

Engineering Mathematics-III (Common to all branches)

Contact Hours/ Week	3(L)	Credits	3
Total Lecture Hours	39	CIE Marks	50
Total Tutorial Hours	00	SEE Marks	100
Sub Code	20MA310	Semester	III

Prerequisites: Engineering Mathematics-I and II.

SL No	Course objectives:
1.	To develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusion.
2.	To introduce the basic concepts and applications of probability in engineering.
3.	Formulate and solve partial differential equations. Use of separation of variable method to solve wave, heat and Laplace equations.
4.	Learn to solve algebraic, transcendental and ordinary differential equations numerically
5.	Learn to represent a periodic function in terms of sine and cosine functions.

Unit No.	Course Content	No. of Hours
UNIT-I	Statistics Introduction, Definitions, Curve Fitting, equation of Straight line, parabola and exponential, correlation and regression, formula for correlation coefficient, regression lines and angle between the regression lines	8 Hours
UNIT-II	Random Variable: Discrete Probability distribution, Continuous Probability distribution, expectation, Variance, Moments, Moment generating function, Probability generating function, Binomial distribution, Poisson distribution, Normal distribution and Exponential distributions	8 Hours
UNIT-III	Partial differential equations (P.D.E.) Formation of Partial Differential Equation, Solution of Lagrange's Linear P.D.E. of the type $Pp+Qq=R$. Method of Separation of Variables. Applications of P.D.E.: Classification of PDE, solution of one-dimensional heat and wave, two-dimensional Laplace's equation by the method of separation of variables.	8 Hours
UNIT-IV	Numerical solution of Ordinary differential equations: Taylor's series method, Euler's and modified Euler's method, fourth order Runge-Kutta method	7 Hours
UNIT-V	Fourier Series: Periodic functions, Fourier Expansions, Half Range Expansions, Complex form of Fourier series, Practical Harmonic Analysis	8 Hours

Text Books:

Sl. No	Author/s	Title	Publisher Details
1	B.S.Grewal,	Higher Engineering Mathematics 43 rd edition	Khanna Publications, 2015
2	RamanaB.V	Higher Engineering Mathematics latest edition	Tata-McGraw Hill, 2016

Reference Books:

Sl. No	Author/s	Title	Publisher Details
1	C. Ray Wylie and Louis C. Barrett	Advanced Engineering Mathematics,6 th edition	Tata-McGraw Hill 2005.
2	Louis A. Pipes and Lawrence R. Harvill	Applied Mathematics for Engineers and Physicists 3 rd edition	McGraw Hill 2014
3	Erwin Kreyszig3	Advanced Engineering Mathematics, 10 th edition	Wiley Publications, 2015

Mapping Course Outcomes with Program outcomes & Program Specific outcomes

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2											2			
CO2	2	2											2			
CO3	2	2											2			
CO4	2	2											2			
CO5	2	2											2			

Course Title: Data Structures	Course Code: 20CS310
Credits (L: T:P): 4:0:0	Contact Hours (L: T: P): 52:0:0
Type of Course: Lecture	Category: Professional Core Course
CIE Marks: 50	SEE Marks: 100

Pre-requisite: C programming concepts.

Course Objectives: The course should enable the students to:

1	Provide the knowledge of basic data structures and their implementations.
2	Introduce how arrays, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms in problem solving.
3	Impart the benefits of dynamic and static data structures.
4	Understand the importance of data structures in the context of writing efficient programs.

Unit No.	Course Content	No. of Hours
1	Introduction to Data structures: Pointers Revisited: Pointers to variables, arrays, structures and functions. Array Operations: Traversing, inserting, deleting, Searching, and sorting. Dynamically allocated arrays.	08
2	Linear List: Array vs Linked storage representation. Representation of linked lists in Memory. Linked list operations: Traversing, Searching, Insertion, Updation and Deletion. Circular linked lists, Doubly Linked lists, Header linked lists. Applications of Linked lists.	12
3	Stacks and Queues: Array Representation of Stacks, Stacks using Dynamic Arrays, Linked Stacks. Stack Applications: Conversions of expressions, evaluation of expressions, Recursion. Queues: Array Representation, Circular Queues, queues using Dynamic arrays, Dequeues, Priority Queues, Linked Queues.	12
4	Trees: Basic tree concepts, General trees and their representations. Binary Trees, Array and linked Representation of Binary Trees, Binary tree operations: Binary Tree Traversals, Insertion, deletion, searching. Binary Search Trees – Insertion, Deletion, Traversal and Searching. Binary expression Trees: Construction of expression trees for different notations, Evaluation of Expression.	12
5	Graphs: Basic concepts, Graph storage structures, Graph Traversal methods: Depth first search and Breadth first search, Applications of DFS and BFS.	08

Text Books:

Sl. No	Author/s	Title	Publisher Details
1	E Balaguruswaly	Programming in ANSI C	8 th Edition Paperback 2019, McGraw Hill Education
2	Richard F. Gilberg and Behronz A. Forouzan	Data structures, A Pseudo code Approach with C	3 rd edition, Cengage learning 2013

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Yedidyah, Augenstein, Tannenbaum	Data Structures Using C and C++	2 nd Edition, PHI
2	E Balaguruswaly	Data Structures Using C	Paperback 2017, McGraw Hill Education
3	Ellis Horowitz and Sartaj Sahni	Fundamentals of Data Structures in C	2nd edition, Universities Press, 2014
4	Seymour Lipschutz	Data Structures Schaum's Outlines	Revised First edition, McGraw Hill. 2014

Web Resources:

Sl. No.	Web link
1	https://nptel.ac.in/courses/106102064/
2	https://nptel.ac.in/courses/106105085/

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand the fundamentals of data structures and their applications essential for problem solving.
CO-2	Apply Linear and Non-linear data structures to organize data for different types of problems.
CO-3	Analyze and implement various operations on Linear and Non-linear data structures.
CO-4	Evaluate the most appropriate data structure for efficient data storage for a give problem.

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO-1	3	3	3	3	1	1	1	1	2	2	1	3	3	3	3	3
CO-2	3	3	3	3	1	1	1	1	2	2	1	3	3	3	3	3
CO-3	3	3	3	3	1	1	1	1	2	2	1	3	3	3	3	3
CO-4	3	3	3	3	1	1	1	1	2	2	1	3	3	3	3	3

Course Title: Object Oriented Programming using JAVA	Course Code: 20CS320
Credits (L:T:P): 3:0:1	Contact Hours(L:T:P: 39:0:26)
Type of Course: Lecture, Practical	Category: Professional Core Course
CIE Marks: 50	SEE Marks: 100

Pre-requisite: Knowledge of Programming in C.

Sl.No.	Course Objectives:
1	Understand the basic concepts of Object-Oriented Programming and apply them in problem solving.
2	Gain a clear understanding of Java programming and set up Java JDK environment to create, debug and run simple Java programs.
3	Explore the concepts of reusability and exception-handling mechanism in Java.
4	Study how multi-threaded programming and Applets with events-handling can be designed and developed in Java.

Unit No.	Course Content	No. of Hours
1	<p>INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING AND JAVA Introduction, Procedure–Oriented Programming System, Object-Oriented Paradigm, Basic concepts of Object-Oriented Programming, Objects and Classes, Data Abstraction and Encapsulation, Inheritance, Dynamic Binding, Polymorphism, Message Communication, Benefits of OOP, Applications of OOP, How Java differs from C and C++.</p> <p>The History and Evolution of Java: Java’s Magic: The byte code, The Java Buzzwords: Simple, Secure, Portable, Object-oriented, Robust, Multithreaded, Architecture-neutral, Interpreted, High performance, Distributed, Dynamic; Java Environment - Java Development Kit (JDK).</p> <p>An Overview of Java: Object-Oriented Programming: Abstraction, The three OOP Principles: Encapsulation, Polymorphism, Inheritance; Simple Java Programs; Data Types, Variables and Arrays; Operators; Control Statements.</p>	08
2	<p>JAVA CLASSES AND STRING HANDLING Introducing Classes: Class Fundamentals, Declaring objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The ‘this’ keyword, Garbage collection, A Stack Class.</p> <p>A Closer Look at Methods and Classes: Overloading Methods, Using Object as Parameters and Return Value, Access Control, Static Members, ‘final’, Nested and Inner Classes, String Class, Command-Line Arguments,</p>	08

	<p>Varargs.</p> <p>String Handling:The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying Strings, Additional String Methods, StringBuffer and StringBuilder Classes.</p> <p>Basics of I/O Operations – keyboard input using BufferedReader& Scanner classes.</p>	
3	<p>CLASSES AND REUSABLE PROPERTIES</p> <p>Inheritance: Inheritance Basics, Using super, Creating a Multilevel hierarchy, When Constructors are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using ‘final’ with Inheritance, The Object Class.</p> <p>Packages and Interfaces: Packages, Member Access, Importing Packages, Interfaces, Default Interface Methods, Using ‘static’ Methods in an Interface, Private Interface Methods, Final Thoughts on Packages and Interfaces.</p>	08
4	<p>EXCEPTION HANDLING & MULTITHREADED PROGRAMMING</p> <p>Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using ‘try’ and ‘catch’, Multiple ‘catch’ clauses, Nested ‘try’ Statements, Java’s Built-in Exceptions, Creating Your Own Exceptions Subclasses.</p> <p>Multithreaded Programming: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using IsAlive() and join(), Thread Priorities, Inter-thread Communication, Suspending, Resuming and Stopping Threads, Obtaining a Thread’s State.</p>	08
5	<p>Applet Programming: Introduction, How Applets differ from Applications; Preparing to Write Applets; Building Applet Code; Applet Life Cycle; Creating an Executable Applet; APPLET tag; Adding Applet to HTML file; Running the Applet; Passing parameters to Applets; Aligning the Display; Getting Input from the User.</p>	07

Text Books:

Sl. No.	Author/s	Title	Publisher Details
1	Herbert Schildt	Java: The Complete Reference	11 th Edition, Tata McGraw Hill Education, Released December 2018, ISBN: 9781260440249
2	E Balagurusamy	Programming with Java - A Primer	6 th Edition, Tata McGraw Hill Education, 2019, ISBN (13): 978-93-5316-234-4

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Barbara Liskov	Program Development in Java	Addison-Wesley, 2001
2	Kathy Sierra, Bert Bates	Head First Java: A Brain-Friendly Guide	2 nd Edition (Covers Java 5.0) Paperback – 2009
3	Harvey M. Deitel, Paul J. Deitel	The Complete Java Training Course	Student Edition, Java 1.1 Paperback – Import, 4 December 2001
4	Sachin Malhotra, SaurabhChoudhary	Programming in Java	Paperback, 2018

Web Resources:

Sl. No.	Web link
1	https://nptel.ac.in/courses/106/105/106105191/
2	https://nptel.ac.in/courses/106106147/1

TENTATIVE LIST OF PROGRAMS FOR PRACTICAL SESSIONS

Lab Session No.	Content
1.	a) Generate prime numbers for the given range. b) Find all the roots of a quadratic equation. c) Print 'N' Fibonacci numbers. d) Print pyramid shape using * symbols.
2.	Define a class to represent a bank ACCOUNT and include the following members: I. Data Members(<i>States</i>): a) Name of Depositor b) Account number c) Type of Account d) Balance amount in the account II. Member Methods(<i>Behaviors</i>): a) To assign initial values b) To deposit an amount c) To withdraw an amount after checking for the balance d) To display name & balance III. Define <i>EXECUTEACCOUNT</i> class that defines main method to test above class. IV. In the above class, maintain the total number of account holders

	<p>present in the bank and also define a method to define it. Change the main method appropriately.</p> <p>V. In main method of <i>EXECUTEACCOUNT</i> class, define an array to handle five accounts.</p> <p>VI. In <i>ACCOUNT</i> class constructor, demonstrate the use of “this” keyword</p>					
3.	The daily maximum temperatures recorded for 5 cities during the first 6 days of January month have to be tabulated. Develop an application to read the data and find the city and day corresponding to highest temperature and lowest temperature.					
4.	An election is contested by 5 candidates. The candidates are numbered 1 to 5 and the voting is done by marking the candidate number on the ballot paper. Develop an application to read the ballots and count the votes cast for each candidate using an array variable count. In case, a number read is outside the range 1 to 5, the ballot should be considered as a 'spoilt ballot' and the program should also count the number of spoilt ballots.					
5.	Given are two one dimensional array A and B which are sorted in ascending order. Develop an application to merge them into a single sorted array C that contains every item form A and B, in ascending order.					
6.	Create a class of objects CUBE. Develop an application to read the side for three cubes and print the Volume and outer area.					
7.	<p>The annual examination results of 20 students are to be tabulated as follows:</p> <table border="1" data-bbox="487 1123 1282 1165"> <thead> <tr> <th>Roll No.</th> <th>Subject-1</th> <th>Subject-2</th> <th>Subject 3</th> </tr> </thead> </table> <p>Develop an application to read the data and determine the following:</p> <p>a) Total marks obtained by each student.</p> <p>b) The highest marks in each subject and the Roll No. of the student.</p> <p>c) The student who obtained the highest total marks.</p>	Roll No.	Subject-1	Subject-2	Subject 3	
Roll No.	Subject-1	Subject-2	Subject 3			
8.	<p>Write a program to read a list containing Book Title, Book Code, Cost and Quantity interactively for min. of 10 books and produce a five column output as shown below.</p> <table border="1" data-bbox="389 1417 1364 1459"> <thead> <tr> <th>NAME</th> <th>CODE</th> <th>UNIT PRICE</th> <th>QUANTITY</th> <th>TOTAL PRICE</th> </tr> </thead> </table> <p>Define the suitable functions and perform the transactions.</p>	NAME	CODE	UNIT PRICE	QUANTITY	TOTAL PRICE
NAME	CODE	UNIT PRICE	QUANTITY	TOTAL PRICE		
9.	<p>Given that an EMPLOYEE class contains the following members:</p> <p><i>Members:</i> Employee ID, Employee Name, Department name & Basic Pay</p> <p><i>Methods:</i> To read each employee details, to calculate Gross Pay and to print the employee details. Develop an application to read data of N employees and compute the Gross Pay and Net Pay of each employee.</p> <p>Gross Pay = Basic Pay + DA + HRA (DA = 58% of Basic Pay, HRA = 16% of Basic Pay)</p> <p>Net Pay = Gross – <i>Income Tax</i></p> <p><u><i>Income Tax</i> calculated as follows:</u></p> <p>Gross Pay - Up to 2 lakhs - Nil</p> <p>Above 2 and up to 3 lakhs - 10% of the Gross Pay</p>					

	Above 3 and up to 5 lakhs - 15% of the Gross Pay and Above 5 lakhs 30 % of the Gross Pay, an additional charge of 2% of the tax will be added to total tax
10.	<p>Develop an application with an abstract Bank class consisting of below features:</p> <ol style="list-style-type: none"> Bank_Type (National/International) getRoi() is an abstract method deposit() offerCreditCard <ul style="list-style-type: none"> Identify various (atleast 4) banks which will extend bank class with below conditions: <ul style="list-style-type: none"> If the bank is type of nationalized the roi is 7% else 8%. The interest is offered only if the term deposit is minimum of 3 years. If the bank is international, then it can offer platinum credit card otherwise not. Override one of the method and use the concept of dynamic method dispatch.
11.	<p>Student class consists the following attributes:</p> <ol style="list-style-type: none"> roll number read Number(): to initialize roll number print Number(): to display the roll number <ul style="list-style-type: none"> class Test inherits Student and will identify marks for 2 subjects for each student and will display the same. Each student can also be recognized with sports weightage using an interface Sports which will have attributes to assign weightage value and display it. Each Student is rated with total score which is the summation of marks in 2 subjects and sports weightage. Develop an application Results to extend Test and implement Sports which displays the student score card as below: <ul style="list-style-type: none"> Roll No Marks Obtained in Subject-1 and Subject-2 Sports weight Total Score
12.	Develop an application which consists of Stack class and include methods to push and pop the stack elements. Create your own defined Exception class and handle exceptions while stacks run with “Stack as full” and “Stack under flow” while calling push() and pop() methods respectively. Implement this using ‘throws’ and ‘throw’ keywords.
13.	Lab Test/Event

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand and describe the Programming Paradigms, identify classes, objects, members of a class and relationships among them needed to solve a specific problem.
CO-2	Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
CO-3	Develop simple GUI interfaces for a computer program to interact with users.
CO-4	Develop computer programs to solve real world problems in Java.

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1	2	1	1	1	2	1	2	2	3	2	1	1
CO2	3	2	2	1	2	1	1	1	2	1	2	2	3	2	1	1
CO3	3	3	3	3	3	2	2	2	2	2	2	2	3	2	2	2
CO4	3	3	3	3	3	2	2	2	2	2	2	2	3	2	2	2

Course Title: Digital System Design	Course Code: 20CS330
Credits (L: T:P): 3:0:0	Contact Hours (L: T: P): 39:0:0
Type of Course: Lecture	Category: Professional Core Course
CIE Marks: 50	SEE Marks: 100

Pre-requisite: NIL

Sl.No	Course Objectives:
1	Understand Boolean algebra and basic properties of Boolean algebra; able to simplify simple Boolean functions by using the basic Boolean properties.
2	Able to design simple combinational logics using basic gates. Able to optimize simple logic using Karnaugh maps, understand "don't care".
3	Familiar with basic sequential logic components: SR Latch, D Flip-Flop and their usage and able to analyze sequential logic circuits.
4	Understand finite state machines (FSM) concepts and work in team to do sequence circuit design based FSM and state table using D-FFs.

Unit No.	Course Content	No. of Hours
1	Digital Logic: Combinational Logic Circuits, Boolean laws and Theorems, Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions, Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method.	08
2	Data Processing Circuits: Multiplexers, Demultiplexers, 1-of-16 Decoder, BCD to Decimal Decoders, Encoders, Parity Generators and Checkers, Magnitude Comparator.	08
3	Flip-Flops: RS Flip-Flops, Gated Flip-Flops, Edge-triggered RS FLIP-FLOP, Edge-triggered D FLIP-FLOPs, Edge-triggered JK FLIP-FLOPs, JK Master-slave FLIP-FLOP, Switch Contact Bounce Circuits, Various Representation of FLIP-FLOPs, Conversion of Flip-Flops.	08
4	Registers: Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In - Parallel Out, Universal Shift Register, Applications of Shift Registers.	07
5	Counters: Asynchronous Counters, Synchronous Counters, Decade Counters. Design of Synchronous Sequential Circuits: Model Selection, State Transition Diagram, State Synthesis table, Design equations and Circuit diagram.	08

Text Books:

Sl. No.	Author/s	Title	Publisher Details
1	Donald P Leach, Albert Paul Malvino & Goutam Saha	Digital Principles and Applications	7 th Edition, Tata McGraw Hill, 2014

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Morris Mano, Kim and Charles	Logic and Computer Design Fundamentals	Prentice Hall, 5 th Edition, 2016
2	Donald D. Givone	Digital Principles and Design	1 st edition, Tata McGraw-Hill, 2012
3	John M. Yarbrough	Digital Logic Applications and Design	Thomson Learning, 1 st edition 2001
4	Kohavi	Switching and Finite Automata Theory	TMH, 3 rd Edition 2010

Web Resources:

Sl. No.	Web link
1	https://nptel.ac.in/courses/108105113/15
2	https://nptel.ac.in/courses/117105080/19

Course Outcomes:

After completing this course, students should be able to:

CO-1	Understand the fundamental concepts of Boolean algebra, Boolean theorems, K-MAP, Quine-McCluskey algorithm and combinational and sequential circuits.
CO-2	Apply the knowledge of theoretical foundations to simplify and solve Boolean functions
CO-3	Analyze combinational and sequential circuits using the knowledge of Boolean algebra, timing aspects and operation of flip-flops
CO-4	Design and implement combinational circuits, synchronous/asynchronous counters and register circuits.
CO-5	Evaluate the performance of sequential circuits using various models

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO-1	3	3	3	2	1	0	0	0	1	2	2	2	3	3	1	2
CO-2	3	3	3	2	2	0	1	1	1	2	2	2	3	3	1	2
CO-3	3	3	3	2	2	1	0	1	2	1	1	2	3	3	1	2
CO-4	3	3	3	2	2	1	1	0	2	2	2	2	3	2	1	2
CO-5	3	3	3	2	2	1	1	0	2	2	2	2	3	3	1	2

Course Title: Computer Organization	Course Code: 20CS340
Credits (L: T:P): 3:0:0	Contact Hours (L: T: P): 39:0:0
Type of Course: Lecture	Category: Professional Core Course
CIE Marks: 50	SEE Marks: 100

Pre-requisite:NIL

Sl No	Course Objectives:
1.	To understand the structure, function and characteristics of computer system.
2.	To identify the elements of modern instructions sets and their impact on processor design.
3.	Learn different ways of communicating with I/O devices and hierarchical memory systems like cache memory and virtual memory.
4.	To describe ALU operations with integer and floating–point operands and understand the basic processing unit and organization of simple processor and other large computing systems.

Unit No.	Course Content	No. of Hours
1.	Basic Structures of Computers, Machine Instructions & Programs: Operational Concepts, Number Representations and Arithmetic Operations, Character Representation, Performance. Instruction Set Architecture: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Stacks, Subroutines, Additional Instructions, CISC Instruction Sets, RISC and CISC styles.	09
2.	Input/Output Organization: Basic Input/Output, Accessing I/O Devices, Interrupts, Bus Structure, Bus Operation, Arbitration.	07
3.	The Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Direct Memory Access, Memory Hierarchy, Cache Memories, Virtual Memory.	08
4.	Arithmetic Operations: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Signed Numbers, Fast Multiplication: Bit-Pair Recoding of Multipliers, Integer Division, Floating-point Numbers and Operations.	08
5.	Basic Processing Unit: Some Fundamental Concepts, Instruction Execution, Hardware Components, Instruction Fetch and Execution Steps, Hardwired Control, CISC style Processors.	07

Text Books:

Sl. No.	Author/s	Title	Publisher Details
1	Carl V Hamacher, Zvonko Vranesic	Computer Organization and Embedded Systems	6 th Edition, McGraw Hill, 2012

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	M. MorisMano	Computer Systems Architecture	3 rd Edition, Pearson/PHI, 2007
2	Carl Hamacher, Zvonko Vranesic, Safwat Zaky	Computer Organization	5th Edition, Tata McGraw Hill, 2002
3	William Stallings	Computer Organization & Architecture	9th Edition, Pearson, 2015
4	V Heuring & H Jordan	Computer System Design & Architecture	Addison-Wesley, 1 st Edition, 1999

Web Resources:

Sl. No.	Web link
1	https://nptel.ac.in/courses/106106092/
2	https://www.youtube.com/watch?v=CDO28Esqmcg

Course outcomes: After completing this course, students should be able to:

CO-1	Comprehend and analyze the basic structure, operation of computers and the perspective of Computer architect.
CO-2	Illustrate the concept of programs as sequences of machine instructions.
CO-3	Demonstrate functioning of different sub systems, such as processor, Input/Output and memory.
CO-4	Analyze and design simple arithmetic, logical and processing units.

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO-1	3	2	1	1	1	0	1	0	0	2	0	2	3	3	1	1
CO-2	3	3	3	3	2	1	1	0	1	2	1	2	3	3	2	2
CO-3	3	3	3	3	2	1	1	1	1	2	1	2	3	3	1	2
CO-4	3	3	3	3	2	1	1	1	1	2	1	2	3	3	2	2

Course Title: Discrete Mathematical Structures	Course Code: 20CS350
Credits (L: T:P): 3:0:0	Contact Hours (L: T: P): 39:0:0
Type of Course: Lecture	Category: Professional Core Course
CIE Marks: 50	SEE Marks: 100

Pre-requisite: Previous basic mathematics.

Sl.No	Course Objectives
1.	Introduce concepts of mathematical logic for analyzing propositions and proving theorems.
2.	Work with relations and investigate their properties.
3.	Introducing the concepts of coding and decoding theory
4.	Introduce basic concepts of graphs, digraphs and trees..

Unit No.	Course Content	No. of Hours
1.	Fundamental of Logic: Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication: Rules of Inference, The Use of Quantifiers, Quantifiers.	08
2.	Relations: Cartesian Products and Relations, Properties of relations, Computer Recognition: Zeros- One Matrices and Directed Graphs, Partial; orders: Hasse diagrams, Equivalence Relations and Partitions, Lattices.	08
3	Coding Theory: Elements of coding theory and Hamming Metric, generation of codes using Parity check and Generator matrices.	08
4.	Graph theory: Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex degree, Euler trail and circuits, Planar Graphs, Hamiltonian Paths and cycles.	08
5.	Trees: Definitions, Properties and Examples, Rooted trees, trees and sorting weighted trees and prefix Codes.	07

Text Books:

Sl. No.	Author/s	Title	Publisher Details
1	Ralph.P.Grimaldi, B.V.Ramana	Discrete and Combinatorial Mathematics	5 th Edition, Pearson Education -2009

Educate Elevate Enlighten

JSS Mahavidyapeetha
JSS Science And Technology University
(Established Under JSS Science and Technology University Act No. 43 of 2013)



Reference Books:

Sl. No	Author/s	Title	Publisher Details
1	Kenneth. H.Rosen	Discrete Mathematical Structures Theory and Application	V Edition, PHI/Pearson, Education, 2004
2	Kolman, Busby and Ross	Discrete Mathematical Structures	Fourth Edition, Prentice Hall of India Pvt Ltd-2009
3	Dr. D.S.Chandrashekar	Discrete Mathematical Structures	4 th Edition Prism Books Private Limited, 2013
4	Dr. S.K. Yadav	Discrete Mathematical Structures	Ane Books Pvt. Ltd

Web Resources:

Sl. No.	Web link
1	https://nptel.ac.in/courses/106/106/106106094/
2	https://nptel.ac.in/courses/106106183/

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand the concepts needed to test the logic of the program.
CO-2	Apply the knowledge of relations to determine various properties.
CO-3	Using the knowledge of coding theory, construct and decode group codes based on the various methods.
CO-4	Design different traversal methods for graph and trees.

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO-1	1	1	2	1	3	3	2	3	1	3	1	1	2	1	3	2
CO-2	1	1	2	1	1	3	2	3	2	3	1	1	2	1	3	2
CO-3	1	1	2	1	1	3	2	3	2	3	1	1	2	1	3	2
CO-4	1	1	2	1	1	3	2	3	2	3	1	1	2	1	3	2

Course Title: UNIVERSAL HUMAN VALUES	Course Code: 20HU311/20HU411
Credits (L: T:P): 2 : 0 : 0	Contact Hours Theory: 2 Hours
Type of Course: Lecture	Category: Professional Core Course
CIE Marks: 25 Marks	SEE Marks: 25 Marks

Pre-requisites: Students Induction Program (desirable).

Sl.No	Course Objectives
1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3	Strengthening of self-reflection.
4	Development of commitment and courage to act.

Unit No.	Course Content	No. of Hours
Unit -1	<p>Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I</p> <ol style="list-style-type: none"> 1. Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration 2. Continuous Happiness and Prosperity- A look at basic Human Aspirations 3. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority 4. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario 5. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. 	
UNIT-2	<p>Understanding Harmony in the Human Being - Harmony in Myself!</p> <ol style="list-style-type: none"> 1. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’ 2. Understanding the needs of Self(‘I’) and ‘Body’ - happiness and physical facility 3. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer) 	

	<ol style="list-style-type: none"> 4. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’ 5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health 	
UNIT-3	<p>Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</p> <ol style="list-style-type: none"> 1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship 2. Understanding the meaning of Trust; Difference between intention and competence 3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship 4. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals 5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. 	
UNIT-4	<p>Understanding Harmony in the Nature and Existence - Whole existence as Coexistence</p> <ol style="list-style-type: none"> 1. Understanding the harmony in the Nature 2. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature 3. Understanding Existence as Co-existence of mutually interacting units in all pervasive space Holistic perception of harmony at all levels of existence 	
UNIT-5	<p>Implications of the above Holistic Understanding of Harmony on Professional Ethics</p> <ol style="list-style-type: none"> 1. Natural acceptance of human values 2. Definitiveness of Ethical Human Conduct 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order 4. Competence in professional ethics: <ol style="list-style-type: none"> a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, b. Ability to identify and develop appropriate technologies and management patterns for above production systems. 5. Case studies of typical holistic technologies, management models and production systems 	

	6. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations 7. Sum up.	
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Text Books:

Sl. No.	Author/s	Title	Publisher Details
1	R R Gaur, R Sangal, G P Bagaria,	Human Values and Professional Ethics	Excel Books New Delhi, 2010

Reference Books:

Sl. No	Author/s	Title	Publisher Details
1.	Ek Parichaya, A Nagaraj	Jeevan Vidya	JeevanVidya Prakashan, Amarkantak, 1999
2.	A.N. Tripathi,	Human Values	New Age Intl. Publishers, New Delhi, 2004.
3.		The Story of Stuff (Book).	
4.	Mohandas Karamchand Gandhi	The Story of My Experiments with Truth	
5.	E. F Schumacher.	Small is Beautiful	
6.	Cecile Andrews	Slow is Beautiful	
7.	J C Kumarappa	Economy of Permanence	
8.	PanditSunderlal	Bharat Mein Angreji Raj	
9.	Dharampal	Rediscovering India	
10.	Mohandas K. Gandhi	Hind Swaraj or Indian Home Rule	
11.	Maulana Abdul Kalam Azad	India Wins Freedom	
12.	Vivekananda	Romain Rolland (English)	
13.	Gandhi	Romain Rolland (English)	

Course Outcomes: After completing this course, students should be able to:

CO-1	Become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, keeping human relationships and human nature in mind.
CO-1	Have better critical ability and also become sensitive to their commitment towards

Course Title: Data Structures Laboratory	Course Code: 20CS36L
Credits (L: T:P): 0:0:1.5	Contact Hours(L: T: P):0:0:39
Type of Course: Practical	Category: Professional Core Course
CIE Marks: 50	SEE Marks: 50

Pre-requisite: Knowledge of C programming

SL NO	Course Objectives:
1.	To gain knowledge in practical applications of data structures and to introduce various techniques for representation of the data in the real world.
2.	Strengthening the ability of the students to identify and apply the suitable data structure for the given real world problem.
3.	To develop skills to design and analyze simple linear and non linear data structures.

Lab Session No.	Course Content
1	<p>Define a structure called Student with the members: name, reg_no, marks in 3 tests and average_marks.</p> <p>Develop a menu driven program to perform the following by writing separate function for each operation: a) read information of N students b) display student's information c) to calculate the average of best two test marks of each student.</p> <p>Note: Illustrate the use of pointer to an array of structure and allocate memory dynamically using malloc () /calloc()/realloc().</p>
2	<p>Define a structure called Time containing 3 integer members (hour,minute,second). Develop a menu driven program to perform the following by writing separate function for each operation.</p> <p>a) To read time b) To display time c) To Update time d) Add two times by writing Add (T1, T2) which returns the new Time.</p> <p>Update function increments the time by one second and returns the new time (if the increment results in 60 seconds, then the second member is set to zero and minute member is incremented by one. If the result is 60 minutes, the minute member is set to zero and the hour member is incremented by one. Finally, when the hour becomes 24, Time should be reset to zero)</p> <p>Note: Illustrate the use of pointer to a structure variable and passing and returning of structure type to and from the function (both by value and reference).</p>
3	Develop a menu driven program to implement various operations on array storage representation with static and dynamic memory allocation.
4	Develop a menu driven program to implement singly linked list with various

	<p>operations such as</p> <ul style="list-style-type: none"> i) Insertion and Deletion at front/rear ii) Insertion and Deletion at the specified position iii) Delete by Key iv) Search by key v) Create an ordered list vi) Reverse a list vii) Creating a copy of the list
5	<p>Develop a menu driven program to implement Circular singly linked list with various operations such as</p> <ul style="list-style-type: none"> i) Insertion and Deletion at front/rear ii) Insertion and Deletion at the specified position iii) Delete by Key iv) Search by key v) Create an ordered list vi) Reverse a list vii) Creating a copy of the list
6	<p>Develop a menu driven program to implement Double linked list with various operations such as</p> <ul style="list-style-type: none"> i) Insertion and Deletion at front/rear ii) Insertion and Deletion at the specified position iii) Delete by Key iv) Search by key v) Create an ordered list vi) Reverse a list vii) Creating a copy of the list
7	<p>Develop a menu driven program to implement Circular Double linked list with Header node to perform various operations such as</p> <ul style="list-style-type: none"> i) Insertion and Deletion at front/rear ii) Insertion and Deletion at the specified position iii) Delete by Key iv) Search by key v) Create an ordered list vi) Reverse a list vii) Creating a copy of the list
8	<p>Develop a menu driven program to implement Stack with static and dynamic memory allocation mechanisms using array storage representation. (Represent Stack using structure)</p>
9	<p>Convert infix expression to postfix expression. Convert infix expression to prefix Evaluate the postfix expression.</p>
10	<p>Implement ordinary Queue with static and dynamic memory allocation mechanisms using array storage representation.(Represent Queue using structure) Implement Circular Queue with static and dynamic memory allocation mechanisms using array storage representation.(Represent Queue using structure)</p>

11	Implement Double Ended Queue with static and dynamic memory allocation mechanisms using array storage representation. (Represent Queue using structure) Implement Priority Queue with static and dynamic memory allocation mechanisms using array storage representation. (Represent Queue using structure)
12	Develop a menu driven program to implement binary search tree and traversal techniques. Develop a menu driven program to implement Graph traversal techniques.
13	Lab Test/Event

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Ellis Horowitz and Sartaj Sahni	Fundamentals of Data Structures in C	2 nd edition, Universities Press, 2014
2	Richard F. Gilberg and Behrooz A. Forouzan	Data structures, A Pseudo code Approach with C	2 nd Edition, Universities Press, 2014
3	Seymour Lipschutz	Data Structures	Schaum's Outlines, Revised 1st edition, McGraw Hill, 2014
4	Yedidyah, Augenstein, Tannenbaum	Data Structures Using C	First edition, Pearson Education, 2019.

Web References:

Sl. No.	Web link
1	https://nptel.ac.in/courses/106/105/106105085/
2	https://nptel.ac.in/courses/106/103/106103069/

Course Outcomes:

After completing this course, students should be able to:

CO-1	Apply advance C programming techniques such as pointers, dynamic memory allocation, structures to develop solutions for various problems.
CO-2	Design and implement different data structures such as, stack, queue, linked list, graph and tree using C as the programming language with static or dynamic allocation.
CO-3	Analyze, choose and apply appropriate data structure for implementing solutions for various practical problems.

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO-1	3	3	3	3	1	1	1	1	2	2	1	3	3	3	3	3
CO-2	3	3	3	3	1	1	1	1	2	2	1	3	3	3	3	3
CO-3	3	3	3	3	1	1	1	1	2	2	1	3	3	3	3	3

Course Title: Digital System Design Lab	Course Code: 20CS37L
Credits (L: T:P): 0:0:1.5	Contact Hours (L: T: P): 0:0:39
Type of Course: Practical	Category: Professional Core Course
CIE Marks: 50	SEE Marks: 50

Pre-requisite: NIL

Sl.No	Course Objectives:
1	Introduce the concept of digital and binary systems
2	Be able to design and analyze combinational logic circuits.
3	Be able to design and analyze sequential logic circuits.
4	Reinforce theory and techniques taught in the classroom through experiments

Weeks	Programs
1.	a. Study and verify the truth table of logic gates. b. Realize Basic Gates using Universal Gates. c. Simplify the given expression and realize it using gates.
2.	Design and realize a. Half Adder / Full Adder. b. Half Subtractor / Full Subtractor.
3.	Design and set up the following circuit using IC 7483. a. A 4-bit binary parallel adder. b. A 4-bit binary parallel subtractor.
4.	Design and realize the following using Basic gates & IC 7483. a. BCD to Excess- 3 Code b. Excess-3 to BCD Code
5.	Design and implement a. 4:1 Multiplexer (MUX) using only NAND gates. b. 8:1 Multiplexer (MUX).
6.	Half/Full Adder and Half/Full Subtractor using IC 74153.
7.	Design and implement One- & Two-Bit Magnitude Comparator.
8.	Design and implement a. Decoder circuit using basic gates and to verify using IC 74LS139. b. Half/Full Adder and Half/Full Subtractor using IC 74LS139.
9.	a. Design and implement 3-bit parity generator and verify using Parity Checker. b. Implementation and verification of truth table for J-K flip-flop, Master-slave J-K flip-flop, D flip-flop and T flip-flop.
10.	Design and implementation of Mod-N synchronous counter using J-K flip-flops.

11.	Design and implementation of shift register to function as i) SISO, ii) SIPO, iii) PISO, iv) PIPO, v) shift left and vi) shift right operation.
12.	a. Design and implementation of i) Ring counter and ii) Johnson counter using 4-bit shift register. b. Design and implementation of Decade Counters c. Design and implementation of Asynchronous Counters
13.	LAB INTERNALS

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Donald P Leach, Albert Paul Malvino & Goutam Saha	Digital Principles and Applications	8 th Edition, Tata McGraw Hill, 2015
2	M. Morris Mano	Digital Design	7 th Edition, Pearson Prentice Hall, 2016
3	D. P. Kothari and J. S Dhillon	Digital Circuits and Design	Pearson, 2016
4	Charles H Roth Jr., Larry L. Kinney	Fundamentals of Logic Design	Cengage Learning, 7 th Edition.

Web References:

Sl. No.	Web link
1	https://nptel.ac.in/courses/108/106/108106177/
2	https://nptel.ac.in/courses/117/105/117105080/

Course Outcomes: After completing this course, students should be able to:

CO-1	Demonstrate the truth table of various expressions and combinational circuits using logic gates.
CO-2	Design various combinational circuits such as adders, subtractors, comparators, multiplexers and demultiplexers.
CO-3	Construct flips-flops, counters and shift registers.

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO-1	3	3	3	1	3	1	1	1	3	2	2	2	3	1	1	1
CO-2	3	3	3	3	3	2	1	2	2	1	1	2	2	3	1	1
CO-3	3	3	3	3	3	1	1	2	2	2	2	2	3	3	1	1

Advanced Mathematics-I (Common to all branches)

Contact Hours/ Week	3L	Credits	000
Total Lecture Hours	39	CIE Marks	000
Total Tutorial Hours	000	SEE Marks	100
Sub Code	20MATDIP310	Semester	III

Prerequisites: Basics in differential calculus, Integral calculus and vectors.

Course Learning Objectives:

This course will enable students to master the basic tools of differential and vector calculus, infinite series and differential equations and become skilled for solving problems in science and engineering.

Unit No.	Course Content	No. of Hours
UNIT-I	Differential Calculus-I: Polar curves: angle between the radius vector and tangent, angle of intersection of polar curves. Pedal equation for polar curves. (Without proof)	8 Hours
UNIT-II	Differential Calculus –II: Indeterminate forms L’ Hospital Rule (without proof): $0 \times \infty, \infty - \infty, 0^0, \infty^0, 1^\infty$, Partial differentiation: Partial derivatives, Total derivatives-differentiation of composite functions.	8 Hours
UNIT-III	Vector Calculus: Vector Differentiation: scalar and vector fields, Gradient, directional derivative, divergence, curl-physical interpretation; solenoidal and irrotational vector fields-illustrative problems	8 Hours
UNIT-IV	Infinite Series: Convergence and divergence of infinite series-p-series test, comparison test and Cauchy’s root test (without proof)-Illustrative examples. Taylor’s and Maclaurin’s series expansions for one variable (statement only)-Problems.	8 Hours
UNIT-V	Differential Equations-I Solution of first order and first-degree differential equations: Linear differential equations and Bernoulli’s equation. Exact differential equations. Applications: Orthogonal trajectories (Cartesian form)	8 Hours

Text Books:

Sl. No.	Author/s	Title	Publisher Details
1	Erwin Kreyzig	Advanced Engineering Mathematics, 10 th edition	Wiley Publications, 2016.
2	B. S. Grewal	Higher Engineering Mathematics, 43 rd edition	Khanna Publications, 2015.

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Maurice D	Weir, Joel R. Hass and George B. Thomas, "Thomas' calculus: Early Transcendentals", 12 th edition	Pearson Education, 2016
2	Ramana. B.V	"Higher Engineering Mathematics", 11 th edition	Tata-McGraw Hill. 2010
3	C.Ray Wylie, Louis. C. Barrett	Advanced Engineering Mathematics", 6 th edition	Tata-McGraw Hill 2005.

Course outcomes: On completion of this course, students are able to:

CO-1	Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of the curve.
CO-2	Learn the notation of partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and applications.
CO-3	Illustrate the applications of multivariate calculus to understand the characteristics of vector field.
CO-4	Describe the convergence and divergence of infinite series and understand how a function of single variable can be expanded as a Taylor's series
CO-5	Apply the analytical methods to solve first order and first-degree differential equations and solve some Engineering problems