Semester: III		
DISCRETE MATHEMATICAL STRUCTURES AND PROBABILITY (Theory)		
Course Code:	**MVJ21MCS/IS31**	**CIE Marks:50**
Credits:	**4**	**SEE Marks: 50**
Hours:		**SEE Duration: 3 Hrs**
Course Learning Objectives: The students will be able to		
1	Prepare for a background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science.	
2	Understand and apply mathematical induction, combinatorics, discrete probability, sequence and recurrence, elementary number theory.	
3	Understand and apply probability distribution, sampling theory and joint probability distributions.	

UNIT-I	
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/	**Hrs 8**
UNIT-II	
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/	**Hrs 8**
UNIT-III	
Relations: Cartesian Products, Relations, Properties of Relations, Equivalence Relations. Zero-One Matrices and Directed Graphs. Partial	**Hrs 8**

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/	
UNIT-IV	
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/	**Hrs 8**
UNIT-V	
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**: 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/	**Hrs 8**

Course Outcomes: After completing the course, the students will be able to	
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.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition,2013.
2.	Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education. 2004.
3.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.
4.	Bali N. P. & Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8th Edition

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

Semester: III		
OBJECT ORIENTED PROGRAMMING (Theory)		
Course Code:	**MVJ21IS32**	**CIE Marks:50**
Credits:	**4**	**SEE Marks: 50**
Hours:	**40 L+26T**	**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to

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

UNIT-I

Prerequisites: Basic Knowledge about C or C++ **Hrs 8**

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

Laboratory Sessions/ Experimental learning:

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

• They have a 90% average or higher in the class and have missed 3 or less class lectures.

• They have a 80% average or higher in the class and have not missed any class lectures.

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

Applications: Arrays in mathematical vectors, matrices.

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

- Differences between JVM vs JRE vs JDK in Java: https://www.youtube.com/watch?v=5Bp6GLU6HKE

UNIT-II

Classes, Inheritance, Packages and Interfaces: Classes fundamentals; Declaring objects; Assigning object reference variables; Introducing Methods, Constructors, this keyword, Finalize Method. Inheritance: Inheritance basics, using super, creating multi-level hierarchy ,when constructors are called, method overriding, using abstract classes. Packages, Access Protection, Importing Packages, Interfaces. **Laboratory Sessions/ Experimental learning:** Write a program that calculates the number of buckets of paint to use for a room and the optimal number of cans to purchase. You need to ask the height of the room and the length and width of the room. The room is rectangular. You must paint the walls and the ceiling but not the floor. There are no windows or skylights. You can purchase the following size buckets of paint. • 5-liter bucket costs $15 each and covers 1500 square feet. • 1-liter bucket costs $4 and covers 300 square feet. **Applications:** Inheritance in Banking Sectors **Video link / Additional online information (related to module if any):** Types of Inheritance: https://www.youtube.com/watch?v=ZP27c7i5zpg	**Hrs 8**
UNIT-III	
Exception Handling and Multi-Threaded Programming: Exception Handling fundamentals, Exception Types, Uncaught Exceptions, Using try catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java's built-in exceptions, Programming Examples. **Multi-Threaded Programming**: The java thread model, Main thread, Creating Thread, Creating multiple threads, Using isAlive() and join(),Thread priorities, Synchronization; Interthread Communication - Bounded buffer problem. **Laboratory Sessions/ Experimental learning:** The Producer-Consumer problem describes two processes, the producer and the consumer, which share a common, fixed-size buffer used as a queue. The producer's job is to generate data, put it into the buffer, and start again. At the same time, the consumer is consuming the data (i.e. removing it from the buffer), one piece at a time. Make sure that the producer won't try to add data into the buffer if it's full and that the consumer won't try to remove data from an empty buffer. Write a java code to get the solution for this multi-process synchronization problem.	**Hrs 8**

Applications: Multithreads in Browsers, Servers **Video link / Additional online information (related to module if any):** • Multithreading: https://www.youtube.com/watch?v=O_Ojfq-OIpM	
UNIT-IV	
The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections. **Java Lambda expressions:** Java Lambda expressions, Using Java Lambda expressions, Lambda expression vs method in java, Lambda expression in the array list. **Laboratory Sessions/ Experimental learning:** Write a Java program to iterate through all elements in a array list **.** Write a Java program to create a new array list, add some colors (string) and print out the collection **Applications:** Elements in group **Video link / Additional online information (related to module if any):** • https://www.youtube.com/watch?v=Q_9vV3H-dt4	**Hrs 8**
UNIT-V	
JDBC: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions. **Laboratory Sessions/ Experimental learning:** Develop Student Management System application with swings as the front end and database as the back end using JDBC connectivity. **Applications:** Scientific Applications, Financial Applications **Video link / Additional online information (related to module if any):** • **Java JDBC :**https://www.youtube.com/watch?v=hEWBIJxrLBQ	**Hrs 8**

Course Outcomes: After completing the course, the students will be able to	
CO1	Illustrate the Object Oriented Programming concepts and basic characteristics of Java.
CO2	Demonstrate the principles of classes, inheritance, packages and interfaces.
CO3	Experiment with exception handling Mechanisms and Create multi-threaded programs.

CO4	Interpret the need for advanced Java concepts like collections in developing modular and efficient programs.
CO5	Develop an application with Database using JDBC connectivity.

Reference Books	
1.	Herbert Schildt, Java The Complete Reference, 7 /9th Edition, Tata McGraw Hill, 2007.
2.	Jim Keogh: J2EE-The Complete Reference, McGraw Hill, 2007.
3.	Effective Java, Third Edition, Joshua Bloch, Addison-Wesley Professional,2017
4.	Richard Warburton**,** Java 8 Lambdas: Pragmatic Functional Programming Kindle Edition.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

Semester: III		
OPERATING SYSTEMS		
Course Code: MVJ21IS33		**CIE Marks:100**
Credits: L:T:P:S:3:1:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	Introduce concepts and terminology used in OS.
2	Explain threading and multithreaded systems.
3	Illustrate process synchronization and concept of Deadlock.
4	Introduce Memory and Virtual memory management, File system and storage techniques.

UNIT-I	
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.	**8 Hrs**
UNIT-II	
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.	**8 Hrs**
UNIT-III	
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	**8 Hrs**
UNIT-IV	
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;	**8 Hrs**

Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.	
UNIT-V	
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.**	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
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.

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

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will

have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO/PSO Mapping														
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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

Semester: III		
DATA STRUCTURES AND APPLICATIONS & LAB (Theory and Practice)		
Course Code:	**MVJ21IS34**	**CIE Marks:50+50**
Credits:	**4**	**SEE Marks: 50 +50**
Hours:		**SEE Duration: 03+03 Hours**
Course (Theory) Learning Objectives: The students will be able to		
1	Identify the importance of data structures & memory allocation.	
2	Perform operations on stacks and queues and its applications.	
3	Apply the operations of linked list, Trees & Graphs in various applications.	
4	Apply searching and sorting operations in real time applications.	
Course (Laboratory) Learning Objectives: The students will be able to		
1	Linear data structures and their applications such as stacks, queues and lists,	
2	Non-Linear data structures and their applications such as Trees & Graphs	
3	Sorting and Hashing techniques.	

UNIT-I	

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 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++)
	Hrs 10

```
        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

UNIT-II

Stacks: Definition, Stack Operations, Stack ADT, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Recursion -** GCD, Tower of Hanoi. **Queues:** Definition, Array Representation, Queue Operations, Queue ADT, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues. Programming Examples. **Laboratory Sessions/ Experimental learning:** Design, Develop and Implement a menu driven Program in C for the following operations on DEQUEUE of Integers (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to DEQUEUE b. Delete an Element from DEQUEUE c. Demonstrate Overflow and Underflow situations on DEQUEUE d. Display the status of DEQUEUE e. Exit Support the program with appropriate functions for each of the above operations **Real Time Applications: Game applications, Ticket booking applications (Eg: Train, restaurant etc)** **Video link / Additional online information (related to module if any):** 1.https://nptel.ac.in/courses/106106130/ 2. https://nptel.ac.in/courses/106102064/ 3. https://nptel.ac.in/courses/106105085/ 4.https://nptel.ac.in/courses/106/106/106106127/	**Hrs 10**
UNIT-III	
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	**Hrs 10**

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):

1. https://nptel.ac.in/courses/106106130/
2. https://nptel.ac.in/courses/106102064/

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

UNIT-IV

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

Hrs 10

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 telephone 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

UNIT-V

Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search, Topological Sort. **Hrs 10**

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

Laboratory Sessions/ Experimental learning:

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

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

Video link:

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

https://nptel.ac.in/courses/106/102/106102064/

LABORATORY EXPERIMENTS

S No	Experiment Name	Hrs
1	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,	**3**

S.No	Cities	Number of items
1	Agra	25
2	Chennai	50
3	Kolkata	59
4	Mumbai	72
5	Delhi	12

	a) To display name of cities where salesman has delivered maximum and minimum number of items To search the number of items to be delivered of a user supplied city.	
2	Implement Knuth-Morris- Pratt pattern matching algorithm using C program.	**3**
3	Design, Develop and Implement a menu driven Program in C with the listed operations for the data structure which follows Last In First Out (LIFO) order. (Use Array Implementation of specified DS with maximum size MAX). a. Push an Element b. Pop an Element c. Demonstrate how it can be used to check Palindrome d. Demonstrate Overflow and Underflow situations e. Display the status f. Exit Support the program with appropriate functions for each of the above operations	**3**
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.	**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	**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	**3**

	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	
7	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo. a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it. c. Perform Insertion and Deletion at End of DLL . d. Perform Insertion and Deletion at Front of DLL . e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit	**3**
8	Design, Develop and Implement a menu driven C Program for the following operations on Binary Search Tree (BST) of Integers. a) Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2. b) Traverse the BST recursively in inorder, preorder & postorder Search the BST for a given element (KEY) and report the appropriate message	**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	**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.	**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),	**3**

	and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.	

Course (Theory) Outcomes: After completing the course, the students will be able to	
CO1	Identify the necessity of data structure and its storage process.
CO2	Analyze 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	Analyze the concepts of Graphs, searching, sorting & hashing in real time.
Course (Laboratory) Outcomes: After completing the course, the students will be able to	
CO1	To understand how sensors and embedded systems work
CO2	Design and implement an accessory with BLE connectivity using standard mobile application development tools
CO3	To understand how to communicate with other mobile devices using various communication platforms such as Bluetooth and Wi-Fi.
CO4	Develop and demonstrate applications e.g. smartphone-based, sensor station
CO5	To understand how to program on embedded and mobile platforms.

Text Books/ Reference 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.
3.	Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
4.	Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C‖, 2nd Edition, Pearson Education,1997.
5.	Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
6.	Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
7.	A M Tenenbaum, Data Structures using C, PHI, 1989
8.	Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.
9.	http://opendatastructures.org, https://donsheehy.github.io/datastructures

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks
out of 100 and report CIE for 50 marks.

Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists

CO-PO/PSO Mapping (Theory)														
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

of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO-PO/PSO Mapping (Laboratory)														
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

Semester: III		
ANALOG AND DIGITAL ELECTRONICS AND LAB (Theory and Practice)		
Course Code:	**MVJ21IS35**	**CIE Marks:50+50**
Credits:	**4**	**SEE Marks: 50 +50**
Hours:		**SEE Duration: 03+03 Hours**
Course (Theory) Learning Objectives: The students will be able to		
1	Analyse the working of oscillators and use of regulators.	
2	Make use of simplifying techniques in the design of combinational circuits.	
3	Illustrate combinational and sequential digital circuits.	
4	Demonstrate the use of flipflops and design registers and counters.	
5	Design and test Analog-to-Digital and Digital-to-Analog conversion techniques.	
Course (Laboratory) Learning Objectives: The students will be able to		
1	Analog components and circuits including transistor, regulator, etc.	
2	Combinational logic circuits.	
3	Flip - Flops and their operations.	
4	Counters and Registers using Flip-flops.	
5	Synchronous and Asynchronous Sequential Circuits	

UNIT-I	
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.	**Hrs 8**
UNIT-II	
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.	**Hrs 8**
UNIT-III	

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	**Hrs 8**
UNIT-IV	
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	**Hrs 8**
UNIT-V	
List of Practical Experiments/Hands-on :	**Hrs 10**

- Plotting the V-I characteristics of MOSFET
- Implementing adders and subtractors
- Implementing the simplified equation obtained from K-maps and verify with the truth table

LABORATORY EXPERIMENTS

S No	Experiment Name	Hrs
1.	Study of transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.	3
2.	Design and test IC 723 voltage regulator.	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.	3
4.	a) Realization and implementation of 2-bit comparator using logic gates. b) Implementation of 4-bit magnitude comparator using IC 7485.	3
5.	To design and construct basic flip-flops R-S ,J-K,J-K Master slave flip-flops using gates and verify their truth table.	3

6.	Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops.	3
7.	Design and implementation of 3-bit synchronous up/down counter	3
8.	Design and implement a ring counter and Johnson counter using 4-bit shift register and demonstrate its working.	3
9.	Design and implement a mod-n (n<8) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working.	3
10.	Design and implement an asynchronous counter using decade counter IC to count from 0 to n (n<=9) and demonstrate on 7-segment display (using IC-7447).	3

Course (Theory) Outcomes: After completing the course, the students will be able to	
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.
Course (Laboratory) Outcomes: After completing the course, the students will be able to	
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.

Text Books/ 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

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks
out of 100 and report CIE for 50 marks.

Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

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 (Theory)														
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

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

High-3, Medium-2, Low-1

Semester: III		
CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW (Theory)		
Course Code:	**MVJ21CPH36**	**CIE Marks:50**
Credits:	**1**	**SEE Marks: 50**
Hours:	**20**	**SEE Duration: 3 Hrs**
Course Learning Objectives: The students will be able to		
1	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.	
2	To provide overall legal literacy to the young technocrats to manage complex societal issues in the present scenario.	
3	To understand engineering ethics & their responsibilities, identify their individual roles and ethical responsibilities towards society.	

UNIT-I	
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.	**Hrs 3**
UNIT-II	
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.	**Hrs 3**
UNIT-III	
Elections, Amendments and Emergency Provisions Elections, Electoral Process, and Election Commission of India, Election Laws.	**Hrs 3**

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.	
UNIT-IV	
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.	**Hrs 3**
UNIT-V	
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.	**Hrs 3**

Course Outcomes: After completing the course, the 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/20thEdn., (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.

Continuous Internal Evaluation (CIE):
Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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. One question must be set from each unit.

iii. The duration of examination is 3 hours**.**

Semester: III		
SOFTWARE ENGINEERING & DESIGN		
Course Code: MVJ21IS71		**CIE Marks:50+50**
Credits: L:T:P: 3:0:0		**SEE Marks: 50 +50**
Hours:26		**SEE Duration: 03 Hours**

Course Learning Objectives: The students will be able to	
1	Design a software system, component, or process to meet desired needs within realistic constraints.
2	Assess professional and ethical responsibility
3	Function on multi-disciplinary teams
4	Use the techniques, skills, and modern engineering tools necessary for engineering practice
5	Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems

UNIT-I	
Introduction, Software Processes, Requirements Engineering: Case Study : Create a software process model for library management system Case Study : Create a Function and Non Functional requirement for library management system	**5 Hrs**
UNIT-II	
Modelling Concepts and Class Modelling Case study: Design a class model for Library management system / online ticket Reservation system Hands on : Usage of UML Tools (Gliffy /smart draw)	**6 Hrs**
UNIT-III	
System Models: Interaction models Structural models . Behavioral models, Design Principles, Implementation issues Case study: Design a interaction model for Library management system / online ticket Reservation system / Coffee Vending Machine Hands on : Usage of UML Tools (Gliffy /smart draw)	**5 Hrs**
UNIT-IV	
Software Testing, Software Evolution, Project Planning, Quality management Case Study : Project scheduling for Library management system / online ticket Reservation system / Coffee Vending Machine Hands on : Usage of UML Tools (Gliffy /smart draw)	**5 Hrs**
UNIT-V	
Software Testing, Software Evolution:	**5 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Design a software system, component, or process to meet desired needs within realistic constraints.
CO2	Assess professional and ethical responsibility
CO3	Function on multi-disciplinary teams
CO4	Use the techniques, skills, and modern engineering tools necessary for engineering practice

CO5	Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems

Reference Books	
1.	Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012. (Listed topics only from Chapters 1,2,3,4, 5, 7, 8, 9, 23, and 24)
2.	Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005.

Continuous Internal Evaluation (CIE):
Theory for 50 Marks

Semester End Examination (SEE):
Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

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

Semester: III		
ADDITIONAL MATHEMATICS-I (Theory)		
Course Code:	**MVJ21MATDIP-1**	**CIE Marks:50**
Credits:	**-**	**SEE Marks: 50**
Hours:	**40**	**SEE Duration: 3 Hrs**
Course Learning Objectives: The students will be able to		
1	To familiarize the important and basic concepts of Differential calculus and Differential Equation, ordinary/partial differential equations and Vector calculus and analyze the engineering problems.	

UNIT-I	
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.	**Hrs 8**
UNIT-II	
Integral Calculus: Review of elementary Integral calculus, Reduction formula and problems. $\int_0^{\frac{\pi}{2}} \sin^m x\,dx$, $\int_0^{\frac{\pi}{2}} \cos^m x\,dx$, $\int_0^{\frac{\pi}{2}} \sin^m \cos^n x\,dx$ 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/	**Hrs 8**
UNIT-III	
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.math.ust.hk/~machas/vector-calculus-for-engineers.pdf • https://www.whitman.edu/mathematics/calculus_online/chapter16.html	**Hrs 8**
UNIT-IV	

Probability: Introduction - Conditional Probability, Multiplication theorem, independent events, Baye's theorem and Problems **Video Links:** • https://nptel.ac.in/courses/111/105/111105041/ • https://www.khanacademy.org/math/statistics-probability/probability-library	**Hrs 8**
UNIT-V	
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	**Hrs 8**

Course Outcomes: After completing the course, the students will be able to	
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

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CIE Assessment:

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

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

SEE Assessment:

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

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

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

CO-PO Mapping

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

High-3, Medium-2, Low-1

Semester: IV		
Operations Research, Numerical and Statistical Methods		
Course Code:	**MVJ21MA41B**	**CIE Marks:50**
Credits:	**L:T:P:S: 2:2:0:0**	**SEE Marks: 50**
Hours:	**20L+20T**	**SEE Duration: 3 Hrs**
Course Learning Objectives: The students will be able to		
The purpose of this course is to make students well conversant with numerical methods to solve ordinary differential equations, sampling theory and Operational research emerging in science and engineering.		

UNIT-I	
Numerical Methods-1 Numerical solution of Ordinary Differential Equations of first order and first degree: Modified Euler's method, Taylor's series method, Runge-Kutta method of fourth order, Predictor and Corrector method: Milne's Method and Adams-Bashforth Method. **Self-Study Topic:** Euler's method. **Video Links:** http://nptel.ac.in/courses.php?disciplineID=111	**8 Hrs**
UNIT-II	
Numerical Methods-2: Numerical solution of Ordinary Differential Equations of second order: Runge-Kutta method of fourth order, Predictor and Corrector method: Milne's Method and Adams Bash forth Method. **Calculus of Variations:** Variation of function and Functional, variational problems. Euler's equation, Geodesics. **Self-Study Topic:** Hanging Chain Problems. **Video Links:** http://nptel.ac.in/courses.php?disciplineID=111	**8 Hrs**
UNIT-III	
Operations Research-1 Introduction to Linear Programming Problem (LPP): Assumptions of LPP, Formulation of LPP and Graphical method various examples. The simplex method, Big M method and Two-Phase Method. **Self-Study Topic :** Dual simplex method. **Video Links:** http://nptel.ac.in/courses.php?disciplineID=111	**8 Hrs**

UNIT-IV	
Operations Research-2 **The transportation problem:** Initial Basic Feasible Solution (IBFS) by Northwest Corner Rule method, Matrix Minima Method, Vogel's Approximation Method, MODI method. **Game Theory:** The formulation of two persons, zero sum games; saddle point, maxmin and minmax principle, Solving simple games- a prototype example, Games with mixed strategies (ODD's method, Dominance method and Graphical method). **Self-Study Topic:** Matrix method **Video Links:** http://nptel.ac.in/courses.php?disciplineID=111	**8 Hrs**
UNIT-V	
Statistical Methods **Correlation and Regression**: Correlation, Regression coefficients, line of regression problems. **Curve fitting:** Fitting of the curves of the form $y = ax + b$, $y = ax^2 + bx + c$, $y = ae^{bx}$ by the method of least squares. **Self-Study Topic:** Fitting of the curves of the form $y = x^b$. **Video Links:** http://nptel.ac.in/courses.php?disciplineID=111	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Solve first and second order ordinary differential equation arising in flow problems using single step numerical methods.
CO2	Determine the extremals of functional and solve the simple problems of the Calculus of variations.
CO3	Solve the mathematical formulation of linear programming problem.
CO4	Solve the applications of transport problems and theory of games.
CO5	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data.

Reference Books	
1.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
2.	S. D. Sharma, "Operations Research", Kedar Nath and Ram NathPublishers, Seventh Revised Edition 2014.
3.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers,

	10thedition, 2014.
4.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.
5.	Bali N. P. & Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8th Edition

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three subdivisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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	0	1
CO2	3	2	0	3	0	0	0	0	0	0	0	0
CO3	3	3	0	2	0	0	0	0	0	0	0	1
CO4	2	3	0	3	0	0	0	0	0	0	0	1
CO5	3	3	0	3	0	0	0	0	0	0	0	1

Semester: IV		
MICRO CONTROLLER AND EMBEDDED SYSTEMS (Theory)		
Course Code: MVJ21CG42/MVJ21CS42/MVJ21CD42 MVJ21AI42/MVJ21IS42		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	Explain the fundamentals of ARM based system, basic hardware components, selection methods and attributes of an ARM Controller.
2	Program ARM controller using the various instructions.
3	Explain the fundamentals of Exception, Interrupt Handling and Memory Management Unit of ARM Controller.
4	Identify the Embedded System Design applications.
5	Explain the real time operating system for the embedded system design.

UNIT-I	
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. **ARM Processor Fundamentals**: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions	**8 Hrs**
UNIT-II	
Introduction to the ARM Instruction Set : Data Processing Instructions , Programme Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants **ARM programming using Assembly language:** Writing Assembly code, Profiling and cycle counting, instruction scheduling	**8 Hrs**
UNIT-III	
Exception, Interrupt Handling : Exception handling, Interrupts, Interrupt handling Schemes **Memory Management Unit :** The Memory Hierarchy and Cache Memory, Cache Architecture, Cache Policy, Moving from MPU to an MMU, How Virtual Memory Works, Details of ARM MMU	**8 Hrs**
UNIT-IV	
Embedded System Components: Embedded Vs General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, purpose of embedded systems Core of an Embedded System including all types of processor/controller, Memory,	**8 Hrs**

Sensors, Actuators, LED, 7 segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (on board and external types), Embedded firmware, Other system components.	
UNIT-V	
Real Time Operating System (RTOS) based Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread pre-emption, Multiprocessing and Multitasking, Task Communication (without any program), Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Describe the architectural features and instructions of ARM microcontroller
CO2	Develop Assembly Programs in ARM for Embedded applications.
CO3	Describe the fundamentals of Exception, Interrupt Handling and Memory Management Unit of ARM Controller
CO4	Interface external devices and I/O with ARM microcontroller.
CO5	Demonstrate the need of real time operating system for embedded system applications

Reference Books	
1.	Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developer's guide, Elsevier, Morgan Kaufman publishers, 2008.
2.	Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education, Private Limited, 2nd Edition.
3.	Raghunandan.G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 2019
4.	The Insider's Guide to the ARM7 Based Microcontrollers, Hitex Ltd., 1st edition, 2005.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

High-3, Medium-2, Low-1

Semester: IV		
COMPUTER ORGANIZATION AND ARCHITECTURE (Theory)		
Course Code: MVJ21CG43/MVJ21CS43/MVJ21CD43 MVJ21AI43/MVJ21IS43		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0:0		**SEE Marks: 100**
Hours: 40L		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	Learn the basic structure and operations of a computer.
2	Learn the arithmetic and logic unit.
3	Learn the different ways of communication with I/O devices & memories, memory hierarchies, cache memories and virtual memories.
4	Understand & implement arithmetic process.
5	Understand the processor and pipelining concepts.
6	Understand parallelism and multi-core processors.

UNIT-I	
Basic Structure of Computers: Basic Structure of Computers: Basic Operational Concepts, Bus Structures, Performance –Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement **Machine Instructions and Programs:** 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 **Video link :** https://archive.nptel.ac.in/courses/106105163/	**8 Hrs**
UNIT-II	
Input/output Organization: Input/output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits, Introduction to peripheral component, Interconnect (PCI) bus. Introduction to standard serial communication protocols, I/O Interfaces – PCI Bus, SCSI Bus, USB **Videolink:** https://archive.nptel.ac.in/courses/106/105/106105163/	**8 Hrs**

UNIT-III	
Memory: Memory: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Types of cache, Performance considerations, Control memory, Address sequencing, micro program example, design of control unit Hard wired control. Micro programmed control, Virtual Memory. **Video link :** https://archive.nptel.ac.in/courses/106105163/	**8 Hrs**
UNIT-IV	
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, Implementation of booth algorithm **Video link:** https://archive.nptel.ac.in/courses/106106166/ https://archive.nptel.ac.in/courses/106/105/106105163/	**8 Hrs**
UNIT-V	
Parallelism: Parallel processing challenges –Flynn‘s classification – SISD, MIMD, SIMD, SPMD **Pipelining:** Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline **Data hazards** – Instruction hazards, Vector Processing, Array Processors. Cache coherence and MESI protocol, Clusters – Non-Uniform Memory Access – Vector Computation Video link: https://archive.nptel.ac.in/courses/106102114/ https://archive.nptel.ac.in/courses/106/105/106105163/	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO 1	Explain the basic organization of a computer system.
CO 2	Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
CO 3	Design and analyses simple arithmetic and logical units.
CO 4	Illustrate hardwired control and micro programmed control, pipelining, embedded and other Computing systems.
CO 5	Design and analyses of simple Parallelism and Multithread.

Reference 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).
3.	John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
4.	John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach‖, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	**1**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**1**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**2**	**2**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**1**	**2**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

High-3, Medium-2, Low-1

Semester: IV		
PYTHON PROGRAMMING AND LAB (Theory and Practice)		
Course Code: MVJ21CG44/MVJ21CS44/MVJ21CD44 MVJ21AI44/MVJ21IS44		**CIE Marks:50+50**
Credits: L:T:P: 3:0:1		**SEE Marks: 50 +50**
Hours:40 L+ 26 P		**SEE Duration: 03+03 Hours**

Course Learning Objectives: The students will be able to	
1	Learn the syntax and semantics of Python Programming Language and Lists.
2	Illustrate the process of structuring the data using tuples and dictionaries.
3	Write Python functions to facilitate code reuse and manipulate strings.
4	Illustrate the concepts of object oriented concepts.
5	Demonstrate the use of built-in functions to navigate the libraries, file system and working with database.

UNIT-I	
Introduction to Python: Features of python, Applications of python, Comments, Indentations, Variables and Data Types, Operators, Conditional statement, Loops in Python. Control flow statements. **Python List:** Create Python List, Access Python List, Slicing a Python List, Reassigning a Python List (Mutable), Reassigning the whole Python list, Deleting list and elements, Multidimensional Lists, List Operations, Built-in List Functions.	**8 Hrs**
UNIT-II	
Python Tuple: Create a Python Tuple, Tuples Packing, Tuples Unpacking, Creating a tuple with a single item, Access Python Tuple, Slicing a Tuple, Deleting a Python Tuple, Reassigning Tuples, Tuple Functions Tuple Operations. **Python Dictionary:** Create a Dictionary, Dictionaries with mixed keys, Access a Python Dictionary, Delete Python Dictionary, In-Built Functions on a Python Dictionary, In-Built Methods on a Python Dictionary, Dictionary Operations.	**8 Hrs**
UNIT-III	
Python Set: Accessing values in set, deleting values in set, Updating set, Set operations, Built in set functions**.** **Strings:** String slices, in operator, String Methods. **Python Function:** User-Defined Functions in Python, Python Built-in Functions, Python Lambda Expressions, Recursion Function, Range function.	**8 Hrs**
UNIT-IV	
Object oriented concepts in Python: OOP features, fundamental concepts, Class	**8 Hrs**

encapsulation, Polymorphism, Inheritance. **Python Method:** Introduction to Method, __init__(), Self Parameter, Functions vs Method, Magic Methods	
UNIT-V	
Python Libraries: Introduction to Libraries, Creating and exploring Packages- Numpy, Scipy ,Pandas ,Scikit-learn. **File Handling In Python:** Open File, Close File ,Read and Write File(.txt and .csv), File Methods **Database concepts:** Connecting Python with database**.**	**8 Hrs**

LABORATORY EXPERIMENTS

1. Write a python program to implement Simple Calculator.
2. Develop a Python program to check whether the given number is palindrome or not and count the number of occurrences of each digit in the input number.
3. Implement a python program to check a given number is Disarium number or not.
4. Write a python program to implement insertion sort using lists.
5. Develop a python program to implement binary search.
6. Write a Python program to check whether the register number format (1MJ21**001) is correct or not using String methods.
7. Write a python program by creating a class called Employee to store the details of Name, Employee, Department and Salary, and implement a method to update salary of employees belonging to a given department.
8. Create a class ATM and define ATM operations to create account, deposit, check balance, withdraw and delete account. Use constructor to initialize members.
9. Write a python program to accept a file name from the user and perform the following operations,

   a) Display the first N lines of the file

   b) Find the frequency of occurrence of the word accepted from the user in the file.
10. Develop a Python program to compute the,

    a) Eigen values of a matrix

    b) Determinant of the matrix

c)Rank of a matrix

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate the concepts of control structures in Python and lists.
CO2	Implement Python programs using tuples and dictionaries.
CO3	Implement methods to create and manipulate sets and strings
CO4	Demonstrate the concepts of object-oriented concepts in Python
CO5	Apply the concepts of file handling and database connection

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.	Mark Smart,(2018), Introduction to Data Science with Python: Basics of Numpy and Pandas.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80

marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

High-3, Medium-2, Low-1

Semester VI		
DESIGN AND ANALYSIS OF ALGORITHMS &LAB (Theory and Practice)		
Course Code: MVJ21CG45/MVJ21CS45/MVJ21CD45 MVJ21AI45/MVJ21IS45		**CIE Marks:50+50**
Credits: L:T:P: 3:0:1		**SEE Marks: 50 +50**
Hours:40 L+ 26 P		**SEE Duration: 03+03 Hours**

Course Learning Objectives: The students will be able to	
1	Identify the importance of different asymptotic notation.
2	Determine the complexity of recursive and non-recursive algorithms.
3	Compare the efficiency of various design techniques like greedy method, backtracking etc.
4	Apply appropriate method to solve a given problem.

UNIT-I	
Basic Concept of Algorithms: Introduction-What is an Algorithm, Algorithm Specification, Analysis Framework, Performance Analysis: Space complexity, Time complexity. Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples . Important Problem Types. Fundamental Data Structures.	**8 Hrs**
UNIT-II	
Simple Design Techniques – Brute force : Selection sort, Bubble sort, Sequential Search and Brute-Force String Matching , Exhaustive search –Traveling Salesman problem, Knapsack problem , Assignment Problem. **Divide and Conquer:** General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum , Merge sort, Quick sort , Strassen's matrix multiplication , Advantages and Disadvantages of divide and conquer.	**8 Hrs**
UNIT-III	
Decrease and Conquer approach: Topological Sort, Decrease-by-a-Constant-Factor Algorithms: Josephus Problem. **Greedy Method**: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines. Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm. Single source shortest paths: Dijkstra's Algorithm. Huffman Trees and Codes.	**8 Hrs**
UNIT-IV	
Dynamic Programming: General method with Examples, Multistage Graphs.	**8 Hrs**

Transitive Closure: Warshall's Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem, Bellman-Ford Algorithm , Travelling Sales Person problem , Reliability design.	
UNIT-V	
Backtracking: General method, N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles Programme and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem. **LC Programme and Bound solution :** FIFO Programme and Bound solution. NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.	**8 Hrs**

LABORATORY EXPERIMENTS

1. Sort a given set of n integer elements using Quick Sort method .

2.Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

3. Implement in Java, the 0/1 Knapsack problem using (a) Dynamic Programming method

(b) Greedy method.

4. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program in Java.

5. Find Minimum Cost Spanning Tree of a given connected undirected graph using

Kruskal's algorithm. Use Union-Find algorithms in your program.

6.Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.

7. Write Java programs to Implement All-Pairs Shortest Paths problem using Floyd's algorithm using Dynamic programming.

8. Write Java programs to Implement Travelling Sales Person problem using Dynamic programming.

9. Design and implement in Java to Implement Queens Backtracking using Dynamic programming

10. Design and implement in Java to find a subset of a given set S = {Sl, S2,.....,Sn}

of n positive integers whose SUM is equal to a given positive integer d.

For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and

{1,8}. Display a suitable message, if the given problem instance doesn't have a solution.

Course Outcomes: After completing the course, the students will be able to	
CO1	Describe the need of algorithm and the notations used in design analysis.
CO2	Compare the efficiency of brute force, divide and conquer techniques for problem solving.
CO3	Ability to apply greedy algorithms, hashing and string matching algorithms.
CO4	Ability to design efficient algorithms using various design techniques.
CO5	Ability to apply the knowledge of complexity classes P, NP, and NP Complete and prove certain problems are NP-Complete.

Reference Books	
1.	Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.
2.	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
3.	Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education).
4.	Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Course Title	Software Engineering & Project Management	Semester	V
Course Code	MVJ21IS51	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 2 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

Describe the importance of management and functions of a manager.

Explain the process of planning and organizing.

Explain the requirements of direction and supervision and Explain the methods of establishing control.

Identify the role of entrepreneurs in the economic development of the nation and recognize the barriers of entrepreneurship.

Explain the importance of Intellectual property protection.

Module-1	L1,L2,L3	12 Hours

Syllabus Content:

Management: importance of management, definition, management functions, roles of a manager, levels of management, managerial skills, management and administration, management –a science or art, management – a profession, professional management v/s family management. Development of management thought; Early classical approaches, Neo classical approaches, modern approaches.

Application: Enterprises

Video Link: https://www.youtube.com/watch?v=mub7Z8Fl3ZU

Module-2	L1,L2,L3	12 Hours

Syllabus Content:

Planning: Nature, Importance of planning, forms, types of plans , steps in planning , limitations of planning, making planning effective , planning skills, strategic planning in Indian industry.

Organizing: Organization Meaning, process of organizing, span of management principles of organizing, Departmentation, organization structure, committees, teams.

Application: Industry

Video Link: https://www.youtube.com/watch?v=pCUs3UKwYpc

Module-3	L1,L2,L3	12 Hours

Syllabus Content:

Direction and supervision: Requirements of effective direction, giving orders, motivation, job satisfaction, morale , organizational commitment, first level supervision or front line supervision.

Controlling: Meaning and steps in controlling , Essential of a sound control system , Methods of establishing control

Application: Industry

Video Link: https://www.youtube.com/watch?v=MufenDklR8E

Module-4	L1,L2,L3	12 Hours

Syllabus Content:

Entrepreneurship: Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur – an emerging Class. Concept of Entrepreneurship – Evolution of Entrepreneurship, Development of Entrepreneurship, Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

Application: Industry

Video Link: https://www.youtube.com/watch?v=aozlwC3XwfY

Module-5	L1,L2,L3	12 Hours

Syllabus Content:

Introduction to IPR, origin and concepts of IPR, Concept of property, Forms of IP protection: Patents, copyrights, trademarks, designs, Trade secrets,

Traditional knowledge, Geographical indications. Basic concepts and historical background of patent system and law- National and international scenario (American & European Patent Regimes). International Treaties/Conventions on IPR: Paris Convention, Berne convention, Madrid agreement, Rome convention, World Intellectual Property Organization (WIPO), World Trade Organization, TRIPS Agreement, Patent Co-operation Treaty

Application: Industry

Video Link: https://www.youtube.com/watch?v=hHQWCFE0J84

Practical Experiments:	L3	20 Hours

Case study on Enterprises:

Case study (Microsoft),

Case study (Captain G R Gopinath),

Case study (N R Narayana Murthy & Infosys)

Practical Sessions:

Idea Generation and Opportunity Recognition

Strategy and Business Model Analysis Formulation of Project	
Course outcomes:	
CO1	Describe the importance of management and functions of a manager.
CO2	Explain the process of planning and principles of organizing
CO3	Identify the role of entrepreneurs in the economic development of the nation.
CO4	Compare the different leadership styles.
CO5	Apply the ethical principles related to the intellectual property protection

Text/Reference Books:	
1.	Management and Entrepreneurship, N V R Naidu, T Krishna Rao 4th reprint.
2.	Law relating to Intellectual Property rights , B. L. Wadhera, 5th edition,Universal Law Publishing, 2011
3.	Principles of Management, P C Tripathi, P N Reddy, 5th edition, TataMcGraw Hill, 2012
4.	Dynamics of Entrepreneurial Development & Management, Vasant Desai, Himalaya publishing house, 2009

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:

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	3	2	3					2	3	3
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CO3	3	3	2	2	3					2	3	3
CO4	3	3	2	2	3					2	3	3
CO5	3	3	3	2	3					2	3	3

High-3, Medium-2, Low-1

Course Title	**Data Communication & Computer Networks**	**Semester**	**V**
Course Code	**MVJ21IS52**	**CIE**	**50**
Total No. of Contact Hours	**50**	**SEE**	**50**
No. of Contact Hours/week	**4 (L : T : P :: 2 : 1 : 0)**	**Total**	**100**
Credits	**3**	**Exam. Duration**	**3 Hours**

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

Understand the Computer Networks and Data Transmissions

Learn Functions of different protocols in networked computers

Get details about Functions of Network layer, Router and deliver of data to host network

Learn the function of mobile networking and switching

Multimedia data transmission in network

Module-1	**L1,L2,L3**	**12 Hours**

Syllabus Content:

Application Layer: Principals of network applications, Network Application Architecture, Processing Communicating. Transport Services Available to Applications, Transport Services provided by the Internet, Application-Layer Protocols.

The Web and HTTP: Overview of HTTP – Non-Persistent and Persistent Connections – HTTP Message Format – User-Server Interaction: Cookies – Web Caching.

Internet's Directory Service: Service Provided by DNS, Overview of How DNS Works, DNS Records and Messages – Peer-to-Peer File Distribution.

Application: Web Programming

Video Link:

https://www.geeksforgeeks.org/basics-computer-networking/

Module-2	**L1,L2,L3**	**12 Hours**

Syllabus Content:

Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers. Overview of the Transport Layer in the Internet – Multiplexing and Demultiplexing: Connectionless Transport: UDP, UDP segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective Repeat, Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Time out, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control: The Causes and

the Costs of Congestion Approaches to Congestion Control.

Application:

Video Link:

https://www.guru99.com/types-of-computer-network.html

Module-3	L1,L2,L3	12 Hours

Syllabus Content:

The Network Layer: What's inside a Router – Input Processing – Switching – Output Processing – Where Does Queuing Occur? – Routing Control plane – Ipv6, A Brief foray into IP Security.

Routing Algorithms: The Link-State (LS) Routing Algorithm – The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing – Routing in the Internet – Intra -AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP, Broadcast Routing Algorithms - Multicast.

Application: Router Programming – Simulation , Hands-on simulation – Sensor Networks (Simulation)

Video Link:

https://lecturenotes.in/notes/15491-note-for-computer-network-cn-by-vtu-rangers

Module-4	L1,L2,L3	12 Hours

Syllabus Content:

Circuit switched networks, Datagram networks, Virtual circuit networks, Structure of a Switch-Structure of Circuit Switches & Packet Switches, Data Link Layer-Detection and Correction-Introduction, Block Coding-Error Detection and Correction, Hamming Distance, Minimum Hamming Distance, Linear Block Codes, Cyclic Codes-CRC, Polynomials, Checksum

Module-5	L1,L2,L3	12 Hours

Syllabus Content:

1. Data Link Layer – Data Link Control- Framing, Flow and error control, Protocols, Noiseless Channels, Noisy Channels, HDLC, Point-to-Point Protocol- Framing, Transition phases, Multiple Access- Random access-Aloha, CSMA, CSMA/CD, CSMA/CA, Controlled access- reservation, polling, token passing, Channelization - FDMA,TDMA,CDMA

Practical Experiments:

1. Study of LAN cables and other related devices.
2. Establishing LAN by assigning IP Address.
3. Implementation of FTP using java.
4. Implementation of TCP using java.
5. Implementation of UDP using java.

Course outcomes:	
CO1	Establish LAN and assigning IP address to each node
CO2	Can apply different protocols to transfer data between computers
CO3	Know how the network deliver the packets to destination network
CO4	Analyze flow control and Error control mechanism using standard data link layer protocols and Compare
CO5	Analyze different protocols used for Ethernet and various connecting devices used in networks.

Text/Reference Books:	
1.	Data Communication and Networking, Forth Edition, Behrouz A. Forouzan, , Mc Graw Hill.
2.	James F. Kurose and Keith W. Ross, Computer Networks A Top Down Approach, Sixth Edition, Pearson
3.	William Stallings, Data and Computer Communication, Tenth Edition, Pearson Education, 2013.
4.	WilliamStallings, " Data and Computer Communication", PearsonEducation, 10thEdition, 2014.

CIE Assessment:

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

Quizzes/mini tests (4 marks)

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SEE Assessment:

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.

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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
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CO2	3	3	3	2	3					2	3	3
CO3	3	3	2	2	3					2	3	3
CO4	3	3	2	2	3					2	3	3

CO5	3	3	3	2	3					2	3	3

High-3, Medium-2, Low-1

Course Title	**Database Management System & Lab**	**Semester**	**V**
Course Code	**MVJ21IS53**	**CIE**	**50**
Total No. of Contact Hours	**50**	**SEE**	**50**
No. of Contact Hours/week	**4 (L : T : P :: 2 : 1 : 0)**	**Total**	**100**
Credits	**4**	**Exam. Duration**	**3 Hours**

Course objective is to:

- Provide Key Knowledge in database system concepts, applications and advantages.
- To get knowledge about SQL programming
- Design a database as redundant and error free
- Students can build a database application for real world problems
- Can derive the knowledge or pattern from real world data

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

Introduction: Database-System Applications – Purpose of Database – View of Data – Database Languages – Relational Databases – Database Design – Data Storage and Querying – Transaction Management – Database Architecture – Data mining and Information Retrieval – Specialty Databases – Database Users and Administrators.

Introduction to Relational Model: Structure of Relational Database – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations – Relational Algebra.

Application: This module will give basic knowledge of database and SQL.

Video Link: https://www.youtube.com/watch?v=X9bQsAoqmfI

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

Introduction to SQL: Overview of the SQL Query Languages – SQL Definition – Basic Structure of SQL Queries – Additional Basic Operations – Set Operations – Null Values – Aggregate Functions - Nested Subqueries – Modification of Database.

Intermediate SQL: Join Expressions – Views – Integrity Constraints – SQL Data types and Schemas – Authorization.

Advanced SQL: Functions and Procedures – Triggers.

Application: Students can learn more complex queries and can design error free database using constraints.

Video Link: https://www.youtube.com/watch?v=fRMv14j5XJU

Module-3	**L1,L2,L3**	**8 Hours**

Relational Database Design: Features of Good Relational Designs – Atomic Domains and First Normal

Form – Decomposition Using Functional Dependencies – Functional-Dependency Theory – Algorithm for Decomposition – 2nd Normal Form, 3rd Normal Form, Boyce Codd Normal Form Decomposition using Multivalued Dependencies – 4th Normal Form and domain Key Normal Form.

Application: Students can learn how to divide the table without any data lose and can execute queries without any anomalies.

Video Link: https://www.youtube.com/watch?v=Ko_LE3TNO64&t=1s

https://www.youtube.com/watch?v=p62he-WUp9E

Module-4	**L1,L2,L3**	**8 Hours**

Transaction: Transaction Concept – A Simple Transaction Model – Transaction Atomicity and Durability – Transaction Isolation – Serializability – Isolation Levels – Implementation of Isolation Level –

Concurrency Control: Lock-Based Protocol – Timestamp-Based Protocols – Validation-Based Protocol.

Advanced SQL: Accessing SQL From a Programming Language.

Application design and Development: Application Programs and User Interfaces – Web Fundamentals – Servlet and JSP

Application: Students can develop a web-based application for accessing database.

Video Link: https://www.youtube.com/watch?v=w83Ug6IwVTw

https://www.youtube.com/watch?v=Thm0xW9oTow

https://www.youtube.com/watch?v=C_J6K8DodS8

Module-5	**L1,L2,L3**	**8 Hours**

Data Warehousing, Data Mining, and Information Retrieval: Data Warehousing and Mining – Data Warehousing – Data Mining – Classification – Association Rules – Data mining algorithms using Weka Tools.

Application: Students can develop an application using JAVA with Weka for data mining operations.

Video Link: https://www.youtube.com/watch?v=XlbM9ibjUuM

Course outcomes:

CO1	Understand the database requirements of real-world problems
CO2	Querying the data according to different requirements
CO3	Design database for real world problems like bank, commercial shops
CO4	Develop application program to real world problems
CO5	Database mining to derive pattern among different data sets

LABORATORY EXPERIMENTS	(10 hours)
1.a. Study of User privileges b. Experiments on All Data Definition Language (create, modify, drop table etc.,) 2. Experiments on All Data Manipulation Language (Insert, Delete, Update) 3. Experiments on Nested Sub-queries and Inner Queries 4. Experiments on All types of Joins 5. Experiment on Cursor, Assertion and Triggers 6. Experiments on PL\SQL and Procedure and Function 7. Implementation of Normal forms – (The faculty should give some set of attributes and students should solve by different normal forms) 8. Front-end & Back-end application 1 (Front end – any programming language, Back-end – any database software) 9. Front-end & Back-end application 2 (GUI Based) 10. Front-end & Back-end application 3 (GUI based application for shops, etc.,) 11. Implementation of Data mining Algorithms 1 – using Weka or Orange	

Course Outcome for DBMS Laboratory:	
CO1	Create table, insert data using sql commands
CO2	Execute queries for acquire data from database
CO3	Develop a program for commercial shop bill maintenance
CO4	Develop a web application to remote data processing
CO5	Implement data mining algorithms for derive patterns in data

Text/Reference Books:	
1.	Database System Concepts, Sixth Edition, by Abraham Silberschatz, Henery F. Korth, S. Sundarshan
2.	Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
3.	Database Management System, Ramakrishnan and Gehrke, 3rd Edition, Mc-GrawHill, 2013.
4.	Data Mining Concepts and Techniques, Second Edition, by Jiawei Han and Micheline Kamber, Elsevier.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional

quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semestera test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab

and are awarded 10 marks. Total marks for the laboratory is 50.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type Questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms

of COs and Bloom's taxonomy level.

Course Title	Web Technology	Semester	V
Course Code	MVJ21IS54	CIE	50
Total No. of Contact Hours	50	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 2 : 1 : 0)	Total	100
Credits	4	Exam. Duration	3 Hours

Course objective is to:

Teach students HTML and CSS for designing web pages.

Introduce students to the basics of JavaScript as a programming language.

Familiarize students with the Document Object Model and enable them to create dynamic web pages that react to user input. Teach students about installing and configuring Apache Server and incorporating backend support for their web pages. Introduce students to the newer features available as part of the HTML standard

Module -1	L1,L2,L3	8 Hours

Introduction, UI Design and UX : Internet, WWW, Web Servers and Browsers, URLs, MIME, HTTP, Basic Markup, Images, Hyperlinks, Lists, Tables, Forms, DataList, Canvas, Audio and Video, Geo-Location, Local Storage, Web Workers, Offline Web Applications, Drag and Drop.HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats

Application: To deliver data (HTML files, image files, query results) on the World Wide Web.

Video Link:

https://www.freecodecamp.org/

https://developer.mozilla.org/en-US/docs/Web/CSS

Module -2	L1,L2,L3	8 Hours

Style Sheets: CSS Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML Style Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout-Beyond the Normal Flow-Other Properties-Case Study. Client- Side Programming:

Application: Describing the presentation of Web pages, including colors, layout, and fonts

Video Link:

https://www.vogella.com/tutorials/CSS/article.html

https://nptel.ac.in/courses/106/105/106105084/

Module - 3	L1,L2,L3	8 Hours
JavaScript: Introduction to Client-Side Scripting, JavaScript Basics, Screen Input and Keyboard Output, Functions, Objects, Inheritance, Hoisting, Arrays, JavaScript Objects, Accessing and Modifying DOM, Events and Event Handlers - Load, Mouse, Synthetic Events, Key and Form Related Events, Event Bubbling, Cookies. Application: Web Sites, Web Server Applications, Mobile Apps, Games Platform Video Link: https://www.udemy.com/courses/development/web-development/ https://javascript.info/hello-world#modern-markup		
Module-4	**L1,L2,L3**	**8 Hours**
PHP Arrays and Superglobals, Arrays, $_GET and $_POST Superglobal Arrays, $_SERVERArray, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions, PHP Error Reporting, PHP Error and Exception Handling Application: e-Commerce Applications. Web Pages and Web-Based Applications Video Link: http://www.nptelvideos.com/video.php?id=2142&c=27 http://www.nptelvideos.com/video.php?id=2131&c=27 http://www.nptelvideos.com/video.php?id=2116&c=27		
Module-5	**L1,L2,L3**	**8 Hours**
Bootstrap: Grid Systems, Layout, Tables and Forms, Buttons and Images, Progress Bar, Navigations. jQuery: Usage, Selecting DOM Elements, Getting and Setting Attributes, Changing Styles, File Handling and System Calls, Arrays, Cookies, Sessions, Database Access. Application: Bootstrap is a front-end framework used to create modern websites and web apps Video Link: https://getbootstrap.com/docs/4.5/examples/ https://www.w3schools.com/bootstrap/bootstrap_buttons.asp		

Course outcomes:

CO1	Outline the basic concepts of information and web architecture.
CO2	Design solutions for programming questions using JavaScript
CO3	Study Hyper Text markup language and create websites using HTML, CSS Codes.

CO4	Setup a web server and host a website with back end support.
CO5	Incorporate the latest HTML features in the web pages designed by them with fallback options wherever required.

Text/Reference Books:

1.	Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2.	Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education
3.	Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
4.	Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001
5.	Bates, "Developing Web Applications", Wiley, 2006.

LABORATORY EXPERIMENTS	**(10 hours)**

1.Java script: simple calculator

2. JavaScript : Calculate squares and cubes of the numbers from 0 to 1

3. JavaScript : TEXT-GROWING and TEXT-SHRINKING

4. HTML5 and JavaScript :

a) position in the string of the left-most vowel

b) number with its digits in the reverse order

5. XML document to store information about a student

6. PHP : display the number of visitors visiting the web page.

7. PHP : display digital clock with current time of the server.

8. PHP :

a) Implement simple calculator operations.

b) Find the Transpose of a matrix, Multiplication of two matrices and 24 Addition of two matrices.

9. PHP : program with variable states with value "Mississippi Alabama Texas Massachusetts Kansas"

10. PHP : program to sort the student records using selection sort

Course Outcome for DBMS Laboratory:

CO1	Design and develop static and dynamic web pages.
CO2	Have a good understanding of Web Application Terminologies, Internet Tools other web services
CO3	Learn Database Connectivity to web applications.

CO4	Familiarize with Client-Side Programming, Server-Side Programming, Active server Pages.
CO5	Have a good understanding of Web Application Terminologies, Internet Tools other web services.

Text/Reference Books:	
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CO2	3	3	3	2	3					2		2
CO3	3	3	2	2	3					2		2
CO4	3	3	2	2	3					2		3
CO5	3	3	3	2	3					2		2

High-3, Medium-2, Low-1

Professional Electives-V sem

Course Title	**Advanced JAVA & J2EE**	**Semester**	**V**
Course Code	**MVJ21IS551**	**CIE**	**50**
Total No. of Contact Hours	**40**	**SEE**	**50**
No. of Contact Hours/week	**4 (L : T : P :: 2 : 1 : 0)**	**Total**	**100**
Credits	**3**	**Exam. Duration**	**3 Hours**

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

Construct client-server applications using Java socket API

Identify the need for advanced Java concepts like Enumerations and Collections

Make use of JDBC to access database through Java Programs

Adapt servlets to build server side programs

Demonstrate the use of JavaBeans to develop component-based Java software

Module-1	**L1,L2,L3**	**12 Hours**

Syllabus Content:

Enumerations, Autoboxing and Annotations(metadata): Enumerations, Enumeration fundamentals, the values() and value Of() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at run time by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations

Application: choices on a menu, rounding modes, command line flags, etc. Autoboxing & Auto unboxing: Annotations

Video Link: https://www.youtube.com/watch?v=vJ-Zn4fo0MQ&t=608s

Module-2	**L1,L2,L3**	**12 Hours**

Syllabus Content:

The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections, The legacy Classes and Interfaces,

Parting Thoughts on Collections.

Application: Writing an application

Video Link: https://www.youtube.com/watch?v=Ma7u6KEKzPE

Module-3	L1,L2,L3	12 Hours

Syllabus Content:

String Handling :The String Constructors, String Length, Special String Operations, String Literals, String Concatenation, String Concatenation with Other Data Types, String Conversion and toString( ) Character Extraction, charAt( ), getChars( ), getBytes( ) toCharArray(), String Comparison, equals( ) and equalsIgnoreCase( ), regionMatches( ) startsWith( ) and endsWith( ), equals( ) Versus == , compareTo( ) Searching Strings, Modifying a String, substring( ), concat( ), replace( ), trim( ), Data Conversion Using valueOf( ), Changing the Case of Characters Within a String, Additional String Methods, StringBuffer , StringBuffer Constructors, length( ) and capacity( ), ensureCapacity( ), setLength( ), charAt( ) and setCharAt( ), getChars( ),append( ), insert( ), reverse( ), delete( ) and deleteCharAt( ), replace( ), substring( ), Additional StringBuffer Methods, StringBuilder

Application: Datatype

Video Link: https://www.youtube.com/watch?v=N63JCXwdd14

Module-4	L1,L2,L3	12 Hours

Syllabus Content:

Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects

Application: java-based web application.

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

Module-5	L1,L2,L3	12 Hours

Syllabus Content:

JDBC Overview – JDBC implementation – Connection class – Statements - Catching Database Results, handling database Queries. Networking– InetAddress class – URL class- TCP sockets - UDP sockets, Java Beans –RMI.

Application: Connecting, storing, retrieving data between program and any database.

Video Link: https://www.youtube.com/watch?v=Cq4lwVE2Fzk

Course outcomes:

CO1	Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs
CO2	Build client-server applications and TCP/IP socket programs

CO3	Illustrate database access and details for managing information using the JDBC API
CO4	Describe how servlets fit into Java-based web application architecture
CO5	Develop reusable software components using Java Beans

Text/Reference Books:	
1.	Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.
2.	Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007.
3.	Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004.
4.	Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.
5.	Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata 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:

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

High-3, Medium-2, Low-1

Course Title	Cloud Computing	Semester	V
Course Code	MVJ21IS552	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 2 : 1 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

understands cloud computing models and infrastructure for larger networks

Identify policies, mechanisms and scheduling for resource management, virtualization, and optimization of networks.

Compare multiple approaches to cloud system design and solve real world problems.

Illustrate storage concept and self-organizing capability for different cloud systems.

Understands cloud security and risk..

Module-1	L1,L2,L3	12 Hours

Defining a Cloud, Cloud Computing Reference Model , Characteristics and Benefits, Historical Developments, Building Cloud Computing Environments, Computing Platforms and Technologies, Eras of Computing, Parallel vs. Distributed Computing, Elements of Parallel Computing.

Application:

Art Applications

Business Applications

Data Storage and Backup Applications

Video Link**:**

https://www.youtube.com/watch?v=eaf_l9SBmyQ

Module-2	L1,L2,L3	12 Hours

Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples, Xen, VMware, Microsoft Hyper-V, Cloud Reference Model and Architecture, Infrastructure as a Service, Platform as a Service, Software as a Service, Types of Clouds, Economics of the Cloud, Open Challenges in Clouds.

Application:

- Big data analysis
- Storage
- Recovery
- Backup

Video Link**:**

https://www.youtube.com/watch?v=_pPlanX5wQY

Module-3	L1,L2,L3	12 Hours

Data-intensive computing Characterizing data-intensive computations, Challenges ahead, Historical perspective, Technologies for data-intensive computing – Storage systems, Programming platforms – Map Reduce. Public Cloud Infrastructures: Amazon Web Services - Compute, Storage, and Communication Services; Google App Engine – Architecture, Application Life-Cycle, Cost Model; and Microsoft Azure.

Application:

- Disaster recovery

Online File storage

Photo editing software

Digital video software

Twitter-related applications

Video Link:

https://www.youtube.com/watch?v=9C9VJh19YFs

https://www.youtube.com/watch?v=dB1R9XHAng0

Module-4	L1,L2,L3	12 Hours

ECG Data Analysis on Cloud, Protein Structure Prediction, Satellite Image Processing; Business and Consumer Applications – CRM, Social Networks, Media Applications, and Multiplayer Online Gaming. Advanced Topics in Cloud Computing, Energy efficiency in clouds, Energy-efficient and green cloud computing architecture, Market-based management of clouds, Market-oriented cloud computing, A reference model for MOCC,3 Technologies and initiatives supporting MOCC, Observations

Application:

Creating image-album

Web application for antivirus

Word processing application

Spreadsheets

Presentation software

Video Link:

https://www.youtube.com/watch?v=s9G2NQhvaKQ

Module-5	L1,L2,L3	12 Hours

Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor.

Application:

Finding a way on the map

E-commerce software

Miscellaneous applications

Video Link:

https://www.youtube.com/watch?v=0lw4KU5wHsk

Practical Experiments/ Case Study:

Creating a Warehouse Application in SalesForce.com.

Implementation of SOAP Web services in C#/JAVA Applications.

Installation and Configuration of Hadoop.

Case Study: Amazon Web Services

Case Study: PAAS(Facebook, Google App Engine)

Create an application (Ex: Word Count) using Hadoop Map/Reduce

Course outcomes:

CO1	Explore the basic concepts of cloud computing, cloud infrastructure, cloud models, cloud services, distributed computing, and other related concepts.
CO2	Understand Virtualization, and working of some of industrially popular Virtualization technologies.
CO3	Apply Map Reduce programming model to solve some data-intensive computing applications over public or private cloud platforms.
CO4	Analyzing the security risks in cloud from different perspectives and study some of the available solutions.
CO5	Explain Operating system security, Virtual machine Security and Security of virtualization.

Text/Reference Books:	
1.	Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, and ThamaraiSelvi, 2013, McGraw Hill, New Delhi, India, ISBN-13: 978-1-25-902995-0.
2.	2.Cloud Computing Theory and Practice, Dan C Marinescu, 1st Edition, 2013, Elsevier (MK), ISBN: 9780124046276. (Unit – 5)
3.	3.Distributed Computing and Cloud Computing, from parallel processing to internet of things, Kai Hwang, GeofferyC.Fox, Jack J Dongarra, 1st Edition, 2012, Elsevier(MK), ISBN: 978-0-12-385880-1.
4.	4.Cloud Computing Implementation, Management and Security,John W Rittinghouse, James F Ransome, 1st Edition, 2013, CRC Press, ISBN: 978-1-4398-0680-7.

CIE Assessment:

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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 Mapping

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

High-3, Medium-2, Low-1

Course Title	Agile Technology	Semester	V
Course Code	MVJ21IS553	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 2 : 1 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

Learn about operating system and interact through commands.

Understand texting based command and shell programming

Work with process and files

Understand how networking and client/server system works.

Learn 'perl' script cording

Module-1	L1,L2,L3	12 Hours

Unix Components/Architecture – Environment and Structure – Posix and Single Unix Specification – Login Prompt – Unix Commends and Structure – Commands Arguments Options – Basic Commands & Combining commands – *date, passwd*, and c*al* Command - Types of commands and locating it – man command – Unix online manual page – Knowing user terminal – displaying – setting – managing the non-uniform behaviour of terminals and keyboards – Root Login, etc/passwd and etc/shadow files – command for add, modify and delete users

Unix Files: File types - Organization - hidden files and standard directories – Parent and child relationship - Home Directory – File path with various options – Directory commands – *cat, mv, rm cp, wc* commands – *od, cmp* and *comm, diff* commands – File attributes and Permission – Directory Permission

Application: Students will get awareness about opensource platforms, Unix OS and commands.

Video Link: https://www.youtube.com/watch?v=3DA1grSp4mU

Module-2	L1,L2,L3	12 Hours

vi-basics – input mode command – navigation commands – searching for pattern (/ and ?) search and replace (:S) – shells interpretive cycle – Removing special meanings of wild cards – three standard files and redirections – connecting commands: PIPE, Splitting the output: tee – 'grep' and 'sed' command – command substitution – basic and extended regular expressions – examples involving different regular expression.

Shell Programming: Ordinary and environment variables – The .profile, .read and readonly commands – Command line arguments – logical operators – for conditional execution – exit and exit status of a

command – test command and its shortcut – Control Statements – loop statements – 'if' statement examples – 'case' statement – sort command and its options – set and shift command – handling positional parameter – two special files /dev/null and dev/tty – Head and tail commands – cut and paste commands – unmask and default file permission.

Application: Students can learn basic Unix command and 'vi' editor for text processing.

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

Module-3	**L1,L2,L3**	**12 Hours**

The Process: The process and control – creating parent and child process – ps command its options – background processes – corn command crontab files – kill and find commands – batch command and priority – 'nice' command. Process identifiers – fork, vfork, exit, wait, waitpid, wait3, wait4 functions – race conditions – exec functions – changing user IDs and Group IDs – Interpreter Files – System function – Process Accounting – User Identification – Process times – I/O Redirection.

Process Relationship: Terminal login – network logins – process groups – sessions – Controlling Terminal – tcgetpgrp and tcsetpgrp functions – Job Control – Shell Execution of programs – Orphaned process groups.

Application: Students can learn process related commands and User privileges

Video Link: https://www.youtube.com/watch?v=9YRxhlvt9Zo

Module-4	**L1,L2,L3**	**12 Hours**

Inter-process Communication: Overview of IPC methods – Pipes – popen – pclose functions – Coprocesses, FIFOs – System V IPC – Message Queues – Semaphores. Shared Memory – Client-Server Properties – Stream Pipes – Passing File descriptors – An open server-Version 1, Client-Server Connection Functions.

Application: Students can learn how schedule process for run and inter-process communication.

Video Link: https://www.youtube.com/watch?v=lcRqHwIn5Dk

Module-5	**L1,L2,L3**	**12 Hours**

Structure of Perl script – Variables – Operators – String Handling functions – Range operators – lists and arrays - @variables and splice operators – File and File handling functions – Regular Expressions – simple and multiple search patterns – match and substitute operators – defining and using subroutines.

Application: Students can learn to write shell script in Unix environment.

Video

Link:https://www.youtube.com/watch?v=ELp9ytLjupE&list=PLGqiLyfegVYDeHVG0qigvOK5liPnDi4B9

Practical experiments:

Basic Unix commands Unix Shell Programming	
Course outcomes:	
CO1	Easily interact with Unix shell through commands
CO2	Easily can work with text 'vi' editor for text processing
CO3	Create and execute programs to read/write data from files
CO4	Client/Server communication through network
CO5	Wirte 'perl' script for unix operating system
Text/Reference Books:	
1.	Sumitabha Das., Unix Concepts and Applications., 4th Edition., Tata McGraw Hill
2.	Terrence Chan Unix System Programming Using C++ , PHI, 1999.
3.	W.Richard Stevens, Stephen A. Rago, Advanced Programming in the UNIX Environment , 3rd edition, Pearson Education /PHI, 2005.
4.	Behrouz A. Forouzan, Richard F. Gilberg: Unix and Shell Programming – Cengage Learning – India Edition 2009
5.	M.G. Venkatesh Murth: Unix and Shell Programming, Pearson Education.

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:
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	2	2	2	2	1	1	1	1	1	1	1	1
CO2	2	2	1	1	1	1	1	1	1	1	2	1
CO3	3	2	1	1	1	1	1	1	1	1	2	2
CO4	2	2	1	2	1	1	1	1	1	1	1	1
CO5	2	3	2	1	1	1	1	1	1	1	1	1

High-3, Medium-2, Low-1

Course Title	Business Intelligence	Semester	V
Course Code	MVJ21IS554	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 2 : 1 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

The objective of this course is to learn Business Intelligence.

Module -1	L1,L2,L3	12 Hours

Introduction to Business Intelligence: Understanding the scope of today's BI solutions and how they fit into existing infrastructure Assessing new options such as SaaS and cloud-based technology. Describe BI, its components & architecture, previewing the future of BI Crafting a better experience for all business users, End User Assumptions, Setting up Data for BI, The Functional Area of BI Tools, Query Tools and Reporting, OLAP and Advanced Analytics, Supporting the requirements of senior executives, including performance management.

Module -2	L1,L2,L3	12 Hours

Elements of Business Intelligence Solutions: Reports & ad hoc queries; Analyse OLAP data; Dashboards & Scorecards development, Metadata Models; Automated tasks & events; Mobile & disconnected BI; Collaboration capabilities; Real time monitoring capabilities; Software development kit; Consume BI through portals, web applications, Desktop applications.

Module - 3	L1,L2,L3	12 Hours

Building the BI Project: Planning the BI project, Project Resources; Project Tasks, Risk Management and Mitigation, Cost-justifying BI solutions and measuring success,Collecting User Requirements, Requirements-Gathering Techniques; Prioritizing & Validating BI Requirements, Changing Requirements; BI Design and Development, Best Practices for BI Design; Post-Implementation Evaluations, Maintaining Your BI Environment.

Module-4	L1,L2,L3	12 Hours

Reporting authoring: Building reports with relational vs Multidimensional data models ; Types of Reports – List, crosstabs, Statistics, Chart, map, financial etc; Data Grouping & Sorting, Filtering Reports, Adding Calculations to Reports, Conditional formatting, Adding Summary Lines to Reports. Drill up, drill- down, drill-through capabilities. Run or schedule report, different output forms – PDF, excel, csv, xml etc.

Module-5	L1,L2,L3	12 Hours

BI Deployment, Administration & Security: Centralized Versus Decentralized Architecture, BI Architecture Alternatives, phased & incremental BI roadmap, System Sizing, Measurements and Dependencies, System Sizing, Measurements, and Dependencies. Setting Early Expectations and Measuring the Results. End-User Provisos. OLAP Implementations. Expanding BI Authentication Authorization, Access Permissions, Groups and Roles, Single-sign on Server Administration, Manage Status & Monitoring, Audit, Mail server & Portal integration, Back Up and Restore.	
Course outcomes:	
CO1	To gain knowledge of Business Intelligence
CO2	Business Intelligence is the ability to communicate one's analyses and recommendations to decision-makers
CO3	To build business projects
CO4	To generate and manage BI reports
CO5	To BI Deployment, Administration & Security.
Text/Reference Books:	
1.	Business Intelligence (IBM ICE Publication).
2.	http://en.wikipedia.org/wiki/Business_intelligence.
3.	http://www.webopedia.com/TERM/B/Business_Intelligence.html.
4.	Http://www.cio.com/article/40296/Business_Intelligence_Definition_and_Solutions.

Course Title	**Data Mining and Data warehousing**	**Semester**	**VI**
Course Code	**MVJ21IS61**	**CIE**	**50**
Total No. of Contact Hours	**40**	**SEE**	**50**
No. of Contact Hours/week	**4 (L : T : P :: 2 : 1 : 0)**	**Total**	**100**
Credits	**3**	**Exam. Duration**	**3 Hours**

Course objective is to:

Gather and analyze large sets of data to gain useful business understanding

Understand the data mining functionalities, technologies and steps in pre-processing the data

Learn data mining algorithms, methods and tools

Module-1	**L1, L2, L3**	**12 Hours**

Raw data to valuable information-Lifecycle of Data - What is data warehousing - The building Blocks: Defining Features - Data warehouses and data marts - Overview of the components - Metadata in the data warehouse - Basic elements of data warehousing - Principles of dimensional modelling: Star schema, Snowflake schema and Galaxy schema.

Application:

Identify the potential risk of default and manage and control collections

Performance analysis of each product, service, interchange, and exchange rates

Store and analyze information about faculty and students

Maintain student portals to facilitate student activities

Video Link:

https://www.youtube.com/watch?v=8lHpioyvSng

Module-2	**L1,L2,L3**	**12 Hours**

Introduction to Data Mining Systems, Knowledge Discovery Process -Data Objects and attribute types, Statistical description of data, Data Preprocessing- Data Cleaning, Data Integration and Transformation, Data Reduction.

Application:

Financial Analysis

Telecommunication Industry.

Intrusion Detection Retail Industry Higher Education Video Link: https://www.youtube.com/watch?v=QRZlYzxEFDg		
Module-3	**L1,L2,L3**	**12 Hours**
Market Basket Analysis, Frequent Item sets, Closed Itemsets, Association Rules, Frequent Itemset Mining Methods- Apriori algorithm, Generating Association rules from Frequent Itemsets, A Pattern- Growth Approach for mining frequent Itemsets, Mining Frequent Itemsets using the Vertical Data Format. Application: **Market Basket Analysis** **Medical Diagnosis:** **Census Data** **Protein Sequence** Video Link: https://www.youtube.com/watch?v=RiFrbyiYpRs		
Module-4	**L1,L2,L3**	**12 Hours**
Classification and Prediction ,Basic Concepts, Decision Tree Induction, Bayesian Classification ,Rule Based Classification, Classification by Back propagation , Support Vector Machines, Lazy learners. Application: Sentiment Analysis Email Spam Classification Document Classification Image Classification Video Link: https://www.youtube.com/watch?v=gkagE_fE2sk		
Module-5	**L1,L2,L3**	**12 Hours**

Types of Data in Cluster Analysis , Data similarity and dissimilarity measures ,A Categorization of Major Clustering Methods -Partitioning Methods-K-means, K-medoids , Hierarchical Methods-Agglomerative vs Divisive, Distance measures, BIRCH, Clustering High-Dimensional Data- Outlier Analysis and Detection.

Application:

Clustering analysis

In the field of biology, it can be used to derive plant and animal taxonomies.

Identification of areas of similar land use in an earth observation database.

Video Link:

https://www.youtube.com/watch?v=2QTeuO0C-fY

Experimental Part:

Apriori Algorithm for market Basket Analysis

Bayesian Classification

Decision Tree Induction Algorithm

Frequent Pattern-Growth Algorithm

Course outcomes:

CO1	Design data warehouse by applying principles of dimensional modelling and ETL concepts
CO2	Analyze various data pre-processing techniques for efficient data mining.
CO3	Apply association rule mining for finding hidden and interesting patterns in data.
CO4	Apply statistical procedure, machine learning and neural network based classification algorithms for data prediction
CO5	Apply clustering algorithms for the application and generalizations for real time problems

Text/Reference Books:

1.	Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.
2.	Paulraj Ponniah, Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, Wiley, 2010
3.	Alex Berson, Stephen J Smith, Data warehousing, Data mining, and OLAP, Tata McGraw Hill edition, 2007
4.	Pang-Ning Tan, Michael Steinbach and Vipin Kumar,Introduction to Data Mining, Pearson Education, 2007

5.	G. K. Gupta ,Introduction to Data Mining with Case Studies, Easter Economy Edition, Prentice Hall of India, 2006

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CO3	3	3	3	3	3	3						3
CO4	3	3	3	3	3	3		3				3
CO5	3	3	3	3	3	3						3

High-3, Medium-2, Low-1

Course Title	Introduction to Data Science	Semester	VI
Course Code	MVJ21IS621	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:

Understanding R for data science

Learn about requirement of data analysis

Can understand how machine learning algorithm works

How to visualize the data

Real world data analysis

Module -1	L1,L2,L3	12 Hours

What You Will Learn – What You Won't Learn – Prerequisites – Running R Code.

Data Visualization: Introduction – First Steps – Aesthetic mapping – Common Problems – Facets – Geometric Objects – Statistical Transformations – Position adjustments – Coordinate systems – Layered Grammar of Graphics.

Workflow Basics: Coding Basics – What's in a name? – Calling Functions – Exercises.

Data Transmission: Introduction – Filter rows with filter() – Arrange rows with arrange() – Select Columns with select() – Add new variables with mutate() – Grouped summaries with summarise() – Grouped mutates.

Workflow: Scripts.

Application: Data visualization can be used in storytelling of insight obtained from Bigdata.

Video Link:

https://nptel.ac.in/courses/111/104/111104100/

Module -2	L1,L2,L3	12 Hours

Exploratory Data Analysis: Introduction – Questions – Variation – Covariation – Patterns and models.

Introduction: What is Data science? Big Data and Data Science Hype – Getting Past the Hype – Why Now: Datafication– The Current Landscape – A Data science Profile – Thought Experiment: Meta-

Definition – What is a Data Scientist, Really? In Academia – In Industry Application: Banking, Health care, Transport, Manufacturing, Agriculture etc Video Link: https://www.digimat.in/nptel/courses/video/106106179/L08.html		
Module - 3	**L1,L2,L3**	**12 Hours**
Statistical Thinking in the Age of Big Data – Exploratory Data Analysis – The Data Science Process – Thought Experiment: How Would you Simulate Chaos? Algorithms: Machine Learning Algorithms – Three Basic Algorithms – Exercise: Basic Machine Learning Algorithms – Summing It All Up – Though Experiment: Automated Statistician. Application: Recommendation Systems(You tube) Video Link: https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs28/		
Module-4	**L1,L2,L3**	**12 Hours**
Thought Experiment: Learning by Example – Naïve Bayes – Fancy It Up: Laplace Smoothing – Comparing Naïve Bayes to K-NN – Sample Code in Bash – Scraping the Web: API and Other Tools – Jake's Exercise: Naïve Bayes for Article Classification. Data Visualization and Fraud Detection: Data Visualization History - What Is Data Science, Redux? - A Sample of Data Visualization Projects - Mark's Data Visualization Projects - Data Science and Risk - Data Visualization at Square - Ian's Thought Experiment - Data Visualization for the Rest of Us Application: Spam filter can be applied to get rid of unwanted spam messages in Email and SMS. Video Link: https://www.youtube.com/watch?v=9YXojHh_ZPY		
Module-5	**L1,L2,L3**	**12 Hours**
Social Network Analysis at Morning Analytics - Social Network Analysis - Terminology from Social Networks - Thought Experiment – Morning side Analytics - More Background on Social Network Analysis from a Statistical Point of View - Data Journalism Data Engineering: MapReduce, Pregel, and Hadoop Application: To find out the trending news for the day, Trending hash tags in face book or Twitter Video Link: https://www.youtube.com/watch?v=uEFbdGlSAfQ		

Practical Experiments:
YouTube Data Analysis
Machine Learning algorithms – Hands-On Training
Share Market Analysis - Hands-On Training
Fraud Analysis of Trade document using Data Science
Identifying Revenue drop from customer behavior pattern in Banking Industry

Course outcomes:	
CO1	R programming for data science
CO2	Analyze the data
CO3	Machine learning algorithms
CO4	Visualize the different data with different form
CO5	Interpret, analytic and visualize read world data

Text/Reference Books:	
1.	Hadley Wickham and Garrett Grolemund , R for Data Science, Publisher: O'Reilly Media
2.	Cathy O'Neil and Rachel Schutt, Doing Data Science Straight Talk from the Frontline, Publisher: O'Reilly Media
3.	Ricardo Anjoleto Farias, Nataraj Dasgupta, Vitor Bianchi Lanzetta, Hands-On Data Science with R, O'reilly, 2018.

CIE Assessment:
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Quizzes/mini tests (4 marks)
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Activities/Experimentations related to courses (8 Marks)
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ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

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

CO-PO Mapping

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

High-3, Medium-2, Low-1

Course Title	Introduction to Cyber Security	Semester	VI
Course Code	MVJ21IS622	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:

Explain the fundamental definitions of different security issues.

Familiarize cybercrimes happening with mobile and wireless devices.

Use cybercrime tools to analyze the security gaps.

Familiarize with different OSI layers and security aspects.

Explain legal aspects and Indian IT Act.

Module-1	L1,L2,L3	12 Hours

Syllabus Content:

Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes, How criminal plan the attacks, Social Eng., Cyber fraud vs. Cybercrime Cyber stalking, Cybercafe and Cybercrimes, Botnets, Attack vector, Cloud computing.

Application:

security services that are invoked at the interface between an application

Video Link:

https://www.youtube.com/watch?v=gfFKuiZ9Y7s

Module-2	L1,L2,L3	12 Hours

Syllabus Content:

Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Application:

the usage of small wireless mobile devices such as PDAs, Blackberrys and smartphones

Video Link:

https://www.youtube.com/watch?v=frM_7UMD_-A

Module-3	L1,L2,L3	12 Hours

Syllabus Content:

Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft), Case Study.

Application:

Application-level gateway

Video Link:

https://www.youtube.com/watch?v=6MvRi2Gqh_Y

Module-4	L1,L2,L3	12 Hours

Syllabus Content:

Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidance, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting of a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to the Computer Forensics and Social Networking Sites: The Security/Privacy Threats, Forensics Auditing, Anti Forensics.

Application:

Application of Digital Forensics With increasing digital crime in each branch

Video Link:

https://www.youtube.com/watch?v=2ESqwX3qb94

Module-5	L1,L2,L3	12 Hours

Syllabus Content:

Cyber law: The Indian Context, The Indian IT Act, Digital Signature and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyber law, Technology and Students: Indian Scenario.

Application:

Case IV: Ownership of Program

Video Link:

https://www.youtube.com/watch?v=ZFHCZt5VnMs

Hands on Experiments:

Cyber fraud vs Cybercrime stalking, Cybercafé and Cybercrimes.

Mobile Devices: Security Implementation for organizations.

Phishing, Password cracking, Dos Attacks.

Cyber forensics and digital Evidence.

Course outcomes:

CO1	Understand Cybercrime and Cyber offenses
CO2	Explain cybercrime happening with Mobile and Wireless Devices.
CO3	Analyze cybercrimes using different tools and methods.
CO4	Cyber forensics and Digital forensics
CO5	Legal aspects of cybercrimes.

Text/Reference Books:

1.	"Cyber Security", Nina Godbole, SunitBelapure, Wiley India, New Delhi, 2011.
2.	"Information Systems Security", Nina Godbole, Wiley India, New Delhi, 2017.
3.	"Cyber Security & Global Information Assurance", Kennetch J. Knapp, Information Science Publishing, 2009.
4.	"Cryptography and Network Security", William Stallings, Pearson Publication, 2005.
5.	"Cyber Security", Avantika Yadav, Narosa Publishing, 2017.

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CO5	3	3	3	2	3					2	3	3

High-3, Medium-2, Low-1

Course Title	**JAVA**	**Semester**	**VI**
Course Code	**MVJ21IS623**	**CIE**	**50**
Total No. of Contact Hours	**40**	**SEE**	**50**
No. of Contact Hours/week	**4 (L : T : P :: 2 : 1 : 0)**	**Total**	**100**
Credits	**3**	**Exam. Duration**	**3 Hours**

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

Construct client-server applications using Java socket API

Identify the need for advanced Java concepts like Enumerations and Collections

Make use of JDBC to access database through Java Programs

Adapt servlets to build server side programs

Demonstrate the use of JavaBeans to develop component-based Java software

Module-1	**L1,L2,L3**	**12 Hours**

Syllabus Content:

Enumerations, Autoboxing and Annotations(metadata): Enumerations, Enumeration fundamentals, the values() and value Of() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at run time by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations

Application:

choices on a menu, rounding modes, command line flags, etc.

Autoboxing & Auto unboxing:

Annotations

Video Link: https://www.youtube.com/watch?v=vJ-Zn4fo0MQ&t=608s

Module-2	**L1,L2,L3**	**12 Hours**

Syllabus Content:

The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections, The legacy Classes and Interfaces,

Parting Thoughts on Collections.

Application: Writing an application

Video Link:https://www.youtube.com/watch?v=Ma7u6KEKzPE

Module-3	**L1,L2,L3**	**12 Hours**

Syllabus Content:

String Handling :The String Constructors, String Length, Special String Operations, String Literals, String Concatenation, String Concatenation with Other Data Types, String Conversion and toString( ) Character Extraction, charAt( ), getChars( ), getBytes( ) toCharArray(), String Comparison, equals( ) and equalsIgnoreCase( ), regionMatches( ) startsWith( ) and endsWith( ), equals( ) Versus == , compareTo( ) Searching Strings, Modifying a String, substring( ), concat( ), replace( ), trim( ), Data Conversion Using valueOf( ), Changing the Case of Characters Within a String, Additional String Methods, StringBuffer , StringBuffer Constructors, length( ) and capacity( ), ensureCapacity( ), setLength( ), charAt( ) and setCharAt( ), getChars( ),append( ), insert( ), reverse( ), delete( ) and deleteCharAt( ), replace( ), substring( ), Additional StringBuffer Methods, StringBuilder

Application: Datatype

Video Link: https://www.youtube.com/watch?v=N63JCXwdd14

Module-4	**L1,L2,L3**	**12 Hours**

Syllabus Content:

Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects

Application: java-based web application.

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

Module-5	**L1,L2,L3**	**12 Hours**

Syllabus Content:

JDBC Overview – JDBC implementation – Connection class – Statements - Catching Database Results, handling database Queries. Networking– InetAddress class – URL class- TCP sockets - UDP sockets, Java Beans –RMI.

Application: Connecting, storing, retrieving data between program and any database.

Video Link: https://www.youtube.com/watch?v=Cq4lwVE2Fzk

Practical Experiments:

1. Program to demonstrate working of Inet Address class and the methods of the InetAddress class for Java Networking
2. Program to demonstrate how to apply event handling mechanism to JCheckBox Swing Components :
3. Program to demonstrate JDBC
4. Program to demonstrate RMI
5. Program to demonstrate SERVLETS
6. Program to demonstrate JSP

Program to demonstrate JAVA BEANS

Course outcomes:

CO1	Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs
CO2	Build client-server applications and TCP/IP socket programs
CO3	Illustrate database access and details for managing information using the JDBC API
CO4	Describe how servlets fit into Java-based web application architecture
CO5	Develop reusable software components using Java Beans

Text/Reference Books:

1.	Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.
2.	Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007.
3.	Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004.
4.	Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.
5.	Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.

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

High-3, Medium-2, Low-1

Course Title	Database Management System	Semester	VI
Course Code	MVJ21IS624	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 2 : 1 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- Provide Key Knowledge in database system concepts, applications and advantages.
- To get knowledge about SQL programming
- Design a database as redundant and error free
- Students can build a database application for real world problems
- Can derive the knowledge or pattern from real world data

Module-1	L1,L2,L3	12 Hours

Introduction: Database-System Applications – Purpose of Database – View of Data – Database Languages – Relational Databases – Database Design – Data Storage and Querying – Transaction Management – Database Architecture – Data mining and Information Retrieval – Specialty Databases – Database Users and Administrators.

Introduction to Relational Model: Structure of Relational Database – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations – Relational Algebra.

Application: This module will give basic knowledge of database and SQL.

Video Link: https://www.youtube.com/watch?v=X9bQsAoqmfI

Module-2	L1,L2,L3	12 Hours

Introduction to SQL: Overview of the SQL Query Languages – SQL Definition – Basic Structure of SQL Queries – Additional Basic Operations – Set Operations – Null Values – Aggregate Functions - Nested Subqueries – Modification of Database.

Intermediate SQL: Join Expressions – Views – Integrity Constraints – SQL Data types and Schemas – Authorization.

Advanced SQL: Functions and Procedures – Triggers.

Application: Students can learn more complex queries and can design error free database using

constraints.

Video Link: https://www.youtube.com/watch?v=fRMv14j5XJU

Module-3	L1,L2,L3	12 Hours

Relational Database Design: Features of Good Relational Designs – Atomic Domains and First Normal Form – Decomposition Using Functional Dependencies – Functional-Dependency Theory – Algorithm for Decomposition – 2nd Normal Form, 3rd Normal Form, Boyce Codd Normal Form Decomposition using Multivalued Dependencies – 4th Normal Form and domain Key Normal Form.

Application: Students can learn how to divide the table without any data lose and can execute queries without any anomalies.

Video Link**:** https://www.youtube.com/watch?v=Ko_LE3TNO64&t=1s

https://www.youtube.com/watch?v=p62he-WUp9E

Module-4	L1,L2,L3	12 Hours

Transaction: Transaction Concept – A Simple Transaction Model – Transaction Atomicity and Durability – Transaction Isolation – Serializability – Isolation Levels – Implementation of Isolation Level –

Concurrency Control: Lock-Based Protocol – Timestamp-Based Protocols – Validation-Based Protocol.

Advanced SQL: Accessing SQL From a Programming Language.

Application design and Development: Application Programs and User Interfaces – Web Fundamentals – Servlet and JSP

Application: Students can develop a web-based application for accessing database.

Video Link: https://www.youtube.com/watch?v=w83Ug6IwVTw

https://www.youtube.com/watch?v=Thm0xW9oTow

https://www.youtube.com/watch?v=C_J6K8DodS8

Module-5	L1,L2,L3	12 Hours

Data Warehousing, Data Mining, and Information Retrieval: Data Warehousing and Mining – Data Warehousing – Data Mining – Classification – Association Rules – Data mining algorithms using Weka Tools.

Application: Students can develop an application using JAVA with Weka for data mining operations.

Video Link: https://www.youtube.com/watch?v=XlbM9ibjUuM

Practical Experiments Accessing Database through JDBC (Hands-On) Clustering – Using Weka tool (Hands-On) Classification using Weka tool (Hands-On) Machine Learning algorithms using Weka tool (Hands-On)

Course outcomes:	
CO1	Understand the database requirements of real-world problems
CO2	Querying the data according to different requirements
CO3	Design database for real world problems like bank, commercial shops
CO4	Develop application program to real world problems
CO5	Database mining to derive pattern among different data sets

Text/Reference Books:	
1.	Database System Concepts, Sixth Edition, by Abraham Silberschatz, Henery F. Korth, S. Sundarshan
2.	Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
3.	Database Management System, Ramakrishnan and Gehrke, 3rd Edition, Mc-GrawHill, 2013.
4.	Data Mining Concepts and Techniques, Second Edition, by Jiawei Han and Micheline Kamber, Elsevier.

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

High-3, Medium-2, Low-1

Course Title	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**	**Semester**	VI
Course Code	MVJ21IS63	**CIE**	50
Total No. of Contact Hours	40 L : T : P :: 40 : 0 : 0	**SEE**	50
No. of Contact Hours/week	3	**Total**	100
Credits	4	**Exam. Duration**	3 Hours

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

- Describe the basic principles, techniques, and applications of Artificial Intelligence
- Analyze and explain different AI learning methods.
- Define machine learning and problems relevant to machine learning.
- Differentiate supervised, unsupervised and reinforcement learning

Module-1	**RBT Level** L1,L2	**Hours 8**

INTRODUCTION: What Is AI? The Foundations of Artificial Intelligence ,The History of Artificial Intelligence, The State of the Art .

Intelligent Agents : Agents and Environments ,Good Behavior: The Concept of Rationality ,The Nature of Environments, The Structure of Agents.Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules.

Experimental Learning: Implementation of Relational and Inheritable Knowledge

Video Links

- https://www.youtube.com/watch?v=3MW3ICnkQ9k

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

PROLOG- The natural Language of Artificial Intelligence: Introduction, Converting English to Prolog Facts and Rules, Goals, Prolog Terminology, Variables, Control Structures, Arithmetic operators, Matching in Prolog, Backtracking, Cuts, Recursion, Lists, Dynamic databases, Input/Output and Streams

Using Predicate Logic: Representing simple facts in logic, representing instance and ISA relationships, Computable Functions and Predicates, Resolution, Natural Deduction.

Experimental Learning:

Implementing programs in PROLOG to solve problems of Predicate Logic

Video Links:

- https://www.youtube.com/watch?v=pzUBrJLIESU
- https://www.youtube.com/watch?v=2juspgYR7as
- https://www.youtube.com/watch?v=h9jLWM2lFr0
- https://www.youtube.com/watch?v=-v1K9AnkAeM

Module-3	**RBT Level** L1,L2 , L3	**Hours 8**

Syllabus Content:

Introduction: well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

Application:

Designing Supervised Learning Problems

Video Link:

http://web4.cs.ucl.ac.uk/staff/D.Barber/textbook/091117.pdf

http://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

Module-4	**RBT Level** L1,L2 ,L3	**Hours 8**

Syllabus Content

Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Application:

Designing Supervised Learning Problems

Video Link:

http://web4.cs.ucl.ac.uk/staff/D.Barber/textbook/091117.pdf

http://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

Module-5	**RBT Level** L1,L2 ,L3	**Hours 8**

Syllabus Content:

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems,

Perceptron's, Backpropagation algorithm Application: Solving real time problems like Automatic Vehicle Design etc. Video Link: https://becominghuman.ai/understanding-decision-trees-43032111380f https://onlinecourses.science.psu.edu/stat507/node/59/

Course outcomes:	
CO1	Identify AI based problems and understand Intelligent agents
CO2	Apply predicate logic and heuristic techniques to solve AI problems.
CO3	Identify the problems for machine learning. And select the either supervised, unsupervised or reinforcement learning.
CO4	Explain theory of probability and statistics related to machine learning
CO5	Investigate concept learning, ANN, Bayes classifier, k nearest neighbor, Q, Question

Text/Reference Books:	
1	Artificial Intelligence: A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.
2	Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.
3	Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
4	EthemAlpaydın, Introduction to machine learning, second edition, MIT press
5	E. Rich , K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill.
6	Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India.
7	G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem Solving", Fourth Edition, Pearson Education, 2002.
8	N.P. Padhy "Artificial Intelligence and Intelligent Systems" , Oxford University Press-2015

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CO5	3	3	3	2	3					2	3	3

High-3, Medium-2, Low-1

Course Title	**Machine Learning Laboratory**	**Semester**	**VI**
Course Code	**MVJ21IS63**	**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	**4**	**Exam. Duration**	**3 Hours**

Course objective is to:

This course will enable students to

Make use of data sets in implementing the machine learning algorithms

Implementing the machine learning concepts and algorithms in any suitable language of choice.

Sl No	Experiment Name	RBT Level	Hours
1	Implementation of FIND-Algorithm	L3	4
2	Implementation of Candidate-Elimination algorithm	L3	4
3	Implementation of ID3 algorithm	L3	4
4	Implementation of Backpropagation algorithm	L3	4
5	Implementation of naïve Bayesian Classifier	L3	4
6	Implementation of Bayesian network	L3	4
7	Implementation of EM algorithm	L3	4
8	Implementation of *k*-Means algorithm	L3	4
9	Implementation of *k*-Nearest Neighbour algorithm	L3	4
10	Implementation of Locally Weighted Regression algorithm	L3	4

Course outcomes:

CO1	Understand the implementation procedures for the machine learning algorithms.
CO2	Design Java/Python programs for various Learning algorithms
CO3	Apply appropriate data sets to the Machine Learning algorithms
CO4	Identify and apply Machine Learning algorithms to solve real world problems
CO5	Perform statistical analysis of machine learning techniques.

CO-PO Mapping

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

Course Title	CRYPTOGRAPHY AND NETWORK SECURITY	**Semester**	VI
Course Code	MVJ21IS64	**CIE**	50
Total No. of Contact Hours	50 L : T : P :: 40 : 10 : 0	**SEE**	50
No. of Contact Hours/week	4	**Total**	100
Credits	4(IPCC)	**Exam. Duration**	3 Hours

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

- Acquire fundamental knowledge on the concepts of finite fields and number theory.
- To gain various block cipher and stream cipher models.
- Describe the principles of public key cryptosystems, hash functions and digital signature.
- Learn the various malicious attacks and firewall applications.
- To develop various security protocols for web and email applications

Module-1	**RBT Level** L1,L2 , L3	**Hours 10**

INTRODUCTION & NUMBER THEORY: Services, Mechanisms and attacks- Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques. finite fields and number theory: Groups, Rings, Fields-Modular arithmetic- Euclid‟s algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat‟s and Euler‟s theorem- Testing for primality -The Chinese remainder theorem- Discrete logarithms.

Applications: Developing cryptographic algorithms

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

- https://www.cc.gatech.edu/~echow/ipcc/hpc-course/
- https://nptel.ac.in/courses/111/103/111103020/

Module-2	**RBT Level** L2 , L3	**Hours 10**

BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY: Data Encryption Standard-Block cipher principles- block cipher modes of operation-Advanced Encryption Standard (AES)-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange- Elliptic curve arithmetic-Elliptic curve cryptography.

Applications: Online transactions

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

- http://www.infocobuild.com/education/audio-video-courses/computer-

science/IntroductionToCryptography-Ruhr/lecture-08.html • https://www.comparitech.com/blog/information-security/diffie-hellman-key-exchange/		
Module-3	**RBT Level** L2,L3 , L4	**Hours 10**
HASH FUNCTIONS AND DIGITAL SIGNATURES: Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS – EI Gamal – Schnorr. **Applications:** Cyber forensic **Video link / Additional online information (related to module if any):** • https://www.educba.com/md5-alogrithm/ • https://www.tutorialspoint.com/cryptography/cryptography_digital_signatures.htm		
Module-4	**RBT Level** L3,L4 , L6	**Hours 10**
SECURITY PRACTICE & SYSTEM SECURITY: Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures. **Applications:** Antivirus / Malware detecting software **Video link / Additional online information (related to module if any):** • https://www.simplilearn.com/what-is-kerberos-article • https://searchsecurity.techtarget.com/feature/The-five-different-types-of-firewalls		
Module-5	**RBT Level** L4,L5 ,L6	**Hours 10**

E-MAIL, IP & WEB SECURITY: E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPSec - IP and IPv6-Authentication Header-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL-SET **Applications:** Email and Banking applications **Video link / Additional online information (related to module if any):** • https://www.barracuda.com/glossary/email-security • https://www.youtube.com/watch?v=ubHZQrECeew

Course outcomes:	
CO1	Implement number theory for various identified attacks.
CO2	Design and develop the public key cryptographic algorithms.
CO3	Develop the digital signature and hashing algorithms
CO4	Design a firewall for detecting malicious attacks.
CO5	Design the protocols for improving security on email, web and IP.

Text/Reference Books:	
1	William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.
2	Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security”, Prentice Hall of India, 2002.
3	Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill, 2007.
4	Man Young Rhee, “Internet Security: Cryptographic Principles”, “ Algorithms and Protocols”, Wiley Publications, 2003.
5	Charles Pfleeger, “Security in Computing”, 4th Edition, Prentice Hall of India, 2006.
6	Ulysess Black, “Internet Security Protocols”, Pearson Education Asia, 2000.

CO-PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

CO1	3	1	-	-	-	-	-	1	-	2	-	-	2	3
CO2	3	2	2	1	-	-	-	-	-	2	-	1	2	2
CO3	2	3	1	3	-	1	1	1	-	1	-	2	2	1
CO4	3	2	2	1	-	2	-	-	-	-	2	1	2	2
CO5	2	2	3	3	-	1	2	1	2	-	1	2	2	2

Course Title	CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY	**Semester**	VI
Course Code	MVJ21ISL64	**CIE**	50
Total No. of Contact Hours	40 L : T : P :: 10 : 0 : 30	**SEE**	50
No. of Contact Hours/week	3	**Total**	100
Credits	4	**Exam. Duration**	3 Hours

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

1. Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to various attacks.
2. Learn the various number theory concepts and applications.
3. Analyse the message digest algorithms and create digest values.
4. To develop and apply authentication, email security, web security services and mechanisms
5. Create java script for web applications for providing security.

Sl No	**Experiment Name**	**RBT Level**	**Hours**
1	Write a program that contains a string (char pointer) with a value \Hello World'. The program should XOR each character in this string with 0 and displays the result.	**L3**	**3**
2	Write a program that contains a string (char pointer) with a value \Hello World'. The program should AND or and XOR each character in this string with 127 and display the result.	**L3**	**3**
3	Write a Java program to perform encryption and decryption using the following algorithms: a) Ceaser Cipher b) Substitution Cipher c) Hill Cipher.	**L3**	**3**

4	Write a Java program to implement the DES algorithm logic.	**L3**	**3**
5	Write a C/JAVA program to implement the BlowFish algorithm logic.	**L3**	**3**
6	Write a C/JAVA program to implement the Rijndael algorithm logic.	**L3**	**3**
7	Using Java Cryptography, encrypt the text “Hello world” using BlowFish. Create your own key using Java key tool.	**L3**	**3**
8	Write a Java program to implement RSA Algorithm with p=3, q=11.	**L3**	**3**
9	Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).	**L3**	**3**
10	Calculate the message digest of a text using the MD5 algorithm in JAVA.	**L3**	**3**
11	Calculate the message digest of a text using the SHA-1 algorithm in JAVA.	**L3**	**3**
12	Using Java Cryptography, encrypt the text “Hello world” using BlowFish. Create your own key using Java key tool.	**L3**	**3**

	OPEN ENDED EXPERIMENT 1. Perform encryption and decryption using mono-alphabetic cipher. The program should support the following : o Construct an input file named plaintext.txt (consisting of 1000 alphabets, without any space or special characters) o Encrypt the characters of plaintext.txt and store the corresponding ciphertext characters in ciphertext.txt o Compute the frequency of occurrence of each alphabet in both plaintext.txt and ciphertext.txt and tabulate the results 2. Write a program to perform the following using Playfair cipher technique o Encrypt a given message M with different keys {k1,k2,...,kn}. Print key and cipher text pair o Decrypt the cipher texts obtained in (i) to get back M	**L3**	**3**

Course outcomes:	
CO1	Identify the major types of threats to information security and the associated attacks, Services and Mechanisms
CO2	Design and develop cryptographic algorithms using public key cryptography.
CO3	Generate the own key for developing cryptography algorithms.
CO4	Implement the key exchange algorithms using scripts.
CO5	Design the various security protocols for web applications.

CO-PO/PSO Mapping

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

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

High-3, Medium-2, Low-1

Semester: VII		
BIGDATA AND HADOOP &LAB		
Course Code: MVJ21IS71		**CIE Marks:50+50**
Credits: L:T:P: 3:0:2		**SEE Marks: 50 +50**
Hours:40 L+ 26 P		**SEE Duration: 03+03 Hours**

Course Learning Objectives: The students will be able to	
1	Understand Hadoop Distributed File System and examine MapReduce Programming
2	Explore Hadoop Tools and Manage Hadoop with Ambari
3	Appraise the role of Business Intelligence
4	Assess core data mining techniques for data analytics
5	Identify various Text Mining techniques

UNIT-I	
Introduction to big data and Hadoop Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy,	**8 Hrs**
UNIT-II	
Introduction to Infosphere BigInsights and Big Sheets. HDFS(Hadoop Distributed File System)The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives	**8 Hrs**
UNIT-III	
Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures Map Reduce , Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.	**8 Hrs**
UNIT-IV	
Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User DefinedFunctions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, QueryingData and User Defined Functions.	**8 Hrs**
UNIT-V	
Hbase :HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.Big SQL : Introduction , Data Analytics with RMachine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering.	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Master the concepts of HDFS and MapReduce framework

CO2	Investigate Hadoop related tools for Big Data Analytics and perform basic Hadoop Administration
CO3	Recognize the role of Business Intelligence, Data warehousing and Visualization in decision making
CO4	Infer the importance of core data mining techniques for data analytics
CO5	Compare and contrast different Text Mining Techniques

Reference Books	
1.	Tom White," Hadoop: The Definitive Guide",O'reily Media,Third Edition, 2012
2.	Seema Acharya, SubhasiniChellappan," Big Data Analytics",Wiley,2015

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

Semester: VII		
BLOCK CHAIN TECHNOLOGY		
Course Code: MVJ21IS721		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	Understand how blockchain systems (mainly Bitcoin and Ethereum) work
2	To securely interact with them,
3	Design, build, and deploy smart contracts and distributed applications

UNIT-I	
Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.	**8 Hrs**
UNIT-II	
Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.	**8 Hrs**
UNIT-III	
Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate., Introducing modeling language for business resources and transactions, Introduction to key concepts related to smart contracts, accounts, transaction events, patterns and examples	**8 Hrs**
UNIT-IV	
History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin	**8 Hrs**
UNIT-V	
Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain., Overview of how IoT can benefit from Blockchain implementation	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Learn design principles of Bitcoin and Ethereum and Nakamoto consensus.
CO2	. Explain the Simplified Payment Verification protocol.
CO3	Interact with a blockchain system by sending and reading transactions.
CO4	Design, build, and deploy a distributed application.

CO5	Evaluate security, privacy, and efficiency of a given blockchain system.

Reference Books	
1.	"Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction,",Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder,Princeton University Press,July 19, 2016
2.	"Mastering Bitcoin: Unlocking Digital Cryptocurrencies" ,Antonopoulos

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

High-3, Medium-2, Low-1

Semester: VII		
DEEP LEARNING		
Course Code: MVJ21IS722		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**
Course Learning Objectives: The students will be able to		
1	Explain the fundamentals of Deep Learning	
2	Familiarize with Tensor Flow, Installation of software module	
3	Design and build support vector machine	

UNIT-I	
Feedforward Neural networks. Gradient descent and the backpropagation algorithm. Unit saturation, aka the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima. Heuristics for faster training. Nestors accelerated gradient descent. Regularization. Dropout. Convolutional Neural Networks Architectures, convolution / pooling layers	**8 Hrs**
UNIT-II	
Recurrent Neural Networks , LSTM, GRU, Encoder Decoder architectures, Deep Unsupervised Learning , Autoencoders (standard, sparse, denoising, contractive, etc), Variational Autoencoders, Adversarial Generative Networks, Autoencoder and DBM	**8 Hrs**
UNIT-III	
Applications of Deep Learning to Computer Vision , Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models. Attention models for computer vision tasks. Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics	**8 Hrs**
UNIT-IV	
Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-ofWords model (CBOW), Glove, Evaluations and Applications in word similarity, analogy reasoning Named Entity Recognition, Opinion Mining using Recurrent Neural Networks , Parsing and Sentiment Analysis using Recursive Neural Networks ,	**8 Hrs**
UNIT-V	
Sentence Classification using Convolutional Neural Networks , Dialogue Generation with LSTMs , Applications of Dynamic Memory Networks in NLP , Recent Research in NLP using Deep Learning: Factoid Question Asnwering, similar question detection, Dialogue topic tracking, Neural Summarization, Smart Reply	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Basics of Deep Learning

CO2	Understand TensorFlow and Reinforcement Learning
CO3	Explain RNN and Unsupervised Feature Learning
CO4	Explain RNN and Unsupervised Feature Learning
CO5	Explain Architecture of CNNs

Reference Books	
1.	Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville,"Deep learning",An MIT Press book in preparation,2015
2.	Bengio, Yoshua," Learning deep architectures for AI " . Foundations and trends in Machine Learning 2.1,2009: 1127

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

Semester: VII		
FILE STRUCTURES		
Course Code: MVJ21IS723		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	Explain the fundamentals of file structures and their management.
2	Measure the performance of different file structures
3	Organize different file structures in the memory.
4	Demonstrate hashing and indexing techniques.

UNIT-I	
Introduction: File Structures: The Heart of the file structure Design, A Short History of File Structure Design, A Conceptual Toolkit; Fundamental File Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters, The Unix Directory Structure, Physical devices and Logical Files, File-related Header Files, UNIX file System Commands; Secondary Storage and System Software: Disks, Magnetic Tape, Disk versus Tape; CD-ROM: Introduction, Physical Organization, Strengths and Weaknesses; Storage as Hierarchy, A journey of a Byte, Buffer Management, Input /Output in UNIX. Fundamental File Structure Concepts, Managing Files of Records : Field and Record Organization, Using Classes to Manipulate Buffers, Using Inheritance for Record Buffer Classes, Managing Fixed Length, Fixed Field Buffers, An Object-Oriented Class for Record Files, Record Access, More about Record Structures, Encapsulating Record Operations in a Single Class, File Access and File Organization.	**8 Hrs**
UNIT-II	
Organization of Files for Performance, Indexing: Data Compression, Reclaiming Space in files, Internal Sorting and Binary Searching, Keysorting; What is an Index? A Simple Index for Entry-Sequenced File, Using Template Classes in C++ for Object I/O, Object-Oriented support for Indexed, Entry-Sequenced Files of Data Objects, Indexes that are too large to hold in Memory, Indexing to provide access by Multiple keys, Retrieval Using Combinations of Secondary Keys, Improving the Secondary Index structure: Inverted Lists, Selective indexes, Binding.	**8 Hrs**
UNIT-III	
Consequential Processing and the Sorting of Large Files: A Model for Implementing Cosequential Processes, Application of the Model to a General Ledger Program, Extension of the Model to include Mutiway Merging, A Second Look at Sorting in Memory, Merging as a Way of Sorting Large Files on Disk. Multi-Level Indexing and B-Trees: The invention of B-Tree, Statement of the problem, Indexing with Binary Search Trees; Multi-Level Indexing, B-Trees, Example of Creating a B-Tree, An Object-Oriented Representation of B-Trees, B-Tree Methods; Nomenclature, Formal Definition of B-Tree Properties, Worst-case Search Depth, Deletion,	**8 Hrs**

Merging and Redistribution, Redistribution during insertion; B* Trees, Buffering of pages; Virtual BTrees; Variable-length Records and keys.	
UNIT-IV	
Indexed Sequential File Access and Prefix B + Trees: Indexed Sequential Access, Maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of Keys, The Simple Prefix B+ Tree and its maintenance, Index Set Block Size, Internal Structure of Index Set Blocks: A Variable-order B- Tree, Loading a Simple Prefix B+ Trees, B-Trees, B+ Trees and Simple Prefix B+ Trees in Perspective	**8 Hrs**
UNIT-V	
Hashing: Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distribution, How much Extra Memory should be used?, Collision resolution by progressive overflow, Buckets, Making deletions, Other collision resolution techniques, Patterns of record access. Extendible Hashing: How Extendible Hashing Works, Implementation, Deletion, Extendible Hashing Performance, Alternative Approaches.	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Choose appropriate file structure for storage representation.
CO2	Identify a suitable sorting technique to arrange the data
CO3	Select suitable indexing for better performance to a given problem.
CO4	Select suitable hashing techniques for better performance to a given problem.
CO5	Identify the sorting techniques

Reference Books	
1.	Michael J. Folk, Bill Zoellick, Greg Riccardi: File Structures-An Object Oriented Approach with C++, 3rd Edition, Pearson Education, 1998.
2.	K.R. Venugopal, K.G. Srinivas, P.M. Krishnaraj: File Structures Using C++, Tata McGraw-Hill, 2008.
3.	Scot Robert Ladd: C++ Components and Algorithms, BPB Publications, 1993

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three subdivisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

Semester: VII		
INTERNET OF THINGS		
Course Code: MVJ21IS731		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	Assess the genesis and impact of IoT applications, architectures in real world
2	Illustrate diverse methods of deploying smart objects and connect them to network.
3	Compare different Application protocols for IoT.

UNIT-I	
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.	**8 Hrs**
UNIT-II	
Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies, IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances	**8 Hrs**
UNIT-III	
Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods, Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of IOT Security,	**8 Hrs**
UNIT-IV	
Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment, IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints	**8 Hrs**
UNIT-V	
RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, 08 Smart City Use-Case Examples.	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to

CO1	Describe the characteristics and key technologies for IoT system
CO2	. Interfacing Sensor and Actuator with Arduino development board.
CO3	Implementing IoT device by interfacing communication module and cloud
CO4	Describe protocols of resource constraint network
CO5	Elaborate the need for Data Analytics and Security in IoT

Reference Books	
1.	"IoTFundamentals: Networking Technologies, Protocols, and Use Cases for the Internet ofThings", David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743
2.	"Internet of Things",Srinivasa K G,CENGAGE Leaning India,2017

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

High-3, Medium-2, Low-1

Semester: VII		
NATURAL LANGUAGE PROCESSING		
Course Code: MVJ21IS732		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**
Course Learning Objectives: The students will be able to		
1	Expose students to the concepts of n-grams and Language Modelling with n-gram	
2	Expose students to the Natural Language Processing pipeline	
3	Expose students to the Information Extraction problems and end to end Natural Language Generation problems as applications of Natural Language Processing	

UNIT-I	
Text Normalization, Morphology and Finite State Transducer: Concept/ Types of Ambiguity in Natural Language Processing, Empirical Laws: Zipf's Law, Heap's Law. Text Normalization: Content and Function Words, Type vs. Token, Unix Tools for Crude Tokenization and Normalization, Word Tokenization and Normalization, Lemmatization and Stemming, Sentence Segmentation. Morphology and Finite State Transducers: Survey of English Morphology, Finite State Morphological Parsing, Combining FST Lexicon and Rules, Lexicon - Free FST - The Porter Stemmer, Human Morphological Parsing	**8 Hrs**
UNIT-II	
N-Grams, Edit Distance and Language Modelling: n-grams, Evaluating Language Models - Perplexity, Generalization and Zeros, Smoothing - Kneser-Ney Smoothing, Web and Stupid Back Off, Perplexity's Relation to Entropy. Spelling Correction and Noisy Channel: Noisy Channel Model, Real World Spelling Error, Minimum Edit Distance Algorithm, Improved Edit Models. Word Classes and Part-of-Speech (POS) Tagging: English Word Classes, Penn Tagsets for English, Rule-Based Part-of-Speech Tagging, Transformation-Based Tagging, POS Tagging using Hidden Markov Model, Maximum Entropy Model and Conditional Random Fields, Neural Language Models with Deep Artificial Neural Network	**8 Hrs**
UNIT-III	
Parsing: Context Free Grammar. Syntactic Parsing: Ambiguity Presented By Parse Trees, CKY Parsing, Chart Parsing and Earley Parser. Partial Parsing: Chunking. Statistical Parsing: Probabilistic Context Free Grammar, Probabilistic CKY Parsing of PCFG, Problems with PCFG, Probabilistic Lexicalized PCFG. Introduction to Dependency Parsing: Dependency Relations, Dependency Formalisms, Dependency Tree Banks, Evaluating Parsers.	**8 Hrs**
UNIT-IV	
Semantics - Lexical semantics: Word Senses and Relations Between Word Senses, WordNet: A Database of Lexical Relations, Word Sense Disambiguation - Overview, Supervised Word Sense Disambiguation, WSD - Dictionary and Thesaurus	**8 Hrs**

Methods, Semi- Supervised WSD, Unsupervised Word Sense Induction. Word Similarity or Semantic Relatedness Based On Thesaurus: Resnik Similarity, Lin Similarity, Jiang-Conrath Distance, Extended Gloss Overlap And Extended Lesk Method. Lexicons For Sentiment and Affect Extraction: Available Sentiment Lexicons, Using Wordnet Synonyms And Antonyms - Sentiwordnet, Supervised Learning of Word Sentiments, Using Lexicon For Sentiment Recognition, Lexicons For Emotions And Other Affective States.	
UNIT-V	
Information Retrieval, Natural Language Generation and Neural Network Methods for Natural Language Processing - Information retrieval: Information Extraction vs. Retrieval, Information Extraction Sub-Problems, Named Entity Recognition - Practical NER Architectures. Natural Language Generation: An Architecture, Question Answering System - IR Based Factoid Question Answering, Knowledge Based Question Answering, IBM's Watson, Dialogue System And Chatbot - Rule Based And Corpus Based Chatbots.	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Implement meaningful course or research projects using current Natural Language Processing technology
CO2	Analyze the natural language text.
CO3	Define the importance of natural language.
CO4	Understand the concepts Text mining.
CO5	Illustrate information retrieval techniques

Reference Books	
1.	Daniel Jurafsky and James H Martin, "Speech and Natural Language Processing"http://web.stanford. edu/~jurafsky/slp3/,3rd Edition Draft
2.	Yoav Goldberg "Neural Network Methods for Natural Language Processing",Morgan and Claypool Publishers

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

High-3, Medium-2, Low-1

Semester: VII		
DATA SECURITY AND PRIVACY		
Course Code: MVJ21IS733		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	Identify standard algorithms used to provide confidentiality, integrity and authenticity for data
2	Distinguish key distribution and management schemes.
3	Deploy encryption techniques to secure data in transit across data networks
4	Implement security applications in the field of Information technology
5	Demonstrate data privacy

UNIT-I	
Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Mono-alphabetic Cipher, Playfair Cipher, Hill Cipher, Poly alphabetic Cipher, One Time Pad. Block Ciphers and the data encryption standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm.	**8 Hrs**
UNIT-II	
Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. Other Public-Key Cryptosystems: Diffiehellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves 27.09.2022 over real numbers, elliptic curves over Zp, elliptic curves overGF(2m), Elliptic curve cryptography, Analog of Diffie-hellman key exchange, Elliptic curve encryption/ decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on a asymmetric cipher	**8 Hrs**
UNIT-III	
Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X509 certificates. Certificates, X-509 version 3, Public Key infrastructure	**8 Hrs**

UNIT-IV	
Privacy-Preserving Data Mining Algorithms, The Randomization Method, Group Based Anonymization.	**8 Hrs**
UNIT-V	
Distributed Privacy-Preserving Data Mining, Privacy-Preservation of Application Results, Limitations of Privacy: The Curse of Dimensionality, Applications of Privacy-Preserving Data Mining	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify the vulnerabilities in any computing system and hence to choose security solution.
CO2	Plan to resolve the identified security issues.
CO3	Analyse security mechanisms using theoretical approache
CO4	Recognize the importance of data privacy, limitations and applications
CO5	Organize the privacy preserving algorithms

Reference Books	
1.	Cryptography and Network Security, William Stallings
2.	., Pearson 7th edition. 4. Privacy Preserving Data Mining: Models and Algorithms, Charu C. Aggarwal, Philip S Yu, Kluwer Academic Publishers, 2008, ISBN 978-0-387-70991-8, DOI 10.1007/978- 0-387-70992-5
3.	Cryptography and Network Security, Atul Kahate, McGraw Hill Education, 4th Edition.
4.	Cryptography and Information Security, V K Pachghare, 2nd edition, PHI.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

High-3, Medium-2, Low-1

Semester: VII		
CLOUD COMPUTING		
Course Code: MVJ21IS741		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	To provide students with the fundamentals and essentials of Cloud Computing.
2	To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
3	To enable students exploring some important cloud computing driven commercial systems and applications

UNIT-I	
Introduction to Networking, Data communication, Cloud Computing, Origin of Cloud Computing, Basic Concepts and Terminology. Goals and Benefits, Risks and Challenges, Roles and Boundaries, Cloud Characteristics .Cloud Delivery Models, Cloud Deployment Models	**8 Hrs**
UNIT-II	
Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology.Web Technology, Multitenant Technology, Service Technology .Applications, Cloud computing for Healthcare, Energy Systems, Transportation Systems, Manufacturing Industry	**8 Hrs**
UNIT-III	
Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server: Cloud Storage Device, Cloud Usage Monitor, Resource Replication, Ready-Made Environment .Specialized Cloud Mechanisms: Automated Scaling Listener, Load Balancer, SLA Monitor, Pay Per Use Monitor: Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi:Device Broker	**8 Hrs**
UNIT-IV	
Cloud Management Mechanisms: Remote Administration System, Resource Management System, SLA Management System, Billing Management System .Cost Metrics and Pricing Models: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations . Service Quality Metrics and SLAs: Service Quality Metrics, SLA Guidelines.	**8 Hrs**
UNIT-V	
Fundamental Cloud Architectures: Illustration with Case Study Fundamental Cloud Security: Basic Terms and Concepts, Threat Agents, Cloud Security Threats .Cloud Security Mechanisms: Encryption, Hashing: Digital Signature, Public Key Infrastructure, Identity and Access Management	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Use the concepts of classes and objects in Object Oriented Programming. Use UML to model a complex system by defining actors and use cases.
CO2	Construct Class Models and analyze the dynamics of a system using Activity, Sequence, State and Process models.
CO3	Depict the architecture of a software system by using component and deployment models and design a database based on a class model.
CO4	Use GRASP and SOLID principles in the design of software.
CO5	Apply software design patterns in a variety of situations.

Reference Books	
1.	Thomas Erl, ZaighamMahmood,RichardoPuttini, "Cloud Computing:Concepts", Prentice Hall/PearsonPTR, ISBN: 9780133387520,Fourth Printing, 2014
2.	ArshdeepBahga, Vijay Madisetti:"Cloud Computing: A Hands-On Approach", University Press, ISBN: 9780996025508,2016
3.	K.Chandrasekaran ,"Essentials of Cloud Computing ",Chapman and Hall/CRC Press, ISBN 9781482205435,2014
4.	Thomas Erl, Robert Cope, Amin Naserpour,Cloud Computing Design Patterns, Prentice Hall/Service Tech Press, Pearson, ISBN: 978-0133858563,2015

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three

sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

High-3, Medium-2, Low-1

Semester: VII		
INTRODUCTION TO AI		
Course Code: MVJ21IS742		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	Identify the problems where AI is required and the different methods available.
2	Compare and contrast different AI techniques available.
3	Define and explain learning algorithms.
4	Design different learning algorithms for improving the performance of AI systems.
5	Implement projects using different AI learning techniques

UNIT-I	
What is artificial intelligence, Problems, Problem Spaces and search, Heuristic search technique.Application: Solving various AI based problems.	**8 Hrs**
UNIT-II	
Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules.Application: Developing information about the objects	**8 Hrs**
UNIT-III	
Symbolic Reasoning under Uncertainty, Statistical reasoning, Weak Slot and Filter Structures. Application: Connecting one concept to another , combining ideas about data.	**8 Hrs**
UNIT-IV	
Strong slot-and-filler structures, Game Playing.Application: Designing Smart Games	**8 Hrs**
UNIT-V	
Natural Language Processing, Learning, Expert Systems.Application: Sentiment analysis	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify the AI based problems.
CO2	Apply techniques to solve problems
CO3	Define learning and explain various learning techniques.
CO4	Discuss expert systems
CO5	Implement projects using different AI learning techniques.

Reference Books	
1.	E. Rich , K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill.
2.	Stuart Russel, Peter Norvig, "Artificial Intelligence: A Modern Approach" , 2nd Edition, Pearson Education, 2003.
3.	Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India.
4.	G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem Solving", Fourth Edition, Pearson Education, 2002.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

High-3, Medium-2, Low-1

Semester: VII		
PYTHON PROGRAMMING		
Course Code: MVJ21IS743		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	Learn fundamental features of object-oriented language
2	Design, write, debug, run Python Programs
3	Develop console -based applications using Python
4	Develop console & windows applications using Python
5	Introduce event driven Graphical User Interface (GUI) programming using Python built in functions

UNIT-I	
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	**8 Hrs**
UNIT-II	
Iteration, Strings, Files.Application: Pattern recognition and Reading resultant column in supervised learning data set	**8 Hrs**
UNIT-III	
Lists, Dictionaries, Tuples, Regular Expressions.Application: Handling query languages and Managing Large set of data with respect to database	**8 Hrs**
UNIT-IV	
Classes and objects, Classes and functions, Classes and methods.Application: Designing games and puzzles	**8 Hrs**
UNIT-V	
Networked programs, Using Web Services, Using databases and SQL.Application: Music composition and movie development	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
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.

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
4.	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)

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom’s taxonomy level.

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

Semester: VII		
INTRODUCTION TO BIGDATA		
Course Code: MVJ21IS744		**CIE Marks:100**
Credits: L:T:P:S: 3:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 3 Hrs**

Course Learning Objectives: The students will be able to	
1	Understand Hadoop Distributed File system and examine MapReduce Programming
2	Explore Hadoop tools and manage Hadoop with Sqoop
3	Appraise the role of data mining and its applications across industries
4	Identify various Text Mining techniques

UNIT-I	
Hadoop Distributed file system:HDFS Design, Features, HDFS Components, HDFS user commands Hadoop MapReduce Framework: The MapReduce Model, Map-reduce Parallel Data Flow,Map Reduce Programming	**8 Hrs**
UNIT-II	
Essential Hadoop Tools:Using apache Pig, Using Apache Hive, Using Apache Sqoop, Using Apache Apache Flume, Apache H Base	**8 Hrs**
UNIT-III	
Data Warehousing: Introduction, Design Consideration, DW Development Approaches, DW Architectures Data Mining: Introduction, Gathering, and Selection, data cleaning and preparation, outputs ofData Mining, Data Mining Techniques	**8 Hrs**
UNIT-IV	
Decision Trees: Introduction, Decision Tree Problem, Decision Tree Constructions, Lessons from Construction Trees. Decision Tree Algorithm Regressions: Introduction, Correlations and Relationships, Non-Linear Regression, Logistic Regression, Advantages and disadvantages.	**8 Hrs**
UNIT-V	
Text Mining: Introduction, Text Mining Applications, Text Mining Process, Term Document Matrix, Mining the TDM, Comparison, Best Practices Web Mining: Introduction, Web Content Mining, Web Structured Mining, Web Usage Mining, Web Mining Algorithms.	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Master the concepts of HDFS and MapReduce framework
CO2	Investigate Hadoop related tools for Big Data Analytics and perform basic
CO3	Infer the importance of core data mining techniques for data analytics
CO4	Use Machine Learning algorithms for real world big data.
CO5	Use MapReduce Algorithms in real world big data.

Reference Books	
1.	Douglas Eadline,"Hadoop 2 Quick-Start Guide: Learn the Essentials of Big DataComputing in the Apache Hadoop 2 Ecosystem", 1stEdition, Pearson Education,2016. 2. Anil Maheshwari, “Data Analytics”, 1stEdition, McGraw Hill Education,2017

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom’s taxonomy level.

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

High-3, Medium-2, Low-1

Semester: VII		
PROJECT PHASE I		
Course Code: MVJ21ISPR76		**CIE Marks:100**
Credits: L:T:P:S:0:0:4		**SEE Marks: 100**
Hours:		**SEE Duration: 3 Hrs**

Course objective :

To support independent learning and innovative attitude.

To guide to select and utilize adequate information from varied resources upholding ethics.

To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.

To develop interactive, communication, organisation, time management, and presentation skills.

To impart flexibility and adaptability.

To inspire independent and team working.

To expand intellectual capacity, credibility, judgement, intuition.

To adhere to punctuality, setting and meeting deadlines.

To instil responsibilities to oneself and others.

To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas

Project Work Phase - II:Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism..

Course outcomes:

Present the project and be able to defend it.

Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.

Habituated to critical thinking and use problem solving skills.

Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.

Work in a team to achieve common goal.

Learn on their own, reflect on their learning and take appropriate actions to improve it
CIE procedure for Mini - Project: CIE procedure for Project Work Phase - 1: (i)Single discipline:The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work phase -1, shall be based on the evaluation of project work phase -1 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates. (ii) Interdisciplinary:Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work phase -1, shall be based on the evaluation of project work phase -1 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates

Semester: VII		
NOSQL DATABASE		
Course Code: MVJ21IS77		**CIE Marks:100**
Credits: L:T:P:S: 1:0:0		**SEE Marks: 100**
Hours: 40L+26T		**SEE Duration: 2 Hrs**

Course Learning Objectives: The students will be able to	
1	Recognize and Describe the four types of NoSQL Databases, the Document-oriented, KeyValue
2	Pairs, Column-oriented and Graph databases useful for diverse applications.
3	Apply performance tuning on Column-oriented NoSQL databases and Document-oriented NoSQL Databases.
4	Differentiate the detailed architecture of column oriented NoSQL database, Document database and Graph Database and relate usage of processor, memory, storage and file system commands
5	Evaluate several applications for location based service and recommendation services. Devise an application using the components of NoSQL.

UNIT-I	
Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing AggregateOriented Databases. More Details on Data Models; Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access,	**8 Hrs**
UNIT-II	
Distribution Models; Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums. Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes	**8 Hrs**
UNIT-III	
Map-Reduce, Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations, A Two Stage Map-Reduce Example, Incremental Map-Reduce Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets	**8 Hrs**
UNIT-IV	
Document Databases, What Is a Document Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event	**8 Hrs**

Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E- Commerce Applications, When Not to Use, Complex Transactions Spanning Dif erent Operations, Queries against Varying Aggregate Structure	
UNIT-V	
Graph Databases, What Is a Graph Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use.	**8 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate an understanding of the detailed architecture of Column Oriented NoSQL databases, Document databases, Graph databases.
CO2	Use the concepts pertaining to all the types of databases.
CO3	Analyze the structural Models of NoSQL.
CO4	Develop various applications using NoSQL databases

Reference Books	
1.	Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addision Wesley, 2012
2.	Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13: 978-9332557338)
3.	Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)
4.	Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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

High-3, Medium-2, Low-1

Course Title	Project Phase II	Semester	VIII
Course Code	MVJ21ISP81	CIE	50
Total No. of Contact Hours	-	SEE	50
No. of Contact Hours/week	L : T : P :: 0 : 0 : 16	Total	100
Credits	8	Exam. Duration	3 Hours

Course Objective:

- To support independent learning.
- To develop interactive, communication, organization, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgment, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instill responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Project Work Phase - II: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.

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

CO1	Describe the project and be able to defend it. Develop critical thinking and problem solving skills.
CO2	Learn to use modern tools and techniques. Communicate effectively and to present ideas clearly and coherently both in written and oral forms.
CO3	Develop skills to work in a team to achieve common goal. Develop skills of project management and finance.

CO4	Develop skills of self-learning, evaluate their learning and take appropriate actions to improve it.
CO5	Prepare them for life-long learning to face the challenges and support the technological changes to meet the societal needs.

Scheme of Evaluation :

Internal Marks: The Internal marks (50 marks) evaluation shall be based on Phase wise completion of the project work, Project report, Presentation and Demonstration of the actual/model/prototype of the project.

Semester End Examination: SEE marks for the project (50 marks) shall be based on Project report, Presentation and Demonstration of the actual/model/prototype of the project, as per the norms by the examiners appointed

CO-PO Mapping

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

High-3, Medium-2, Low-1

Course Title	**Research / Industrial Internship**	**Semester**	**VIII**
Course Code	**MVJ21INT82**	**CIE**	**50**
Total No. of Contact Hours	**Industrial Oriented**	**SEE**	**50**
No. of Contact Hours/week	**-**	**Total**	**100**
Credits	**3**	**Exam. Duration**	**3 Hours**

Course Objective:

- To get the field exposure and experience
- To apply the theoretical concept in field application
- To prepare the comparison statement of difference activities

Internship: This shall be carried out by students in industry set-up related to the construction/ materials testing laboratories/research organizations/project management consulting firms/QS and QA organizations/ planning and design offices/Professional organizations and other avenues related to the civil engineering domain in consultation and approval of internship guide/HOD /internship committees of the institutions.

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

CO1	Develop skills to work in a team to achieve common goal. Develop skills of project management and finance.
CO2	Develop skills of self-learning, evaluate their learning and take appropriate actions to improve it.
CO3	Prepare them for life-long learning to face the challenges and support the technological changes to meet the societal needs.

Scheme of Evaluation :

Internal Marks: The Internal marks (50 marks) evaluation shall be based on midterm and final presentation of the activities undertaken during the internship, to a panel comprising internship

guide, a senior faculty from the department and head of the department. Each student should submit the internship report at the end of semester with internship certificate.

Semester End Examination: Viva-Voce examination shall be conducted by a panel of examiners consisting of internship supervisor, a senior faculty from the department and head of the department.

CO-PO Mapping

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

High-3, Medium-2, Low-1

Course Title	SEMINAR	Semester	VIII
Course Code	MVJ21ISS83	CIE	50
Total No. of Contact Hours	-	SEE	50
No. of Contact Hours/week	-	Total	100
Credits	1	Exam. Duration	3 Hours

Course Objective:

- To inculcate self-learning, face audience confidently, enhance communication skill, involve in group discussion and present and exchange ideas.

Seminar: Each student, under the guidance of a Faculty, is required to choose, preferably, a recent topic of his/her interest relevant to the course of specialization. Carryout literature survey; organize the Course topics in a systematic order.

- Conduct literature survey in the domain area to find appropriate topic.
- Prepare the synopsis report with own sentences in a standard format.
- Learn to use MS word, MS power point, MS equation and Drawing tools or any such facilities in the preparation of report and presentation.
- Present the seminar topic orally and/or through power point slides.
- Communicate effectively to answer the queries and involve in debate/discussion.
- The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

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

CO1	Develop knowledge in the field of Civil Engineering and other disciplines through independent learning and collaborative study.
CO2	Identify and discuss the current, real-time issues and challenges in engineering & technology. Develop written and oral communication skills.
CO3	Explore concepts in larger diverse social and academic contexts.
CO4	Apply principles of ethics and respect in interaction with others.

CO5	Develop the skills to enable life-long learning.

Scheme of Evaluation :

Internal Marks: The Internal marks (50 marks) evaluation shall be based on midterm and final presentation, to a panel comprising seminar guide, a senior faculty from the department and head of the department. Each student should submit the Seminar report at the end of semester End Examination: Viva-Voce examination shall be conducted by a panel of examiners consisting of seminar supervisor, a senior faculty from the department and head of the department.

CO-PO Mapping

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

High-3, Medium-2, Low-1