Computer Science and Engineering Scheme and Syllabus

2022-23 Admitted batch (160 credits)

III Semester B.E. (CSE)

Sl. No	Category	Subject Code	Subject Title	Credits	HOURS/ WEEK			EXAMINATION MARKS		
					L	T	P	CIE	SEE	Total
1	BSC	22UMA301C	Partial Differential Equations And Integral Transforms	3	3	0	0	50	50	100
2	PCC	22UCS302C	OOPS with Java	3	2	0	2	50	50	100
3	PCC	22UCS303C	Computer Organization	3	3	0	0	50	50	100
4	PCC	22UCS304C	Data Structures	3	2	2	0	50	50	100
5	PCC	22UCS305L	Digital Systems Lab	1	0	0	2	50	50	100
6	PCC	22UCS306L	Data Structures Lab	1	0	0	2	50	50	100
7	AEC	22UCS308L	Data Analytics Using R	1	0	0	2	50	50	100
8	PCC	22UCS307C	Digital Systems	3	3	0	0	50	50	100
9	HSMC	22UCS310M	Yoga/NSS/Sports#	0	0	0	0	50	50	100
10	AEC	22UBT340C	Biology for Engineers	2	2	0	0	100	0	100
		22UMA300M	Bridge Course Mathematics-I *	0	3	0	0	50	50	100
Total				20	15	2	8	550	450	1000
*Only for Lateral Entry students # To be completed during the intervening semester of III to VIII semester										

22UMA301C	Partial Differential Equations and Integral Transforms	03 - Credits (3 : 0 : 0)
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

Course Objectives:

1. PDE's provides a powerful tool for quantifying rates of change optimizing functions, and modeling complex systems.
2. To provide a way, to represent periodic functions in terms of simple trigonometric functions.
3. To transform a function from the time domain to the frequency domain.
4. Provides a powerful mathematical tool for analyzing, designing, and manipulating discrete time signals and systems..

UNIT-I	10 Hrs.

Partial Differential Equations_I : Introduction to PDE, Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE.
(RBT Levels: L1, L2 and L3)

UNIT–II	10 Hrs.

Partial Differential Equations_II : Solutions of PDE by the method of separation of variable. Derivation of one-dimensional heat and wave equations and their solutions by explicit method, solution of Laplace equation by using five point formulas.
(RBT Levels: L1, L2 and L3)

UNIT–III	10 Hrs.

Fourier series :Periodic functions, Conditions for Fourier series expansions, Fourier series expansion of continuous and functions having finite number of discontinuities, even and odd functions. Half-range series, practical harmonic analysis.
(RBT Levels: L1, L2 and L3)

UNIT–IV	10 Hrs.

Fourier transforms and z-transforms : Infinite Fourier transforms and inverse Fourier transforms- simple properties, Fourier sine and Fourier cosine transforms, Inverse Fourier sine and cosine transforms. Z-transforms-definition, standard forms, linearity property, damping rule, shifting rule-problems. Inverse Z-transforms.
(RBT Levels: L1, L2 and L3)

Reference Books *

1. Numerical Methods for Engineers by Steven C Chapra &Raymond P Canale.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
3. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi
4. Advanced Engineering Mathematics by E Kreyszig ,John Wiley & Sons

Course Outcomes**

After completion of the course student will be able to

1. Identify different types of PDEs including linear vs nonlinear, first order vs higher-order, and partial derivatives of different variables.

2. Learn various analytical techniques to solve to specific types of PDEs, such as variable separable and explicit method.
3. Grasp the concept of representing periodic functions as an infinite sum sinusoidal (sine and cosine) with different frequencies.
4. Grasp the concept of the Fourier transform as a mathematical tool that converts a function from the time domain into the frequency domain.

22UCS302C	Object Oriented Programming with Java	Credits: 03
L:T:P - 2 : 0: 2		CIE Marks: 50
Total Hours/Week: 4(2:0:2)		SEE Marks: 50

Course Objectives:

UNIT-I	10 Hrs.

An overview of Java ,Data Types, Variables and Arrays , Operators , Control Statements
Introducing Classes: Class Fundamentals , Declaring Objects , Introducing Methods , Constructors ,this keyword ,garbage collection, method overloading, String Handling.

UNIT–II	10 Hrs.

Inheritance , Packages and Interfaces
Exception Handling : Exception-Handling Fundamentals – Exception Classes , Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses

UNIT–III	10 Hrs.

Lambda Expressions: Fundamentals, Block Lambda expressions, Passing Lambda Expressions as argument, Lambda Expressions and Exceptions.
Multithreaded Programming: The Java Thread Model , The Main Thread , Creating a Thread, Creating Multiple Threads, Thread Priorities , Synchronization, Inter thread communication.

UNIT–IV	10 Hrs.

Lambda Expressions: Fundamentals, Block Lambda expressions, Passing Lambda Expressions as argument, Lambda Expressions and Exceptions.
Multithreaded Programming: The Java Thread Model , The Main Thread , Creating a Thread, Creating Multiple Threads, Thread Priorities , Synchronization, Inter thread communication.

Reference Books *

1. Herbert Schildt ,Java The Complete Reference, , MGH Education, 9th Edition, 2014
2. Jim Keogh ,J2EE - The Complete Reference, , tata McGraw Hill, 2007
3. Cay S Horstmann ,Gary Cornell ,Core Java Volume 1- Fundamentals, , Pearson Education, 8th Edition, 2007
4. E Balagurusamy ,Programming with Java , , MGH Education, 6th Edition, 2019

Course Outcomes**

After completion of the course student will be able to

1. Explain the object-oriented concepts and other features of JAVA.
2. Identify classes, objects, members of a class and relationships among them needed for a specific problem.
3. Demonstrate the concepts of polymorphism, inheritance, exception handling and other features of JAVA.
4. Write Java application programs using OOP principles and proper program structuring.
5. Design and develop standalone applications using Java.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2													
CO2	3	3		3									2		1
CO3	3	3		2									3	2	2
CO4	3	3		2									3	3	3
CO5	3	3		3									3	3	3

22UCS303C	Computer Organization	Credits: 03
L:T:P -3:0:0		CIE Marks: 50
Total Hours: 40:0:0		SEE Marks: 50

Course Objectives:

UNIT-I	10 Hrs.

Basic structure of Computers: Computer types, Functional Units, Basic operational concepts, Bus structures.

Machine instructions and programs: Numbers, Arithmetic operations and characters, Memory locations and addresses, Memory operations, Instructions and instruction sequencing, Addressing modes, Assembly language, assembler directives, number notation, , Stacks and Queues, Subroutines, Encoding of machine instructions.

UNIT–II	10 Hrs.

Input/output organization: Accessing I/O devices, Interrupts-Interrupt hardware , Enabling and Disabling Interrupts, Handling Multiple devices, controlling device requests, Exceptions, Direct memory access – Bus Arbitrations, Buses-Asynchronous Bus and Synchronous bus , **Interface Circuits**- Parallel port and serial port, Standard I/O Interfaces –Peripheral component interconnect Bus, SCSI bus ,USB.

UNIT–III	10 Hrs.

The memory system: Some Basic concepts, Semiconductor RAM memories, Read only memories, speed, size, and cost, cache memories

Arithmetic Unit: Addition and subtraction of signed numbers, Design of fast adders, Multiplication of positive numbers, Signed operand multiplication, Fast multiplication. Integer Division, Floating point numbers and operations– IEEE standard for Floating point numbers, Arithmetic operations on Floating point numbers. Implementing Floating point operations.

UNIT–IV	10 Hrs.

Basic Processing Unit: Some fundamental concepts, Execution of complete instruction, Hardwired Control, Micro-programmed control, Microinstructions,

Pipelining: basic concepts, role of cache memory, pipeline performance

Large computer systems: forms of parallel processing, array processor, the structure of general purpose and multiprocessors

Performance: Processor Clock, Basic performance equation, pipelining and super scalar operations, Clock rate, Instruction set, compiler, performance measurement

Reference Books *

1. Hamcher, Zvonko Vranesic, Safwatzaky, Computer Organization, Fifth edition, TMGH
2. J. P. Hayes, Computer Architecture and Organization, Third edition, TMGH
3. William Stallings Computer Organization and Architecture, ,Seventh edition 2007,PHI

Course Outcomes**

After completion of the course student will be able to

1. Explain the design and function of different units of computer
2. Perform the various operations on given data
3. Analyze the execution of the program and different organizations of functional units
4. Develop an assembly programs and micro programs for simple machine instructions
5. Design the basic functional units of computer

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1											1	1		
CO2		3										1	1		2
CO3		2	2									1	1		2
CO4			3									1	1	2	2
CO5			3									1	1		3

22UCS304C	Data Structures	Credits: 03
L:T:P –2:2:0		CIEMarks:50
Total Hours/Week: 04		SEEMarks:50

Course Objectives:

UNIT-I	10 Hrs.

Pointer applications: Arrays and pointers, pointer arithmetic and arrays, passing an array to a function, Using pointers to functions.
Memory allocation functions, Array of pointers, pointers to void and pointers to functions.
Recursion: iterative and recursive definition iterative and recursive solution, designing recursive functions, limitations of recursion.
Stacks: Basic stack operations: Push, Pop, Stack top,
Stack linked list: Implementation, Data structure, Stack head, Stack data node, Stack algorithms, Create Stack, Push Stack, Stack top, Empty Stack, Full Stack, Stack count, Destroy Stack
C language implementations: Insert data, Push Stack , Print Stack, Pop character
Stack ADT: Data structure, ADT Implementations, Stack structure, Create stack, Push stack, Pop stack, Stack top, Empty stack, Stack count, Destroy stack
Stack Implementation using array

UNIT–II	12 Hrs.

Stack applications:
Reversing data: Reverse a list, Convert decimal to binary, Infix to postfix transformation, Evaluating postfix expressions
Queues: **Queue Operations**: Enqueue, Dequeue, Queue front, Queue rear, Queue example, **Queue Linked list design**: Data structure, Queue head, Queue data node, Queue algorithms, Create queue, Enqueue, Dequeue, Retrieving queue data, Empty queue, Full queue, Queue count, Destroy queue

UNIT–III	12 Hrs.

General Linear lists: Basic operations, Insertion, Deletion, Retrieval, Traversal,
Implementation: Data structure, Head node, Data node, Algorithms, Create list, Insert node, Delete node, List search, Retrieve node, Empty list, Full list, List count, Traverse list, Destroy list,
List ADT: ADT functions, Create list, Add node, Internal insertion function, Remove node, Internal delete function, Search list, Internal search function, Retrieve node, Empty list Full list, List count, Traverse, Destroy list,

UNIT–IV	12 Hrs.

Non-Linear lists: Trees: Basic tree concepts: Terminology, User representation
Binary trees: Properties, Height of binary trees, Balance, Complete and Nearly complete binary trees
Binary tree traversals: Depth-first traversals, Breadth-first traversals, **Expression Trees**: Infix traversal, Postfix traversal, Prefix traversal **Huffman code, General trees,**
Binary search trees: Basic concepts,
BST operations: Traversals, Searches, Insertion Find the smallest and largest node, BST search, Insertion, Deletion
Binary search tree ADT, Data structure, Head and node structure, Algorithms, Create a BST, Insert a BST, Internal insert function, Delete a BST, Internal delete function, Retrieve a BST, Internal retrieve function,

Traverse a BST, Internal traverse function, Empty a BST, Full BST, BST count, Destroy a BST, Internal destroy function.

Graphs: Basic concepts, **Operations**: Insert vertex, Delete vertex, Add edge, Delete edge, Find vertex, **Graph storage structures**: Adjacency matrix, Adjacency list.

Reference Books *

1. Approach Using C, (Chapter 6:6.9 Chapter 7,Chapter 9,10, Chapter 11:11.3,11.4,11.5, Chapter 12,Chapter 13, Chapter 14,Appendix G:G.1,G.2,G.3, Appendix H,I,Appendix J), Third Edition, Cengage Learning India Private Limited
2. Behrouz A. Forouzan and Richard F. Gilberg,,**Data Structure A Pseudocode Approach with C**, (Chapter 1(1.2,1.3,1.5), 2,3,4 (4.1-4.4), 5, 6(6.1-6.3)7(7.1-7.3), 11(11.1-11.3),12(12.2-12.4)13(13.1-13.3)Appendix F., 2nd Edition, 2005. Cengage Learning Publisher
3. Aaron M. Tenanbaum ,YedidyahLangsam,Data Structures Using C, Pearson
4. YeshwantKanetkar,Data Structures Through C, BPB

Course Outcomes**

After completion of the course student will be able to

1. Demonstrate the understanding of pointers, dynamic memory allocation, recursion and data structures.
2. Explain implementation of data structures with and without ADT
3. Identify the data structures needed to solve given problem.
4. Design and develop solutions for simple problems using the data structures
   Compare and contrast different data structures

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	2	2	2	2	-	-	-	-	-	-	-	3	-	2
CO2	-	2	2	2	2	-	-	-	-	-	-	-	2	-	2
CO3	-	3	3	3	3	-	-	-	-	-	-	-	3	-	3
CO4	-	3	3	3	3	-	-	-	-	-	-	-	3	-	3
CO5	-	3	3	3	3	-	-	-	-	-	-	-	3	-	3

22UCS305L	Digital Systems Laboratory	Credits: 01
L:T:P - 0 : 0 : 2		CIE Marks: 50
Total Hours/Week: 02		SEE Marks: 50

Practice Assignments Using Digital IC's

1. Implementation of Boolean Expressions of basic logic gates such as 2-input/3-input AND, OR, NAND, NOR, EX-OR Gates.
2. Simplification of simple Boolean Expressions in SOP/POS forms.

Part A (Hardware Implementation)

1. Design a Binary to Gray Code converter with K map simplification and ExOR Gates.
2. Given any 4-variable logic expression, simplify using K-MAP/Quine McCliskey and realize the simplified logic expression using 8:1 multiplexer IC.
3. Realize a full adder using 3-to-8 decoder IC and 4 input NAND gates.
4. Realize a full substractor circuit using 3-to-8-line decoder IC and 4 input NAND gate.
5. Realize a J-K Master/Slave Flip-Flop using NAND gates and verify its truth table.
6. Design and implement a mod-n (n<8) synchronous Up counter using J-K Flip-Flop and basic gates.
7. Design and implement a mod-n (n<8) synchronous Down counter using J-K Flip-Flop and basic gates.
8. Design and implement an asynchronous counter using decade counter IC to count up from 0 to mod-n (n<=9) & display the numbers using 7-segment display.
9. Design a Ring and Johnson Counter using a 4-bit Shift Register IC.

Part B (Software Implementation)

1. Write the Verilog/VHDL code for Binary to Gray Code converter and verify it's working.
2. Write the Verilog/VHDL code for an 8:1 multiplexer. Simulate and verify it's working.
3. Write the Verilog/VHDL code for a full adder. Simulate and verify its working.
4. Write the Verilog/VHDL code for D Flip-Flop with positive-edge triggering. Simulate and verify its working.
5. Write a Verilog/VHDL code for mod-8 up counter. Simulate and verify it's working.
6. Write the Verilog/VHDL code for switched tail counter. Simulate and verify its working

Note:

- For part-B any simulation package like MaxPlus-II/MultiSim/Active HDL etc. may be used.
- In the examination questions must be given on lots. Each student must be given one question from PART-A and one from PART-B.
- Practice Assignments are not to be considered for SEE Examination.
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- **Continuous Internal Evaluation (50 marks):**

Marks are based on execution of assignments and lab internal test. The marks are distributed as below;

1. 30 Marks for lab assignment execution.
2. 20 Marks for lab internal test.

Semester End Examination (50 marks):

Reference Books

1. D. D. Givone, 8th Edition, 2017, "Digital Principles and Design", McGraw Hill.
2. R. D. Sudhakar Samuel, Revised Edition, 2005, "Logic Design - A simplified approach", Sanguine Technical Publications.
3. Malvino, Leach and Saha, 6th Edition, 2007, "Digital Principles and applications", McGraw Hill.
4. McGraw Hill, 2nd Edition, 2002, "Fundamental of digital Logic with Verilog Design", McGraw Hill.

Course Outcomes

After completion of the course student will be able to

1. Design and implement combinational circuits.
2. Design and Implement sequential Circuits.
3. Simulate sequential and combinational circuits using VHDL/Verilog Programming.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	1	1	-	1
CO3	2	1	2	-	-	-	-	-	-	-	-	1	1	-	1

22UCS306L	Data Structures Lab	Credits:-1
L:T:P-0:0:2		CIEMarks:50
Total Hours/Week: 02		SEEMarks:50

Assignment List

1. Write C program to perform the following using function pointer concept.
   i. **complex_sum( )** takes addresses of the two complex numbers as parameters as void* and returns the result as void *
   ii. **int_sum( )** takes two integer operand as void* as parameters and returns the result as void*.
   iii. **float_sum( )** takes two integer operand as void* as parameters and returns the result as void*.
   iv. **sum_two_nos( )** that takes addresses of two operands and address of the function that is to be invoked on these two operands
   v. **getfun( )** that accepts from the user appropriate function based on users choice.
   vi. **main( )**method that invokes these function based on users choice.
2. Write Recursive function for the followings:
   a. To find sum of first N natural numbers.
   b. To print first N Fibonacci series.
   c. To convert given decimal number to binary.
   d. Write main ( ) to call above functions.
3. Develop linked stack ADT and create stack of integer using the ADT's defined.
4. Develop array stack ADT and create stack of students using the ADT's defined.
5. Develop linked Queue ADT and create Queue of floats using the ADT's defined.
6. Develop array Queue ADT and create Queue of strings using the ADT's defined.
7. Create Linked list ADT and use the same to create list of student's information.
8. Create binary tree and allow following operations on tree
   i. Search an element ii. Insert an element iii. Tree is balanced or not iv. No of occurrences of key element v. No of nodes, no of leaf nodes, no of intermediate node vi. Find parent of key node vii. Traverse in preorder, postorder, inorder, breadth first order viii. To copy tree
9. Create binary search tree of integers and allow following operations on tree:

i. Insert an element ii. Delete an element iii. Search an element iv. Tree is balanced or not v. No of occurrences of key element vi. No of nodes, no of leaf nodes, no of intermediate node vii. Find parent of key node viii. Traverse in preorder, postorder, inorder, breadth first order ix. To copy tree x. To print elements in descending order

Course Outcomes

After completion of the course student will be able to

1. Write C programs to use data structures to represent, organize and manipulate data for given problem.
2. Design and implement solutions for organization of data using different data structures.
3. Choose appropriate data structures for representing, organizing and manipulating data for different kinds of problems

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	3	3	3	3	-	-	-	-	-	-	-	3	-	3
CO2	-	3	3	3	3	-	-	-	-	-	-	3	3	-	3
CO3	-	3	3	3	3	-	-	-	-	-	-	2	3	-	3

22UCS309L	Data Analytics Using R	Credits: 01
L: T:P -0:1:1		CIE Marks: 50
Total Hours: 24		SEE Marks: 50

UNIT-I	3(T)+3(P)

Introduction to Data Analytics: Overview of Data Analytics, Need of Data Analytics, Nature of Data, Classification of Data: Structured, Semi-Structured, Unstructured, Characteristics of Data, Applications of Data Analytics

Introduction to R: Overview of R programming, Data Types in R, Few Commands for Data Exploration

Loading and Handling Data in R: Expression, Variables and Functions, Missing Values Treatment in R,Using the 'as' Operator to Change the Structure of Data

UNIT–II	3(T)+3(P)

Vectors: Sequence Vector, rep function, Vector Access, Vector Names, Vector Math, Vector Recycling, **Matrices:** Matrix Access, **Factors:** Creating Factor, **List:** List Tags and Values, Add/Delete Element to or from a List, Size of a List, **Few Common Analytical Tasks, Aggregating and Group Processing of a Variable, Simple Analysis Using R**

Methods for Reading Data: CSV and Spreadsheets, Reading Data from Packages

UNIT–III	3(T)+3(P)

Exploring Data in R: Introduction, Data Frames, R Functions for Understanding Data in Data Frames, R Functions for Understanding Data in Data Frames, Load Data Frames, Exploring Data, Data Summary, Finding the Missing Values, Invalid Values and Outliers, Descriptive Statistics, Spotting Problems in Data with Visualization

UNIT–IV	3(T)+3(P)

Linear Regression using R: Introduction, Model Fitting, Linear Regression, Assumptions of Linear Regression **Case study:** Exploring the appropriate data sets from Kaggle web site and perform the data analytics using linear regression.

Reference Books

1. Seema Acharya, Data analytics using R, 2018, McGraw Hill Education (India).
2. Owen Jones, Robert Maillardet, and Andrew Robinson, Introduction to Scientific Programming and Simulation Using R, 2014, CRC Press
3. Daniel Bell, R Programming a Step-by-Step Guide for Absolute Beginners, Second Edition May 2020, KDP Amazon Publishing
4. Mark Gardener, Beginning R The Statistical Programming Language,2012, John Wiley & Sons, Inc

Course Outcomes

After completion of the course student will be able to

1. Demonstrate proficiency in using R's data structures, data reading functions (e.g., read.csv, read.table) and preprocessing the data.
2. Construct different graphs for visualizations of the data (e.g., histograms, scatter plots, bar charts) to interpret the insights they provide
3. Develop R scripts to conduct exploratory data analysis (EDA) to uncover patterns, trends, outliers in data and interpret the insights they provide

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	1		1							1	1		1
CO2	1	2	1		1							1	2	1	1
CO3	1	2	3	2	1							1	2	2	2

22UCS307C	Digital Systems	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Boolean algebra and Combinational Circuits:

Boolean algebra definition, Principle of Duality, Boolean algebra theorems, Boolean formulas and functions, Normal forms. Minterm canonical form, m-notation, Maxterm Canonical form, M-notation. Manipulation of Boolean expressions. Gates and combinational circuits. Incomplete Boolean functions and don't care conditions, Additional Boolean operations and Gates.

UNIT–II	10 Hrs.

Simplifications of Boolean Expressions:

Formulations of simplification problem, Prime Implicants and Irredundant disjunctive expressions, Prime implicates and Irredundant conjunctive expressions, Karnaugh maps, Using Karnaugh maps to obtain minimal expressions for complete Boolean functions, Minimal expressions of incomplete Boolean functions.

The Quine-McCluskey method of generating Prime Implicants and Prime Implicates, Decimal method for obtaining prime Implicants, Variable-Entered Karnaugh maps

UNIT–III	10 Hrs.

Logic Design with MSI Components and Programmable Logic Devices:

Binary adders and Subtractor, Decimal adders, Comparators, Decoders, Multiplexers. Programmable logic devices (PLDs), Programmable read only memories (PROMs), Programmable logic arrays (PLAs), Programmable array logics (PALs

UNIT–IV	10 Hrs.

Flip-Flops and Applications:

The Basic Bistable Element: Lathes, Master-Slave flip-flops (Pulse-Triggered flip-flops), Edge triggered flop-flops, Characteristic equations.

Registers: Serial In Serial Out, Serial In Parallel Out Parallel in Parallel Out, Parallel In Serial Out, Circular, Universal Shift Registers.

Counters: Binary Ripple Counter, Synchronous Binary Counters, Mod and Ring counters. Design of Synchronous Counters. **HDL** implementations of combinational and sequential circuits

Reference Books *

1. D. D. Givone, 8th Edition, 2017, "Digital Principles and Design", McGraw Hill.
2. R. D. Sudhakar Samuel, Revised Edition, 2005, "Logic Design - A simplified approach", Sanguine Technical Publications.
3. Malvino, Leach and Saha, 6th Edition, 2007, "Digital Principles and applications", McGraw Hill.
   McGraw Hill, 2nd Edition, 2002, "Fundamental of digital Logic with Verilog Design", McGraw Hill

Course Outcomes**

After completion of the course student will be able to

1. Demonstrate the understanding of Boolean algebra.
2. Describe the working of Combinational circuits.
3. Apply the Boolean theorems, K-Map, Q-M and VEM methods to simplify Boolean expressions.
4. Describe the working of Sequential circuits.
   Simulate combinational circuits using HDL programming.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	1	1	-	1
CO3	2	-	-	-	-	-	-	-	-	-	-	1	1	-	1
CO4	1	1	2	-	-	-	-	-	-	-	-	1	1	-	2
CO5	1	1	2	-	-	-	-	-	-	-	-	1	1	-	2

22UBT340C/22UBT440C	Biology For Engineers/ Bioinspiration For Engineers	02 - Credits (2: 0 : 0)
Hours / Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

Course Objectives:

1. Provide students with an opportunity to collaborate in the learning process and develop critical thinking skills.
2. Enables the design of biocompatible materials and devices.
3. Helps in developing new medical technologies.
4. Facilitates the creation of sustainable energy systems.
5. Supports the development of bioremediation techniques for environmental cleanup.
6. Informs the development of advanced bio manufacturing processes.
7. Supports the advancement of personalized medicine.

UNIT-I	10 Hrs.

NATURE BIOINSPIRED MATERIALS AND MECHANISMS

Bio inspiration - Introduction, Alliance between Engineering and Biology, Biomimicry - Science mimicking nature. Human Blood substitutes-hemoglobin based oxygen carriers (HBOCs) and perflourocarbons (PFCs). Artificial Intelligence for disease diagnosis. Bioichips & their applications.Biosensors & their applications, Nanobiomolecules in medical science, Biofilms in dental treatment.

UNIT–II	10 Hrs.

Bio inspiration models used in engineering: Bio Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf), Respiration (MFCs), Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Gecko Feet, Plant burrs (Velcro), Shark skin (Friction reducing swimsuits), Kingfisher beak (Bullet train), Fire fly
LED.

UNIT–III	10 Hrs.

HUMAN ORGAN SYSTEMS AND BIO DESIGNS

Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson‟s disease).
Heart as a pump system (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators).
Lungs as purification system gas exchange mechanisms, spirometry, Ventilators, Heart-lung machine).
Eye as a Camera system, bionic eye. **Kidney** as a filtration system - dialysis systems. **Muscular and Skeletal Systems** as scaffolds, bioengineering solutions for muscular dystrophy and osteoporosis

UNIT–IV	10 Hrs.

TRENDS IN BIOENGINEERING

Bio printing techniques and materials, 3D printing of ear, bone and skin. 3D printed foods, electrical tongue and electrical nose in food science, DNA origami and Bio computing, Bio imaging and Self- healing Bio concrete (based on bacillus spores, calcium lactate nutrients and bio mineralization processes) and Bioremediation and Bio mining via microbial surface adsorption(removal of heavy metals like Lead,

Cadmium, Mercury, Arsenic). Bio-bleaching

Reference Books *

- Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022.
- Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012
- Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
- Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011
- Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2020.
- Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, CRC Press, 2012
- Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
- Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N GeethaA C Udayashankar Lambert Academic Publishing, 2019.
- 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
- Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016.

Web links and Video Lectures (e-Resources)

- VTU EDUSAT / SWAYAM / NPTEL / MOOCS / Coursera / MIT-open learning resource
- https://nptel.ac.in/courses/121106008
- https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
- https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring- 2009.
- https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006.
- https://www.coursera.org/courses?query=biology.
- https://onlinecourses.nptel.ac.in/noc19_ge31/preview.
- https://www.classcentral.com/subject/biology.
- https://www.futurelearn.com/courses/biology-basic-concepts.

Course Outcomes**

After completion of the course student will be able to

1. Corroborate the concepts of biomimetics for specific requirements.
2. Elucidate the basic biological concepts via relevant industrial applications and case studies.
3. Evaluate the principles of design and development, for exploring novel bioengineering projects. Think critically towards exploring innovative bio based solutions for eco friendly and socially relevant problems.

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	3		2	1		3						1			
CO 2	3	2	1	1		3						1			
CO 3	3		3	1		3						1			
CO 4	3		1	2		3	3					1			

22UMA300M	Bridge Course Mathematics-I	Mandatory - Credits (3 : 0 0)
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

Course Objectives:

1. Maurice D weir, Joel Hass and Frank R. Giordano, “Thomas calculus”, Pearson, eleventh edition, 2011.
2. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
3. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Erwin Kreyszing‟s Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014.

Differential Equations-1	10 Hrs.

Introduction to Differential Equations: Ordinary differential equations of first order**:** Variable separable, Homogeneous. Exact form and reducible to exact differential equations- Integrating factors on $1/N\ (\partial M/\partial y - \partial N/\ )\ and\ 1/M\ (\partial N/\partial x - \partial M/\partial y\ )$. Linear and Bernoulli‟s equation.

(RBT Levels: L1, L2 and L3)

Differential Equations-2	10 Hrs.

Introduction to Higher Order Differential Equations: Second and higher order linear ODE‟s with constant coefficients-Inverse differential operator, method of variation of parameters (second order); Cauchy‟s and Legendre homogeneous equations.

(RBT Levels: L1, L2 and L3)

Partial differentiation	10 Hrs.

Introduction to function of several variables: Partial derivatives; Euler‟s theorem - problems. Total derivatives-differentiation of composite functions. Jacobeans-problems.

(RBT Levels: L1, L2 and L3)

Integral Calculus and Beta, Gamma functions	10 Hrs.

Introduction to Multiple integrals: Evaluation of double and triple integrals. Area bounded by the curve.

Introduction to Beta and Gamma functions: Definitions, Relation between beta and gamma functions-problems.

(RBT Levels: L1, L2 and L3)

Reference Books *

5. Maurice D weir, Joel Hass and Frank R. Giordano, “Thomas calculus”, Pearson, eleventh edition, 2011.
6. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
7. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
8. Erwin Kreyszing‟s Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014.

Course Outcomes**

After completion of the course student will be able to

1. Maurice D weir, Joel Hass and Frank R. Giordano, “Thomas calculus”, Pearson, eleventh edition, 2011.

2. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
3. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Erwin Kreyszing‟s Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014.

2022-23 Admitted batch (160 credits

IV Semester B.E. (CSE)

Sl. No	Category	Subject Code	Subject Title	Credits	HOURS/ WEEK			EXAMINATION MARKS		
					L	T	P	CIE	SEE	Total
1.	**BSC**	**22UMA401C**	**Statistics and Probability Distribution**	**3**	**3**	**0**	**0**	**50**	**50**	**100**
2.	**PCC**	**22UCS402C**	**Operating Systems**	**3**	**2**	**2**	**0**	**50**	**50**	**100**
3.	**PCC**	**22UCS403C**	**Systems Software**	**3**	**2**	**0**	**2**	**50**	**50**	**100**
4	**PCC**	**22UCS404C**	**Finite Automata and Formal Languages**	**3**	**3**	**0**	**0**	**50**	**50**	**100**
5.	**PCC**	**22UCS405C**	**Database Management System**	**3**	**2**	**2**	**0**	**50**	**50**	**100**
6.	**PCC**	**22UCS406L**	**Database Management System Lab**	**1**	**0**	**0**	3	**50**	**50**	**100**
8.	**PCC**	**22UCS407L**	**Operating Systems Lab**	**1**	**0**	**0**	**2**	**50**	**50**	**100**
9.	**PCC**	**22UCS408L**	**Python Application Programming Lab**	**2**	**0**	**2**	**2**	**50**	**50**	**100**
10.	**HSMC**	22UHS424C	**Universal Human Values – II**	**1**	**1**	**0**	**0**	**50**	**50**	**100**
		22UMA400M	**Bridge Course Mathematics-II ***	**0**	**3**	**0**	**0**	**50**	**50**	**100**
Total				**20**	16	6	9	**450**	**450**	**900**
*** Only for Lateral Entry students**										

22UMA401C	Statistics and Probability Distributions	03 - Credits (3 : 0 : 0)
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SE Marks : 50

UNIT – I	10 Hrs.

Statistics

Curve fitting by the method of least squares: $y = a + bx$, $y = ab^x$, $y = a + bx + cx^2$. Correlation, expression for the rank correlation coefficient and regression.

(RBT Levels: L1, L2 and L3)

UNIT – II Probability	10 Hrs.

Addition rule, conditional probability, multiplication rule, Baye"s rule. Discrete and continuous random variables-Probability density function, Cumulative distribution function, Problems on expectation and variance.

(RBT Levels: L1, L2 and L3)

UNIT – III Probability distributions	10 Hrs.

Binomial distributions, Poisson distributions and Normal distributions. Concept of joint probability, Joint probability distributions.

(RBT Levels: L1, L2 and L3)

UNIT – IV Markov chains	10 Hrs.

Introduction, Probability vectors, Stochastic Matrices, Fixed Points and Regular stochastic Matrices, Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states.

(RBT Levels: L1, L2 and L3)

References:

1. Numerical Methods for Engineers by Steven C Chapra & Raymond P Canale.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
3. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi.
4. Advanced Engineering Mathematics by E Kreyszig ,John Wiley & Sons.
5. Probability and stochastic processes by Roy D. Yates and David J. Goodman, wiley India pvt.ltd 2nd edition 2012.
6. Theory and problems of probability by Seymour Lipschutz (Schaum"s Series).

Course Objectives:

1. To apply the knowledge of Statistics in various Engineering fields.
2. To be acquired knowledge about predictions preferably on the basis of mathematical equations.
3. To be understand the principal concepts about probability.

Course Outcomes:

After completion of the course the students shall be able to,

1. Apply the least square sense method to construct the specific relation for the given group of data.
2. Solve problems on correlation and regression
3. Apply the concepts of probability
4. Apply the concepts of probability distributions
5. Apply the concept of Markov Chain for commercial and industry purpose.

Evaluation Scheme:

Assessment	Marks	Weightage
CIE-I	40	20
CIE-II	40	20
Assignments/ Quizzes/Case Study/ Course Project/Term Paper/Field Work	10	10
SEE	100	50
Total	190	100

Question paper pattern for CIE-I and CIE-II:

Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering Unit-I and Unit-II (no multiple choice questions and No true or false questions).

In Part-B, four questions are to be set as per the following table.

CIE	Number of questions / Maximum marks	Sub divisions	Covering entire unit
I	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-I
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-II
II	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-III
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-IV

Question paper pattern for SEE:

1. Question paper consists Part-A and Part-B. Question number 1 is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
2. In Part-B total of eight questions with two from each unit; with internal choice to be set uniformly covering the entire syllabus.
3. Each question carries 20 marks and should not have more than four subdivisions.
4. In Part-B, any FOUR full questions are to be answered choosing at least one from each unit.
5. Sketches, figures and tables if any should be clearly drawn, as the same is scanned for printing.

The question paper should contain all the data / figures /

22UCS402C	OPERATING SYSTEMS	Credits: 03
L:T:P – 2: 2: 0		CIE Marks: 50
Total Hours/Week: 04		SEE Marks: 50

UNIT-I	(6+4) Hrs.

Introduction: What Operating Systems Do?, Computer-System Organization, Computer-System Architecture, Operating-System Operations,

PROCESS: Processes Process Concept, Process Scheduling, operations on Processes, Interposes Communication, IPC in Shared-Memory Systems, IPC in Message-passing Systems.

Threads & Concurrency: overview, Multicore Programming, Multithreading Models,

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms,

UNIT–II	(6+4) Hrs.

Synchronization Tools: Background, The Critical-Section Problem, Peterson's Solution, Hardware Support for Synchronization, Mutex Locks, Semaphores, Monitors, Classic problems of synchronization.

Deadlocks: System Model, Deadlock in Multithreaded Applications, Deadlock Characterization, Methods for Handling Deadlocks, Methods for Handling Deadlocks, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

UNIT–III	(6+4) Hrs.

Main Memory: Background, Contiguous Memory Allocation, Paging Structure of the Page Table, Swapping.

Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing

UNIT–IV	(6+4) Hrs.

File-System Interface: File Concept, Access Methods, Directory Structure, Protection

File-System Implementation: File-System Structure, File-System Operations, Directory Implementation, Allocation Methods, Free-Space Management

File-System Internals: File Systems, File System Mounting, Partitions and Mounting, file Sharing, Virtual File Systems.

Reference Books

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts (Tenth Edition, 2018), John Wiley & Son's, Inc. ISBN 978-1-118-06333-0

2. D. M. Dhamdhere, Operating Systems-A Concept Based Approach (3rd Edition, 2013), Tata McGraw-Hill
3. Andrew S. Tanenbaum and Herbert Bos, Modern Operating Systems,(4th edition, 2014), Pearson.

Course Outcomes

After completion of the course student will be able to

1. List and explain goals, service, of operating systems
2. Explain functioning of process management, process coordination, memory management and file system management.
3. Analyze the performances of different process scheduling, memory management, file system implementation.
4. Apply scheduling and memory allocation policies for solving scheduling and memory management problems.
5. Develop simple concurrent applications using processes and threads

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1			1								1	1		
CO2	1	2	1	1								1	1		1
CO3	1	2	1	1								1	1		1
CO4	1	2	3	1								1	1		1
CO5	1	2	3	1								1	1		3

22UCS403C	System Software	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Machine Architecture: Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples, Traditional (CISC) Machines - VAX Architecture, RISC Machines - Ultra SP ARC Architecture.

Assemblers: Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation.

UNIT–II	10 Hrs.

Assemblers: Machine Independent Assembler Features: Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking.

Loaders And Linkers: Basic Loader Functions - Design of an Absolute loader, A Simple Bootstrap Loader, Machine-Dependent Loader Features - Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader, Machine-Independent Loader Features - Automatic Library Search, Loader Options, Loader Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders.

UNIT–III	10 Hrs.

Macro Processor: Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion.

Compilers: Basic Compiler Function - Grammars, Lexical Analysis, Syntactic Analysis, Code Generation, Machine Dependent Compiler Features Intermediate Form of the Program. Machine-Dependent Code Optimization.

UNIT–IV	10 Hrs.

Lex And Yacc: The Simplest Lex Program, Recognizing Words with LEX, Grammars, Parser-Lexer Communication, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand-Written Lexers, Using LEX - Regular Expression, Examples of Regular Expressions, A Word Counting Program,

Using YACC - Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, Symbol Values and Actions, The LEXER,

Compiling and Running a Simple Parser, Arithmetic Expressions and Ambiguity, Variables and Typed Tokens.

Reference Books

1. System Software – An Introduction to Systems Programming, Leyland. L. Beck, Pearson Education, 3rd Edition, 2012
2. Lex and Yacc, John. R. Levine, Tony Mason and Doug Brown, O'Reilly, SPD. 1999
3. System Programming and Operating Systems, D. M. Dhamdhere, McGraw Hill Education, 3rd Edition.

Course Outcomes

After completion of the course student will be able to

1. List and define features/concepts of machine architectures and system softwares.
2. Explain characteristics/concepts/basic operations of machines architectures, system softwares.
3. Write programs to implement simple assembler, loader, linker, macroprocessor, lexical analyzer and syntactic analyzer.
4. Compare and contrast types of software, machine architectures, system software and Lexical and syntactic analyzer.
5. Modify assembler and loader algorithms to incorporate machine independent features and feasible alternative designs.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		2	2	2									1		1
CO2		2	2	2									2		1
CO3		3	3	2									3		1
CO4		2	2	2									3		1
CO5		2	2	2									3		1

22UCS404C	Finite Automata and Formal Languages	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Introduction to the Theory of Computation: Three Basic Concepts Languages Grammars Automata, Some Applications.

Deterministic Finite Accepters: Deterministic Accepters and Transition Graphs, Languages and Dfa's, Regular Languages.

Nondeterministic Finite Accepters: Definition of a Nondeterministic Accepter

Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata.

UNIT–II	10 Hrs.

Regular Languages and Regular Grammars: Regular expressions; Formal Definition of a Regular Expression, Languages Associated with Regular Expressions.

Connection between Regular Expression and Regular Languages: Regular Expressions Denote Regular Languages, Regular Expressions for Regular Languages.

Regular Grammars: Right- and Left-Linear Grammars, Right-Linear Grammars for Regular Languages **Properties of Regular Languages:** Closure under Simple Set Operations, Closure under Other Operations; Identifying Nonregular Languages: A Pumping Lemma (4 Hours)

UNIT–III	10 Hrs.

Context-Free Languages: Context-Free Grammars; Examples of Context-Free Languages, Leftmost and Rightmost Derivations, Derivation Trees.

Parsing and Ambiguity: Ambiguity in Grammars and Languages.

Simplification of Context-Free Grammars and Normal Forms: A Useful Substitution Rule, Removing Useless Productions, Removing λ-Productions, Removing Unit-Productions.

Two Important Normal Forms: Chomsky Normal Form, Greibach Normal Form (3 Hours)

UNIT–IV	10 Hrs.

Pushdown Automata: Nondeterministic Pushdown Automata: Definition of a Pushdown Automaton, The Language Accepted by a Pushdown Automaton.

Pushdown Automata and Context-Free Languages: Pushdown Automata for Context-Free Languages, Context-Free Grammars for Pushdown Automata.

Turing Machines: Definition of a Turing Machine, Turing Machines as Language Accepters, Turing Machines as Transducers.

Turing Machine with More Complex Storage: Multitape and Multidimensional Turing Machines.

Reference Books

1. Peter Linz (2015), Introduction to Formal Languages and Automata (6th Edition), Jones and Bartlett Student Edition.
2. Hopcroft, Motwani, and Ullman (2014), Introduction to Automata Theory, Languages and Computation (3rd Edition), Pearson Education India.
3. Michael Sipser (2012), Introduction to the Theory of Computation (3rd Edition), Cengage Learning.
4. E Rich (2012), Automata, Computability and Complexity: Theory and Applications (1st Edition), Pearson Education India.
5. Martin and John C (2013), Introduction to languages and the theory of computation (4th Edition), McGraw-Hill.
6. K L P Mishra and N. Chandrasekaran (2012), Theory of Computer Science (3rd Edition), PHI Learning Pvt. Ltd.

Course Outcomes

After completion of the course student will be able to

1. Demonstrate a fundamental knowledge of the core concepts in automata theory and formal languages.
2. Prove the properties of languages, grammars and automata with formal mathematical methods;
3. Analyse the closure properties of regular and context-free languages.
4. Design finite automata, pushdown automata, Turing machines for solving language pattern recognition problems
5. Apply mathematical and formal techniques for solving problems in Computer Science.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3	3	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	2	3	-	-	-	-	-	-	-	-	1	-	-
CO3	1	3	3	2	1	-	-	-	-	-	-	-	1	-	-
CO4	3	2	3	2	2	-	-	-	-	-	-	-	1	-	3
CO5	1	2	1	3	3	-	-	-	-	-	-	-	2	-	3

22UCS405C	Database Management Systems	Credits: 3
L:T:P 2: 2: 0		CIEMarks:50
Total Hours/Week: 4		SEEMarks:50

Unit -I	10 Hrs.

Databases and database users: Introduction, an example, Characteristics of Database approach, Actors on the scene, Workers behind the scene, Advantages of using the DBMS approach.

Database System Concepts and Architecture: Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, The database system environment.

Data modelling using the Entity relationship model (ER Model): Using High-Level Conceptual Data Models for Database Design, An sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for COMPANY database, ER Diagrams, Naming Conventions.

Unit II	10 Hrs.

Relational data Model and Relational Database constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and dealing with constraint violations.

Relational Database Design Using ER to Relational Mapping:

Relational algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations. Examples of Queries in Relational Algebra.

Unit III	10 Hrs.

Basic SQL: SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Basic retrievalQueries in SQL. INSERT, DELETE and UPDATE statements in SQL.

More SQL: Complex queries, Triggers, Views and schema modification: More Complex SQL Queries, Views (Virtual Table in SQL).Schema Change Statement in SQL.

Basics of Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

Unit IV	10 Hrs.

Relational Database Design Algorithms and Further Dependencies: Further topics in functional dependencies: Inference rules, equivalence and minimal cover. Properties of relational decompositions.

Introduction to Transaction Processing Concepts and Theory: Introduction to transaction processing, Transaction and System concepts, Desirable Properties of transaction, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability.

Concurrency Control Techniques: Two-Phase Locking Technique for concurrency Control(2PL).

Reference Books

4. Elmasri and Navathe, (2018) Fundamentals of Database Systems(7th Edition), Addison Wesley
5. Silberschatz, Korth and Sudharshan, (2006),Database System(5th Edition), Mc-GrawHill
6. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, TATA McrawHill

Course Outcomes

After completion of the course student will be able to

1. Explain the concepts of database management system and OLTP.
2. Model Entity-Relationship diagrams for enterprise level databases.
3. Formulate Queries using SQL and Relational Formal Query Languages.
4. Apply normalization concepts to refine designed database.
5. Design and develop database application for real life problem.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3											2			
CO2		3	3		2							2	3		2
CO3	2	3	3	2	3							2	3		3
CO4	2	3	3						3		3	2	3		3
CO5	2	2	3	3	3						2	2	3		3

22UCS406L	Database Management System Lab	Credits: 01
L:T:P - 0: 0: 2		CIE Marks: 50
Total Hours/Week: 02		SEE Marks: 50

Assignment List

Design the Database for any one of the following applications and implement the SQL Queries on designed database.

a) Banking System,
b) Employee Organization
c) Inventory Processing System
d) Library Management

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) using CREATE, ALTER, DROP, INSERT statements.
2. Implement the queries for Updation, Selection, Deletion operations. Use ROLL BACK, COMMIT & SAVE POINTS Concepts with UPDATE, SELECT, DELETE statements.
3. Implement the queries (along with sub-Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT clauses.
4. Implement the queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY and HAVING clauses.
5. Implement the query to create a view and access the content of view and drop the view.
6. Develop PL/SQL program using PROCEDURE.
7. Develop PL/SQL program using FUNCTIONS.
8. Develop PL/SQL program using CURSOR.
9. Develop PL/SQL Programs using TRIGGERS.
10. Develop PL/SQL programs using PACKAGES.

Course outcomes:

At the end of the course the student will be able to:

1. Create and maintain database using SQL.
2. Query the given database to solve given problem.
3. Design database for given application.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	3				3	1	2	3	3	2	2
CO2	2	3	3	3	3				2	1	2	3	3	2	2
CO3	2	3	3	3	3				3	3	3	3	3	3	3

22UCS407L	Operating System Laboratory	Credits: 01
L:T:P – 0:0:2		CIE Marks: 50
Total Hours/Week: 2		SEE Marks: 50

Assignment list

1. Implementation of scheduling policies
2. Implementation of memory allocation techniques.
3. Developing solutions for deadlock problems.
4. Implementation of page replacement policies.
5. Developing concurrent applications using processes.
6. Demonstration of synchronization using semaphores.
7. Implementation of UNIX like shell commands.
8. Developing concurrent applications using Threads.

Reference Books *

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles, 10th edition, 2006, Wiley-India,
2. D. M. Dhamdhere, Operating Systems - A Concept Based Approach, Third edition,2006. Tata McGraw-Hill,
3. Harvey M. Deital, Operating systems, 3rd Edition, Addison Wesley
4. William Stallings, Operating systems, 6th Edition, Addison Wesley

Course Outcomes

After completion of the course student will be able to

1. Simulate and demonstrate different functionalities of operating system
2. Implement UNIX like Shell commands.
3. Develop simple applications using concurrent programming

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2										3		3
CO2	2	2	2										3		3
CO3	2	3	3		1								3	1	3

22UCS408L	PYTHON APPLICATION PROGRAMMING	Credits: 3
L:T:P 2: 0: 2		CIEMarks:50
Total Hours/Week: 40 **(28T+12L)**		SEEMarks:50

Unit -I	XX Hrs.

Sequence data types and associated operations: String, List, Tuple, Dictionaries.

Regular Expressions in python.

Exceptions: exceptions, exception handling, types of exceptions, user defined exceptions.

Unit II	XX Hrs.

Object Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, The Polymorphism.

Networking in python.

Unit III	XX Hrs.

Threads.

Graphical user Interfaces.

Unit IV	XX Hrs.

How to work with Database: How to use SQLite Manager to work with a database, How to use python to work with database.

Web Scrapping: Beautiful Soup.

Introduction to DJango: Features of DJango, DJango web server, Understanding DJango environment, A simple 'Hello world' application.

Reference Books

1. Dr. R. Nageswawa Rao, (2018), "Core Python Programming", (2nd Edition), Dreamtech press.
2. Gowrishankar S. Veena A.(2019)." Introduction to Python Programming",(1st Edition), CRC Press Taylor & Francis Group.
3. Michael Urban and Joel Murach ,(2016),"Python Programming", (1st Edition) ,Mike Murach Elizabeth Drake.

Course Outcomes

At the end of the course the student will be able to:

1. Demonstrate the use of strings, lists, dictionaries and tuples in simple applications.

2. Write simple applications using regular expressions, multiple threads.
3. Build simple database applications with GUI.
4. Build simple python applications using DJango and Web Scrapping.
5. Analyze the given problem and select appropriate data types and modules to develop the solution.

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3	3		1								3	1	1
CO2	3	3	3		1								3	1	1
CO3	3	3	3		1								3	1	3
CO4		2	1		2										
CO5	2	3	1		1								3	1	1

22UHS424C	UNIVERSAL HUMAN VALUES-II	Credit: 01
L:T:P - 1 : 0: 0		CIE Marks: 50
Total Hours/Week:01		SEE Marks: 50

UNIT-I **(4 Hrs)**

Introduction to Value Education: Right Understanding; Relationship and Physical Facility; Understanding Value Education; Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity - the Basic Human Aspiration-Current Scenario and Method to Fulfill the Basic Human Aspirations.

UNIT–II **(4 Hrs)**

Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

UNIT–III **(4 Hrs)**

Harmony in the Family and Society and Nature: Harmony in the Family – the Basic Unit of Human Interaction; 'Trust' – the Foundational Value in Relationship; 'Respect' – as the Right Evaluation: Other Feelings, Justice in Human-to-Human Relationship; Understanding Harmony in the Society; Vision for the Universal Human Order; Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature.

UNIT–IV **(3 Hrs)**

Implications of the Holistic Understanding – a Look at Professional Ethics

Definitiveness of (Ethical) Human Conduct; A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order; Competence in Professional Ethics; Holistic Technologies, Production Systems and Management Models; Strategies for Transition towards Value-based Life and Profession.

Reference Books

1. R R Gaur, R Sangal, G P Bagaria, „Human Values and Professional Ethics", , Excel Books, New Delhi, 2010.
2. A. Nagaraj, Jeevan Vidya Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.
4. Annie Leonard, The Story of Stuff (Book), Simon & Schuster, 2011.
   Mohandas Karamchand Gandhi, The Story of My Experiments with Truth, Public Affairs Press of Washington, DC. 1948.
6. E. F Schumacher, Small is Beautiful,. Blond & Briggs, 1973.
7. Cecile Andrews, Slow is Beautiful, New Society Publishers, 2006.
8. J C Kumarappa, Economy of Permanence, Akhil Bharat Sarva-Seva-Sangh, Rajghat, Kashi, 1958.
9. Pandit Sunderlal, Bharat Mein AngrejiRaj, Publications Division, M/O Information & Broadcasting, Govt. of India, 2016
10. Dharampal, Rediscovering India, Society for Integrated Development of Himalayas, 2003

11. Gandhi, Mohandas K.Hind Swaraj or Indian Home Rule Ahmedabad, Nava jivan Pub. House, 1946.
12. India Wins Freedom, Maulana Abdul Kalam Azad, Orient Black Swan, 1988.
13. Romain Rolland, Gandhi, Romain Rolland (English), Srishti, 2000.

Course Outcomes:

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

CO1: Explore holistic vision of life - themselves and their surroundings.

CO2: Develop competence and capabilities for maintaining Health and Hygiene.

CO3: Analyse various problems in life, family, Society and in handling problems with Sustainable Solutions.

CO4: Apply values to their own self in different day-to-day settings in real life and in handling problems with sustainable solutions.

CO5: Adopt the value of appreciation and aspiration for excellence and gratitude for all.

Course Articulation Matrix

Course Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1							3	2	3			1			
CO2	-	-	-	-	-	3	3	1	1			1			
CO3	-	-		-	-	3	3	2	1	-		1		-	
CO4			-			2	2	3	2	-	-	1	-	-	
CO5								3				1			

22UMA400M	Bridge Course Mathematics-II	Credits – 0; Mandatory Course L-T-P:(3 : 0 : 0)
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

Differential Calculus (10 Hrs.)

Review of elementary calculus, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Taylor‟s and Maclaurin‟s series expansions for one variable (without proof) problems

(RBT Levels: L1, L2 and L3)

Vector Differentiation (10 Hrs.)

Introduction, Scalar and vector fields**.** Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrigational vector fields- problems.

(RBT Levels: L1, L2 and L3)

Laplace Transform (10 Hrs.)

Introduction, Definition of Laplace Transform, Laplace Transform of standard functions, Properties: Shifting, differentiation, Integral and division by t. Periodic function, Heaviside‟s Unit step function.

(RBT Levels: L1, L2 and L3)

Inverse Laplace transforms (10 Hrs.)

Properties, Convolution theorem-problems, Solutions of linear differential equations.

(RBT Levels: L1, L2 and L3)

References:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin Kreyszing‟s Advanced Engineering Mathematics volume I and volume II, wiley India Pvt.Ltd., 2014.
3. Elementary Differential Equations by Earl D. Rainville and Phillip E, Bedient, Sixth Edition
4. Erwin Kreyszing‟s Advanced Engineering Mathematics, wiley India Pvt.Ltd., 2014.

Course Objectives:

This course will enable students to

1. Provide (Polar Curves) an alternative way of representing functions compared to the Cartesian coordinate system.
2. Analyze vector valued functions and understand the behavior of various physical quantities in both theoretical and practical contexts.

3. Simplify the process linear ordinary differential equations. It transforms the differential equations, which may be difficult to solve directly, into algebraic equations, making the problem more tractable.

Course Outcomes:

At the end of the course the student should be able to,

1. Use (polar curves) to model and analyse various physical phenomena, such as orbits of celestial bodies, antenna radiation patterns and fluid flow in circular systems.
2. Find the velocity and acceleration vectors of objects in motion.
3. Find applications in various fields of engineering, including control systems, circuit analysis, fluid dynamics, heat transfer and many more.
4. Solve differential equations, understand systems responses and gain insights into the behaviour of various engineering and physical systems in the time domain.

Evaluation Scheme:

Assessment	Marks	Weightage
CIE-I	40	20
CIE-II	40	20
Assignments/ Quizzes/Case Study/ Course Project/Term Paper/Field Work	20	10
SEE	100	50
Total	200	100

Question paper pattern for CIE-I and CIE-II:

1. Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering two units (no multiple choice questions and No true or false questions).

2. In Part-B, any TWO full questions are to be answered.

CIE	Number of questions / Maximum marks	Sub divisions	Contents
I	Four questions of 15 marks (Solve any two)	Sub divisions shall not be mixed with Differential equations-1 and Differential equations-2	Differential Equations-1
		Sub divisions shall not be mixed with Differential equations-1 and Differential equations-2	Differential Equations-2
II	Four questions of 15 marks (Solve any two)	Sub divisions shall not be mixed with Laplace Transform and Inverse Laplace transform	Laplace Transform
		Sub divisions shall not be mixed with Laplace Transform and Inverse Laplace transform	Inverse Laplace Transform

Question paper pattern for SEE:

1. Question paper consists Part-A and Part-B. Question number 1 is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
2. In Part-B total of eight questions with two from each unit; with internal choice to be set uniformly covering the entire syllabus.
3. Each question carries 20 marks and should not have more than four subdivisions. In Part-B, any FOUR full questions

2022-23 Admitted batch (160 credits)

V Semester B.E. (CSE)

Sl. No.	Category	Subject Code	Subject Title	Credits	HOURS/ WEEK			EXAMINATION MARKS		
					L	T	P	CIE	SEE	Total
1.	IPCC	22UCS501C	Analysis and Design of Algorithms	3	2	0	2	50	50	100
2.	PCC	22UCS502C	Software Engineering	3	3	0	0	50	50	100
3.	PCC	22UCS503C	Web Technologies	3	2	0	2	50	50	100
4	PROJ	22UCS505P	Miniproject	2	0	0	4	50	50	100
5.	PEC	22UCSXXXE	Professional Elective Course - I	3	3	0	0	50	50	100
		22UCS071E	UI/UX Design							
		22UCS080E	Linux System Administration							
6,	AEC	22UHS521C	Soft Skills	2	2	0	0	50	50	100
7.	OEC	22UCSXXXN 22UCS534N	Open Elective – I Data Science	3	3	0	0	50	50	100
Total				19	15	0	8	350	350	700

SUBJECT CODE : 22UCS501C	Analysis and Design of Algorithms	Credits:03
L:T:P - 2 : 0: 2		CIE Marks: 50
Total Hours/Week: 4		SEE Marks: 50

UNIT-I	06Hrs.

Introduction: Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental Data Structures. **Fundamentals of the Analysis of Algorithm Efficiency:** Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms. **Brute Force:** Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Exhaustive Search.

UNIT–II	06 Hrs.

Divide and Conquer: Mergesort, Quicksort, Binary Search, Multiplication of large integers and Stressen's Matrix Multiplication.

Decrease and Conquer: Depth First Search, Breadth First Search, Topological Sorting.

UNIT–III	06 Hrs.

Transform and Conquer: Presorting, Balanced Search Trees, Heaps and Heapsort, Problem Reduction **Space and Time Tradeoffs:** Sorting by Counting, Input Enhancement in String Matching **Dynamic Programming:** Warshall's and Floyd's Algorithms. The Knapsack Problem and Memory Functions.

UNIT–IV	06 Hrs.

Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.

Backtracking: N-Queens Problem, Sum of Subsets, **Branch-and-Bound**.

Reference Books *

7. Levitin A., 2017, Introduction to The Design & Analysis of Algorithms, 3rd Edition, Pearson Education.
8. Cormen T. H., Leiserson C. E., Ronal L., Rivest C. S., Introduction to Algorithms, 2nd Edition, PHI.
1.

Course Outcomes

After completion of the course student will be able to

1. Analyze and compare the running time of algorithms using asymptotic notations.
2. Demonstrate the working of major algorithms divide-and-conquer and decrease-and-conquer strategies.
3. Design and implement the dynamic programming and greedy strategy paradigm.
4. Demonstrate the working of backtracking and branch-and-bound approaches.
5. Interpret the efficient algorithms in common engineering design situations.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3	3	-	1	-	-	-	-	-	-	2	-	3	3
CO2	2	3	3	2	3	-	-	-	-	-	-	-	-	2	
CO3	2	2	3	2	3	-	-	-	-	-	-	3	-	3	2
CO4	2	2	3	3	2	-	-	-	-	-	-	-	-	2	-
CO5	2	2	3	2	-	-	-	-	-	-	-	-	3	1	2

22UCS502C	SOFTWARE ENGINEERING	Credits: 03
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.

Introduction: Introduction to Software engineering, Professional and ethical responsibility.

Software processes: Models, Process iteration, Process activities; Coping with change, Process improvement

Agile software development: Agile methods, Agile development techniques, Agile project management, Scaling agile methods

UNIT–II	10 Hrs.

Requirements engineering: Functional and non-functional requirements, Requirements engineering processes, Requirement's elicitation, Requirements specification, Requirements validation, Requirements change

System modeling: Context models, Interaction models, Structural models Behavioral models model-driven architecture

Design and implementation: Object-oriented design using the UmL, Design patterns, Implementation issues, Open-source development

UNIT–III	10 Hrs.

Dependable Systems: Dependability properties, Socio-technical systems, Redundancy and diversity, Dependable process, Formal methods and dependability

Reliability and Safety engineering: Availability and reliability, Reliability requirements, Safety-critical systems, safety requirements, safety engineering process, safety cases

Security Engineering: Security and dependability, Security and organizations, Security requirements, Secure systems design, Security testing and assurance

UNIT–IV	10 Hrs.

Software testing: Development testing, Test-driven development, Release testing, User testing

Project management: Risk management, managing people, Teamwork

Project planning: Software pricing, Plan-driven development, Project scheduling, Agile planning, Estimation techniques, COCOmO cost modeling.

Reference Books *

1. Sommerville, I. (2016) Software Engineering. 10th Edition, Pearson Education Limited, Boston.
2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005.
3. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.

Course Outcomes

After completion of the course student will be able to

1. Analyze a complex software problem and to apply principles of computer science to identify solutions.

2. Design, implement, and evaluate a software solution to meet a given set of functional, non-functional, and domain requirements.

3. Understand professional, ethical, and social responsibilities of a software engineering professional.

4. Use the techniques, skills, and modern engineering tools necessary for engineering practice

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	1				2				**1**			**1**	**1**	
CO2	2	1	2							**1**			**1**	**2**	
CO3	1	1											**1**	**1**	
CO4	1	1										**2**	**1**	**1**	

22UCS503C	Web Technologies	Credits: 03
L:T:P - 2 : 0: 2		CIE Marks: 50
Total Hours/Week: 40		SEE Marks: 50

UNIT-I	6 Hrs.

Fundamentals: A Brief Introduction to the Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators.

Introduction to HTML/XHTML : Origins and Evolution of HTML and XHTML, Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists; Tables, Forms :The Audio Element, The Video Element, Organization Elements, The Time Element, Syntactic Differences between HTML and XHTML.

UNIT–II	6 Hrs.

Cascading Style Sheets: Introduction, Levels of Style Sheets, Style Specification Formats, Selector Forms, Property-Value Forms, Font Properties, List Properties, Alignment of Text, Color: The Box Model, Background Images, The span and div Tags, Conflict Resolution.

The Basics of JavaScript: Overview of JavaScript, Object Orientation and JavaScript, General Syntactic Characteristics, Primitives, Operations, and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification Arrays, Functions, And Example, Constructors, Pattern Matching Using Regular Expressions.

UNIT–III	7 Hrs.

JavaScript and HTML Documents: The JavaScript Execution Environment**,** The Document Object Model**,** Element Access in JavaScript**,** Events and Event Handling. Handling Events from Body Elements**,** Handling Events from Button Elements Handling Events from Textbox and Password,

Dynamic Documents with JavaScript: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements.

UNIT–IV	6 Hrs.

Introduction to PHP: Origins and Uses of PHP, Overview of PHP, General Syntactic Characteristics, Primitives, Operations, and Expressions, Output, Control Statements, Arrays, Functions, Pattern Matching, Form Handling ,Cookies, Session Tracking.

Database Access through the Web: Database Access with PHP and MySQL.

List of Experiments

1. Design and develop static web page using HTML to demonstrate tables, different forms of hypertext links and frames.
2. Design and develop web page to demonstrate CSS (Use different font styles, set background image for both the page and single elements on page, Control the repetition of image with background-repeat property, define style for links as a:link, a:active, a:hover,a:visited)
3. Develop web page to demonstrate Form validation using JavaScript.
4. Develop dynamic web page to demonstrate Positioning Elements, Moving Elements,
5. Implement web page to demonstrate Element Visibility, Changing Colors and Fonts,
6. Develop dynamic web page to demonstrate Dynamic Content,

7. Develop dynamic web page to demonstrate Stacking Elements, Locating the Mouse Cursor, reacting to a Mouse Click
8. PHP program to demonstrate Cookie creation, display and deletion.

Reference Books

1. Robert W. Sebesta, Programming the World Wide Web, 8th Edition, 2014 Pearson Education
2. Chris Bates , Web Programming Building Internet Applications, 3rd Edition,2006, Wiley India
3. Robin Nixon, Learning PHP, MySQL & JavaScript, 5thEdition, 2015, O'Reilly Publications

Course Outcomes

After completion of the course student will be able to

1. Implement web concepts using different tools like HTML/XHTML/CSS/JavaScript /XML/XSLT/jQuery/AngularJS.
2. Design web applications using client-side Java Scripts.
3. Implement web applications using server –side PHP.
4. Develop web application for real world problem.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	3	2	-	2	2	-	-	-	-	-	-	1		2
CO2	2	-	1	-	3	1	-	-	-	-	-	-		1	
CO3	1	2	-	-	2	-	-	-	1	-	-	-	2		1
CO4	2	1	1	-	2	1	-	-	1	-	-	1		1	2

22UCS505P	MINI PROJECT	Credits: 02
L:T:P - 0 : 0: 4		CIEMarks:50
Total Hours/Week: 04		SEEMarks:50

Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students. The mentor shall monitor progress of the student/s continuously. The student/s is/are required to present the progress of the Mini Project work during the semester as per the schedule provided by the Department Project Coordinator.

CIE for Mini-Project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates. (ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all the guides of the college. The CIE marks awarded for the Mini-project, shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

SEE for Mini-Project:

(i) Single discipline: Contribution to the Mini-project and the performance of each group member shall be assessed individually in the semester end examination (SEE) conducted at the department. (ii) Interdisciplinary: Contribution to the Mini-project and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted separately at the departments to which the student/s belongs to.

Course Outcomes

After completion of the course student will be able to

1. Develop the ability to solve real life problems related to software development.
2. Identify the issues and challenges in the domain.
3. Explain the deeper understanding in specific functional areas of the real problems.
4. Explore career opportunities in their areas of interest.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	2	2	2			3	3	2	3	2	2	3
CO2	-	3	2	2	-	-	-	-	3	3	1	3	-	2	3
CO3	3	3	3	2	3	-	-	-	2	2	3	2	3	3	3
CO4	-	3	3	2	2	-	-	-	1	2	2	3	2	1	1

Scheme of Evaluation for Mini Project

Sl.No.	Course Component	CIE Evaluation (Max. 50 Marks)	SEE Evaluation (Max. 50 Marks)
1	Mini Project	Respective Guide (Project Report, Project Presentation Skill, Interaction in the ratio of 50:25:25)	(Project Evaluation: 30 Marks and Presentation: 20 Marks) Conducted by Departmental Committee consisting of 1. HOD/Nominee 2. Project Coordinator/Guide 3. Examiner
Total Marks			**100**

Rubrics for CIE Evaluation

The following percentage of weightage is assigned to the student based on the performance in the CIE Evaluation

Sl.No.	Performance	Percentage of Weightage
1	Excellent	91 to 100
2	Very Good	81 to 90
3	Good	71 to 80
4	Moderate	61 to 70
5	Poor	40 to 60

22UCS071EC	UI/UX Design	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 40		SEE Marks: 50

UNIT-I	6 Hrs.
User Interface Design (UI) -The Relationship Between UI and UX , Roles in UI/UX, A Brief Historical Overview of Interface Design, Interface Conventions, Approaches to Screen Based UI, Template vs Content, Formal Elements of Interface Design, Active Elements of Interface Design, Composing the Elements of Interface Design, UI Design Process.	

UNIT–II	6 Hrs.
Visual Communication design component in Interface Design The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions- Business definition and requirement analysis, Basic business functions, Design standards.	

UNIT–III	7 Hrs.
UX Basics- Foundation of UX design, Good and poor design, Understanding Your Users, Designing the Experience-Elements of user Experience, Visual Design Principles, Functional Layout, Interaction design, Introduction to the Interface, Navigation Design, User Testing, Developing and Releasing Your Design	

UNIT–IV	6 Hrs.
User Study- Interviews, writing personas: user and device personas, User Context, Building Low Fidelity Wireframe and High-Fidelity Polished Wireframe Using wireframing Tools, Creating the working Prototype using Prototyping tools, Sharing and Exporting Design	

Reference Books

TEXT BOOKs:

1. A Project Guide to UX Design: For user experience designers in the field or in the making (2nd. ed.). Russ Unger and Carolyn Chandler. New Riders Publishing, USA, 2012.
2. The Elements of User Experience: User-Centered Design for the Web and Beyond, Second Edition Jesse James Garrett, Pearson Education. 2011.

REFERENCE BOOKs:

3. The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Third Edition Wilbert O. Galitz , Wiley Publishing, 2007.
4. The UX Book Process and Guidelines for Ensuring a Quality User Experience, Rex Hartson and Pardha S. Pyla, Elsevier, 2012

Course Outcomes

After completion of the course student will be able to

1. **Explain iterative user-centered design of graphical user interfaces and user experience.**
2. **Apply the user Interfaces to different devices and requirements.**
3. **Describe the components of user experience, especially emotional impact.**
4. **Design better user experience through user interfaces**
5. **Create high quality professional documents and artifacts related to the design process.**

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	3	2	-	2	2	-	-	-	-	-	-	1		2
CO2	2	-	1	-	3	1	-	-	-	-	-	-		1	
CO3	1	2	-	-	2	-	-	-	1	-	-	-	2		1
CO4	2	1	1	-	2	1	-	-	1	-	-	1		1	2

SUBJECT CODE 22UCS080E	Linux System Administration	Credits: 03
L: T:P - 3: 0: 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Introduction to LINUX and Installation: A Brief History Understanding operating systems, the free software foundation and the GNU project, Linux Arrives, the strength of Linux; Linux in the market, the work of system administrator; starting the use Linux; Exploring the file system; finding the command Help

Linux installation: Reviewing your computer's hardware; Configuration Disk Space; Installing Linux: kickstart installations process, Using the graphical configuration tool.

Managing software packages: Managing packages, managing packages graphically, using rpm to manage software packages, Updating the system automatically.

Commands: Basic and Utility commands in Linux.

UNIT–II	10 Hrs.

Customizing the Environment and Shell: Exploring the bash shell, the shell prompt, functions of a shell, different types of a shells, entering commands, the shell start-up process, Using Aliases**.** Some basic Linux commands; Shell variable; Data redirection; editing text with vi; printing from the command line

Managing Processes: Defining processes; Managing Linux processes; Managing memory; Scheduling the processes; Controlling access to at and crontab.

Managing Users: creating and managing user accounts: managing user account graphically, creating new user at command line, creating new groups, modifying user at the command line, automating home directory, disabling user accounts

Linux users and Groups: Types of users and groups, Linux groups; user and group files; shadow passwords, changing user passwords, User information commands.

UNIT–III	10 Hrs.

File permissions: changing ownership, changing file permissions, default file permissions. **Introduction to File systems**: Partition and file systems, Inode and Links, File types, Accessing Removable Media, Using find,

Managing File Archives: Compressed files, using tar and cpio archiving files.

Understanding the file system: reviewing the file system types, checking file system status, file system attributes, creating new file system, using fdisk utility, formatting file systems, mounting new file systems, using network file systems, automating file system mounting, Using the autofs mounting services, managing the swap space, setting Quotas on disk usage Complex File permissions.

UNIT -IV **10 Hrs**

Essential of shell Programming: SHELL script, read: making interactive, usage of positional parameters, logical operators, conditional executions, The if conditional, using test and evaluate expressions, Numeric comparison, case conditional statements, expr: computation and string handling; Looping: while, for; Arrays and String handling commands, Functions

Programs on basic utilities and administrator tasks.

Textbook:

1. Nicholas wells, The complete Guide to Linux System Administration Cengage Learning, ISBN-10 : 0619216166 ,ISBN-13 : 978-0619216160,2005
2. Your Unix: The ultimate Guide McGraw-Hill, Inc. Professional Book Group 11 West 19th Street New York, NY United States ISBN:978-0-07-252042 (Unit-4)
3. Alexandru Calcatinge, & Balog, J. Mastering Linux Administration. Packt Publishing Ltd.2021.
4. Ganesh Sanjiv Naik ,Learning Shell Scripting, Packt Publishing Ltd.2015.

Course Outcomes**

After completion of the course student will be able to

1. Applying Shell Scripting for Administrative Tasks.

2. Backup and Linux Security Management

3. System Installation and Configuration

4. Understanding Linux Architecture and Components

5. User and Group Management**.**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2											1		
CO2	1	2												1	
CO3	1		2												1
CO4	1		3										1		
CO5	1	2	3										1		1

21UHS521C	QUANTITATIVE APTITUDE AND PROFESSIONAL SKILLS	Credits: 02
L:T:P - 2 : 2 : 0		CIE Marks: 50
Total Hours/Week: 4		SEE Marks: 50

UNIT-I	12 Hrs.
Number Properties, Tense, Blood Relation and Direction Sense, Ratio and Proportion, Parts of Speech, Analyzing Arguments.	
UNIT–II	**13 Hrs.**
Percentage, Synonyms and Antonyms, Syllogism, Average, Mixtures and Aligations, Error Spotting and Sentence Completion, Coding Decoding,	
UNIT–III	**12 Hrs.**
Time and Work, Clocks and Calendars, Time, Speed and Distance, Group Discussion- General & Current Topics, Boats and Streams, Problem on Ages	
UNIT–IV	**13 Hrs.**
Profit and Loss, Simple and Compound Interest, Probability, Permutation & Combination, LCM and HCF, Pipes and Cisterns, Resume Building	

Reference Books

1. R. S. Aggarwal, "A Modern Approach to Verbal and Non – Verbal Reasoning", Sultan Chand and Sons, New Delhi, 2018
2. R. S. Aggarwal, "Quantitative Aptitude", Sultan Chand and Sons, New Delhi, 2018
3. Chopra, "Verbal and Non – Verbal Reasoning", MacMillan India
4. M Tyra, "Magical Book on Quicker Maths", BSC Publications, 2018
5. George J Summers, "The Great Book of Puzzles & Teasers", Jaico Publishing House, 1989
6. Shakuntala Devi, "Puzzles to Puzzle You", Orient Paper Backs, New Delhi, 1976
7. R. S. Aggarwal, "A Modern Approach to Logical Reasoning", Sultan Chand and Sons, New Delhi, 2018
8. Cambridge Advanced Learner's Dictionary, Cambridge University Press. Kaplan's GRE guide
9. Archana Ram, "PlaceMentor", Oxfer Publication

Course Objectives:

1. To develop and augment written English language vocabulary and comprehension skills
2. To augment the ability to understand and analyze a problem and find its solution through analysis of data given.
3. To fine-tune the quantitative analysis and problem-solving skills

Course Outcomes (Students will be able to…)

After active participation in this course, the student will have.

CO1: Enhanced his/her vocabulary and learnt techniques to augment it further.

CO2: Learned techniques to augment his/her verbal ability.

CO3: Understood step-by-analysis of the given problem and learnt to develop a method for solving it.

CO4: Enhanced and augmented his/her ability to work with quantitative problems.

COs	**Programme Outcomes (POs)**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1		1							2	3		1
CO2		1							2	3		
CO3		2	2	3								2
CO4		1		2							2	2

Course Code: 22UCS534N	Introduction To Data Science	Credits:	03
Hours/Week (L: T:P): 3:0:0		CIE Marks:	50
Total Hours of Pedagogy (Theory + Lab): 40		SEE Marks:	50
Course Type: Theory			

Course Objectives:

This course will enable students to:

1. Provide a strong foundation for data science and application areas related to it.
2. Learn the process of working with data on large scale.
3. Explore the concepts of Data Processing.
4. Learn basic concepts of Machine Learning.
5. Prepare students for advanced courses in Data Science.

UNIT-I	10 Hrs.

Introduction to Data Science: Importance of data Science, Need for Data Science, what is Data Science ? Data Science Process, prerequisites for data science, Components of Data Science, Tools and Skills needed.
Statistics: Data Types, Variable Types, Statistics, Sampling Techniques.Information gain and Entrophy.
[Text Book1:1(1.1,1.2,1.3,1.5,1.6,1.7),2(2.1,2.2,2.3,2.4,2.5)]

UNIT-II	10 Hrs.

Probability: Probability Theory, Probability types, Probability Distribution Functions, Bayes Theorem.
Data Modeling and Analytics: Data Science Methodology-Analytics for data science, Example of DataAnalytics, Data Analytics Life Cycle-Data Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalization.
[Text Book1:2(2.6,2.7,2.8,2.9),4(4.1,4.2,4.3)]

https://www.geeksforgeeks.org/data-science-vs-machine-learning

https://www.zucisystems.com/blog/what-is-the-role-of-machine-learning-in-data-science

UNIT-III	10 Hrs.

Machine learning: Designing a Learning System, Perspective and Issues in Machine Learning, Supervised learning, Unsupervised learning, Semi- supervised learning, Reinforcement Learning, Role of Machine Learning in Data Science, Data Science vs Machine Learning.
[Text Book2:1.2(1.2.1,1.2.2,1.2.3,1.2.4,1.2.5)]

UNIT-IV	10 Hrs.

Databases for Data Science: SQL-for Data Science, Basic Statistics with SQL, Data Wrangling, Filtering, Joins, Aggregation, Advanced NoSQL for Data Science, Document Databases for Data science, Wide Column Databases for Data science, Graph Databases for Data Science.
TextBook1:3.1(3.1.1,3.1.2,3.1.3), 3.2(3.2.1,3.2.2,3.2.3,3.2.4).

Suggested Learning resources

Text Books:

1. Fundamentals of Data Science**,** Sanjeev J. Wagh, Manisha S. Bhende, and Anuradha D. Thakare, First edition published 2022 by CRC Press.
2. Machine Learning, Tom Mitchell, McGraw Hill, 1997.

E-Resources

1. https://www.geeksforgeeks.org/data-science-vs-machine-learning

2. https://www.zucisystems.com/blog/what-is-the-role-of-machine-learning-in-data-science

Course Outcomes:

At the end of the course the student will be able to:

CO1: Apply the fundamental concepts of data science
CO2: Evaluate the data analysis techniques for applications handling large data and demonstrate the data science process.
CO3: Analyze the concept of machine learning used in the data science process.
CO4: Demonstrate and present the inference using various tools.
CO5: Analyze to think through the ethics surrounding privacy, data sharing.

Course Outcomes	Programme Outcomes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3		1	1	2							
CO2	1	2	2	1	2							1
CO3	1	2	3	2	2							
CO4					3							1
CO5			2					3				

2022-23 Admitted batch (160 credits)

VI Semester B.E. (CSE)

Sl. No	Category	Subject Code	Subject Title	Credits	HOURS/ WEEK			EXAMINATION MARKS		
					L	T	P	CIE	SEE	Total
1.	HSMC	22UHS600M	Indian Knowledge System	1	2	0	0	50	50	100
2.	PCC	22UCS601C	Computer Networks	3	2	2	0	50	50	100
3.	PCC	22UCS602C	Compiler Design	3	2	2	0	50	50	100
4.	PCC	22UCS603C	Machine Learning	3	3	0	0	50	50	100
5.	PCC	22UCS604C	Computer Graphics	3	3	0	0	50	50	100
6.	PCC	22UCS605L	Machine Learning Lab	1	0	0	2	50	50	100
7	PEC	22UCSXXXE	Professional Elective Course - II	3	3	0	0	50	50	100
		22UCS036E	Adhoc Wireless Network							
		22UCS080E	LINUX SYSTEM ADMINISTRATION							
8	PCC	22UCS606L	Computer Networks Lab	1	0	0	2	50	50	100
9.	OEC	22UCSXXXN	Open Elective – II	3	3	0	0	50	50	100
		22UCS633N	Human Computer Interface							
		22UCS634N	Software Engineering							
Total				21	18	4	4	450	450	900

21UHS600M		**Credit:01**
Hrs/Week: 1:0:0	**Indian Knowledge Systems**	**CIE Marks:**50
Total Hours: 15Hrs	(Common to All Branches)	**SEE Marks:**50

UNIT - I	**3Hrs**

Indian Knowledge Systems (IKS)

Overview, Vedic Corpus, Philosophy, Character, scope and importance, traditional knowledge vis-à-vis Indigenous knowledge, traditional knowledge vs. western knowledge.

UNIT – II	**4Hrs**

Traditional Knowledge in Mathematics and Humanities

Introduction to Indian Mathematics, Unique aspects of Indian Mathematics, Indian Mathematicians and their

Contribution. Number Systems and Units of Measurement.

Linguistics, Art, Craft and Trade in India.

UNIT - III	**4Hrs**

Traditional Knowledge in Physics and Chemistry

Measurements for time, distance and weight, Astronomy, Indian contributions in astronomy, Astrology, the celestial coordinate system, Elements of the Indian calendar, Notion of years and month, Pañcāṅga – The Indian calendar system.

Metals and Metalworking: The rise and fall of a great Indian technology, Mining and ore extraction, Zinc extraction, Copper and it's alloys, Iron and steel in ancient India

UNIT - IV	**4Hrs**

Traditional Knowledge in Professional domain

Town Planning and Architecture, Agriculture, Governance and Public Administration, United Nations sustainable development goals

Reference books:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi (2022**).** Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi.
2. Sampad and Vijay "The Wonder that is Sanskrit", Sri Aurobindo Society, Puducherry. (2011).
3. Acarya, P.K. Indian Architecture, Munshiram Manoharlal Publishers, New Delhi. (1996).

4. Kapoor Kapil, Singh Avadhesh "Indian Knowledge Systems Vol – I & II", Indian Institute of Advanced Study, Shimla, H.P. (2021).

5. Dasgupta,S. A History of Indian Philosophy- Volume 1, Motilal Banarsidass, New Delhi. (1975).

6. PLofker, K. (1963). Mathematics in India, Princeton University Press, New Jeresy, USA"

Suggested Web Links:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/
3. http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63

(Centre of Excellence for Indian Knowledge System, IIT Kharagpur)

4. https://www.wipo.int/pressroom/en/briefs/tk_ip.html
5. https://unctad.org/system/files/official-document/ditcted10_en.pdf
6. http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf

developmentgoals/?gclid=EAIaIQobChMInpJtb_p8gIVTeN3Ch2

7. https://unfoundation.org/what-we-do/issues/sustainable-developmentgoals/?gclid=EAIaIQobChMInp-Jtb_p8gIVTeN3Ch27LAmPEAAYASAAEgIm1vD_BwELAmPEAAYASAAEgIm1vD_BwE

Course Outcomes:

At the end of the course student will be able to:

CO1: Provide an overview of the concept of the Indian Knowledge System and its importance

CO2: Appreciate the need and importance of protecting traditional knowledge.

CO3: Recognize the relevance of Traditional knowledge in different domains.

CO4: Establish the significance of Indian Knowledge systems in the contemporary world.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2							3				1	1		
CO2						2							1		
CO3			2	2									1		
CO4						3	2						1		

22UCS601C	Computer Networks	Credits: 03
L:T:P - 2 : 2 : 0		CIE Marks: 50
Total Hours/Week: 04		SEE Marks: 50

UNIT-I	10 Hrs.

Introduction: Data Communications: Components, Data representations, Data flow, Networks: Distributed Processing, Physical structures: Type of Connection, Physical Topology, and Network Types: Local Area Network, Wide Area Network, Switching: Circuit Switched Networks, Packet Switched Networks.

Network Models: Protocol Layering: Scenarios, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP Protocol Suite, Description of each Layer, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing. THE OSI MODEL: OSI versus TCP/IP, Physical Layer: Transmission Impairment.

UNIT–II	10 Hrs.

Data Link Layer: Error Detection and Correction: Introduction, Types of Errors, Block Coding: Error Detection, Hamming Distance, Parity Check Codes Cyclic Codes: Cyclic Redundancy Check, Polynomials, Cyclic Code Encoder Using Polynomials. Checksum: Concept, Examples.

Data Link Control: DLC Services: Framing, Character Oriented and Bit Oriented Framing, Flow and Error Control, Connectionless and Connection Oriented. Data Link Layer Protocols: Simple Protocol, Stop and Wait Protocol. Piggy Backing. HDLC: Framing.

UNIT–III	10 Hrs.

Network Layer: Network layer services. Congestion Control: Open Loop Congestion Control and Closed loop Congestion Control. IPv4 Address: Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Translation (NAT), Internet Protocol: Datagram Format, Fragmentation. ICMPv4: Messages, Debugging Tools. IPv6 Addressing, Transition from IPv4 to IPv6.

Routing Algorithms: Distance–Vector Routing, Link State Routing, Path Vector Routing.

UNIT–IV	10 Hrs.

Transport Layer: Transport layer services, Transport layer Protocols: UDP, TCP services, TCP features, TCP Segment, A TCP Connection, SCTP Services, SCTP Features, Packet Format, An SCTP Association.

Application Layer: Electronic Mail: Architecture, SMTP, POP3, IMAP4, MIME. File Transfer Protocol. TELNET. Domain Name System: Name Space, DNS in the Internet: Generic Domains, Country Domains. Resolution: Recursive Resolution, Iterative Resolution.

Reference Books

1. Behrouz A. Forouzan, 5th Edition, 2013, "Data Communications and Networking", McGraw-Hill.
2. Alberto LeonGarcia and Indra Widjaja, 2nd Edition, "Communication Networks – Fundamental Concepts and Key Architectures", Tata McGrawHill.
3. Nader F. Mir, 8th Edition, 2007, "Computer and Communication Networks", Pearson Education.
4. Larry L. Peterson and Bruce S. David, 4th Edition, 2007, "Computer Networks – A Systems Approach, Elsevier.

Course Outcomes

After completion of the course student will be able to

1. Explain the fundamental concepts of Computer Networks.
2. Analyze different network protocols.
3. Apply techniques for efficient handling of Computer Networks.
4. Formulate Routing and Congestion Control Algorithms.
5. Implement Application Layer protocols.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	1	3	1	2	1	-	-	-	-	-	-	-	3	-	-
CO3	2	2	3	1	-	-	1	2	-	-	-	-	1	2	3
CO4	1	3	1	3	1	-	-	-	-	-	-	-	3	-	-
CO5	1	2	3	2	-	3	1	1	-	-	-	-	1	2	2

22UCS602C	Compiler Design	Credits: 03
L:T:P –2:2:0		CIEMarks:50
Total Hours/Week: 04		SEEMarks:50

UNIT-I	10 Hrs.

Introduction, lexical analysis: Language processors; The structure of a Compiler; Grouping of Phases into Passes, Compiler Construction Tools, Applications of Compiler Technology

Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens. Lexical Analyzer generator

UNIT–II	10 Hrs.

Syntax analysis – 1: Introduction; Context-free Grammars; Writing a Grammar; Top-down Parsing.

Syntax analysis – 2: Bottom-up Parsing; Introduction to LR Parsing: Simple LR, Using Ambiguous Grammars, Parser Generators.

UNIT–III	10 Hrs.

Syntax-directed translation: Syntax-Directed definitions; Evaluation order for SDDs; Applications of Syntax-directed translation; Syntax-directed translation schemes.

Intermediate Code Generation: Variants of syntax trees; Three-address code; Types and declarations; Translation of expressions; Type checking;

UNIT–IV	10 Hrs.

Control flow:short circuit ,Backpatching..

Code Generation: Issues in the design of Code Generator; The Target language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks, sample code generation

Reference Books

1. Alfred V Aho, Monica S Lam, Compilers-Principles, Techniques and Tools**,** 2nd Edition,2007, Addison-Wesley.
2. John Levine, DougBrown, TonyMason ,L**ex&Yacc,**2ndEdition , 1992,O'Reilly Media ,
3. Andrew W Apple, **Modern Compiler Implementation in C,** Cambridge University Press.

Course Outcomes

After completion of the course student will be able to

1. Demonstrate the understanding of different phases of Compilation
2. Express programming language tokens using regular expressions, and language constructs using Context free grammar.

3. Construct Lexical Analyzer , parser/parsing tables and Syntax directed translation schemes for simple inputs
4. Generate intermediate code for statements in high level language
5. Apply optimization techniques to intermediate code and generate machine code for high level language program

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	1	--	--	--	--	--	--	--	--	--	--	**1**	--	--
CO2	1	3	3	--	--	--	--	--	--	--	--	--	**3**	--	**3**
CO3	--	3	3	--	--	--	--	--	--	--	--	**1**	**3**	--	**3**
CO4	--	3	3	--	--	--	--	--	--	--	--	**1**	**3**	--	**3**
CO5	--	3	3	--	--	--	--	--	--	--	--	**1**	**3**	--	**3**

22UCS603C	Machine Learning	Credits : 3
L:T:P – 3:0:0		CIE Marks : 50
Total Hours/Week : 3		SEE Marks : 50

UNIT-I	10 Hrs.

Introduction to Machine Learning: Introduction**,** What is Machine Learning?, Applications of Machine Learning, Types of Machine Learning, Well posed learning problems, issues in Machine Learning.

Preparing for model: Introduction, Machine Learning Activities

Linear Regression: Introduction, Example of Regression, Common regression algorithm

Concept Learning: Introduction, Concept learning task, Concept Learning as search, Find-s, Candidate elimination algorithm

UNIT–II	10 Hrs.

Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems for decision tree learning, the basic decision tree learning algorithm, Hypothesis space searching in decision tree learning, Issues in decision tree learning

Artificial Neural Networks (ANN) : Introduction, Neural Network Representations, Appropriate Problems For Neural Network Learning, Perceptron, Multilayer Networks And The Back propagation Algorithm, Remarks On The Back propagation Algorithm, An Illustrative Example : Face Recognition..

UNIT–III	10 Hrs.

Bayesian learning : Introduction Bay's theorem, Maximum likelihood and least squared hypothesis, Maximum likelihood hypothesis for predicting probabilities, Minimum Description length principle, Bay's optimal classifier, Gibbs algorithm, Naïve Bay's Classifier. An Example : Classify Text.

Instance Based Learning : Introduction, k-Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis function and case based reasoning

Dimensionality Reduction : Introduction, Subset Selection, Principal Components Analysis, Linear discriminate analysis

UNIT–IV	10 Hrs.

Clustering: Introduction, Mixture Densities, K-means Clustering, Expectation Maximization Algorithm, Mixture Latent Variable models, Supervised learning after clustering, Hierarchical clustering, Choosing the number of clusters

Hypothesis and Performance Evaluation : Basic Performance Criterion, Precision and recall, Other ways to measure Performance**,** Estimating Hypothesis Accuracy, Basics of Sampling Theory, General approach for deriving confidence intervals, difference in error of two hypothesis, comparing learning algorithms

Reference Books

1.Machine Learning Tom Mitchell McGraw - Hill 2nd Edition, 2013

2.An Introduction to Machine Learning Miroslav Kubat Springer 2ndEdition,2017

3.Introduction to Machine Learning Ethem Alpayd in MIT press, Cambridge, Massachusetts, London 2nd Edition, 2010

4. Elements of Statistical Learning Trevor Hastie. Robert Tipeshirani, Jerome Fredman Springer 2nd Edition, 2010

5.Building Machine Learning Systems with Python Luis Pedro Coelho and Willi Richart PACKT Publication 2ndEdition, 2013

Course Outcomes

After completion of the course student will be able to

1. Define machine learning and types of learning algorithms
2. Explain various machine learning algorithms.
3. Apply machine learning algorithm to solve problems of moderate complexity.
4. Analyze performance of algorithms by varying some parameters
5. To formulate machine learning model for the simple problem

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		1	1	1									1		1
CO2	1	2	2	2									2		2
CO3	1	3	3	2	3								3		3
CO4	1	3	3	3	3								3		3
CO5	1	3	3	3	3								3		3

22UCS604C	Computer Graphics	Credits: 03
L:T:P - 3:0:0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

Course objectives:

- Have insight into concepts of computer graphics hardware architecture and its applications.
- Have proficiency in 2D and 3D geometric transformations, visualization and interactive graphics applications using OpenGL API.

UNIT -I (10 Hours)

Overview of Graphics Systems: Video Display Devices, Raster-Scan Displays, GraphicsWorkstations and Viewing Systems, Introduction to OpenGL, **Graphics Output Primitives :**Coordinate Reference Frames, Specifying A Two-Dimensional World-Coordinate Reference Frame in OpenGL, OpenGL Point Functions, OpenGL Line Functions, **Line drawing algorithms:**Bresenham's Line-Drawing Algorithm, OpenGL Curve Functions, Circle generating Algorithms: Midpoint Circle Algorithm

Revised Bloom's Taxonomy Level	L1: Remembering L2: Understanding L3: Applying L4: Analysing

UNIT- II (10 hours)

Fill-Area primitives, OpenGL Polygon Fill-Area Functions, OpenGL Vertex Arrays, Pixel-Array Primitives, OpenGL Pixel-Array Functions, Character Primitives, OpenGL Character Functions. **Geometric Transformations-1:** Basic Two-Dimensional Geometric Transformations, Matrix Representations and Homogeneous Coordinates, Inverse Transformations, Two-Dimensional Composite Transformations, Other Two-Dimensional Transformations, Raster Methods for Geometric Transformations, OpenGL Raster Transformations, Transformations between Two-Dimensional Coordinate Systems.

Revised Bloom's Taxonomy Level	L1: Remembering L2: Understanding L3: Applying L4: AnalysingL5: Evaluating L6: Creating

UNIT- III (10 Hours)

Geometric Transformations-2: Geometric Transformations in Three-Dimensional Space, Three-Dimensional Translation, Three-Dimensional Rotation, Three-Dimensional Scaling, Composite Three Dimensional Transformations, Other Three Dimensional Transformations, Transformations between Three Dimensional Coordinate Systems, Affine Transformations,OpenGL Geometric Transformations Functions.

Two-Dimensional Viewing: The Two-Dimensional Viewing Pipeline, The clipping Window, Normalization and Viewport Transformations, OpenGL Two-Dimensional Viewing Functions,

Revised Bloom's Taxonomy Level	L1: Remembering L2: Understanding L3: Applying L4: AnalysingL5: Evaluating L6: Creating

UNIT- IV (10 Hours)

Clipping Algorithms: Two-Dimensional Point Clipping, Two-Dimensional Line Clipping: Cohen-Sutherland line Clipping, Polygon Fill-Area Clipping: Sutherland-Hodgeman Polygon Clipping, Curve Clipping, Text Clipping.

Viewing: Classical and Computer Viewing, Viewing with a Computer, Positioning of the Camera, Simple Projections, Projections in OpenGL, Hidden-Surface Removal, Interactive Mesh Displays, Parallel-Projection Matrices, Perspective-Projection Matrices, Projections and Shadows.

Revised Bloom's Taxonomy Level	L1: Remembering L2: Understanding L3: Applying L4: AnalysingL5: Evaluating L6: Creating

Reference Books

1. Donald Hearn and Pauline Baker Computer Graphics with OpenGL Pearson Education 3rd Edition, 2004.
2. Edward Angel, Addison-Wesley Interactive Computer Graphics A Top-Down Approach using OpenGL, 5th Edition, 2008.
3. F.S.Hill Jr.Computer Graphics using OpenGL Pearson Education 2nd Edition, 2001.
4. James D. Foley, Andries Van Dam, Steven K Feiner, John F. Hughes Computer Graphics Addison-Wesley 1997

Course outcomes

At the end of the course the student will be able to:
CO1: Explain fundamental concepts of computer graphics..
CO2: Implement the graphics algorithms to draw geometric primitives.
CO3: Develop an interactive 2D and 3D graphics applications.
CO4: Illustrate the animations of graphics models using geometric transformation functions.
CO5: Illustrate the 2D and 3D viewing concepts

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

	Programme Outcomes(Pos)												Program Specific Outcomes (PSOs)		
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	1	1		2	-	-	-	-	-	-	-	1	-	-
CO3	3	2	2		2	-	-	-	-	-	-	-	1	2	2
CO4	3	2	2	-	2	-	-	-	-	-	-	-	1	-	-
CO5	3	2	2	-	2	-	-	-	-	-	-	-	1	-	-

22UCS606L	Machine Learning Lab	Credits : 1
L:T:P – 0:0:2		CIE Marks : 50
Total Hours/Week : 2		SEE Marks : 50

	12 Hrs.

1. Assignment on Practice of NumPy Library
2. Assignment on Practice of Pandas Library
3. Assignment on Find S algorithm. Let's assume we have a dataset of customers with two attributes: 'age' and 'annual_income'. Divide customers into two groups: "Young Customers" and "High-Income Customers" using the Find-S algorithm.
4. Assignment on candidate elimination algorithm: consider a simplified dataset with two binary attributes ('A' and 'B') and a binary target variable ('Target'). Apply Candidate Elimination algorithm to find the most specific and most general hypotheses that cover all positive and negative examples
5. Assignment on simple regression: Build an application where it can predict a salary based on year of experience using Single Variable Linear Regression (Use Salary dataset from Kaggle). Display the coefficient and intercept. Also visualize the results by plotting the graphs on both training and testing dataset.
6. Assignment on multi-regression: Build an application where it can predict price of a house using multiple variable Linear Regression (Use USA_Housing dataset from Kaggle). Display all the coefficients.
7. Assignment on binary classification using Decision Tree Classifier: Build an application to decide on whether to play the tennis using Decision Tree. Use Tennis data from Kaggle. Do the required data processing. Display Accuracy score, Classification report and Confusion matrix.
8. Assignment on binary classification using Perceptron: Implement Perceptron model. Use this model to classify a patient that she is having cancer or not. Use Breast cancer dataset from sklearn library. Display Accuracy score, Classification report and Confusion matrix.
9. Assignment on Multi classification using Multilayer Perceptron (MLP): Buid an application to classify a given flower into its specie using MLP. Use Iris dataset from Kaggle. Display Accuracy score, Classification report and Confusion matrix.
10. Assignment on regression using KNN: Build an application where it can predict a salary based on year of experience using KNN (Use Salary dataset from Kaggle).
11. Assignment on Classification using KNN: Buid an application to classify a given flower into its specie using KNN (Use Iris dataset from sklearn library)
12. Assignment on Naïve Bayes classifier: Using Naïve Bayes classifier, build an application to classify a given text. Use text data from sklearn (Text classification)
13. Assignment on Image Processing: Build an application to recognise a Digit from an image using MLP

(Use Digit image Dataset from sklearn)

14. Assignment on Dimensionality Reduction using PCA.

15. Assignment on clustering: Generate random data points and apply following algorithms to form clusters based on the distance between the data points. Compare results.

i. Hierarchical clustering

ii. K-mean Clustering:

Reference Books

1.Machine Learning Tom Mitchell McGraw - Hill 2nd Edition, 2013

2.An Introduction to Machine Learning Miroslav Kubat Springer 2ndEdition,2017

3.Introduction to Machine Learning Ethem Alpayd in MIT press, Cambridge, Massachusetts, London 2ndEdition, 2010

4. Elements of Statistical Learning Trevor Hastie. Robert Tipeshirani, Jerome Fredman Springer 2ndEdition, 2010

5.Building Machine Learning Systems with Python Luis Pedro Coelho and Willi Richart PACKT Publication 2ndEdition, 2013

Course Outcomes

After completion of the course student will be able to

6. To formulate machine learning model for the simple problem
7. Apply machine learning algorithm to solve problems of moderate complexity.
8. Analyze performance of algorithms by varying some parameters

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		1	1	1									1		1
CO2	1	2	2	2									2		2
CO3	1	3	3	2	3								3		3

SUBJECT CODE 21UCS036E	ADHOC WIRELESS NETWORKS	Credits: 03
L:T:P - N_L : N_T: N_P 3:0:0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

INTRODUCTION, Cellular and Ad Hoc Wireless Networks, Applications of Ad Hoc Wireless Networks,

ISSUES IN AD HOC WIRELESS NETWORKS,

MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS: Issues in designing a mac protocol, design goals of a mac protocol, classifications of mac protocols,

CONTENTION-BASED PROTOCOLS: MACAW: A Media Access Protocol, Floor Acquisition Multiple Access Protocols, Busy Tone Multiple Access Protocols, MACA-By Invitation, Media Access with Reduced Handshake

UNIT–II	10Hrs.

ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS: Issues in designing a routing protocol for ad hoc wireless networks, classifications of routing protocols,

TABLE-DRIVEN ROUTING PROTOCOLS: Destination Sequenced Distance-Vector Routing Protocol, Wireless Routing Protocol, Cluster-Head Gateway Switch Routing Protocol, Source-Tree Adaptive Routing Protocol

ON-DEMAND ROUTING PROTOCOLS: Dynamic Source Routing Protocol, Ad Hoc On-Demand Distance-Vector Routing Protocol, Temporally Ordered Routing Algorithm, Location-Aided Routing

UNIT–III	10 Hrs.

TRANSPORT LAYER PROTOCOLS FOR AD HOC WIRELESS NETWORKS:

Issues in designing a transport layer protocol, design goals of a transport layer protocol, classification of transport layer solutions, tcp over ad hoc wireless networks, Brief Revisit to Traditional TCP and its performance in ADhoc network, Feedback-Based TCP, TCP with Explicit Link Failure Notification, TCP-BuS, Ad Hoc TCP , SplitTCP,

UNIT–IV	10 Hrs.

WIRELESS SENSOR NETWORKS, Applications of Sensor Networks, Comparison with Ad Hoc Wireless Networks, 3 Issues and Challenges, SENSOR NETWORK ARCHITECTURE, Layered Architecture, Clustered Architecture, Data Dissemination, Data Gathering, Mac Protocols For Sensor Networks

Reference Books *

1. C. Siva Ram Murthy and B.S.Manoj - AdHoc Wireless Networks: Architectures and Protocols, 2004, PHI
2. Jagannathan Sarangapani - Wireless Ad-hoc and Sensor Networks: Protocols, Performance and Control, CRC Press.

Course Outcomes**

After completion of the course student will be able to

1. Know the AdHoc wireless network operation and applications.
2. Identify design of MAC protocols for Ad Hoc Wireless Networks.
3. Analyze Routing protocols for Ad Hoc Wireless Networks .
4. Know the need for TCP protocol in Ad Hoc Wireless Networks.
5. Identify issues and challenges in Wireless sensor network.

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	3	2	-	2	2	-	-	-	-	-	-	1	-	-
CO2	-	2	1	-	2	1	-	-	-	-	-	-	-	1	-
CO3	3	2	-	-	1	-	-	-	1	-	-	-	1	1	3
CO4	2	1	1	-	2	1	-	-	1	-	-	1	-	2	1
CO5	1	2	1	-	1	-	-	-	1	-	-	1	1	-	2

SUBJECT CODE 22UCS080E	Linux System Administration	Credits: 03
L: T:P - 3: 0: 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Introduction to LINUX and Installation: A Brief History Understanding operating systems, the free software foundation and the GNU project, Linux Arrives, the strength of Linux; Linux in the market, the work of system administrator; starting the use Linux; Exploring the file system; finding the command Help

Linux installation: Reviewing your computer's hardware; Configuration Disk Space; Installing Linux: kickstart installations process, Using the graphical configuration tool.

Managing software packages: Managing packages, managing packages graphically, using rpm to manage software packages, Updating the system automatically.

Commands: Basic and Utility commands in Linux.

UNIT–II	10 Hrs.

Customizing the Environment and Shell: Exploring the bash shell, the shell prompt, functions of a shell, different types of a shells, entering commands, the shell start-up process, Using Aliases**.** Some basic Linux commands; Shell variable; Data redirection; editing text with vi; printing from the command line

Managing Processes: Defining processes; Managing Linux processes; Managing memory; Scheduling the processes; Controlling access to at and crontab.

Managing Users: creating and managing user accounts: managing user account graphically, creating new user at command line, creating new groups, modifying user at the command line, automating home directory, disabling user accounts

Linux users and Groups: Types of users and groups, Linux groups; user and group files; shadow passwords, changing user passwords, User information commands.

UNIT–III	10 Hrs.

File permissions: changing ownership, changing file permissions, default file permissions. **Introduction to File systems**: Partition and file systems, Inode and Links, File types, Accessing Removable Media, Using find,

Managing File Archives: Compressed files, using tar and cpio archiving files.

Understanding the file system: reviewing the file system types, checking file system status, file system attributes, creating new file system, using fdisk utility, formatting file systems, mounting new file systems, using network file systems, automating file system mounting, Using the autofs mounting services, managing the swap space, setting Quotas on disk usage Complex File permissions.

UNIT -IV	10 Hrs

Essential of shell Programming: SHELL script, read: making interactive, usage of positional parameters, logical operators, conditional executions, The if conditional, using test and evaluate expressions, Numeric comparison, case conditional statements, expr: computation and string handling; Looping: while, for; Arrays and String handling commands, Functions

Programs on basic utilities and administrator tasks.

Textbook:

5. Nicholas wells, The complete Guide to Linux System Administration Cengage Learning, ISBN-10 : 0619216166 ,ISBN-13 : 978-0619216160,2005
6. Your Unix: The ultimate Guide McGraw-Hill, Inc. Professional Book Group 11 West 19th Street New York, NY United States ISBN:978-0-07-252042 (Unit-4)
7. Alexandru Calcatinge, & Balog, J. Mastering Linux Administration. Packt Publishing Ltd.2021.
8. Ganesh Sanjiv Naik ,Learning Shell Scripting, Packt Publishing Ltd.2015.

Course Outcomes**

1. **After completion of the course student will be able to**
2. Applying Shell Scripting for Administrative Tasks.
3. Backup and Linux Security Management
4. System Installation and Configuration
5. Understanding Linux Architecture and Components, User and Group Management**.**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	2											1		
CO2	1	2												1	
CO3	1		2												1
CO4	1		3										1		
CO5	1	2	3										1		1

SUBJECT CODE : 21UCS504L	Computer Networks Laboratory	Credits: 01
L:T:P - 0 : 0 : 2		CIE Marks: 50
Exam Hours: 03		SEE Marks: 50

Part –A (Simulation Exercises)

Introduction Part Introduce students to network simulation through the Network simulation Package, create a simple network model with multiple scenarios, Collect statistics on network performance through the use of simulator tools, Analyze and draw conclusion on network performance

1. Simulate four nodes' point-to-point network and study how the loss, utilization and transmission of wireless LAN (IEEE 802.11b) network varies as the distance between access point and wireless nodes.

2. Simulate point-to-point network which consists of 4 to 6 nodes and study network performance analysis of different scheduling technique like First In Out (FIFO), Priority, Round Robin, Weight Fair Queue (WFQ) using Net Sim.

3. Simulate and study the throughputs of slow start, Congestion avoidance (also known as Old Tahoe) and First Retransmit (also known as Tahoe), Congestion Control Algorithms during client-server TCP downloads.

4. Create a network topology which consists of six nodes, simulate and study the working and routing table formation of Interior Routing Protocol i.e. Routing Information Protocol (RIP) and Open Shortest Path First (OSPF).

PART – B (Programming)

1. Write a program for error detecting code using CRC-CCITT (16 bit)

2. Write a program for hamming code generation for error detection and correction.

3. Write a program for distance vector algorithm to find suitable path for transmission.

4. Write a program for congestion control using leaky bucket algorithm.

5. Write a C program to develop a DNS client server to resolve the given hostname.

6. Write a client-server application for chat using UDP.

7. Using TCP / IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents to the requested file if present.

8. Write a program for simple RSA algorithm to encrypt and decrypt the data.

Course Outcomes

After completion of the course student will be able to

1. Simulate the network with different configurations to measure the performance parameters

2. Implement the data link, network layer and application layer protocols.

3. Analyze routing algorithm to find the suitable path for transmission and control of flow rate.

4. Enable communication between the peers using TCP/IP and UDP sockets.

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	3	3	2	-	2	-	-	-	-	2	1	2	1
CO2	0	3	3	3	3	1	3	-	-	-	-	2	1	2	3
CO3	1	3	3	3	1	1	2	-	-	-	-	2	1	2	3
CO4	0	3	3	2	3	1	2	-	2	-	-	2	1	3	2

UCS633N	Human Computer Interface	Credits: 3
L:T:P - 3:0:0		CIEMarks:50
Total Hours/Week40		SEEMarks:50

UNIT-I	10 Hrs.

FOUNDATIONS

The human: Introduction Input output channels Human memory Psychology and the design of interactive systems The computer : Text entry devices Display devices Physical controls, sensors and special devices

UNIT–II	10 Hrs.

INTERACTIONS

Models of interaction, *Design Focus* Frameworks and HCI Ergonomics *Industrial interfaces* Interaction styles Elements of the WIMP interface Interactivity The context of the interaction Paradigms for interaction

UNIT–III	10 Hrs.

HCI IN THE SOFTWARE PROCESS

Design rules Implementation support, Evaluation techniques, Universal design, User support

UNIT–IV	10 Hrs.

COGNITIVE MODELS

Socio-organizational issues and stakeholder requirements Communication and collaboratio0n models Task analysis Dialog notations and design Models of the system Modeling rich interaction

Reference Books *

1. **Human-Computer Interaction** (3rd Edition) Authors: Dix, Finlay, Abowd and Beale. Publisher: Pearson, 2003 ISBN: 0130461091
2. **Introduction to Human Factors Engineering** (2nd Edition) Authors: Wickens, Lee, Liu, and Gordon-Becker Publisher: Pearson, 2004 ISBN-10: 0131837362
3. **Designing the User Interface: Strategies for Effective Human-Computer Interaction** (5th Edition) Authors: Shneiderman, Plaisant, Cohen, and Jacobs Publisher: Addison Wesley; 5th edition (2009) ISBN: 978-0321537

Course Outcomes**

After completion of the course student will be able to

1. Describe and apply user-centered design methods to conduct formative and summative evaluations.
2. Explain and apply core theories and models from the field of HCI.
3. Design and implement useful, usable, and engaging graphical computer interfaces.
4. Discuss and critique research in the field of HCI.
5. Describe special considerations in designing user interfaces for wellness

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	2	-	2	2	-	-	-	-	-	-			
CO2	3	2	3	-	2	1	-	-	-	-	-	-			
CO3	3	2	3	-	3	-	-	-	1	-	-	-			
CO4	2	1	1	-	2	1	-	-	1	-	-	**1**			
CO5	1	1	1	**1**											

SUBJECT CODE : 21UCS634N	Software Engineering	Credits: 03
L:T:P – 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 40		SEE Marks: 50

UNIT-I	10 Hrs.

OVERVIEW: Introduction: FAQ's about software engineering, Professional and ethical responsibility. **Socio-Technical systems:** Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems.

CRITICAL SYSTEMS, SOFTWARE PROCESSES: Critical Systems: A simple safety-critical system; System dependability; Availability and reliability. **Software Processes**: Models, Process iteration, Process activities.

UNIT–II	10 Hrs.

REQUIREMENTS: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; The software requirements document.

REQUIREMENTS ENGINEERING PROCESSES: Feasibility studies; Requirements elicitation and analysis; Requirements validation; **System Models:** System Models: Context models; Behavioral models; Data models.

UNIT–III	10 Hrs.

SOFTWARE DESIGN: Architectural Design: System organization, Modular decomposition styles; Control styles. **Object-Oriented Design**: An Object-Oriented design process; Design evolution.

DEVELOPMENT: Rapid Software Development: Agile methods; Extreme programming; Rapid application development. **Software Evolution**: Program evolution dynamics; Software maintenance; Evolution processes.

UNIT–IV	10 Hrs.

VERIFICATION AND VALIDATION: Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods.

Software Testing: System testing; Component testing;Test automation.

Project Management: Project Management: Management activities; Project planning; Project scheduling. **Managing People:** Selecting staff, Motivating People, Managing Groups.

Reference Books *

1. Ian Somerville , 8th Edition, 2007, Software Engineering, Pearson Education.
2. Len Bass, Paul Clements, Rick , 2nd Edition, 2003, Software Architecture in Practice, Pearson Education.
3. Roger S. Pressman, 6th /7th Edition, 2007, Software Engineering: A Practitioners Approach, McGraw-Hill.
4. Shari Lawrence Pfleeger, Joanne, 3rd Edition 2006, Software Engineering Theory and Practice, Pearson Education.
5. Waman S Jawadekar , 1st Edition, 2004, Software Engineering Principles and Practice, Tata McGraw-Hill.
6. Ian Somerville , 10th Edition, 2018, Software Engineering, Pearson Education.

Web links and Video Lectures:

1. http://nptel.ac.in/courses/106/101/106101061/
2. http://nptel.ac.in/courses/106/105/106105087/
3. http://nptel.ac.in/courses/106/105/106105182/
4. http://uml.org
5. VTU EDUSAT PROGRAMME

Course Outcomes**

After completion of the course student will be able to

CO1: Understand the existing theories, models and techniques used for software product development.

CO2: Write software requirement specification based on the formal specifications for software systems.

CO3: Design and develop different components of the software product using standard models.

CO4: Verify and validate the individual components and the whole software product using different testing tools.

CO5: Demonstrate the management of people, project and software quality during the software development process.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		2	1	2				1			3		1	3	2
CO2		3	2	2				1			3		1	3	2
CO3		3	3	2				1			3		1	3	2
CO4		1	2	2				1			3		1	3	2
CO5		2	2	2				1			3		1	3	2

2022-23 Admitted batch (160 credits)

VII Semester B.E. (CSE)

Sl. No	Category	Subject Code	Subject Title	Credits	HOURS/ WEEK			EXAMINATION MARKS		
					L	T	P	CIE	SEE	Total
1.	HSMC	22UHS701C	Management and Entrepreneurship	3	3	0	0	50	50	100
2.	PCC	22UCS702C	Cloud Computing	3	3	0	0	50	50	100
3.	PEC	22UCSXXXE	Professional Elective Course-III	3	3	0	0	50	50	100
4.	PEC	22UCSXXXE	Professional Elective Course –IV	3	3	0	0	50	50	100
5	Project	22UCS703P	Project Work	12	0	0	24	50	50	100
Total				24	12	0	24	250	250	500

22UHS701C	Management and Entrepreneurship	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Nature and Functions of Management: Importance, Definition, Functions and Levels of Management, Roles of a manager, Managerial Skills, Management & Administration, Management - a science or an art or a profession.

Development of Management Thought: Early Management Approaches- Scientific, Administrative, and Bureaucracy. Modern Approaches - Quantitative, Systems and Contingency Approaches.

UNIT–II	10 Hrs.

Planning: Nature, Importance, Forms, Steps in planning, Limitations of planning, Making planning effective.

Decision Making: Meaning, Types, Steps in Rational Decision Making, Environments of Decision making,Common Difficulties in Decision making.

Organization: Meaning, Process of Organizing, Span of Management, Principles of Organizing, OrganizationStructure, Committees, Teams.

UNIT–III	10 Hrs.

Coordination: Distinction between coordination and cooperation, Need for coordination, Requisites for excellent coordination, Types, Techniques, Difficulty of coordination.

Staffing: Importance and Need for Proper Staffing, Manpower Planning, Recruitment, Selection, Placement.

Direction and Supervision: Requirements of effective direction, Giving orders, Motivation: Meaning and Nature of Motivation.

UNIT–IV	10 Hrs.

Entrepreneurship: Introduction, Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneurs, Intrapreneur, Entrepreneurship, Role of Entrepreneurs in Economic Development, Entrepreneurship in India, Barriers of Entrepreneurship.

Preparation Of Project: Meaning of Project, Project Identification, Project Selection, Project Report: Need, Significance and Contents, Project Formulation, Project Appraisal, Identification of Business Opportunities, Feasibility Studies: Technical, Financial, Market and Social.

Reference Books

1. P. C. Tripathi, P.N. Reddy, 2012, "Principles of Management" (5th Edition), Tata McGraw Hill.
2. N. V. R Naidu & T. Krisna Rao, 2019, "Management & Entrepreneurship" (1st Edition), Wiley.
3. Robert Lusier, 2012, "Management Fundamentals - Concepts, Application" (5th Edition) , Skill Development", *Thomson*/South-Western.
4. S. S. Khanka, 1999, "Entrepreneurship Development" (1st Revised Edition), S. Chand & Co. New Delhi.
5. Stephen Robbins, 2003, "Management" (17th Edition), Pearson Education/PHI.
6. Vasant Desai, 2001, "Dynamics of Entrepreneurial Development & Management" (4th Edition), Himalaya Publishing House.

Course Outcomes

After completion of the course student will be able to

1. Identify the different levels of management along with the different types of managers, their roles and functions.
2. Develop the ability to plan and organize the activities required to complete the project.
3. Recognize, understand and explain the role of staffing in management.
4. Explain the fundamentals of entrepreneurship and its development process.
5. Develop the ability to solve a specific problem right from its identification to successful completion of the project.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	3	2	-	-	-	2	2	3	-	-
CO2	-	2	-	-	-	-	2	-	3	3	3	3	2	-	-
CO3	-	-	-	-	-	-	-	-	3	3	2	2	2	-	-
CO4	-	-	2	-	-	3	-	-	-	3	2	2	1	-	-
CO5	-	2	2	2	-	-	-	-	2	2	3	3	1	-	-

22UCS702C	CLOUD COMPUTING	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 40/03		SEE Marks: 50

UNIT-I	10 Hrs.

Introduction: Cloud Computing at a Glance, Historical Development, Characteristics of Cloud Computing, Building Cloud Computing Environments, Computing Platforms and Technologies.

Cloud Computing Architecture: Introduction, Cloud Reference Model, Types of Clouds, Economics of Cloud, Open Challenges.

UNIT–II	10 Hrs.

Aneka: Cloud Application Platform: Framework Overview, Anatomy of the Aneka Container, Building Aneka Clouds, Cloud Computing and Management.

Concurrent Computing: Thread Programming: Introducing Parallelism for Single Machine Computation, Programming Application with Threads, Multi Applications with Threads, Multithreading with Aneka.

UNIT–III	10 Hrs.

Virtualization: Introduction and Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing. Pros and Cons of Virtualization.

Cloud Applications: Scientific Applications, Business and Consumer Applications

UNIT–IV	10 Hrs.

High Throughput Computing: Task Programming: Task Computing, Task-based Application Models, Aneka Task-Based Programming.

Data Intensive Computing: Map- Reduce Programming: What is Data-Intensive Compuitng? Technologies for Data-Intensive Computing, Aneka MapReduce Programming

Reference Books

1. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, (2021), "Mastering Cloud Computing", (3rd Edition), McGraw Hill Education (India) Private Limited.

Course Outcomes

After completion of the course student will be able to

1. Understand the basics of cloud computing, challenges, architecture, reference model, types of cloud, service models with respect to all service models etc.

2. Deploy cloud instances in Aneka cloud computing platform and threading programming of Aneka.
3. Analyze virtualization technology, Cloud Platforms in Industry and Data Intensive Computing, etc.
4. Evaluate the security related to multi-tenancy and appraise compliance issues that arise from cloud computing.

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	-	-	-	-	-	3	2	-	-	-	2	2	3	-	-
CO2	-	2	-	-	-	-	2	-	3	3	3	3	2	-	-
CO3	-	-	-	-	-	-	-	-	3	3	2	2	2	-	-
CO4	-	-	2	-	-	3	-	-	-	3	2	2	1	-	-

21UCS703P	Project Work	12 - Credits (0 : 0 : 24)
Hours/Week :		CIE Marks : 50
Total Hours :		SEE Marks : 50
		(0L-0T-26P Hours)

Students have to take up literature survey, formulate the problem of the project, define the project objectives and prepare the project implementation schedule. Project work, based on the problem defined, should be completed and implemented. The implementation of the project work can be done either in a reputed industry/ research organization/ parent institute. A certified report with project demonstration and a seminar is to be presented by the students. The seminar should highlight – Broad project area of their project work carried out.

CIE of 50 marks will be conducted by the Committee consisting of HOD/Nominee + Project Coordinator + Guides as per the rubrics. For SEE, student has to make a presentation of the work carried out to Project Evaluation Committee (PEC- Project coordinator, Hod/Nominee, External Examiner). PEC will allot SEE marks for 50.

Course Outcomes

At the end of this course, students will be able to:

1. Identify, formulate & analyze the engineering problems associated with Computer Science & engineering and interdisciplinary research.
2. Design & implement proposed solutions for complex engineering problems to meet specified objectives by analyzing / validating the design / solutions of engineering problems using contemporary tools & resources.
3. Prepare engineering documents and make effective presentation to communicate effectively and collaboratively with detailed analysis and interpretation of results to yield valid conclusions.
4. Demonstrate social, ethical cultural & engineering professional responsibilities.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3						3	3	3	1	3	3	3	3
CO2	3	3		2		2		3	3	3	2	2	3	3	3
CO3	3	3	3	3	3	3	1	3	3	3	3	3	3	3	
CO4	1	1	2					3	3	3	1	2	3	3	

2022-23 Admitted batch (160 credits)

VIII Semester B.E. (CSE)

Sl. No	Category	Subject Code	Subject Title	Credits	HOURS/ WEEK			EXAMINATION MARKS		
					L	T	P	CIE	SEE	Total
1.	AEC	22UCS800O	MOOCs	3	-	-	-	25	75	100
2.	INT	22UCS802I	Internship	10	-	-	20	100	0	100
3.	OEC	22UCS803C	MOOCs	3	-	-	-	25	75	100
Total				16	0	2	20	150	150	300

*** 7th and 8th semesters are swapped between group 1 and group 2 students**

22UCS802I	Internship	Credits: 10
L:T:P - 0 : 0 : 20		CIE Marks: 100
Total Hours/Week: 20		SEE Marks: 100

Internship:

Students need to meet following criteria to successfully complete the internship course.

1. **Student's Diary/ Daily Log**

   Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated based on the following criteria:

   - Regularity in maintenance of the diary.
   - Adequacy & quality of information recorded.
   - Drawings, sketches, and data recorded.
   - Thought process and recording techniques used.
   - Organization of the information.

2. **Internship Report**

   The Internship report will be evaluated based on following criteria:

   - Originality.
   - Internship certificate from the industry.
   - Adequacy and purposeful write-up.
   - Organization, format, drawings, sketches, style, language etc.
   - Variety and relevance of learning experience.
   - Practical applications, relationships with basic theory and concepts taught in the course.

Evaluation:

The industrial training of the students will be evaluated in three stages:

1. Evaluation by Industry.
2. Evaluation through seminar presentation
3. Viva-voce at the Institute.

Evaluation Through Seminar Presentation/Viva-Voce at The Institute

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.

Summary of Internship Evaluation (Industry Representative)	
Evaluation Criteria	**Score from the above tables**
Quality of Work	10
Ability to Learn	10
Initiative and Creativity	10
Character Traits	10
Dependability	10
Organizational Fit	10
Response to Supervision	10
	70
Internship Guide	
Demonstration of experience	10
Report	10
Presentation	10
	30

Total CIE 100 = 70 (Industry Evaluation) + 30 (CIE). No SEE conducted for Internship.

Course Outcomes

After completion of the course student will be able to

1. Demonstrate the knowledge gained during the internship at the industry.
2. Exhibit abilities to use theoretical concepts in solving practical problems in their field of study.
3. Demonstrate communication, interpersonal and other critical skills in their profession.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1		2	2	2	2	2				2			2	1	1
CO2		2	2	2	2	2				2			2	1	1
CO3		1	1	1	1	1				3			1		1