MVJCE CURRICULUM

FOR

COMPUTER SCIENCE & ENGINEERING (Scheme 2019)

III SEMESTER

Course Title	**DISCRETE MATHEMATICAL STRUCTURES AND** PROBABILITY	Semester	03
Course Code	MVJ19MCS31	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	**Exam Duration**	3 Hours

Course objective is to:

- Prepare for a background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science.
- Understand and apply logic, relations, functions, basic set theory, countability and counting arguments, proof techniques,
- Understand and apply mathematical induction, combinatorics, discrete probability, recursion, sequence and recurrence, elementary number theory
- Understand and apply graph theory and mathematical proof techniques.

Module–1	L1,L2, L3	**Hours 10**
Properties of the Integers: Mathematical Induction, The Well Ordering Principle Mathematical Induction, Recursive Definitions. Principles of Counting. **Fundamental Principles of Counting:** The Rules of Sum and Product, Permutations, Combinations The Binomial Theorem, Combinations with Repetition.		
Module–2	L1,L2, L3	**Hours 10**
The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements Nothing is in its Right Place, Rook Polynomials. **Recurrence Relations:** First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients.		
Module–3	L1,L2, L3	**Hours 10**
Probability Theory: Basic terminology, Definition of probability, Probability and set notations, Addition law of probability, independent events, conditional probability, multiplication law of probability, Baye's theorem.		
Module–4	L1,L2, L3	**Hours 10**
Probability Distributions: Random variables (discrete and continuous), probability mass/density functions. Binomial distribution, Poisson distribution. Exponential and normal distributions, problems. **Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient.		
Module–5	L1,L2, L3	**Hours 10**

Sampling Theory: Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t–distribution, Chi–square distribution as a test of goodness of fit. **Stochastic process:** Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability simple problems.

Course Outcomes:	
CO1	Demonstrate the application of discrete structures in different fields of computer science.
CO2	Solve problems using recurrence relations and generating functions.
CO3	Determine the nature of the events and hence calculate the appropriate probabilities of the events
CO4	Develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, information theory and design engineering.
CO5	Demonstrate testing of hypothesis of sampling distributions and illustrate examples of Markov chains related to discrete parameter stochastic process.

Text Books:	
1	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition,2013.
2	Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, , 5th Edition, PearsonEducation. 2004.

Reference Books:	
1	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw –Hill, 2006.
2	Bali N. P. & Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8th Edition
3	Basavaraj S Anami and Venakanna S Madalli: Discrete Mathematics A Concept based approach, Universities Press, 2016
4	Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests – Quizzes/mini tests (4 marks)

- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub–divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

CO–**PO/PSO Mapping**														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	0	3	0	0	0	0	0	0	1	1	3	2
CO2	2	3	0	3	0	0	0	0	0	0	1	1	2	-
CO3	2	3	0	3	0	0	0	0	0	0	1	1	2	-
CO4	3	3	0	3	0	0	0	0	0	0	1	1	1	-
CO5	3	3	0	3	0	0	0	0	0	0	1	1	1	-

High–3, Medium–2, Low–1

Course Title	**DATA STRUCTURES AND** APPLICATIONS	Semester	03
Course Code	MVJ19CS32	CIE	50
Total No. of Contact Hours	50	SEE	50

No. of Contact Hours/week	4 (L : T : P :: 3 : 2 : 0)	Total	100
Credits	4	**Exam. Duration**	3 Hours

Course objective is to: ***The Students will be able to***

- Identify the importance of data structures & memory allocation.
- Perform operations on stacks and queues and its applications.
- Apply the operations of linked list, Trees & Graphs in various applications.
- Apply searching and sorting operations in real time applications.

Module–1	L1,L2, L3	**Hours 10**

Introduction: Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Review of Arrays, Structures, Self–Referential Structures. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, Dynamically allocated arrays.

Abstract Data Type, Array Operations: Traversing, inserting, deleting, searching, and sorting**,**

Array ADT :Multidimensional Arrays, Polynomials and Sparse Matrices.

Strings: Basic Terminology, Storing, Operations and Pattern Matching algorithms. Programming Examples.

Laboratory Sessions/ Experimental learning:

1. Create an array of structure which has the following members Student name, Student USN, Marks1, Marks2, Marks3. Allocate memory to store 5 students details initially. When a new student details need to be entered or to be deleted in this array, dynamically change the array size. Write a program to implement this scenario and display the result.
2. Find the bug for the following code and then Debug it

```
int minval(int *A, int n) {
int currmin;
for (int i=0; i<n; i++)
 if (A[i] < currmin)
   currmin = A[i];
 return currmin;
}
```

3. Compile the following code and debug it.

```
#include <stdio.h>
#include <string.h>
struct student
{
```

```
    int id;
    char name[30];
    float percentage;
  };
 int main()
{
    int i;
    struct student record1 = {1, "Raju", 90.5};
    struct student *ptr;
      printf("Records of STUDENT1: \n");
      printf(" Id is: %d \n", ptr->id);
      printf(" Name is: %s \n", ptr->name);
      printf(" Percentage is: %f \n\n", ptr->percentage);
   return 0;
}
```

Real Time Applications: System memory allocation

Video link / Additional online information (related to module if any):

1. https://nptel.ac.in/courses/106106130/
2. https://nptel.ac.in/courses/106105085/
3. https://nptel.ac.in/courses/106/106/106106127/
4. https://www.coursera.org/lecture/data-structures/arrays-OsBSF

Module–2	L1,L2, L3	**Hours 10**

Stacks: Definition, Stack Operations, Stack ADT, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression.

Recursion – GCD, Tower of Hanoi.

Queues: Definition, Array Representation, Queue Operations, Queue ADT, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues. Programming Examples.

Laboratory Sessions/ Experimental learning:

Design, Develop and Implement a menu driven Program in C for the following operations on DEQUEUE of Integers (Array Implementation of Queue with maximum size MAX)

a. Insert an Element on to DEQUEUE
b. Delete an Element from DEQUEUE

c. Demonstrate Overflow and Underflow situations on DEQUEUE

d. Display the status of DEQUEUE

e. Exit Support the program with appropriate functions for each of the above operations

Real Time Applications: Game applications, Ticket booking applications (Eg: Train, restaurant etc)

Video link / Additional online information (related to module if any):

1. https://nptel.ac.in/courses/106106130/

2. https://nptel.ac.in/courses/106102064/

3. https://nptel.ac.in/courses/106105085/

4.https://nptel.ac.in/courses/106/106/106106127/

Module-3	L1,L2, L3	**Hours 10**

Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists Polynomials. Programming Examples

Hashing: Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.

Laboratory Sessions/ Experimental learning:

1. Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes a. Represent and Evaluate a Polynomial P(x,y,z) = 6x2 y 2 z−4yz5 +3x3 yz+2xy5 z−2xyz3 b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations

2. Debug the following code and explain the process

```
//Insert a value into an ordered linked list
void insert(lnode*& curr, int val) {
  if (curr == NULL)
    curr = new lnode(val, NULL);
  else if (lnode->val > val)
    curr = new lnode(val, curr->next);
  else {
    curr = curr->next;
    insert(curr, val);
  }
```

}

Real Time Applications: Music Player, Image Viewer, Web browser, Process Management, Mechanical field

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2. https://nptel.ac.in/courses/106102064/
3. https://nptel.ac.in/courses/106105085/

Module-4	L1,L2, L3	**Hours 10**

Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals – Inorder, postorder, preorder; Additional Binary tree operations. Threaded binary trees, Binary Search Trees Definition, Insertion, Deletion, Traversal, Searching, Application of Trees–Evaluation of Expression, AVL Trees, Splay Trees, B–Tree, Programming Examples

Laboratory Sessions/ Experimental learning:

Design, Develop and Implement a menu driven Program in C for the following operations on AVL Trees

i) Construct an AVL tree by inserting the following elements in the given order.
63, 9, 19, 27, 18, 108, 99, 81.

ii) searching for a node

iii)Deleting a node

Real Time Applications: Indexing in databases, Programming Languages, Computer chess games, Computer file system, Undo function in text editor, representing city region telehone network etc.

Video link:

1.https://nptel.ac.in/courses/106102064/

2.http://www.digimat.in/nptel/courses/video/106106127/L50.html

3.https://www.youtube.com/watch?v=ffgg_zmbaxw

Module-5	L1,L2, L3	**Hours 10**

Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search, Topological Sort.

Sorting and Searching: Quick sort,Insertion Sort, Radix sort, Merge Sort, Address Calculation Sort.

Laboratory Sessions/ Experimental learning:

Sort a given set of elements using the sorting Method which divides input array in two halves, calls itself for the two halves and then merges the two sorted halves" and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

Real Time Applications: Graph Theory, E–Commerce websites, Google Maps, Facebook

Video link:	
1.	https://www.youtube.com/watch?v=hk5rQs7TQ7E&feature=youtu.be
2.	https://nptel.ac.in/courses/106/102/106102064/
Course Outcomes:	
CO1	Identify the necessity of data structure and its storage process.
CO2	Analyse the various operations performed on stack and queues for different applications.
CO3	Perform various operations on linked list for different applications.
CO4	Learn Trees and its applications.
CO5	Analyse the concepts of Graphs, searching, sorting & hashing in real time.

Text Books:	
1.	Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2.	Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.
Reference Books:	
1.	Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
2.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C‖ 2nd Edition, Pearson Education,1997
3.	Gilberg & Forouzan, Data Structures: A Pseudo–code approach with C, 2nd Ed, Cengage Learning,2014.
4.	Jean–Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
5.	A M Tenenbaum, Data Structures using C, PHI, 1989
6.	Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.
7.	http://opendatastructures.org, https://donsheehy.github.io/datastructures

CIE Assessment:

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CO–**PO/PSO Mapping**														
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CO2	3	3	3	-	-	-	-	-	1	-	1	2	1	-
CO3	2	2	2	1	3	-	-	-	-	-	1	3	2	3
CO4	3	2	3	-	-	-	-	-	-	2	3	2	2	-
CO5	3	2	3	-	-	-	-	-	-	2	3	2	2	2

High–3, Medium–2, Low–1

Course Title	**OBJECT ORIENTED** PROGRAMMING	Semester	03
Course Code	MVJ19CS33	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3(L: T : P :: 3 : 0 : 0)	Total	100
Credits	3	**Exam. Duration**	3 Hours

Course objective is to: ***This course will enable students to***

- Identify the need for Java – an object oriented language. Set up Java JDK environment to create, debug and run simple Java programs.
- Illustrate the use of classes and distinguish the usage of different types of Inheritance and constructors in real world.
- Demonstrate the use of exceptions and to create multi–threaded programs
- Illustrate the use of Collections with elements in Java program.
- Develop Java Application using JDBC connectivity.

Module–1	L1,L2, L3	**Hours 8**
Prerequisites : Basic Knowledge about C or C++		

Introduction to Object Oriented Concepts and Java: Java's Magic: the Byte code; Java Development Kit (JDK); The Java Buzz words, Object Oriented Programming – Two Paradigms, Abstraction, The Three OOP Principles and its advantages, Simple Java programs. Data types, variables and arrays, Operators, Control Statements.

Laboratory Sessions/ Experimental learning:

A professor in college will allow a student to be excused from the final exam if either of the following is true:

- They have a 90% average or higher in the class and have missed 3 or less class lectures.
- They have a 80% average or higher in the class and have not missed any class lectures.

The program below will determine whether a student can get out of the exam or not. Rewrite the program so only one if statement is used.

Applications: Arrays in mathematical vectors, matrices.

Video link / Additional online information (related to module if any):

- Differences between JVM vs JRE vs JDK in Java:

https://www.youtube.com/watch?v=5Bp6GLU6HKE

Module–2	L2, L3	**Hours 8**

Classes, Inheritance, Packages and Interfaces: Classes fundamentals; Declaring objects; Assigning object reference variables; Introducing Methods, Constructors, this keyword, Finalize Method. Inheritance: Inheritance basics, using super, creating multi–level hierarchy ,when constructors are called, method overriding, using abstract classes. Packages, Access Protection, Importing Packages, Interfaces.

Laboratory Sessions/ Experimental learning:

Write a program that calculates the number of buckets of paint to use for a room and the optimal number of cans to purchase. You need to ask the height of the room and the length and width of the room. The room is rectangular. You must paint the walls and the ceiling but not the floor. There are no windows or skylights. You can purchase the following size buckets of paint.

- 5–liter bucket costs $15 each and covers 1500 square feet.
- 1–liter bucket costs $4 and covers 300 square feet.

Applications: Inheritance in Banking Sectors

Video link / Additional online information (related to module if any):

- Types of Inheritance: https://www.youtube.com/watch?v=ZP27c7i5zpg

Module–3	L2,L3,L4	**Hours 8**

Exception Handling and Multi–Threaded Programming : Exception Handling fundamentals, Exception Types, Uncaught Exceptions, Using try catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java's built–in exceptions, Programming Examples.

Multi–**Threaded Programming**: The java thread model, Main thread, Creating Thread, Creating

multiple threads, Using isAlive() and join(),Thread priorities, Synchronization; InterThread Communication – Bounded buffer problem.

Laboratory Sessions/ Experimental learning:

The Producer–Consumer problem describes two processes, the producer and the consumer, which share a common, fixed–size buffer used as a queue. The producer's job is to generate data, put it into the buffer, and start again.At the same time, the consumer is consuming the data (i.e. removing it from the buffer), one piece at a time.

Make sure that the producer won't try to add data into the buffer if it's full and that the consumer won't try to remove data from an empty buffer. Write a java code to get the solution for this multi–process synchronization problem.

Applications: Multithreads in Browsers, Servers

Video link / Additional online information (related to module if any):

- Multithreading : https://www.youtube.com/watch?v=O_Ojfq-OIpM

Module–4	L3,L4, L6	**Hours 8**

The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections.

Java Lambda expressions: Java Lambda expressions, Using Java Lambda expressions, Lambda expression vs method in java, Lambda expression in the array list.

Laboratory Sessions/ Experimental learning:

Write a Java program to iterate through all elements in a array list .

Write a Java program to create a new array list, add some colors (string) and print out the collection

Applications: Elements in group

Video link / Additional online information (related to module if any):

- https://www.youtube.com/watch?v=Q_9vV3H-dt4

Module–5	L4,L5, L6	**Hours 8**

JDBC: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.

Laboratory Sessions/ Experimental learning:

Develop Student Management System application with swings as the front end and database as the back end using JDBC connectivity.

Applications: Scientific Applications, Financial Applications

Video link / Additional online information (related to module if any):

- **Java JDBC :**https://www.youtube.com/watch?v=hEWBIJxrLBQ

Course Outcomes:

CO1	Illustrate the Object Oriented Programming concepts and basic characteristics of Java.
CO2	Demonstrate the principles of classes, inheritance, packages and interfaces.
CO3	Experiment with exception handling Mechanisms and Create multi–threaded programs.
CO4	Interpret the need for advanced Java concepts like collections in developing modular and efficient programs.
CO5	Develop an application with Database using JDBC connectivity.

Text Books:	
1.	Herbert Schildt, Java The Complete Reference, 7 /9th Edition, Tata McGraw Hill, 2007.
2.	Jim Keogh: J2EE–The Complete Reference, McGraw Hill, 2007.
Reference Books:	
1.	Effective Java, Third Edition, Joshua Bloch, Addison–Wesley Professional,2017
2.	Richard Warburton**,** Java 8 Lambdas: Pragmatic Functional Programming Kindle Edition.
3.	Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806
4.	Rajkumar Buyya , S Thamarasi selvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited.
5.	E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.

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CO–PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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CO3	3	3	1	2	-	-	-	-	-	1	-	3	2	3
CO4	3	3	3	3	-	-	-	2	2	2	-	3	2	-
CO5	3	3	3	3	-	-	2	2	3	2	-	3	2	3

High–3, Medium–2, Low–1

Course Title	**UNIX SHELL PROGRAMMING**	Semester	03
Course Code	MVJ19CS34	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	**Exam. Duration**	3 Hours

Course objective is to: ***The Students will be able to***

- Provide introduction to UNIX operating system and its File System.
- Gain an understanding of important aspects related to the shell and the process.
- Develop the ability to formulate regular expressions and use them for pattern matching.
- Provide a comprehensive introduction to Shell Programming, services and utilities.

Module–1	L1,L2	**Hours 8**

Introduction to UNIX and File system:

Introduction to file system. What are the different file systems?

Why UNIX? What is CLI, how is it different than a computer program. Why do programmers around the world prefer Linux as the OS? Inside UNIX, General features of a command, PATH, Internal and External commands, Command structure. The File System: The File, What's in a (File)name, The Parent–Child relationship, The UNIX File System – hierarchical directory structure (files, inodes), pwd, Absolute pathnames, cd, Relative pathnames, mkdir, rmdir, cp, rm, mv, cat, file.

File Attributes: ls, ls -l, ls -d, File Permissions, chmod, File systems and inodes, ln: Links, Hard links, Symbolic links, find.

Practical Exposure: Commands: ^C, ^D, ^U, ^S, ^Q in a Unix terminal window		
Module–2	L3	**Hours 8**
Shell and Process: What is a script? What are Shell scripts? **Free Course:** https://www.udemy.com/course/linux-shell-scripting-free/ **The Shell:** The shell as command processor, Pattern matching, Redirection, Pipes, Command substitution, Shell variables. **The Process:** Understanding the Process, How a process is created, The Login shell, init, Internal and External commands, ps, Running jobs in background, Signals, kill, Job control, cron. Make: Handling multisource C applications, A multisource application, make. **Flipped Classroom Session:** Escaping and quoting, Special Files, tee, nice, at and batch.		
Module–3	L3	**Hours 8**
Advanced Filters: pr: paginating files, head: displaying the beginning of the file, tail: displaying the end of the file, cut: slitting a file vertically, paste: pasting files, sort: ordering a file, uniq: locate repeated and non–repeated lines, tr: translating characters, displaying a word count list. Filters using Regular Expressions: grep and sed. Programming with awk: awk preliminaries, Splitting a line into fields, BEGIN and END sections, Built–in variables, Arrays, Functions, Control flow, Looping.		
Module–4	L2 & L3	**Hours 8**
Shell Programming: Shell Scripts, read: Making scripts interactive, Positional parameters, Exit status of command, Logical operators && and || – Conditional execution, exit status of a command, if conditional, using test to evaluate expression, case conditional, expr: Computation and String handling, Looping: using while, until and for. **Documentation by students (Assignment):** man documentation, General–Purpose Utilities.		
Module–5	L1,L2 & L3	**Hours 8**
Services and Utilities: The vi Editor: vi Preliminaries, Quitting vi The Last Line Mode, Inserting and Replacing Text, Saving Text, Exit to the UNIX Shell, The Repeat Factor, The Command Mode, Navigation, Operators, Deleting, Moving and Yanking Text, Changing Text(c and –), The Dot: Repeating the Last Command, Undoing Last Editing Instructions(u and U), String Search, Searching with Regular Expressions, Search and Replace (:s). ftp: File Transfer Protocol, The Mail Service, The Web Service. **Demonstration:** Web server setup and configuration; gdb.		
List of Practical Experiments/Hands–on :	L3	**Hours 10**
1. Practical Exposure: Commands: ^C, ^D, ^U, ^S, ^Q in a Unix terminal window 2. Free Course: https://www.udemy.com/course/linux-shell-scripting-free/		
Course Outcomes:		

CO1	Describe the architecture and features of the UNIX operating system and distinguish it from other operating systems.
CO2	Demonstrate UNIX commands for file handling and process control.
CO3	Construct regular expressions for pattern matching and apply them to various filters for a specific task .
CO4	Analyse a given problem and apply requisite facets of shell programming in order to devise a shell script to solve the problem.
CO5	Apply the services and utilities provided by the Unix Shell Programming for various software development needs .

Text Books:	
1.	Sumitabha Das: "YOUR UNIX – The Ultimate Guide", Tata McGraw Hill, 23rd reprint, 2012
2.	"Sumitabha Das: "UNIX – Concepts and Applications", 4th Edition, Tata McGraw Hill, Copyright ©2006
Reference Books:	
1.	Behrouz A. Forouzan and Richard F. Gilberg: "UNIX and Shell Programming", Cengage Learning, 2005.
2.	M.G. Venkateshmurthy: "UNIX & Shell Programming", Pearson Education, 2005.

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- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub–divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

CO–PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	1	-	2	-	-	2	-
CO2	2	1	2	1	-	1	-	1	-	2	-	1	2	1

CO3	2	3	3	2	-	1	-	1	-	1	-	2	2	1
CO4	2	3	2	3	-	1	1	1	-	-	1	2	2	1
CO5	2	2	3	3	-	1	2	1	2	-	1	2	-	1

High–3, Medium–2, Low–1

Course Title	**COMPUTER ORGANIZATION AND ARCHITECTURE**	Semester	03
Course Code	MVJ19CS35	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3(L: T : P :: 3 : 0 :0)	Total	100
Credits	3	**Exam. Duration**	3 Hours

Course objective is to:

- Learn the basic structure and operations of a computer.
- Learn the arithmetic and logic unit.
- Learn the different ways of communication with I/O devices & memories, memory hierarchies, cache memories and virtual memories.
- Understand & implement arithmetic process.
- Understand the processor and pipelining concepts.
- Understand parallelism and multi–core processors.

Module–1	L1,L2,L3	**Hours 8**

Basic Structure of Computers: Basic Operational Concepts, Bus Structures, Performance –Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement.

Machine Instructions and Programs: Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions.

Arithmetic: Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division.

Text book 1: Chapter 1 – 1.1 to 1.9,Chapter2 – 2.1 to 2.10

Text book 1: Chapter6 – 6.1 to 6.7

Laboratory Sessions/ Experimental learning: Study of peripherals, components of a Computer System

Applications: Basic Computer Devices **Video link :** https://nptel.ac.in/courses/106105163/		
Module–2	L1,L2,L3	**Hours 8**
Input/output Organization: Accessing I/O Devices, Interrupts Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces PCI Bus, SCSI Bus, USB **Text book 1: Chapter4 4.1 to 4.7** **Laboratory Sessions/ Experimental learning:** Design of ALU **Applications:** input /output operations Videolink:https://www.youtube.com/watch?v=RkAE4zE4uSE&list=PL13FD5F00C21BBC0B&index=11		
Module–3	L1,L2,L3	**Hours 8**
Memory: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories Types of cache ,Cache miss management Mapping Functions, Replacement Algorithms, Performance Considerations,(ARM Cache and Pentium cache). **Text book 1: Chapter5 5.1 to 5.4, 5.5** **Laboratory Sessions/ Experimental learning:**Design of Memory Applications: Different Types of Memory **Video link :** https://nptel.ac.in/courses/106105163/		
Module–4	L1,L2,L3	**Hours 8**
Processor : A Basic MIPS implementation Building a Data path Control Implementation Scheme Pipelining Pipelined data path and control Handling Data Hazards & Control Hazards Exceptions. **Text book 2: Chapter 4.** **Laboratory Sessions:** Instruction scheduling Applications: Types of processor **Video link:** https://nptel.ac.in/courses/106106166/		
Module–5	L1,L2,L3	**Hours 8**
Parallelism: Parallel processing challenges –Flynn's classification SISD, MIMD, SIMD, SPMD, and Vector Architectures – Hardware multithreading Multi–core processors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message–Passing Multiprocessors. **Text book 2: Chapter 6.** Laboratory Sessions : Process Scheduling **Applications:** Grid and Cloud Computing **Video link:** https://nptel.ac.in/courses/106102114/		

Course Outcomes:	
CO1	Explain the basic organization of a computer system.
CO2	Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.

CO3	Design and analyses simple arithmetic and logical units.
CO4	Illustrate hardwired control and micro programmed control, pipelining, embedded and other Computing systems.
CO5	Design and analyses of simple Parallelism and Multithread.

Text Books:	
1	Carl Hamacher, Zvonko Vranesic, SafwatZaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2002. (Listed topics only from Chapters 1, 2, 4, 5, and 6).
2	David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.(Listed topics only from Chapters 4and 6).

Reference Books:	
1	John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
2	John L. Hennessey and David A. Patterson, Computer Architecture A Quantitative Approach‖, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
3	http://vlabs.iitkgp.ac.in/coa/

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub–divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

CO–PO/PSO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	1	1	-	-	-	-	-	-	-	2	-
CO2	2	2	1	1	1	-	-	-	-	-	-	-	2	1
CO3	1	2	2	1	1	-	-	-	-	-	-	-	2	-
CO4	2	2	2	1	2	-	-	-	-	-	-	-	2	3
CO5	1	2	2	1	2	-	-	-	-	-	-	-	1	2

High–3, Medium–2, Low–1

Course Title	**ANALOG AND DIGITAL ELECTRONICS**	Semester	03
Course Code	MVJ19CS36/IS36	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	3(L : T : P :: 3 : 0 : 0)	Total	100
Credits	3	**Exam. Duration**	3 Hours

Course objective is to: ***The students will be able to***

- Analyse the working of oscillators and use of regulators.
- Make use of simplifying techniques in the design of combinational circuits.
- Illustrate combinational and sequential digital circuits.
- Demonstrate the use of flipflops and design registers and counters.
- Design and test Analog–to–Digital and Digital–to–Analog conversion techniques.

Module–1	L2	**Hours 8**

Prerequisites : Basic analog Circuits

Metal Oxide Semiconductor Field Effect transistor(MOSFET): Structure and I–V characteristics, MOSFET as a switch, MOSFET as an amplifier, CMOS and its applications.

Oscillators: Basic working and applications of RC Phase shift oscillator, Wien Bridge oscillator, LC oscillator, Colpitt oscillator, Crystal Oscillator.

Linear Power Supplies: Constituents of a Linear Power Supply, Designing Mains Transformer, Linear IC voltage regulators, Regulated Power Supply Parameters.

Module–2	L2, L3	**Hours 8**

Prerequisites : Digital Electronic Fundamentals

Karnaugh maps: Minimum forms of switching functions, two and three variable Karnaugh maps, four variable karnaugh maps, Quine–McClusky Method: determination of prime implicants, The prime implicant chart, petricks method, simplification of incompletely specified functions, simplification using map–entered variables

Activity: Writing and Analyzing C program for K–maps.

Module–3	L2, L3	**Hours 8**

Combinational Circuits: Multiplexer, Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU–Design and popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices,

Activity: Designing a 32–bit ALU

Module–4	L2, L3	**Hours 8**

Flip–**Flops and Registers:** **Flip Flops:** S–R,J–K,D and T flip flops,Edge–triggered JK FLIP–FLOPs 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. Counters: Asynchronous Counters, Decoding Gates, Synchronous Counters, Changing the Counter Modulus, Decade Counters, Applications of Counters. Activity: Implementing 2 digit counters using seven segment display		
Module–5	L2	**Hours 8**
D/A Conversion and A/D Conversion: **Digital to analog converters**: weighted resistor/converter, R–2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit. **Analog to digital converters:** quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D Converter ICs **Activity:** Demonstration of CODEC which houses both ADC and DAC.		
List of Practical Experiments/Hands–on :	L3	**Hours 10**
• Plotting the V–I characteristics of MOSFET • Implementing adders and subtarctors • Implementing the simplified equation obtained from K–maps and verify with the truth table		

Course Outcomes:	
CO1	Design and analyze analog circuits using transistors,power supply, MOSFETS, regulator IC and opamp.
CO2	Simplify digital circuits using Karnaugh Map , POS and Quine–McClusky Methods
CO3	Explain construction and working of data processing circuits
CO4	Understanding the various types of latches and flip flops and building the registers and counters using flip flops.
CO5	Explain the basic principles of A/D and D/A conversion circuits and develop the same.

Text Books:	
1	Anil K Maini, Varsha Agarwal, Electronic Devices and Circuits, Wiley, 2012.
2	Charles H Roth and Larry L Kinney, Fundamentals of Logic design, Cengage Learning,2019.

Reference Books:	
1	Donald P Leach, Albert Paul Malvino & Goutam Saha, Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015.

2	M. Morris Mani, Digital Design, 4th Edition, Pearson Prentice Hall, 2008.
3	David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
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SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub–divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

CO–PO/PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	1	2	-
CO2	3	3	2	2	-	-	-	-	-	-	-	1	2	-
CO3	3	3	3	2	-	-	-	-	-	-	-	1	2	-
CO4	3	3	2	2	-	-	-	-	-	-	-	1	2	-
CO5	3	3	3	2	-	-	-	-	-	-	-	1	1	2

High–3, Medium–2, Low–1

Course Title	DATA STRUCTURES AND APPLICATIONS LABORATORY	Semester	03
Course Code	MVJ19CSL37	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3(L : T : P :: 0 : 2 : 2)	Total	100
Credits	2	Exam. Duration	3 Hours

Course objective is to:

This course will enable students to get practical experience in design, develop, implement, analyze and evaluation of

- Linear data structures and their applications such as stacks, queues and lists,
  Non–Linear data structures and their applications such as Trees &Graphs
  Sorting and Hashing techniques

<table>
<tr><th>S No</th><th>Experiment Name</th><th>RBT Level</th><th>Hours</th></tr>
<tr><td>1</td><td>A courier company has number of items to be delivered to its intended customers through its salesman. The salesman visits the following cities to deliver the respective items. Write a C program,
<table>
<tr><td>S.No</td><td>Cities</td><td>Number of items</td></tr>
<tr><td>1</td><td>Agra</td><td>25</td></tr>
<tr><td>2</td><td>Chennai</td><td>50</td></tr>
<tr><td>3</td><td>Kolkata</td><td>59</td></tr>
<tr><td>4</td><td>Mumbai</td><td>72</td></tr>
<tr><td>5</td><td>Delhi</td><td>12</td></tr>
</table>
a) To display name of cities where salesman has delivered maximum and minimum number of items
b) To search the number of items to be delivered of a user supplied city.</td><td>L3</td><td>3</td></tr>
<tr><td>2</td><td>Implement Knuth–Morris– Pratt pattern matching algorithm using C program.</td><td>L3</td><td>3</td></tr>
<tr><td>3</td><td>Design, Develop and Implement a menu driven Program in C with the listed operations for the data structure which follows Last In First Out (LIFO) order. (Use Array Implementation of specified DS with maximum size MAX).
a. Push an Element
b. Pop an Element
c. Demonstrate how it can be used to check Palindrome
d. Demonstrate Overflow and Underflow situations
e. Display the status</td><td>L3</td><td>3</td></tr>
</table>

	f. Exit Support the program with appropriate functions for each of the above operations		
4	Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, −, *, /, % (Remainder), ^ (Power) and alphanumeric operands.	L3	3
5	Design, Develop and Implement a menu driven Program in C for the following operations on Ring Buffer of Integers (Use Array Implementation) a. Insert an Element on to Ring Buffer b. Delete an Element from Ring Buffer c. Demonstrate Overflow and Underflow situations on Ring Buffer d. Display the status of Ring Buffer e. Exit Support the program with appropriate functions for each of the above operations	L3	3
6	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Programme, Sem, PhNo a. Create a SLL of N Students Data by using front insertion b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL e. Exit	L3	3
7	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo. a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it. c. Perform Insertion and Deletion at End of DLL . d. Perform Insertion and Deletion at Front of DLL . e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit	L3	3

8	Design, Develop and Implement a menu driven C Program for the following operations on Binary Search Tree (BST) of Integers. a) Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2. b) Traverse the BST recursively in inorder, preorder & postorder c) Search the BST for a given element (KEY) and report the appropriate message	L3	3
9	Design, Develop and Implement a Program in C for the following operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method	L3	3
10	Develop a C program to sort a given set of n integer elements using Quick Sort method. Run the program for varied values of n and show the results of each iteration.	L3	3
11	Given a File of N employee records with a set K of Keys(4−digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table(HT) of m memory locations with L as the set of memory addresses (2− digit) of locations in HT. Let the keys in K and addresses in L are Integers. Design and develop a Program in C that uses Hash function H: K→L as H(K)=K mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.	L3	3

Course Outcomes:	
CO1	Analyze and Compare various linear data structures.
CO2	Code, debug and demonstrate the working nature of different types of data structures and their applications.
CO3	Implement, analyse and evaluate the searching and sorting algorithms.
CO4	Choose the appropriate data structure for solving real world problems.

Reference Books:	
1.	A M Tenenbaum, Data Structures using C, PHI, 1989

2.	Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.
3.	http://opendatastructures.org, https://donsheehy.github.io/datastructures

CIE Assessment:
Regular Lab work :20 Record writing :5 Lab Tests(Minimum 2 tests shall be conducted for 15 marks and average of two will be taken) Viva 10 marks
SEE Assessment:
Examinations will be conducted for 100 marks and scaled-down to 50. The weightage shall be, i. Writeup : 20 marks ii. Conduction : 40 marks iii. Analysis of results : 20 marks iv. Viva : 20

CO-**PO/PSO Mapping**														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	3	3	-	-	3	-	3	2	1	-
CO2	3	3	2	-	3	3	-	-	3	-	3	2	1	2
CO3	3	3	2	-	3	3	-	-	3	-	3	2	2	3
CO4	3	3	2	-	3	3	-	-	3	-	3	2	2	2

High-3, Medium-2, Low-1

Course Title	**ANALOG AND DIGITAL ELECTRONICS LAB**	Semester	03
Course Code	MVJ19CSL38	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3(L : T : P :: 0 : 2 : 2)	Total	100
Credits	2	**Exam. Duration**	3 Hours

Course objective is to: ***The Students will be able to***

- Analog components and circuits including transistor, regulator, etc.
- Combinational logic circuits.
- Flip – Flops and their operations
- Counters and Registers using Flip-flops.

• Synchronous and Asynchronous Sequential Circuits			
S No	**Experiment Name**	**RBT Level**	Hours
1.	Study of transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.	L2	3
2.	Design and test IC 723 voltage regulator	L3	3
3.	Given a 4–variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC.	L2	3
4.	Design and implement a faster way3 to add binary numbers using carry look ahead adders.	L3	3
5.	a) Realization and implementation of 2–bit comparator using logic gates. b) Implementation of 4–bit magnitude comparator using IC 7485.	L2	3
6.	To design and construct basic flip–flops R–S ,J–K,J–K Master slave flip–flops using gates and verify their truth table	L3	3
7.	Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops	L2	3
8.	Design and implementation of 3–bit synchronous up/down counter	L3	3
9.	Design and implement a ring counter and Johnson counter using 4–bit shift register and demonstrate its working.	L2	3
10	Design and implement a mod–n (n<8) synchronous up counter using J–K Flip–Flop ICs and demonstrate its working.	L3	3
11	Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate on 7–segment display (using IC–7447).	L2	3
12	Design 4 bit r–2r ladder DAC using opamp.	L3	3

Course Outcomes:	
CO1	Demonstrate various Electronic Devices like Cathode ray Oscilloscope, Signal generators, Digital Trainer Kit, Multimeters and components like Resistors, Capacitors, Op amp and Integrated Circuit
CO2	Examine and verify different analog circuits.
CO3	Design and demonstrate various combinational logic circuits.

CO4	Design and demonstrate various types of counters and Registers using Flip–flops
CO5	Design and demonstrate the working of DAC.

Reference Books:	
1.	Donald P Leach, Albert Paul Malvino & Goutam Saha, Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015.
2.	M. Morris Mani, Digital Design, 4th Edition, Pearson Prentice Hall, 2008.

CIE Assessment:
Regular Lab work :20 Record writing :5 Lab Tests(Minimum 2 tests shall be conducted for 15 marks and average of two will be taken) Viva 10 marks
SEE Assessment:
Examinations will be conducted for 100 marks and scaled–down to 50. The weightage shall be, i. Writeup : 20 marks ii. Conduction : 40 marks iii. Analysis of results : 20 marks iv. Viva : 20

CO–**PO/PSO Mapping**														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	-	2	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-	1	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-	2	1
CO4	3	3	2	2	-	-	-	-	-	-	-	-	2	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-	1	2

High–3, Medium–2, Low–1

Course Title	**CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW**	Semester	IV
Course Code	MVJ19CPH39/49	CIE	50
Total No. of Contact Hours	20	SEE	50
No. of Contact Hours/week	01 (L : T : P :: 1 :0 : 0)	Total	100
Credits	01	**Exam. Duration**	2 hrs

Course objective is to:

- To know the fundamental political codes, structure, procedures, powers, and duties of Indian constitution, Indian government institutions, fundamental rights, directive principles and the duties of the citizens.
- To provide overall legal literacy to the young technocrats to manage complex societal issues in the present scenario.
- To understand engineering ethics & their responsibilities, identify their individual roles and

ethical responsibilities towards society.		
Module–1	L1,L2,L3	03 Hours
Introduction to Indian Constitution The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian Constitution, The Making of the Constitution, The role of the Constituent Assembly Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and Limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and Significance in Nation Building.		
Module II	L1,L2,L3	03 Hours
Union Executive and State Executive Parliamentary System, Federal System, Centre–State Relations. Union Executive President, Prime Minister, Union Cabinet, Parliament – LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Article 370, 371, 371J) for some States.		
Module III	L1,L2,L3	03 Hours
Elections, Amendments and Emergency Provisions Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments – Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments 7,9,10,12,42,44,61,73,74,75,86, and 91,94,95,100,101,118 and some important Case Studies. Recent Amendments with explanation. Important Judgements with Explanation and its impact on society (from the list of Supreme Court Judgements). Emergency Provisions, types of Emergencies and it's consequences. Constitutional **Special Provisions:** Special Constitutional Provisions for SC & ST, OBC, Special Provision for Women, Children & Backward Classes.		
Module IV	L1,L2,L3	03 Hours
Professional / Engineering Ethics Scope & Aims of Engineering & Professional Ethics – Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of		

Ethics as defined in the website of Institution of Engineers (India) : Profession, Professionalism, Professional Responsibility. Clash of Ethics, Conflicts of Interest. **Responsibilities in Engineering** – Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.		
Module V	L1,L2,L3	03 Hours
Internet Laws, Cyber Crimes and Cyber Laws: Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship, Cybercrimes and enforcement agencies.		

Course Outcomes: On completion of this course, students will be able to	
CO1	Have constitutional knowledge and legal literacy
CO2	Understand Engineering and Professional ethics and responsibilities of Engineers.
CO3	Understand the cyber crimes and cyber laws for cyber safety measure.

Text Books:	
1.	Constitution of India and Professional Ethics, T.S. Anupama, Sunstar Publisher
Reference Books:	
1.	Durga Das Basu (DD Basu): "Introduction to the Constitution on India", (Students Edition.) Prentice Hall EEE, 19th/20th Edn., (Latest Edition) or 2008.
2.	Shubham Singles, Charles E. Haries, and Et al : "Constitution of India and Professional Ethics" by Cengage Learning India Private Limited, Latest Edition 2018.
3	M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall of India Pvt. Ltd. New Delhi, 2004.
4.	M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
5.	Latest Publications of NHRC – Indian Institute of Human Rights, New Delhi.

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests - Quizzes/mini tests (4 marks) - Mini Project / Case Studies (8 Marks)

– Activities/Experimentations related to courses (8 Marks)
SEE Assessment:
i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub–divisions, each carrying 16 marks. Students have to answer five full questions. iii. One question must be set from each unit. The duration of examination is 3 hours.

Course Title	**ADDITIONAL MATHEMATICS–I**	Semester	IV
Course Code	MVJ19MATDIP31	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 0 : 0)	Total	100
Credits	-	**Exam. Duration**	3 HOURS

Course objective is to: ***This course aims to prepare the students***: To familiarize the important and basic concepts of Differential calculus and Differential Equation, ordinary/partial differential equations and Vector calculus and analyse the engineering problems.		
Module–1	L1,L2	8 Hrs.
Differential calculus: Recapitulation of successive differentiation –nth derivative –Leibnitz theorem and Problems, Taylor's and Maclaurin's theorem for function of one variable. **Video Link:** https://users.math.msu.edu/users/gnagy/teaching/ode.pdf		
Module–2	L1,L2	8 Hrs.
Integral Calculus: Review of elementary Integral calculus, Reduction formula		

$\int_0^{\frac{\pi}{2}} \sin^m x\,dx$ $\int_0^{\frac{\pi}{2}} \cos^m x\,dx$ $\int_0^{\frac{\pi}{2}} \sin^m \cos^n x\,dx$ and problems. Evaluation of double and triple integrals and Simple Problems. **Video Link** • https://www.youtube.com/watch?v=rCWOdfQ3cwQ • https://nptel.ac.in/courses/111/105/111105122/		
Module-3	L1,L2	8 Hrs.
Vector Calculus: Derivative of vector valued functions, Velocity, Acceleration and related problems, Scalar and Vector point functions, Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields. Vector identities-div(Φ A), curl (ΦA), curl(grad), div(curl A) **Video Links:** • https://www.whitman.edu/mathematics/calculus_online/chapter16.html • https://www.math.ust.hk/~machas/vector-calculus-for-engineers.pdf		
Module-4	L1,L2,L3	8 Hrs.
Probability: Introduction – Conditional Probability, Multiplication theorem, Independent events, Baye's theorem and Problems **Video Links:** • https://www.khanacademy.org/math/statistics-probability/probability-library • https://nptel.ac.in/courses/111/105/111105041/		
Module-5	L1,L2,L3	8 Hrs.
Differential equation: Homogeneous differential equation, Linear differential equation, Bernoulli's differential equation and Exact differential equation. **Video Link:** https://www.mathsisfun.com/calculus/differential-equations.html		
Course Outcomes:		
CO1	Apply the knowledge of Differential calculus in the modeling of various physical and engineering phenomena	
CO2	Apply the concept of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.	
CO3	Study on Vector calculus to understand the various solution of the Application to Engineering problems.	

CO4	Understand the basic Concepts of Probability
CO5	Solve first order linear differential equation analytically using standard methods.

Text Books:	
1.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
2.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.

Reference Books:	
1.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10thedition,2014.
2.	G. B. Gururajachar: Calculus and Linear Algebra, Academic Excellent Series Publication, 2018-19

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (10 marks)
- Assignment (10 marks)

SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

CO-**PO Mapping**												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	-	-	-	-	-	1	1
CO2	2	3	-	3	-	-	-	-	-	-	1	1
CO3	2	2	-	2	-	-	-	-	-	-	1	-
CO4	3	2	-	3	-	-	-	-	-	-	-	1
CO5	3	3	-	2	-	-	-	-	-	-	-	-

High-3, Medium-2, Low-1