Course Title	Discrete Math & Probability Theory	Semester	III
Course Code	MVJ20MCD31	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 2 : 2 : 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	8Hours

Properties of the Integers: The Well Ordering Principle – Mathematical Induction.
Principles of Counting: Fundamental Principles of Counting, The Rules of Sum and Product, Permutations, Combinations – The Binomial and Multinomial Theorem, Combinations with Repetition.

Application: Distribution with repetition.

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

Module-2	L1,L2,L3	8Hours

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:
1. http://nptel.ac.in/courses.php?disciplineID=111

2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/		
Module-3	**L1,L2,L3**	**8Hours**
Relations: Cartesian Products, Relations, Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions. 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: 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/		
Module-4	**L1,L2,L3**	**8Hours**
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: 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/		
Module-5	**L1,L2,L3**	**8Hours**
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, decoding and error detection. Application: Testing the level of significance & the goodness of fit for large sample and small sample. Video Link: 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/subject/math(MOOCs) 3. 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.

Reference Books:	
1.	Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearso Education. 2004.
2.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
3.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.
4.	Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007
5.	Basavaraj S Anami and Venakanna S Madalli: Discrete Mathematics – A Concept based approach, Universities Press, 2016.

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

High-3, Medium-2, Low-1

Course Title	Data Structure	Semester	III
Course Code	MVJ20CD32	CIE	50
Total No. of Contact Hours	50	SEE	50
No. of Contact Hours/week	5 (L : T : P :: 3 : 2 : 0)	Total	100
Credits	4	Exam. Duration	3 Hours

Course objective is to:

- Understand the various techniques of sorting and searching.
- Design and implement arrays, stacks, queues, and linked lists.
- Understand the complex data structures such as trees and graphs.

Module-1	L1,L2,L3	10Hours

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Laboratory Sessions/ Experimental learning:

- Implementation of searching Techniques

Applications: Array data type used in a programming language to specify a variable that can be indexed. Array data structure is used for arrangement of items at equally spaced and sequential addresses in computer memory makes it easier to perform operations like sorting, merging, traversal, retrievals

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/array_data_structure.htm

Module-2	L1,L2,L3	10 Hours

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Laboratory Sessions/ Experimental learning:

- Stack ADT to perform push and pop operations.
- Stack ADT for Expression Evaluation
- Array Implementation of Queue ADT

Applications: Expression Handling , Backtracking Procedure

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/stack_algorithm.htm
https://www.tutorialspoint.com/data_structures_algorithms/dsa_queue.htm

Module-3	L1,L2,L3	10 Hours

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis

Laboratory Sessions/ Experimental learning:

- Implementation of linked list techniques(SLL,DLL,CLL)

Applications: The cache in your browser that allows you to hit the BACK button where a linked list of URLs can be implemented. A linked list would be a reasonably good choice for implementing a linked list of file names, undo functionality in Photoshop

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/linked_list_algorithms.htm
https://www.tutorialspoint.com/data_structures_algorithms/doubly_linked_list_algorithm.htm

Module-4	L1,L2,L3	10 Hours

Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with Complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Laboratory Sessions/ Experimental learning:

- Develop a program to create a Binary Search Tree and to Traverse the tree.

Applications: Store hierarchical data, like folder structure, organization structure, XML/HTML data. Binary Search Tree is a tree that allows fast search, insert, delete on a sorted data. It also allows finding closest item. Heap is a tree data structure which is implemented using arrays and used to implement priority queues.

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/tree_data_structure.htm
https://www.tutorialspoint.com/data_structures_algorithms/binary_search_tree.htm

Module-5	L1,L2,L3	10 Hours

Introduction to graph – types of graphs - Graph representations - Traversal algorithms- Depth First Search (DFS) and Breadth First Search (BFS) - Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting.

Laboratory Sessions/ Experimental learning:

- Implement shortest path Algorithms

Applications: The link structure of a website could be represented by a directed graph: the vertices are the web pages available at the website and a directed edge from page A to page B exists if and only if A contains a link to B. Graph colouring concept can be applied in job scheduling problems of CPU, jobs are assumed as vertices of the graph and there will be an edge between two jobs that cannot be executed simultaneously and there will be one-one relationship between feasible scheduling of graphs.

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/graph_data_structure.htm

Course outcomes:	
CO1	Implement all the operations of linear data structures to store and retrieve the given data.
CO2	Create a hierarchical data structure to represent the given data using tree data structure.
CO3	Compare efficiency of various searching techniques using different tree data structures.
CO4	Apply stack, Queue, Lists, Trees and Graph concepts in problem solving
CO5	Implement all data structures in a high-level language for problem solving

Reference Books:	
1.	Seymour Lipschutz and Vijayalakshmi Pai G A, –Data Structures‖, Tata McGraw Hill, New Delhi, 2013.
2.	Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, Fundamentals of Data Structures in C, Second Edition, Universities Press, 2008.
3.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 2015

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	3	3	3	2	3	0	0	0	0	2	0	0
CO2	3	3	3	2	3	0	0	0	0	2	0	0
CO3	3	3	2	2	3	0	0	0	0	2	0	0
CO4	3	3	2	2	3	0	0	0	0	2	0	0
CO5	3	3	3	2	3	0	0	0	0	2	0	0

High-3, Medium-2, Low-1

Course Title	Software Testing	Semester	III
Course Code	MVJ20CD33	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 1 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- Understand HTML and CSS for designing web pages.
- Understand basics of JavaScript as a programming language.
- Understand the Document Object Model and enable them to create dynamic web pages that react to user input.
- Understand installing and configuring Apache Server and incorporating backend support for their web pages.
- Get exposure to the newer features available as part of the HTML standard

Module-1	L1,L2,L3	8 Hours

Syllabus Content: Basics of Software Testing: Basic definitions, Software Quality, Requirements, Behaviour and Correctness, Correctness versus Reliability, Testing and Debugging, Test cases, Insights from a Venn diagram, Identifying test cases, Test-generation Strategies, Test Metrics, Error and fault taxonomies, Levels of testing, Testing and Verification, Static Testing. Problem Statements: Generalized pseudocode, the triangle problem, the NextDate function, the commission problem, the SATM (Simple Automatic Teller Machine) problem, the currency converter, Saturn windshield wiper

Application: software systems

Video Link: https://www.youtube.com/watch?v=cv6GvRCIuTs

Module-2	L1,L2,L3	8 Hours

Syllabus Content:Black Box Testing Types of Black Box Testing Techniques: Boundary Value Testing, Normal Boundary Value Testing Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing Guidelines for Boundary Value Testing

Equivalence Class Testing Equivalence Classes, Traditional Equivalence Class Testing Improved Equivalence Class Testing, Equivalence Class Test Cases for the Triangle Problem, Equivalence Class Test Cases for the NextDate Function, Equivalence Class Test Cases for the Commission Problem, Edge Testing Decision Table–Based Testing Decision

Tables, Decision Table Techniques Test Cases for the Triangle Problem, Test Cases for the Next Date Function, Test Cases for the Commission Problem

Application: Multilanguage support and compatibility Testing

Video Link: https://www.youtube.com/watch?v=2MRU2oRUlDo

Module-3	L1,L2,L3	8 Hours

Syllabus Content:

Evaluating Test Cases Mutation Testing, Fuzzing, Fishing Creel Counts and Fault Insertion Software Technical Reviews Economics of Software Reviews, Roles in a Review Types of Reviews, Contents of an Inspection Packet, An Industrial Strength Inspection Process, Effective Review Culture,Inspection Case Study

Application: Pit mutation testing

Video Link: https://www.youtube.com/watch?v=mZjPzlX9YJY

Module-4	L1,L2,L3	8 Hours

Syllabus Content:

Integration and Component-Based Software Testing: Overview, Integration testing strategies, Testing components and assemblies. System, Acceptance and Regression Testing: Overview, System testing, Acceptance testing, Usability, Regression testing, Regression test selection techniques, Test case prioritization and selective execution. Levels of Testing, Integration Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing, A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integration

Application: Online delivery system

Video Link: https://www.coursera.org/lecture/engineeringandroidapps/integration-testing-FbJOF

Module-5	L1,L2,L3	8 Hours

Syllabus Content:

Software test automation – skill needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.

Application: TestSigma

Video Link: https://www.edureka.co/blog/test-automation-strategy/

Practical Experiments:
1. Study of any testing tool.
2. Study of any web testing tool
3. Study of any bug tracking tool
4. Study of any test management tool.
5. Case study on Selenium.

Course outcomes:	
CO1	Apply the concepts of Quality Engineering.
CO2	Design Test cases for various black box testing techniques
CO3	Plan, employ and measure proper Quality approaches applied.
CO4	Apply the appropriate technique for the design of flow graph.
CO5	Create automation test scripts

Text/Reference Books:	
1.	Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 4th Edition, Auerbach Publications, 2013.
2.	Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009.
3.	Aditya P Mathur: Foundations of Software Testing, Pearson Education, 2008
4.	Software testing Principles and Practices – Gopalaswamy Ramesh, Srinivasan Desikan, 2nd Edition, Pearson, 2007
5.	Software Testing – Ron Patton, 2nd edition, Pearson Education, 2004

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

High-3, Medium-2, Low-1

Course Title	Python Programming	Semester	III
Course Code	MVJ20CD34	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 1 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to: This course will enable students to

- Learn fundamental features of object-oriented language
- Design, write, debug, run Python Programs
- Develop console -based applications using Python
- Develop console & windows applications using Python.
- Introduce event driven Graphical User Interface (GUI) programming using Python built in functions

Module-1	L1,L2,L3	8Hours

Syllabus Content:

Why should you learn to write programs, Introduction to Python, Variables, expressions and statements, Conditional execution, Functions.

Application:

- In learning and implementing small project process

Video Link:

1. https://www.py4e.com/
2. http://greenteapress.com/wp/think-python/

Module-2	L1,L2,L3	8 Hours

Syllabus Content: Iteration, Strings, Files.

Application:

- Pattern recognition and Reading resultant column in supervised learning data set

Video Link:

1. https://www.codecademy.com/learn/learn-python
2. http://www.tutorialspoint.com/python/

Module-3	L1,L2,L3	8 Hours

Syllabus Content:

Lists, Dictionaries, Tuples, Regular Expressions.

Application:

- Handling query languages and Managing Large set of data with respect to database

Video Link:

1. https://www.programiz.com/python-programming/class
2. https://www.udemy.com/course/web-scraping-with-python-beautifulsoup/

Module-4	L1,L2,L3	8 Hours

Syllabus Content:

Classes and objects, Classes and functions, Classes and methods.

Application:

- Designing games and puzzles

Video Link:

1. https://datatofish.com/json-string-to-csv-python/
2. https://automatetheboringstuff.com/

Module-5	L1,L2,L3	8 Hours

Syllabus Content:

Networked programs, Using Web Services, Using databases and SQL.

Application:

- Music composition and movie development

Video Link:

1. http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf
2. https://www.datacamp.com/community/tutorials/reading-and-editing-pdfs-and-word-documents-from-python

Practical Experiments:

- Programs related to Basic concepts of Python like Operators, Control flow and

Iterations.

- Programs related to Functions, Strings, Files, Lists and Multi-Dimension Lists
- Installation and use of special Modules like pip, Wiki etc.
- Implementation of Python Program with a Database.

Course outcomes:	
CO1	Understand Python syntax and semantics and be fluent in the use of Python flow control and functions.
CO2	Demonstrate proficiency in handling Strings and File Systems.
CO3	Implement Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
CO4	Interpret the concepts of Object-Oriented Programming as used in Python.
CO5	Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

Text/Reference Books:	
1.	Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1st Edition, CreateSpace Independent Publishing Platform, 2016. (http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf)
2.	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2ndEdition, Green Tea Press, 2015. (http://greenteapress.com/thinkpython2/thinkpython2.pdf)
3.	Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014

CO-PO Mapping

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

High-3, Medium-2, Low-1

Course Title	Optimization Methods	Semester	III
Course Code	MVJ20CD35	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 4 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- Provide introduction to linear programming techniques .
- Provide theoretical foundation and the fundamental algorithms for linear & non-linear optimization.
- Provide introduction to multi-channel queuing models.

Module-1	L1,L2,L3	8 Hours

Linear Programming-Graphical Solution- The Simplex algorithm, Artificial Variable Technique -Duality-Dual Simplex - Variants of the Simplex Method Transportation Model Initial Basic Feasible Solution methods Test for optimality-Variants of the Transportation problem

Application:

logistic regression.

Video Link:

https://www.youtube.com/watch?v=4Xokcy8jeoI

Module-2	L1,L2,L3	8 Hours

Assignment Model- Hungarian algorithm Variants of the Assignment problem, Travelling Salesman Problem Integer Linear Programming- Gomary's cutting plane method Branch and Bound method

Application:

Numerical solution of linear systems.

Video Link:

https://www.youtube.com/watch?v=Q2dewZweAtU

Module-3	L1,L2,L3	8 Hours
Sequencing Problem - N jobs through 2 machines, N Jobs through 3 machines, N jobs through m machines Scheduling - Critical path Method, Project Evaluation and Review Techniques Application: Stochastic gradient descent. Video Link: https://www.youtube.com/watch?v=x6f5JOPhci0		
Module-4	**L1,L2,L3**	**8 Hours**
Introduction to constrained nonlinear optimization theory, Inventory control - Purchase and production model with and without shortage , price break. Application: constrained nonlinear optimization Video Link: https://www.youtube.com/watch?v=TudQZtgpoHk		
Module-5	**L1,L2,L3**	**8 Hours**
Queuing Model- Single channel model, Multichannel model. Application: Quadratic programs Video Link: https://www.youtube.com/watch?v=csG_qfOTvxw		

Course outcomes:	
CO1	Apply linear programming techniques to optimize problems arising in communication engineering
CO2	Solve the assignment problem through Hungarian algorithm
CO3	Determine the optimum values of integer programming problems using Gomary's cutting plane method

CO4	Write well documented and structured optimization algorithm
CO5	Solve the single and multi-channel queuing models.

Reference Books:	
1.	Sharma J.K.: "Operations Research Theory and applications", Macmillan India Ltd., V Edition, 2015.
2.	Hamdy A. Taha: Operations Research – An Introduction", Prentice Hall of India Pvt Ltd., EIGHT Edition, 2014.
3.	Chandrasekara Rao, K. Shanti Lata Misra "Operation Research", Alpha science international Ltd-2015.
4.	Kanti Swarup, P.K.Gupta and Man Mohan "Operations Research", Sultan Chand,2014

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

High-3, Medium-2, Low-1

Course Title	Professional Ethics in Computing	Semester	III
Course Code	MVJ20CD36	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 4 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- To inculcate the sense of social responsibility.
- To develop a firm ethical base
- To make the students realize the significance of ethics in professional environment.

Module-1	L1,L2,L3	8 Hours

Profession ---- Definition
Three types of ethics.
Engineering ethics
Rights and responsibilities of an engineer

Application:

Engineering ethics

Video Link:

https://lib.pstcc.edu/csplagiarism

Module-2	L1,L2,L3	8 Hours

Evolution of engineering ethics
Code of ethics
Kohlberg‟s theory
Gilligan‟s theory

Application:

Business ethics, Outline of ethics

Video Link:

https://www.youtube.com/watch?v=jj1CsGgDgGM

Module-3	L1,L2,L3	8 Hours

Engineering as social experimentation Engineer"s social responsibility Application: Professional boundaries Video Link: https://www.youtube.com/watch?v=OBrMUs_T9Fs		
Module-4	L1,L2,L3	8 Hours
Computer ethics Ethical hacking Privacy Application: Professional responsibility Video Link: https://www.youtube.com/watch?v=Ij3iILP7H-4		
Module-5	L1,L2,L3	8 Hours
Environmental ethics. Livable environment Technology assessment. Application: Virtue ethics Video Link: https://nptel.ac.in/courses/110/105/110105097/		

Course outcomes:	
CO1	Ethical, social and environmental awareness.
CO2	Awareness on Engineer's rights and responsibilities
CO3	Act in morally desirable ways, towards moral commitment and responsible conduct.
CO4	Integrating academic learning with experimental learning in a profession.
CO5	Apply ethics in professional environment.

Reference Books:	
1.	Ethics in engineering: Mike W.Martin Roland, Mac Grow Hill.Schinzinger
2.	Engineerinethics---- M.Govindarajan, S.Natarajan&V.S.Senthil Kumar. Eastern economy Edn.PHI
3.	Engineering ethics-- Harris pitch and Rabbins, cengage.
4.	Caroline whit back---Ethics in engineering practice and research---- Cambridge.
5.	E-learning resources: http://nptel.ac.in/courses.php http://jntuk-coeerd.in/

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

High-3, Medium-2, Low-1

Course Title	Data Structure Lab	Semester	III
Course Code	MVJ20CDL37	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 0 : 1 : 2)	Total	100
Credits	2	Exam. Duration	3 Hours

Course objective is to:

- Implement linear and non-linear data structures
- Understand the different operations of search trees
- Implement graph traversal algorithms
- Get familiarized to sorting and searching techniques

Sl No	Experiment Name	RBT Level	Hours
1	Implementation of searching algorithms a) Linear Search b) Binary Search	L3	3
2	Implementation of sorting algorithms a) Insertion sort b) Selection sort c) Quick sort d) Merge sort	L3	3
3	a) Array implementation of List ADT b) Linked list implementation of List ADT	L3	3
4	a) Array implementation of Stack ADT b) Linked list implementation of Stack ADT	L3	3
5	a) Array implementation of queue ADT b) Linked list implementation of queue ADT	L3	3
6	Program to create a Binary Search Tree and to traverse the tree.	L3	3
7	Program to compute the shortest path from a single source	L3	3
8	Program to construct a graph and perform graph traversal (BFS, DFS)	L3	3
9	Program to construct a minimum spanning tree using: a) Prims Algorithm b) Kruskal's Algorithm	L3	3
10	Development of a Mini project/Present a case Study	L3	3

Course outcomes:

CO1	Compute the time and space complexity of searching and sorting algorithms with asymptotic notations.
CO2	Implement all the operations of linear data structures to store and retrieve the given data.
CO3	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data
CO4	Create a hierarchical data structure to represent the given data using tree data structure.
CO5	Design graph algorithms to compute the shortest path of the given graph and to identify the Minimum spanning tree.

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

High-3, Medium-2, Low-1

Course Title	Python Programming Lab	Semester	III
Course Code	MVJ20CDL38	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 0 : 1 : 2)	Total	100
Credits	2	Exam. Duration	3 Hours

Course objective is to:

- Gain knowledge in writing python programs to do a variety of programming tasks and develop various applications.

Sl No	Experiment Name	RBT Level	Hours
1	Python Program to Reverse a linked list	L3	3
2	Python Program for Find largest prime factor of a number	L3	3
3	Python Program for Efficient program to print all prime factors of a given number	L3	3
4	Python Program for Product of unique prime factors of a number	L3	3
5	Python Program for Find sum of odd factors of a number	L3	3
6	Python Program for Coin Change	L3	3
7	Python Program for Tower of Hanoi	L3	3
8	Python Program to Check if binary representation is palindrome	L3	3
9	Python Program for Basic Euclidean algorithms	L3	3
10	Python Program for Maximum height when coins are arranged in a triangle	L3	3

Course outcomes:

CO1	Write, Test and Debug Python Programs
CO2	Implement Conditionals and Loops for Python Programs
CO3	Use functions and represent Compound data

CO4	Read and write data from & to files in Python
CO5	Develop Applications using Python

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

High-3, Medium-2, Low-1

Course Title	CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW	Semester	III
Course Code	MVJ20CPH39	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	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 technograts 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	RBT Level 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	RBT Level 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	RBT Level 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	RBT Level 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	RBT Level 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 (40 marks each), the final IA marks to be awarded will be the average of three tests Assignment (10 marks)
SEE Assessment:
Question paper for the SEE consists one part. It is compulsory and consists of objective type 1 mark each for total of 50 marks covering the whole syllabus. Ten questions 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	2	2	1	1	1	2	2	1	1	1	1	2
CO2	1	2	2	1	1	2	1	1	1	1	1	2
CO3	2	1	2	1	1	1	1	1	1	1	1	2
CO4	2	2	1	1	1	1	1	1	1	1	1	2
CO5	2	2	1	1	1	2	1	1	1	1	1	2

High-3, Medium-2, Low-1

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_Kt6jqzA3pZ3yA7g_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

Introduction 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

Scheme of Evaluation

Details		Marks
Assessment by Faculty mentor (Class Room Evaluation)	CIE(50)	10
Self-Assessment + Assessment by peers		20
Activities / Experimentations related to courses/Assignment		10
Mini Projects / Case Studies		10

Semester End Examination	SEE (50)	50
Total		100

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

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

High-3, Medium-2, Low-1

Course Title	Additional Mathematics-I (Common to all branches)	Semester	III
Course Code	MVJ20MDSDIP301	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	-	Exam. Duration	3hrs

Course objective is to:

This course viz., 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	8Hrs.

Differential calculus: Recapitulations of successive differentiations -nth derivative -Leibnitz theorem and Problems, Mean value theorem -Rolle's theorem, Lagrange's Mean value theorem , Cauchy's theorem and Taylor's theorem for function of one variables.

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 Simples Problems.

Video Link:

https://www.youtube.com/watch?v=rCWOdfQ3cwQ

https://nptel.ac.in/courses/111/105/111105122/

Module-3	L1,L2	8Hrs.

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 Link:

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 Link: 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: Homogenous 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 change of order 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 to 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, 10th edition,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) Assignments (10 marks)
SEE Assessment:
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. 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. 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	0	3	0	0	0	0	0	0	1	1
CO2	2	3	0	3	0	0	0	0	0	0	1	1
CO3	2	2	0	2	0	0	0	0	0	0	1	0
CO4	3	2	0	3	0	0	0	0	0	0	0	1
CO5	3	3	0	2	0	0	0	0	0	0	0	0

High-3, Medium-2, Low-1