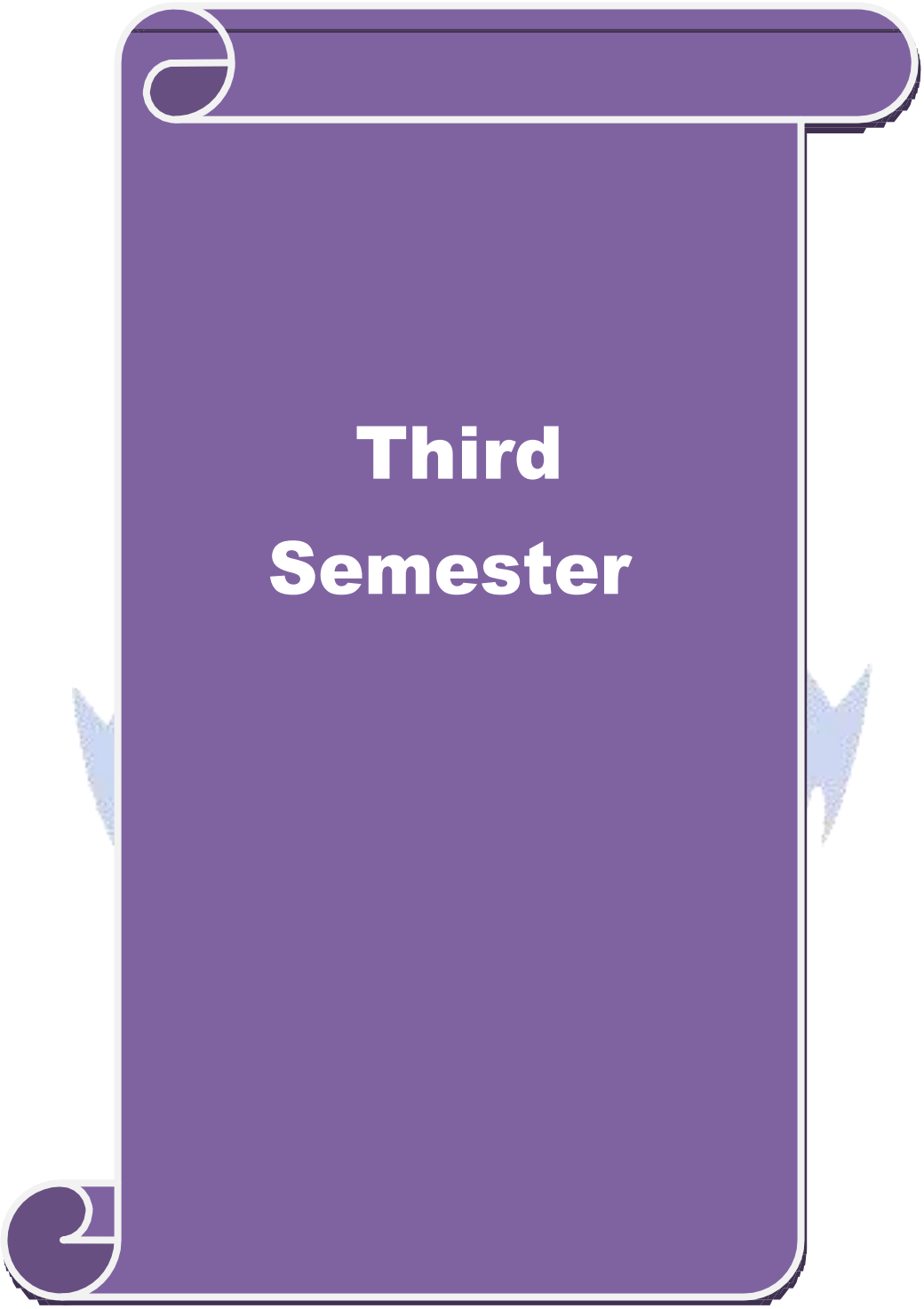
Reference Books	
1	Sherry Kinkoph Gunter, My Google Apps, 2014.
2	
3	

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	4	0	0	4
Pre-requisite		Basic understanding of data storage, retrieval and algorithms	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	INTRODUCTION	15 hours

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

Unit:2	LINKED LIST	12 hours

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

Unit:3	TREES	15 hours

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

Unit:4	EXTERNAL SORTING	15 hours

Storage Devices -Sorting with Disks: K-Way Merging – Sorting with Tapes Symbol Tables: Static Tree Tables - Dynamic Tree Tables - Hash Tables: Hashing Functions - Overflow Handling.

Unit:5	**INTERNAL SORTING**	**15 hours**
Insertion Sort - Quick Sort - 2 Way Merge Sort - Heap Sort – Shell Sort - Sorting on Several Keys. Files: Files, Queries and Sequential organizations – Index Techniques -File Organizations.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Ellis Horowitz, Sartaj Shani, Data Structures, Galgotia Publication.
2	Ellis Horowitz, Sartaj Shani, Sanguthevar Rajasekaran, Computer Algorithms, Galgotia Publication.
3	S.Lovelyn Rose, R.Venkatesan, Data Structures, Wiley India Private Limited,2015, 1st Edition

Reference Books	
1	Jean-Paul,Tremblay & Paul G.Sorenson , An Introduction to Data structures with Applications Tata McGraw Hill Company 2008, 2ndEdition.
2	Samanta.D , Classic Data Structure Prentice Hall of India Pvt Ltd 2007, 9th Edition
3	Seymour Lipschutz, Data Structures McGraw Hill Publications, 2014, 1st Edition

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	
2	
3	

Course Designed By:

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

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

Course code		Java Programming	L	T	P	C
Core/Elective/Supportive		Core: 5	4	0	0	4
Pre-requisite		Students should have basic understanding of OOPs concept.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	FUNDAMENTALS OF OBJECT-ORIENTED PROGRAMMING	15 hours

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

Unit:2	BRANCHING AND LOOPING	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	3	2
Pre-requisite		Students should have basic understanding of OOPs concept.	Syllabus Version		2021-22 Onwards	

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

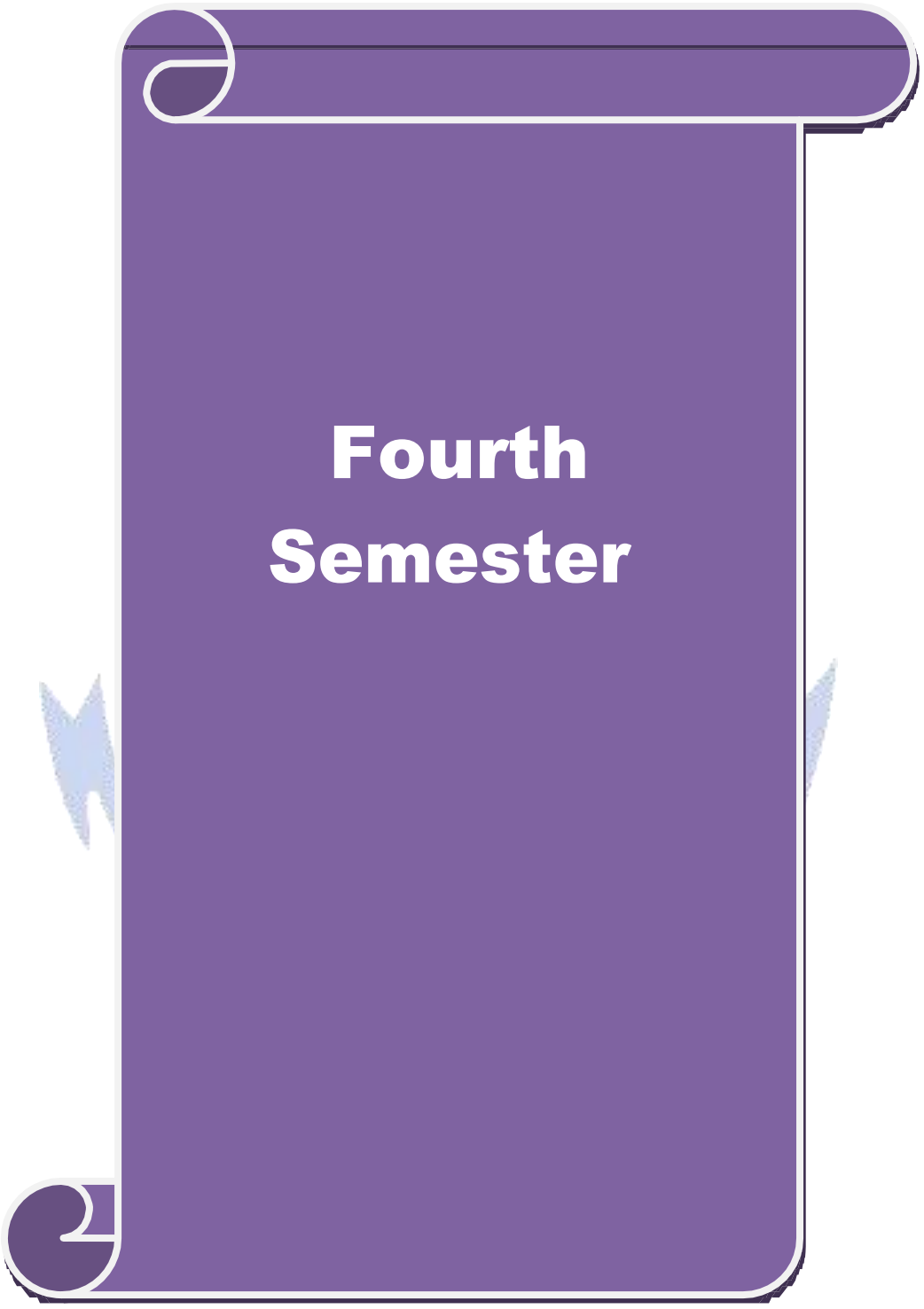
Programs	**36 hours**
1. Write a Java Applications to extract a portion of a character string and print the extracted string.	
2. Write a Java Program to implement the concept of multiple inheritance using Interfaces.	
3. Write a Java Program to create an Exception called payout-of-bounds and throw the 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/
Course Designed By:	

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

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


Fourth
Semester

Course code		System Software and Operating Systems	L	T	P	C
Core/Elective/Supportive		Core : 6	4	0	0	4
Pre-requisite		Students Should have the basic knowledge in computer.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	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	
2	
3	

Course Designed By:

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

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

Course code		Linux and Shell Programming	L	T	P	C
Core/Elective/Supportive		Core : 6	4	0	0	4
Pre-requisite		Before starting the course students should have the basic knowledge about operating system and C programming.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	INTRODUCTION	12 hours

Introduction to LINUX Operating System: Introduction - The LINUX Operating System.

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.
2	
3	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://spoken-tutorial.org/
2	https://www.tutorialspoint.com/linux/index.htm
3	
Course Designed By:	

Mapping with Programme Outcomes

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

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

Course code		Programming Lab – LINUX and SHELL PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core Lab: 5	0	0	4	3
Pre-requisite		Students should have the prior basic knowledge in operating system.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

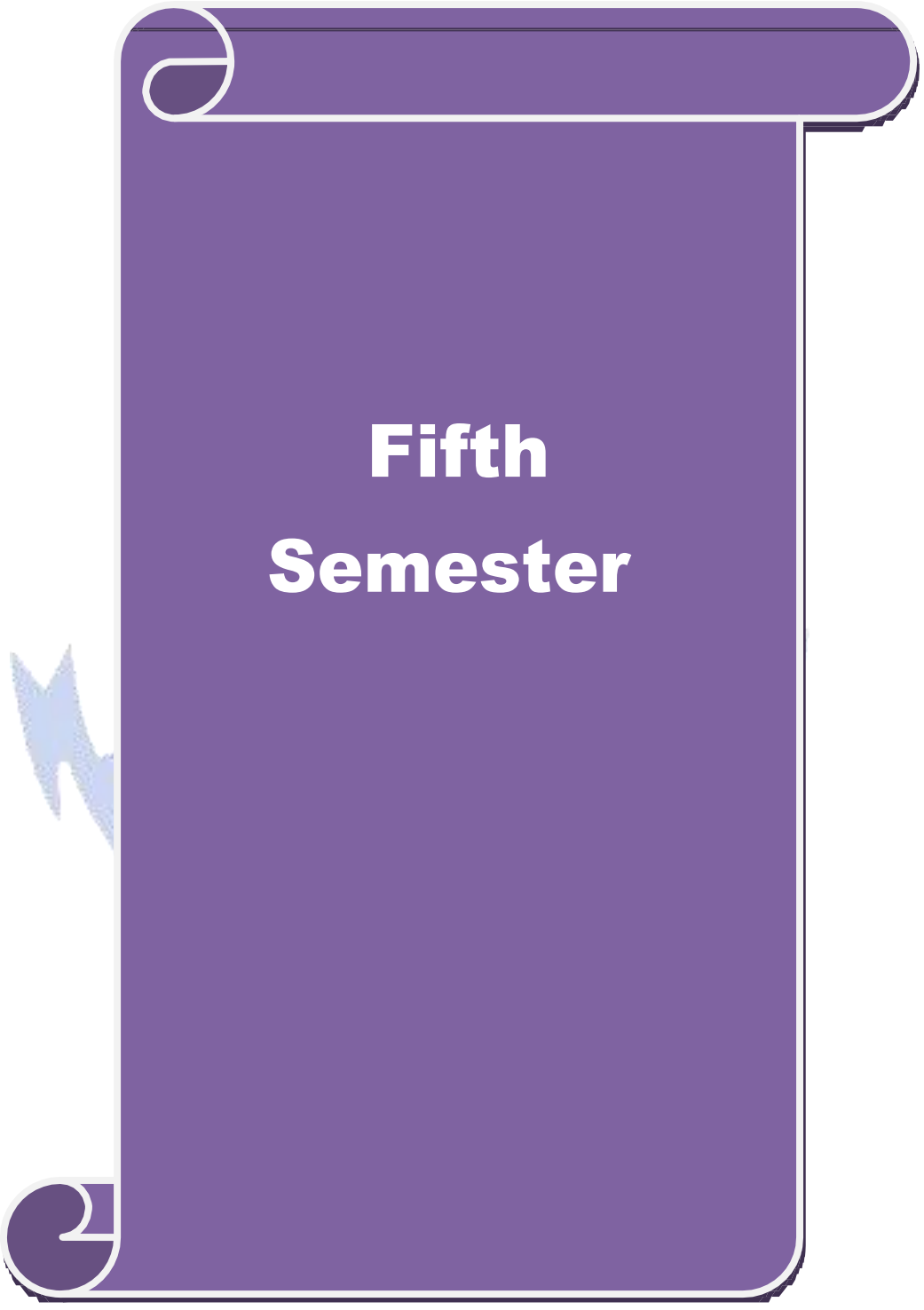
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Programs	**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
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


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		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	DATABASE CONCEPTS	15 hours

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

Unit:2	ORACLE9i	15 hours

Oracle9*i*: Overview: Personal Databases – Client/Server Databases – Oracle9i an introduction – SQL *Plus Environment – SQL – Logging into SQL *Plus - SQL *Plus Commands – Errors & Help – Alternate Text Editors - SQL *Plus Worksheet - *i*SQL *Plus. Oracle Tables: DDL: Naming Rules and conventions – Data Types – Constraints – Creating Oracle Table – Displaying Table Information – Altering an Existing Table – Dropping, Renaming, Truncating Table – Table Types – Spooling – Error codes.

Unit:3	WORKING WITH TABLE	15 hours

Working with Table: Data Management and Retrieval: DML – adding a new Row/Record – Customized Prompts – Updating and Deleting an Existing Rows/Records – retrieving Data from Table – Arithmetic Operations – restricting Data with WHERE clause – Sorting – Revisiting

Substitution Variables – DEFINE command – CASE structure. Functions and Grouping: Built-in functions –Grouping Data. Multiple Tables: Joins and Set operations: Join – Set operations.		
Unit:4	**PL/SQL**	**15 hours**
PL/SQL: A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Declaration – Assignment operation – Bind variables – Substitution Variables – Printing – Arithmetic Operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQ L in PL/SQL – Data Manipulation – Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit & Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.		
Unit:5	**PL/SQL COMPOSITE DATA TYPES**	**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		2021-22 Onwards	

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.
3	
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	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		2021-22 Onwards	

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.]		
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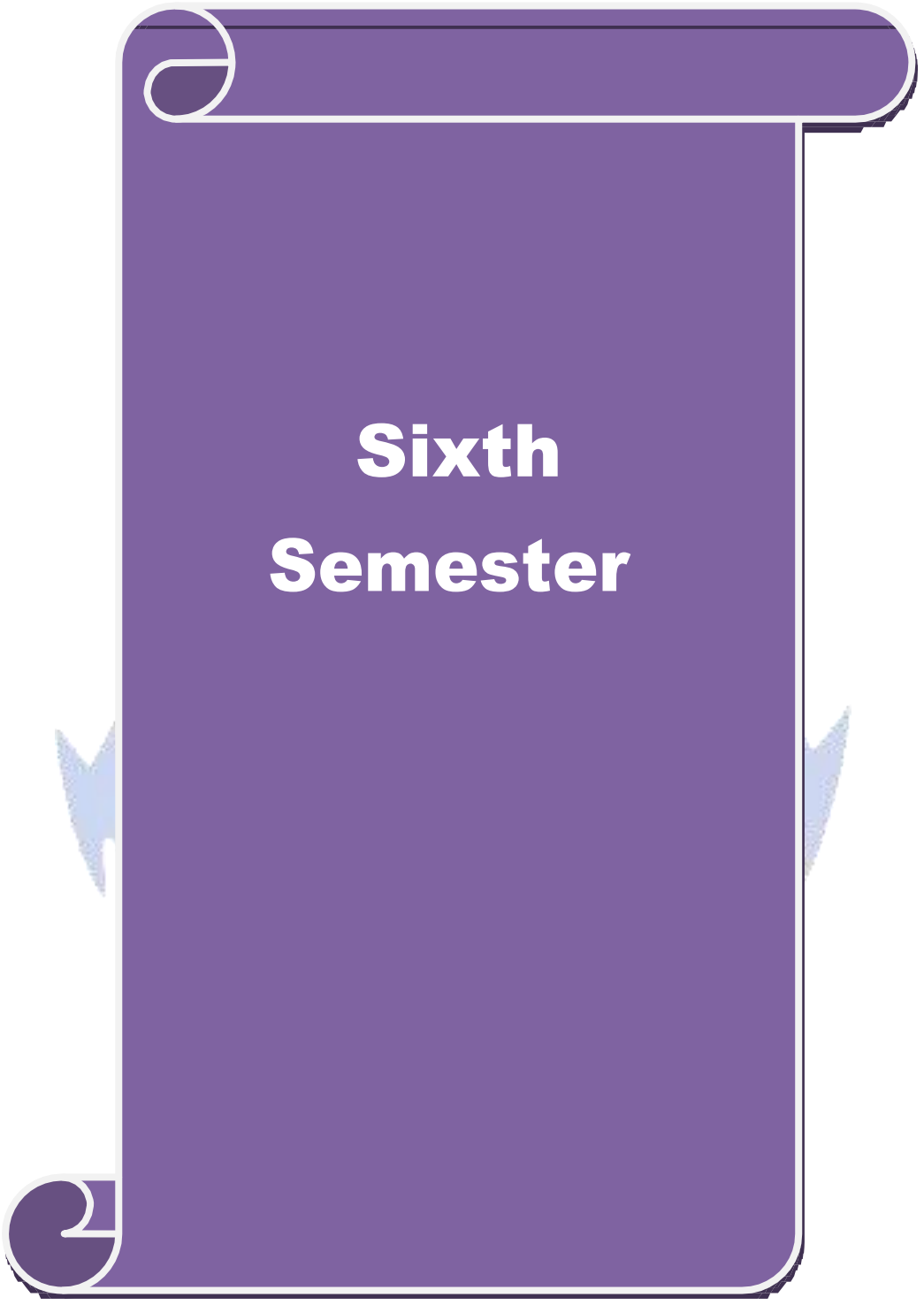
Course Designed By:		

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


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		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	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.]	
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Course Designed By:	

Mapping with Programme Outcomes

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

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

Course code		Project Work Lab	L	T	P	C
Core/Elective/Supportive		Core: 11	0	0	5	4
Pre-requisite		Students should have the strong knowledge in any one of the programming languages in this course.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

AIM OF THE PROJECT WORK

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

Viva Voce

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

2.1.1 Drawbacks
2.2 Proposed System
2.2.1 Features
3. System Design and Development
3.1 File Design
3.2 Input Design
3.3 Output Design
3.4 Database Design
3.5 System Development
3.5.1 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	S	S	S	S	M	M	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	M	M	S	S	S	S	S
CO4	S	S	S	M	S	S	S	S	S	S
CO5	S	S	S	M	S	S	S	S	S	S

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

Course code		Programming Lab – Graphics & Multimedia	L	T	P	C
Core/Elective/Supportive		Core Lab : 7	0	0	5	4
Pre-requisite		Students should have the basic knowledge on C and C++ to do computer graphics and multimedia applications.	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

1. To learn the basic principles of 2-dimensional computer graphics.
2. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
3. Provide an understanding of mapping from a world coordinates to device coordinates, clipping and projections.
4. To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization and business applications.
5. To comprehend and analyse the fundamentals of animation, virtual reality, underlying technologies, principles and applications.

Expected Course Outcomes:

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

1	Understand the basic concepts of computer graphics.	**K1**
2	Design scan conversion problems using C and C++ programming.	**K2**
3	Apply clipping and filling techniques for modifying an object.	**K3**
4	Understand the concepts of different type of geometric transformation of objects in 2D.	**K4**
5	Understand and develop the practical implementation of modeling, rendering, viewing of objects in 2D	**K6**

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

Programs	**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
CO2	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


Elective
Courses

Course code		Mobile Computing	L	T	P	C
Core/Elective/Supportive		Elective : I	6	0	0	4
Pre-requisite		Basic knowledge on mobile technologies	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	INTRODUCTION	10 hours

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

Unit:2	MOBILE COMPUTING THROUGH TELEPHONY	10 hours

UNIT II: MOBILE COMPUTING THROUGH TELEPHONY: Evaluation of telephony – Multiple access procedures – Mobile computing through telephone – IVR Application –Voice XML – TAPI

Unit:3	EMERGING TECHNOLOGIES	10 hours

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

Unit:4	GPRS	12 hours

GPRS – GPRS and packet data network – GPRS network architecture – GPRS network operations

– Data services in GPRS – Application for GPRS- Limitations – Billing and Charging. WAP : MMS – GPRS Applications		
Unit:5	**CDMA and 3G**	**12 hours**
CDMA and 3G: Spread spectrum technology – Is 95 – CDMA vs GSM – Wireless Data – Third generation networks – Applications on 3G WIRELESS LAN: Wireless LAN advantages – IEEE 802.11 standards – Architecture – Mobile in Wireless LAN – Deploying wireless LAN – Mobile adhoc networks and sensor networks – Wireless LAN Security – WiFi vs 3G.		
	Total Lecture hours	**55 hours**

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

Mapping with Programme Outcomes

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

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

Course code		Distributed Computing	L	T	P	C
Core/Elective/Supportive		Elective : I	6	0	0	4
Pre-requisite		Basic knowledge in databases, client and server	Syllabus Version	2021-22 Onwards		

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	Introduction to Distributed Systems	15 hours

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

Unit:2	Challenges and Managing Distributed Resources	15 hours

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

Unit:3	Design Considerations	15 hours

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

Unit:4	Client Server Network Model	15 hours

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

Unit:5	Distributed Databases	12 hours

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

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

Text Book(s)	
1	John A. Sharp, An introduction to distributed and parallel processing, Blackwell Scientific Publication(Unit I & III)
2	Uyless D. Black, Data communication and distributed networks‖(unit II)
3	Joel M.Crichllow , Introduction to distributed & parallel computing (Unit IV)
Reference Books	
1	Stefans Ceri, Ginseppe Pelagatti , Distributed database Principles and systems, McGraw Hill
2	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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Course Designed By:	

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

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

Course code		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		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	BASICS OF PYTHON	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.]	
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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		MIDDLEWARE TECHNOLOGIES	L	T	P	C
Core/Elective/Supportive		Elective : II	5	0	0	4
Pre-requisite		Basic knowledge on client, server, and web application	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	CLIENT-SERVER ARCHITECTURE	15 hours

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

Unit:2	PRESENTATION SERVICES	15 hours

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

Unit:3	COMPONENT MODEL	15 hours

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

Unit:4	ASP.NET	15 hours

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

Unit:5	ASP.NET and ADO.NET	12 hours

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

WSDL – UDDI – SOAP – HTTP – Developing simple web services – Connecting a Web Service to a data source – Developing ASP.NET Clients for Web Services.		
	Total Lecture hours	**75 hours**
Text Book(s)		
1	Justin Couch and Daniel H Steinberg, "J2EE bible", Willey India Pvt. Ltd, New Delhi, 2002.	
2	MridulaParihar et al., ASP.NET Bible,2002 Edition, Hungry Minds Inc, New York, USA. 5.	
3	Bill Evjen, Hanselman, Muhammad, Sivakumar& Rader, Professional ASP.NET 2.0, 2006 Edition, Wiley India(p) Ltd.	
Reference Books		
1	Paul Tremblett, "Instant Enterprise Java Beans", TMH Publishing company, New Delhi, 2001.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
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Course Designed By:		

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

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

Course code		ANIMATION TECHNIQUES	L	T	P	C
Core/Elective/Supportive		Elective : II	5	0	0	4
Pre-requisite		Basic knowledge in 2D and 3D animations	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	BASICS	15 hours

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

Unit:2	CREATING ANIMATION IN FLASH	15 hours

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

Unit:3	3D ANIMATION & ITS CONCEPTS	15 hours

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

Unit:4	MOTION CAPTION	15 hours

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

Unit:5	CONCEPT DEVELOPMENT	12 hours

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

	Total Lecture hours	**75 hours**
Text Book(s)		
1	Principles of Multimedia, Ranjan Parekh, 2007, TMH. (Unit I, Unit V)	
2	Multimedia Technologies, Ashok Banerji, Ananda Mohan Ghosh, McGraw Hill Publication	
Reference Books		
1	Ze-Nian Li and Mark S.Drew, “Fundamentals of Multimedia”, First Edition, Pearson Education, 2007	
2	Prabhat K Andleigh, Kiran Thakrar, “Multimedia systems design”, First Edition, PHI, 2007	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
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Course Designed By:		

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

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

Course code		COMPUTER INSTALLATION & SERVICING	L	T	P	C
Core/Elective/Supportive		Elective : II	5	0	0	4
Pre-requisite		Basics of computer software installation and servicing	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	PC SYSTEM	15 hours

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

Unit:2	FLOPPY DISK	15 hours

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

Unit:3	INPUT DEVICES	15 hours

Input Devices - Monitors and Display Adapters.

Unit:4	OUTPUT DEVICES	15 hours

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

Unit:5	Troubleshooting and servicing	12 hours

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

	Total Lecture hours	75 hours

Text Book(s)	
1	Computer Installation and Servicing, 2nd Edition, D.Balasubramaniam, Tata McGrawHill, 2005.
Reference Books	
1	D Balasubramanian,"COMPUTER INSTALLATION AND SERVICING", Second edition, Mc-Graw Hills Publication, 2005.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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Course Designed By:	

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

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

Course code		Data Mining	L	T	P	C
Core/Elective/Supportive		Elective: III	5	0	0	4
Pre-requisite		Basic knowledge on data, database, and statistical functions	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	BASIC DATA MINING TASKS	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 – Advanced Association Rules Techniques – Measuring the Quality of Rules.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Margaret H.Dunbam, Data Mining Introductory and Advanced Topics, Pearson Education – 2003.
2	Arun K.Pujari, "Data Mining Techniques", Universities Press, 2010.

Reference Books	
1	Jiawei Han & Micheline Kamber, Data Mining Concepts & Techniques, 2001 Academic Press.
2	K.P.Soman, Shyam Diwakar, V.Ajay, "Insight into Data Mining – Theory and Practice", Prentice Hall of India, 2009.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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Course Designed By:

Mapping with Programme Outcomes

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

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

Course code		EMBEDDED SYSTEMS	L	T	P	C
Core/Elective/Supportive		Elective: III	5	0	0	4
Pre-requisite		Basic knowledge in devices and programming skills in C and C++	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	INTRODUCTION TO EMBEDDED SYSTEM	15 hours

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

Unit:2	DEVICES AND BUSES FOR DEVICE NETWORKS	12 hours

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

Unit:3	PROGRAMMING CONCEPTS AND EMBEDDED PROGRAMMING IN C AND C++	15 hours

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

memory needs		
Unit:4	**PROGRAM MODELING CONCEPTS IN SINGLE AND MULTI PROCESSOR SYSTEMS**	**15 hours**
Program modeling concepts in single and multi processor systems: Modeling process for software analysis before software implementation – Programming models for event controlled or response time constrained real time programs – Modeling of multiprocessor systems. Software engineering practices: Software algorithm complexity – Software development process life cycle and its models – Software analysis – Software design – Implementation – Testing, Validation and debugging – Software maintenance		
Unit:5	**INTER-PROCESS COMMUNICATION AND SYNCHRONIZATION OF PROCESSES, TASKS AND THREADS**	**15 hours**
Inter-process communication and synchronization of processes, tasks and threads: Multiple processor – Problem of sharing data by multiple tasks and routines – Inter process communication. Real time operating systems: Operating system services – I/O subsystem – Network operating systems – Real time and embedded operating systems – Interrupt routine in RTOS environment – RTOS task scheduling – Performance metric in scheduling.		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Raj Kamal, ― Embedded Systems – Architecture, Programming and Design, TMH, 2007
Reference Books	
1	James K. Peckol, Embedded Systems, John Wiley & Sons, 2019
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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	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		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	INTRODUCTION	15 hours

Introduction - Definition & characteristics of IoT - physical design of IoT - logical design of IoT - IoT enabling Technologies - IoT levels & Deployment templates. Domain specific Iots : Home Automation - cities - Environment - Energy - retail - logistics - Agriculture - Industry 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		Network Security Lab	L	T	P	C
Core/Elective/Supportive		Skill based Subject Lab : 4	0	0	3	2
Pre-requisite		Basic knowledge in internet, network security concepts and programming skills	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Programs	**36 hours**
1. Write a program to encrypt the data using the encryption methods: i. Substitution Ciphers ii. Transposition Ciphers	
2. Write a program to implement DES algorithm.	
3. Write a program to implement the Public Key Cryptography using Diffie –Hellman Algorithm.	
4. Write a program to implement the Public Key Cryptography using RSA algorithm.	
5. Write a program to secure the Database using User Authentication Security.	
6. Write a server security program for Dynamic Page Generation.	
Total Lecture hours	**36 hours**

Text Book(s)

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

Reference Books

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

2	Behrouz A.Forouzan, Cryptography and Network Security, TMH.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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Course Designed By:	

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

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

Skill Based Course

Course code		DATA COMMUNICATION & NETWORKS	L	T	P	C
Core/Elective/Supportive		Skill based Subject - 1	4	0	0	3
Pre-requisite		Basic knowledge on computer networking	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	INTRODUCTION TO COMMUNICATIONS AND NETWORKING	15 hours

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

Unit:2	ANALOG AND DIGITAL TRANSMISSION METHODS	12 hours

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

Unit:3	TRANSMISSION MEDIA	15 hours

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

Circuit switching – Packet switching - Message switching - Router and Routing – Factors affecting routing algorithms - Routing algorithm -Approaches to routing.		
Unit:4	**NETWORKING PROTOCOLS AND OSI MODEL**	**15 hours**
Networking protocols and OSI model: Introduction – Protocols in computer communications - The OSI model - OSI layer functions.		
Unit:5	**INTEGRATED SERVICES DIGITAL NETWORKING (ISDN):**	**15 hours**
Integrated services digital networking (ISDN): Introduction – Background of ISDN - ISDN architecture – ISDN interfaces - Functional grouping – Reference points - ISDN protocol architecture – Broadband ISDN (B-ISDN). of ATM – Packet size – Virtual circuits in ATM – ATM cells – Switching – ATM layers – Miscellaneous Topics.		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Data Communications and Networks, Achyut. S. Godbole, Tata McGraw-Hill Publishing Company, 2007.
Reference Books	
1	Introduction to Data communications and Networking. W.Tomasi. Pearson education.
2	Computer Networks, L.L.Peterson and B.S.Davie;4th Edition, HEVIBK
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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Course Designed By:	

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

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

Course code		Lab – NETWORK LAB	L	T	P	C
Core/Elective/Supportive		Skill Based Subject 2 (Lab) :1	0	0	3	2
Pre-requisite		Basic knowledge on computer networks	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

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

Text Book(s)

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

Reference Books

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

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

Course Designed By:

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

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

Course code		Network Security & Management	L	T	P	C
Core/Elective/Supportive		Skill based Subject – 3	6	0	0	3
Pre-requisite		Basic knowledge on computer network threats	Syllabus Version		2021-22 Onwards	

Course Objectives:

The main objectives of this course are to:

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

Expected Course Outcomes:

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

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

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

Unit:1	INTRODUCTION TO SECURITY MANAGEMENT	15 hours

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

Unit:2	CRYPTOGRAPHY	12 hours

Cryptography: Terminology and background – Data Encryption Methods – Cryptographic Algorithms- Secret Key Cryptography - Public key cryptography – Message Digest – Security Mechanisms – Speech Cryptography. Hardware and Software Security: Hardware security – Smart Card – Biometrics – Virtual Private Networks (VPNs) - Trusted Operating Systems – Pretty Good Privacy (PGP) – Security Protocols. Database Security: Introduction to Database – Characteristics of a Database Approach – Database Security Issues - Database Security – Vendor-Specific Security – Data Warehouse Control and Security.

Unit:3	INTRUSION DETECTION SYSTEMS	15 hours

Intrusion Detection Systems: What is not ad IDS – Infrastructure of IDS – Classification of Intrusion Detection Systems – Host-Based IDS – Network-Based IDS - Anomaly Vs Signature Detection – Manage an IDS – Intrusion Detection Tools – IDS Products and Vendors. Network

Security: Fundamental Concepts – Identification and Authentication – Access Control – A Model for Network Security – Malicious Software – Firewalls.		
Unit:4	**NETWORK MANAGEMENT**	**15 hours**
Network Management: Goal of Network Management – Network Management Standards – Network Management Model – Infrastructure for Network Management - Simple Network Management Protocol (SNMP). Security Management: Security Plan - Security Analysis - Change Management - Disaster Recovery - Systems Security Management - Protecting Storage Media- Protection of System Documentation -Exchanges of Information and Software – Security Requirements of Systems.		
Unit:5	**ELECTRONIC MAIL POLICY AND SECURITY OF INTERNET BANKING SYSTEMS**	**15 hours**
Electronic Mail Policy: Electronic Mail – What are the E-mail threats that organization's face - Why do you need an E-mail Policy - How do you create an E-mail Policy - Publishing the E-mail Policy - University E-mail Policy. Security of Internet Banking Systems: Introduction Banking System – Security Problem – Methodology for Security Problem – Schematic flow of Internet Banking – A layered approach to security.		
Unit:6	**Contemporary Issues**	**3 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**75 hours**

Text Book(s)	
1	Network Security and Management, Brijendra Singh, PHI 2007.
2	William Stallings, Cryptography and Network Security Principles and Practices, Fourth edition, PHI Education Asia.
3	
Reference Books	
1	Atul Kahate, Cryptography and Network Security, 2 nd Edition, TMH.
2	Behrouz A.Forouzan, Cryptography and Network Security, TMH.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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Course Designed By:	

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

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

Course Code		Cyber Security	L	T	P	C
Core/elective/Supportive		Naan Mudhalvan Skill based Course-I	2	0	0	2

Cyber Security course contents

1. **Course 1**: Information Security Fundamentals
2. **Course 2**: Cyber Security Introduction
3. **Course 3**: Technologies in Cybersecurity eco-system
4. **Course 4**: Core Threat Intelligence Engineering
5. **Course 5**: Core Vulnerability Management Engineering
6. **Course 6**: Core Penetration Management Techniques
7. **Course 7**: Core Cyber Exploitations
8. **Course 8**: Global Cyber Attack Trends
9. **Course 9**: Security Operations Management
10. **Course 10**: Incident Management
11. **Course 11**: Web and Mobile security Techniques
12. **Course 12**: Privacy and Online Rights
13. **Course 13**: Best Practices for keeping Systems and Data safe
14. **Course 14**: Cloud Security Engineering
15. **Course 15**: Industry Infosec Governance

Course 1 - Information Security Fundamentals : Broad Overview of Information Security will coverthe following topics:

- 1.1 Information Security, 1.2 Computer Security, 1.3 CIA Triad/Principles, 1.4 Non-repudiation, 1.5 Risk Management
- 1.6 Cryptography Basics, 1.7 Authentication, 1.8 Authorization, 1.9 Access Control, 1.10Security Policies
- 1.11 Security Auditing, 1.12 Security Laws and Regulations, 1.13 Defense, 1.14 SecurityMonitoring, 1.15 ISO 27000 framework
- 1.16 Information Security use case demonstration as per industry verticals, 1.17 Policy,Process, Procedures, Standards, Guidelines, Baselines

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- Case structure – Objectives, Target audience, Executive summary, Background, Yourevaluation, Proposed solution, Conclusion
- **Case Study #1:** List Foundations of HealthCare Industries

- Patient medical records contain sensitive information that must be protected from unauthorized access.

- **Case Study #2:** List Strong Foundations of Fintech Industries
  - Financial institutions handle large amounts of sensitive financial data, such as accountnumbers and transaction history, which must be protected from cyber threats
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 2 - Cyber Security Introduction : Broad Overview of Cyber Security will cover the followingtopics:

- 2.1 Cybersecurity, 2.2 Cybers attacks, 2.3 Social Engineering, 2.4 Cybersecurity Defences (Firewall, AV, SIEM, Patch, Password etc), 2.5 Cloud security, 2.6 Endpoint security, 2.7 Mobile security, 2.8 Zero trust, 2.9 IOT, 2.10 Layers of cybersecurity, 2.11 Hacking, 2.12 Incident management, 2.13 Security operations

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- **Case Study #3: Define cyber security governance structure for CISO in bank**
- **Case Study #4: Define cyber security structure for CISO in Auto manufacturing**
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 3 - Technologies in Cybersecurity eco-system: Broad Overview of Technologies will cover thefollowing topics:

- 3.1 Network security – Architecture and Standards, Wireless security, Network Vulnerabilities, Threats – Password cracking, Spoofing, Packet sniffing, Port scanning, Poisoning
- 3.2 System security - Asset classification, Asset accountability, Configuration management, Privilege access control, Virtualization security, System hardening, End-point security, System upgrades and patches, Backup and recovery, Systems Auditing, Threats – Denial of Service (DOS), DHCP spoofing, Dictionary attack, Email spoofing
- 3.3 Software security – Secure Design, Secure Coding, Static Security, Dynamic Security, Open source governance, Software composition analysis, Log and audit trail ,OWASP Top10 Threats

- SQL Injection, Cross Site Scripting (XSS), Cross Site Request Forgery (CSRF)

- 3.4 Cryptography Basics – Security by Obscurity, Cryptographic Keys, Asymmetric, Symmetric, Hashing,

Public Key Infrastructure (PKI), Challenges in cryptography

- 3.5 Application of Cryptography – Virtual Private Network (VPN), Secure Socket Layer (SSL), Digital Signature
- 3.6 Cloud security – Identity and Access management (IAM), Key management, Governance, Risk and Compliance (GRC), Legal, Data sovereignty, Business continuity, Disaster recovery, Cloud security models
- 3.7 Block chain security, 3.8 Zero Trust, 3.9 XDR, 3.10 AI, 3.11 MUD, 3.12 Context aware

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- **Case Study #5:** What are the Fundamental Network protections used in Any Industry
  - Firewalls, IDS, IPS, VPN, Antivirus, SIEM
- **Case Study #6:** List methods to Secure Data in transit and Data at rest
  - Encryption, Hashing,
- **Case Study #7:** How many ways can you protect any user account in applications
  - 2FA, MFA, Password Management
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 4 - Core Threat Intelligence Engineering: Broad Overview of threat intelligence will cover the following topics:

- 4.1 Threat model, 4.2 Tactical, operations and strategic threat intelligence, 4.3 How to detect, respond and defeat threats, 4.4 Adversary data, 4.5 Reactive and proactive threat approach , 4.6 IOC, 4.7 Cyber kill chain,. 4.8 MITRE ATT@ACK

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- **Case Study #8: How many Levels of User expertise are involved to form an Threat Intelteam**
- **Case Study #9: What are the roles included in Threat Intelligence at Industry level**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 5 - Core Vulnerability Management Engineering: Broad Overview of Vulnerability managementwill cover the following topics:

- 5.1 what is vulnerability, Threats, Risks, Exploitation, 5.2 Computer ports / protocols, 5.3 Ethical hack, Recon, Enumeration, Port Scanning, 5.4 Tools, 5.5 Attack Toolset – Metasploit, Nessus, nmap, Burpsuite, 5.6 Basic defence measures - Antivirus, Intrusion Detection / Prevention systems

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- **Case Study #10: What are few examples of an Vulnerability as per Industry orientedapplications**
- **Case Study #11: Explain RACI Matrix in banking environment**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 6 - Core Penetration test techniques: Broad Overview of penetration test techniques will cover the following topics:

- 6.1 what is penetration testing, vulnerability, Threats, Risks, Exploitation, 6.2 Computer ports / protocols, 6.3 Port Scanning, 6.4 Tools, 6.5 Attack Toolset – Metasploit, Nessus, nmap, Burpsuite, 6.6 Basic defence measures - Antivirus, Intrusion Detection / Prevention systems,

6.7 Penetration test approach, tools, 6.8 Pen test reporting, 6.9 Pen test rules, 6.10 Gray box, White box, Black box , 6.11 Sniffing, 6.12 DOS, 6.12 Social engineering, 6.13 Session hijacking, SQL Injection

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- **Case Study #12: How to do network scanning in banking industry**
- **Case Study #13: How to do social engineering (email phishing) in auto manufacturing**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 7 - Core Cyber Exploitations: Broad Overview of cyber exploitation will cover the

following topics:

- 7.1 Exploitation, 7.2 Types of exploits, 7.3 Identify, Protect, Detect, Respond, Recover, 7.3 Honey pot, 7.4 Data collection, analytics 7.5 Proactive and reactive exploitation, 7.6 Red , blue team, and purple team, 7.7 Incident management, 7.8 Data breach, 7.9 Ransomware,

7.10 Zero day attack, 7.11 Man in the middle

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- **Case Study #14: Difference between Vulnerability and Exploitations. How to identifyexploitation in banking industry**
- **Case Study #15: What Network vectors are considered for exploitation. How to implementin healthcare**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 8 – Global attack trends: Broad Overview of cyber-attack trends will cover the followingtopics:

- 8.1 Past, present & future trends of cyber threat landscape (Worldwide)
- 8.2 Cybercrime landscape in Asia Pacific
- 8.3 Organizational processes, Security roles and responsibilities, Due care and Due diligence
- 8.4 Cybersecurity threats – Malware, Viruses and Worms, Trojan horses, Botnets, Zero-dayexploits, Phishing, Spear phishing, Whaling, Social engineering, etc.
- 8.5 Risk management concepts, Personnel security policies, Information security training andawareness
- 8.6 Critical infrastructure protection, Privacy by design

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- **Case Study #16: Explain Ransomware behaviour and impact within the industries.**
- **Case Study #17: What is a Malware and how to setup malware protection in hospital**
- **Case Study #18: Will Linux and Mac have any Attacks and Malware. Consider ecommerceservices**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 9 – Security Operations Management : Broad Overview of SOC will cover the following topics:

- 9.1 SOC security operations centre concept, 9.2 Logging, Attack methodology and monitoring,

9.3 Incident detection and Reporting, 9.4 SIEM, 9.5 Threat intelligence feed , 9.6 24x7 monitoring

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- Case Study #19: **What is Security posture for any healthcare industry**
- **Case Study #20: What is SOC in food chain industry**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 10 – Security Incident Management : Broad Overview of incident management will cover the following topics:

- 10.1 Incident handling and response, 10.2 Incident RACI, 10.3 Forensic package , critical incident package, 10.4 Malware incidents, 10.5 Email security and phishing incidents , 10.6 Threat reporting, 10.7 Third party incidents, 10.8 Feedback process, 10.9 TTX

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- **Case Study #21: What is Zero Day? Does it have any impact on any industry applications.Define process framework**
- **Case Study #22: How are Incidents managed for HealthCare , FinTech, SCADA andAutomotive industries**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 11 – Web and Mobile security Techniques: Broad Overview of web and mobile securitytechniques will cover the following topics:

- 11.1 Web environment setup for scan and tools, 11.2 Scan web application, 11.3 Exploit vulnerabilities, 11.4 Deep analysis, 11.5 Reporting
- 11.6 Mobile environment setup for scan and tools, 11.7 Scan mobile application, 11.8 Exploit vulnerabilities, 11.9 Deep analysis, 11.10 Reporting

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- Cyber breach case study (Equifax, Uber, Target, Stuxnet, SWIFT)
- **Case Study #23: What's the Top standard followed in Web Applications**
- **Case Study #24: What the Top standard followed in Mobile Applications**
- **Case Study #25: List secure frameworks used in Mobile App Development**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 12 – Privacy and online rights: Broad Overview of privacy techniques will cover the followingtopics:

- 12.1 Privacy concept, 12.2 Privacy regulations, 12.3 GDPR, 12.4 Online privacy challenges

12.5 Online marketing/ sales privacy challenges, 12.6 Privacy protection and penalties

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- Cyber breach case study (Equifax, Uber, Target, Stuxnet, SWIFT)
- **Case Study #26: What data is considered as Privacy issue in online ecommerce**
- **Case Study #27: Whats the impact if your company related data is available online?**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 13 – Best Practices for keeping Systems and Data safe: Broad overview of Security best practices will cover the following topics:

- 13.1 Understand your data and risk, 13.2 Protect your systems, 13.3 Cyber Insurance, 13.4 AV, 13.5 Data leakage , 13.6 Security guidelines – NIST, ISO 27001, GDPR, 13.7 Risk Management Frameworks and Security Standards
  - NIST SP800-30: Evaluating security risks
  - ISO 27000 - Information Security Management Standards (ISMS)
  - DO-178C - Software Considerations in Airborne Systems and Equipment Certification
  - ISO/IEC 27034 – Application security guidelines
  - SS 584 : Singapore Standard for Multi Tier Cloud Security

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- **Case Study #28: How can you assure your data is safe in Public network and corporatenetwork**
- **Case Study #29: List 3 simple methods to keep your system safe from malware**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 14 – Cloud security engineering: Broad Overview of cloud security will cover the followingtopics:

- 14.1 Cloud security fundamentals, 14.2 Cloud providers, 14.3 Tools for cloud security, 14.4 Cloud recovery, 14.5 Cloud Monitoring, 14.6 Cloud compliance, certification, audit and compliance, Pen test

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

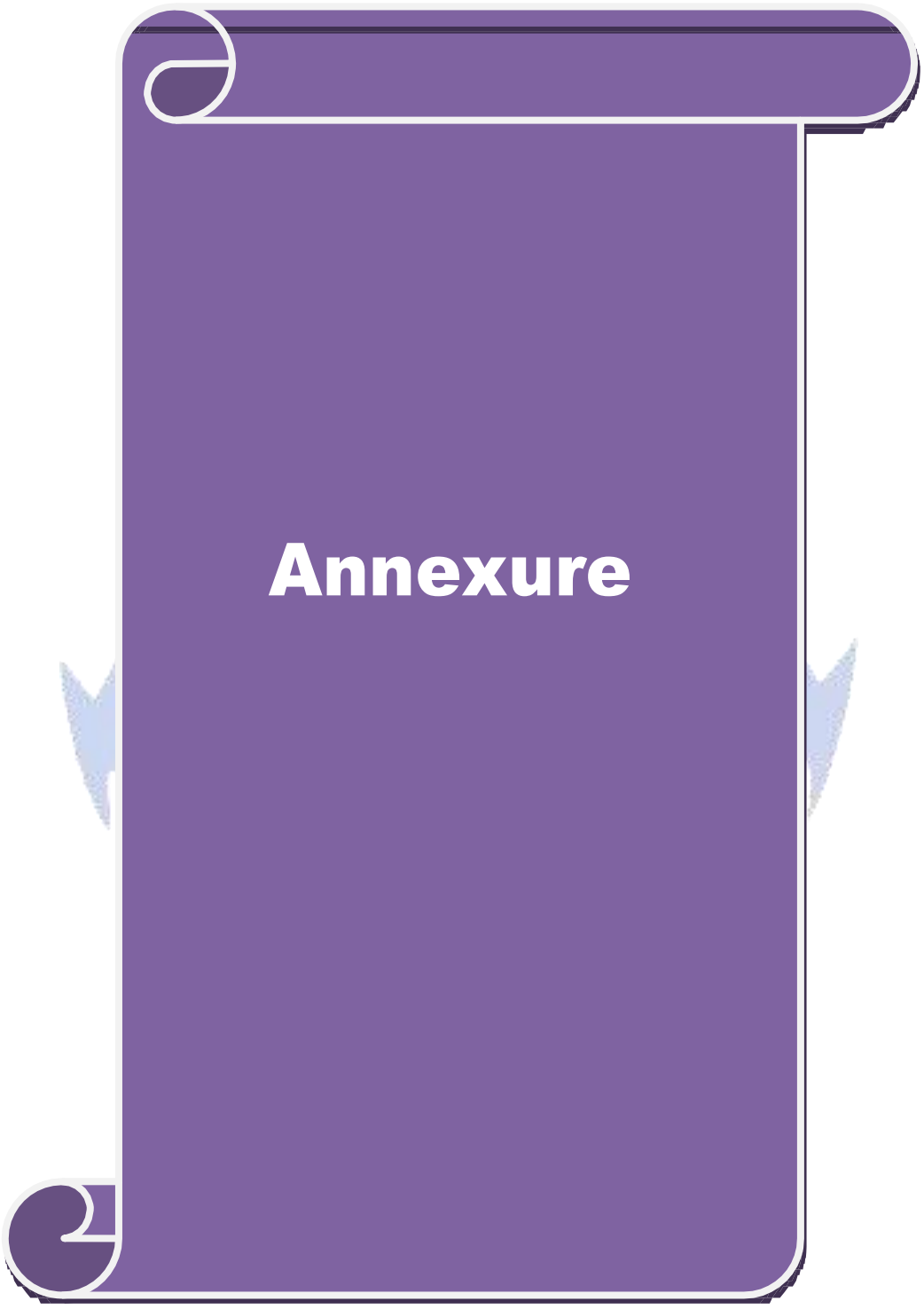
- **Case Study #30: How the Cloud services or applications can be targeted to hackers**
- **Case Study #31: What are the Different methods to store data safe**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz

Course 15 – Industry Infosec Governance: Broad Overview of Industry security governance will coverthe following topics:

- 15.1 Industry roles and student skill identification, 15.2 Industry training, certification, 15.3 Industry career path, 15.4 How to become industry cybersecurity expert, 15.5 Job application process, 15.6 Salary / perks, 15.7 Working in healthcare industry

Case Study / Demo / Role Play / Discussion / Quiz will cover the following topics:

- Cyber breach case study (Equifax, Uber, Target, Stuxnet, SWIFT)
- **Case Study #32: Abbreviated CIA and give one example for Healthcare industry**
- **Case Study #33: Are Policies, procedures and standards important to protect CIA for anIndustry**
- Demo
- Scenario based role play (Cybersecurity strategy development, Incident response plan)
- Group discussion
- Quiz


Annexure

B.Sc. COMPUTER TECHNOLOGY

Syllabus

(With effect from 2021 -2022)

Program Code : 26K

DEPARTMENT OF COMPUTER TECHNOLOGY

Bharathiar University

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

Coimbatore 641 046, INDIA

BHARATHIAR UNIVERSITY : : COIMBATORE 641046
DEPARTMENT OF COMPUTER TECHNOLOGY

MISSION

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