III SEMESTER

Course Title	**DISCRETE MATHEMATICAL STRUCTURES AND PROBABILITY**	**Semester**	03
Course Code	MVJ20MCS31/IS31	**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 mathematical induction, combinatorics, discrete probability, sequence and recurrence, elementary number theory.
- Understand and apply probability distribution, sampling theory and joint probability distributions.

Module-1	L1,L2 & L3	**10 Hrs.**

Properties of the Integers: The Well Ordering Principle – Mathematical Induction.

Principles of Counting: Fundamental Principles of Counting, The Rules of Sumand Product, Permutations, Combinations – The Binomial and Multinomial Theorem, Combinations with Repetition.

Application: Distribution with repetition.

Video Link:

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

Module-2	L1,L2 & L3	**10 Hrs.**

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.

Application: Arrangement with forbidden position.

Video Link:

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

Module-3	L1,L2 & L3	**10 Hrs.**

Relations: Cartesian Products, Relations, Properties of Relations, Equivalence Relations. Zero-One Matrices and Directed Graphs. Partial Orders–Hasse Diagrams and extreme elements.

Functions: Plain and One to One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions.

Application: Zero-one matrix and Hasse diagram

Video Link:

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

Module-4	L1,L2 & L3	**10 Hrs.**

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.

Application: Finding correlation between random variables.

Video Link:

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

Module-5	L1,L2 & L3	**10 Hrs.**

Sampling Theory: Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t-distribution and Chi-square distribution

Coding Theory: Coding of binary information and error detection.

Application: Testing the level of significance & the goodness of fit for large sample and small sample.

Video Link:

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

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	Solving logical problem using concepts of relations and functions.
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.

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	-	3	-	-	-	-	-	-	1	1	2	-
CO2	2	3	-	3	-	-	-	-	-	-	1	1	1	-
CO3	2	3	-	3	-	-	-	-	-	-	1	1	2	3
CO4	3	3	-	3	-	-	-	-	-	-	1	1	2	-
CO5	3	3	-	3	-	-	-	-	-	-	1	1	2	2

High-3, Medium-2, Low-1

Course Title	**DATA STRUCTURES AND APPLICATIONS**	**Semester**	03
Course Code	MVJ20AM32/MVJ20CS32	**CIE**	50
Total No. of Contact Hours	50	**SEE**	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 1 : 0)	**Total**	100
Credits	4	**Exam. Duration**	3 Hours

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

- https://nptel.ac.in/courses/106106130/
- https://nptel.ac.in/courses/106102064/
- https://nptel.ac.in/courses/106105085/
- 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

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

- https://nptel.ac.in/courses/106106130/
- https://nptel.ac.in/courses/106102064/
- 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:

- https://nptel.ac.in/courses/106102064/
- http://www.digimat.in/nptel/courses/video/106106127/L50.html
- 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, Face book

Video link:

• https://www.youtube.com/watch?v=hk5rQs7TQ7E&feature=youtu.be • 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.

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	-	-	-	1	-	-	-	-	-	-	2	2	-
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	**SOFTWARE ENGINEERING**	**Semester**	03
Course Code	MVJ20AM33	**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***

- Understand principles, concepts, methods, and techniques of the software engineering approach to producing quality software (particularly for large, complex systems).
- Impart skills in the design and implementation of efficient software systems across disciplines.
- Familiarize engineering practices and standards used in developing software products and components.
- Gather knowledge on various software testing, maintenance methods.

Module-1	L1,L2, L3	**Hours 8**

INTRODUCTION TO SOFTWARE ENGINEERING: The Evolving nature of software engineering, Changing nature of software engineering, Software engineering Layers, The Software Processes, Software Myths.

PROCESS MODELS: A Generic Process Model, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Spiral Model, the Unified Process, Personal and Team Process Models, the Capability Maturity Model Integration (CMMI).

Laboratory Sessions/ Experimental learning:

To write the SRS for the given real time application using report writing tools.

Applications: In Software development process.

Video link / Additional online information: https://nptel.ac.in/courses/106105182/

Module-2	L1,L2, L3	**Hours 8**

REQUIREMENTS ENGINEERING: Functional and Non-Functional Requirements, The Software requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management, System Modeling: Context Models, Interaction Models, Structural Models, Behavioral Model, Model-Driven Engineering.

DESIGN CONCEPTS: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles.

Applications: In Software development process.

Video link / Additional online information:

• https://www.coursera.org/lecture/client-needs-and-software-requirements/3-2-4-use-cases-bZNCr		
Module-3	L1,L2, L3	**Hours 8**
DESIGN AND IMPLEMENTATION: The Object Oriented Design with UML, Design Patterns, Implementation Issues, Open Source Development. User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation. **SOFTWARE TESTING STRATEGIES:** A Strategic approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing. **Laboratory Sessions/ Experimental learning:** Using Selenium IDE write a test suite containing minimum 4 test cases. **Applications:** In Software development process. **Video link / Additional online information:** https://www.youtube.com/watch?v=T3q6QcCQZQg		
Module-4	L1,L2, L3	**Hours 8**
PRODUCT METRICS: A Frame Work for Product Metrics, Metrics for the Requirements Model, Metrics for Design Model, Metrics for Source Code, Metrics for Testing. **PROCESS AND PROJECT METRICES:** Metrics in the Process and Project Domains, Software Measurements, Metrics for Software Quality, Risk Management: Risk verses Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinements, Risk Mitigation Monitoring and Management (RMMM), The RMMM Plan. **Laboratory Sessions/ Experimental learning:** Create a project using MS projects for any real time scenario. **Applications:** In Software development process. **Video link / Additional online information:** https://youtu.be/tIZ1dg4pxCE		
Module-5	L1,L2, L3	**Hours 8**
QUALITY MANAGEMENT: Quality Concepts, Software Quality, Software Quality Dilemma, Achieving Software Quality, Review Techniques, Reviews: A Formal spectrum, Informal Reviews, Formal Technical Reviews, **SOFTWARE QUALITY ASSURANCE:** Background Issues, Elements of Software Quality Assurance, Tasks, Goals and Metrics, Software Reliability, the ISO 9000 Quality Standards. **Laboratory Sessions/ Experimental learning:** Estimation of test coverage metrics using manual test metrics. **Applications:** In Software development process. **Video link / Additional online information:** https://nptel.ac.in/courses/110105039/		
Course Outcomes:		
CO1	Understand various Process Models.	
CO2	Investigate various requirements engineering and apply design concepts.	
CO3	Identify numerous Software Testing Strategies.	

CO4	Evaluate Process and Project Metrices.
CO5	Illustrate Quality Management and Software Quality Assurance Concepts

Text Books:	
1	Roger S. Pressman (2011), Software Engineering, A Practitioner's approach, 7 th edition, McGraw Hill International Edition, New Delhi
2	Sommerville (2001), Software Engineering, 9 th edition, Pearson education, India
Reference Books:	
1	K. K. Agarval, Yogesh Singh (2007), Software Engineering, 3rd edition, New Age International Publishers, India.
2	Lames F. Peters, Witold Pedrycz(2000), Software Engineering an Engineering approach, John Wiely & Sons, New Delhi, India
3	Shely Cashman Rosenblatt (2006), Systems Analysis and Design, 6th edition, Thomson Publications, India

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	2	2	2	2	2	-	-	1	2	2	2	-	2	-

CO2	2	2	2	2	2	1	-	1	2	2	2	1	2	2
CO3	2	2	2	2	2	1	-	1	2	2	2	-	3	-
CO4	1	2	2	2	2	1	-	1	2	2	2	1	2	2
CO5	1	2	2	1	2	1	2	1	2	2	2	2	1	-

High-3, Medium-2, Low-1

Course Title	**OPERATING SYSTEMS**	**Semester**	03
Course Code	MVJ20AM34/MVJ20CS34	**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***

- Introduce concepts and terminology used in OS.
- Explain threading and multithreaded systems.
- Illustrate process synchronization and concept of Deadlock.

• Introduce Memory and Virtual memory management, File system and storage techniques.		
Module-1	L1,L2, L3	**Hours 8**
Introduction: What operating systems do; Computer System organization; Computer System architecture; Operating System operations; Distributed system; Special-purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; System boot. **Process Management**: Process concept; Process scheduling; Operations on processes; Inter process communication.		
Module-2	L1,L2, L3	**Hours 8**
Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling. **Process Synchronization**: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.		
Module-3	L1,L2, L3	**Hours 8**
Deadlocks : Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Memory Management**: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation		
Module-4	L1,L2, L3	**Hours 8**
Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. **File System, Implementation of File System**: File system: File concept; Access methods; Directory structure; File system mounting; File sharing; **Implementing File system**: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.		
Module-5	L1,L2, L3	**Hours 8**
Mass Storage Structure-Disk Structure - Disk Attachment-Disk Scheduling-Disk Management- Swap-Space Management. **Protection**: Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability- Based systems. **Case Studies:** Windows, Unix, Linux, Android.		
Course Outcomes:		

CO1	Illustrate the fundamental concepts of operating systems
CO2	Compare and illustrate various process scheduling algorithms.
CO3	Ability to recognize and resolve Deadlock problems, Memory Management techniques.
CO4	Apply appropriate memory and file management schemes.
CO5	Appreciate the need of access control and protection in Operating System and illustrate various disk scheduling algorithms.

Text Books:	
1	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts 7th edition,Wiley-India, 2006
2	D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.

Reference Books:	
1	Tanenbaum, A., "Modern Operating Systems", Prentice-Hall of India. 2004
2	P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition,Prentice-Hall of India.

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	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	2	3	-	-	-	-	-	-	-	-	-	3	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-	2	2
CO5	3	2	3	-	-	-	-	-	-	-	-	-	2	-

High-3, Medium-2, Low-1

Course Title	**COMPUTER ORGANIZATION AND ARCHITECTURE**	**Semester**	03
Course Code	MVJ20AM35/MVJ20CS35	**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***

- 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: 0.**Study of peripherals, components of a Computer System **Applications:** Basic Computer Devices **Video link :** https://nptel.ac.in/courses/106105163/		
Module-2	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**	III
Course Code	MVJ20AM36/MVJ20CS36	**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***

- 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 flip flops and design registers and counters.
- Design and test Analog-to-Digital and Digital-to-Analog conversion techniques.

Module-1	L2	**8 Hrs**.

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	**8 Hrs.**

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	**8 Hrs.**
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	**8 Hrs.**
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	**8 Hrs.**
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.		
Laboratory Sessions		
• Plotting the V-I characteristics of MOSFET • Implementing adders and subtracters • 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)
- 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	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	MVJ20AML37/MVJ20CSL37	**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 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</td><td>L3</td><td>3</td></tr>
</table>

	b. Pop an Element c. Demonstrate how it can be used to check Palindrome d. Demonstrate Overflow and Underflow situations e. Display the status 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 .	**L3**	**3**

	e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit		
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 LABORATORY**	**Semester**	03
Course Code	MVJ20AML38/MVJ20CSL38	**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***			

- 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.	**L3**	**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	**L3**	**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.	**L3**	**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).	**L3**	**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.
3.	David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 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

0

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	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-	1	2
CO3	3	3	3	2	-	-	-	-	-	-	-	-	2	3
CO4	3	3	2	2	-	-	-	-	-	-	-	-	2	2

High-3, Medium-2, Low-1

Course Title	**CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW**	**Semester**	IV
Course Code	MVJ20CPH39/49	**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**	III
Course Code	MVJ20MATDIP31	**CIE**	50
Total No. of Contact Hours	40	**SEE**	50
No. of Contact Hours/week	4	**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(φA), curl (φA), curl(grad φ), 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

Course Title	**UNIVERSAL HUMAN VALUES I**	**Semester**	III
Course Code	MVJ20UHV310	**CIE**	50
Total No. of Contact Hours	15	**SEE**	50

No. of Contact Hours/week	1 (L: T : P :1 : 0 :0)	**Total**	100
Credits	1	**Exam. Duration**	3 Hrs.

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

- Perceive the need for developing a holistic perspective of life
- Sensitise the scope of life – individual, family (inter-personal relationship), society and nature/existence, Strengthening self-reflection
- Develop more confidence and commitment to understand, learn and act accordingly

Module-1	L1,L2	**3 Hrs**

Welcome and Introductions: Getting to know each other (Self-exploration)

Aspirations and Concerns: Individual academic, career, Expectations of family, peers, society, nation, Fixing one's goals (Basic human aspirations Need for a holistic perspective Role of UHV)

Self-Management: Self-confidence, peer pressure, time management, anger, stress, Personality development, self-improvement (Harmony in the human Being)

Health: Health issues, healthy diet, healthy lifestyle, Hostel life (Harmony of the Self and Body Mental and physical health)

Relationships: Home sickness, gratitude, towards parents, teachers and, others Ragging and interaction, Competition and cooperation, Peer pressure (Harmony in relationship Feelings of trust, respect, gratitude, glory, love)

Society: Participation in society (Harmony in the society)

Natural Environment: Participation in nature (Harmony in nature/existence)

Video link:

- https://youtube.com/playlist?list=PLYwzG2fd7hzc4HerTNkc3pS_IvcCfKznV
- https://youtube.com/playlist?list=PLYwzG2fd7hzcZz1DkrAegkKF4TseekPFv

Presentation: https://fdp-si.aicte-india.org/AicteSipUHV_download.php

Module-2	L1,L2	**3 Hrs**

Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Self-exploration as the Process for Value Education, Happiness and Prosperity – Current Scenario.

Video link:

- https://www.youtube.com/watch?v=85XCw8SU084
- https://www.youtube.com/watch?v=E1STJoXCXUU&list=PLWDeKF97v9SP_Kt6jqzA3p

Z3yA7g_OAQz • https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-3	L1,L2	**3 Hrs**
Introduction to Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, The Body as an Instrument of the Self, Harmony of the Self with the Body. **Video link:** • https://www.youtube.com/watch?v=GpuZo495F24 • https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-4	L1,L2	**3 Hrs**
Introduction to Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society. **Video link:** • https://www.youtube.com/watch?v=F2KVW4WNnS8 • https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-5	L1,L2	**3 Hrs**
Intr-oduction to Implications of the Holistic Understanding: Natural Acceptance of Human Values,Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Holistic Technologies, Production Systems and Management Models-Typical Case Studies. **Video link:** • https://www.youtube.com/watch?v=BikdYub6RY0 • https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		

Course Outcomes: On completion of the course, students would be able to

CO1	Develop a holistic perspective about life
CO2	Explore his/her role (value) in all aspects of living – as an individual, as a member of a family, as a part of the society as an unit in nature
CO3	Become more responsible in life, and in handling problems with sustainable solutions
CO4	Have better critical ability
CO5	Become sensitive to their commitment

Text Books:

1.	AICTE SIP UHV-I Teaching Material, https://fdp-si.aicte india.org/ AicteSipUHV _download.php

2.	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
3.	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
Reference Books:	
1.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4.	The Story of Stuff (Book).
5.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

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	2	3	2	1	2	1	2	-
CO2	-	1	-	-	-	2	2	3	2	1	2	1	2	-
CO3	-	1	-	-	-	2	2	3	2	1	2	1	2	2
CO4	-	1	-	-	-	2	2	3	2	1	2	1	3	2
CO5	-	1	-	-	-	2	2	3	2	1	2	1	3	3

High-3, Medium-2, Low-1