MVJCE CURRICULUM

for

DEPARTMENT OF COMPUTER SCIENCE AND DESIGN

2022 SCHEME

B.E, III Semester, Computer Science and Design

Semester: III		
Mathematics for Computer Science		
Course Code:	**MVJ22CG31**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1.To introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in Computer Science Engineering and social life situations.

2.To Provide the principles of statistical inferences and the basics of hypothesis testing with emphasis on some commonly encountered hypotheses

3. To Determine whether an input has a statistically significant effect on the system's response through ANOVA testing.

Teaching-Learning Process

Pedagogy (General Instructions):

Teachers can use the following strategies to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.

2. State the need for Mathematics with Engineering Studies and Provide real-life examples.

3. Support and guide the students for self–study.

4. You will assign homework, grading assignments and quizzes, and documenting students' progress.

5. Encourage the students to group learning to improve their creative and analytical skills.

6. Show short, related video lectures in the following ways:

- As an introduction to new topics (pre-lecture activity).
- As a revision of topics (post-lecture activity).
- As additional examples (post-lecture activity).
- As an additional material of challenging topics (pre-and post-lecture activity).
- As a model solution of some exercises (post-lecture activity).

Module-1	
Probability Distributions: Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples. Exponential distribution (RBT Levels: L1, L2 and L3)	8Hrs
Pedagogy : Chalk and Board, Problem-based learning	
Module-2	
Joint probability distribution & Markov Chain : Joint Probability distribution for two discrete random variables, expectation, covariance and correlation. Markov Chain: Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states. (RBT Levels: L1, L2 and L3)	8Hrs
Pedagogy : Chalk and Board, Problem-based learning	
Module-3	
Statistical Inference 1 : Introduction, sampling distribution, standard error, testing of hypothesis, levels of significance, test of significance, confidence limits, simple sampling of attributes, test of significance for large samples, comparison of large samples. (RBT Levels: L1, L2 and L3)	8Hrs
Pedagogy : Chalk and Board, Problem-based learning	
Module-4	
Statistical Inference 2 : Sampling variables, central limit theorem and confidences limit for unknown mean. Test of Significance for means of two small samples, students 't' distribution, Chi-square distribution as a test of goodness of fit. F-Distribution (RBT Levels: L1, L2 and L3)	8Hrs
Pedagogy : Chalk and Board, Problem-based learning	
Module-5	
Design of Experiments & ANOVA : Principles of experimentation in design, Analysis of completely randomized design, randomized block design. The ANOVA Technique, Basic Principle of ANOVA, One-way ANOVA, Two-way ANOVA, Latin-square Design, and Analysis of Co-Variance.	8Hrs

(RBT Levels: L1, L2 and L3)	
Pedagogy : Chalk and Board, Problem-based learning	

Course Outcomes: The students will be able to

CO1: Explain the basic concepts of probability, random variables, probability distribution

CO2: Apply suitable probability distribution models for the given scenario CO3: Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem

CO4: Use statistical methodology and tools in the engineering problem-solving process.

CO5: Compute the confidence intervals for the mean of the population CO6: Apply the ANOVA test related to engineering problems.

1. Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye "Probability &Statistics for Engineers & Scientists", Pearson Education, 9th edition, 2017.

2. Peter Bruce, Andrew Bruce & Peter Gedeck "Practical Statistics for Data Scientists" O'Reilly Media, Inc., 2nd edition 2020. Reference Books: (Name of the author/Title of the Book/ Name of the publisher/Edition and Year) 1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons,9th Edition, 2006. 2. B. S. Grewal "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.

3. G Haribaskaran "Probability, Queuing Theory& Reliability Engineering", Laxmi Publication, Latest Edition, 2006

4. Irwin Miller & Marylees Miller, John E. Freund's "Mathematical Statistics with Applications" Pearson. Dorling Kindersley Pvt. Ltd. India, 8 th edition, 2014.

5. S CGupta and V K Kapoor, "Fundamentals of Mathematical Statistics", S Chand and Company, Latest edition.

6. Robert V.Hogg, Joseph W. McKean & Allen T. Craig. "Introduction to Mathematical Statistics", Pearson Education 7th edition, 2013.

7. Jim Pitman. Probability, Springer-Verlag, 1993.

8. Sheldon M. Ross, "Introduction to Probability Models" 11th edition. Elsevier, 2014.

9. A. M. Yaglom and I. M. Yaglom, "Probability and Information". D.

10. Reidel Publishing Company. Distributed by Hindustan Publishing Corporation (India) Delhi, 1983.

11. P.G. Hoel,S.C. Port and C.J. Stone, "Introduction to Probability Theory", Universal Book Stall, (Reprint), 2003.

12. S.Ross, "A First Course in Probability",Pearson EducationIndia,6th Ed., 2002.

13. W.Feller, "An Introduction to Probability Theory and its Applications",Vol. 1, Wiley, 3rd Ed.,

14. N.P.Bali andManish Goyal,A Textbookof Engineering Mathematics, Laxmi Publications, Reprint, 2010. 15 VeerarajanT, Engineering Mathematics(for semesterIII),TataMcGraw-Hill, New Delhi, 2010

Web links and Video Lectures (e-Resources) :

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

http://www.class-central.com/subject/math(MOOCs)

http://academicearth.org/

http://www.bookstreet.in.

VTU EDUSAT PROGRAMME – 20 VTU e-Shikshana Program

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Programming Assignment
- Seminars

CO-PO Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	1	2	1	2						
CO2	2	2	2	2	2						
CO3	2	2	2	2	2						
CO4	2	2	2	2	2						
CO5	3	3	2	2	2						

III Semester		
OPERATING SYSTEM		
Course Code:	**MVJ22CG32**	**CIE Marks: 50**
L: T:P:S	**3:0:2:0**	**SEE Marks: 50**
Credits:	**4**	**Total :100**
Hours:	**40 hours Theory+24 hours Practical**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. To Demonstrate the need for OS and different types of OS
2. To discuss suitable techniques for management of different resources
3. To demonstrate different APIs/Commands related to processor, memory, storage and file system management

Teaching-Learning Process (General Instructions)

Teachers can use the following strategies to accelerate the attainment of the various course outcomes.

1. Lecturer methods (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

5. Role play for process scheduling.

6. Demonstrate the installation of any one Linux OS on VMware/Virtual Box

Module-1	
Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; 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; Operating System debugging, Operating System generation; System boot. **Textbook 1: Chapter – 1 (1.1-1.12), 2 (2.2-2.11)**	8Hrs
Module-2	

Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. **Process Scheduling:** Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiple-processor scheduling, **Textbook 1: Chapter – 3 (3.1-3.4), 4 (4.1-4.4), 5 (5.1 -5.5)**	8 Hrs
Module-3	
Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; **Deadlocks:** System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Textbook 1: Chapter – 6 (6.1-6.6), 7 (7.1 -7.7)**	8 Hrs
Module-4	
Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. **Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. **Textbook 1: Chapter -8 (8.1-8.6), 9 (9.1-9.6)**	8Hrs
Module-5	
File System, Implementation of File System: File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **Secondary Storage Structure, Protection:** Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix. **Textbook 1: Chapter – 10 (10.1-10.5) ,11 (11.1-11.5),12 (12.1-12.5), 14 (14.1-14.4)**	8Hrs
Laboratory Experiments- 24P	
1.Develop a c program to implement the Process system calls (fork (), exec(), wait(), create process, terminate process) 2. Simulate the following CPU scheduling algorithms to find turnaround time and waiting time a) FCFS b) SJF c) Round Robin d) Priority. 3. Develop a C program to simulate producer-consumer problem using semaphores. 4. Develop a C program which demonstrates interprocess communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIsPPPPP in your program 5. Develop a C program to simulate Bankers Algorithm for DeadLock Avoidance 6. Develop a C program to simulate the following contiguous memory allocation Techniques: a) Worst fit b) Best fit c) First fit	

7. Develop a C program to simulate page replacement algorithms: a) FIFO b) LRU
8.Simulate following File Organization Techniques a) Single level directory b) Two level directory
9. Develop a C program to simulate the Linked file allocation strategies.
10. Develop a C program to simulate SCAN disk scheduling algorithm.
11. Debug a given C program

```
//Moving Disk head to the inner most requested cylinder because this is Circular LOOK. queue[i]=queue2[0];
//Copying second array queue2[] after that first one is copied, into queue []
for(i=temp1+1,j=0;j;j <temp2;i++,j++)
{
queue[i]=queue2[j];
}
//At this point, we have the queue[] with the requests in the
//correct order of execution as per C-LOOK algorithm.
//Now we have to set 0th index of queue[] to be the initial
head position. queue[0]=head position;
// Calculating SEEK TIME. Seek is initially set to 0 in the declaration
part. for(j=0; j<n; j++)//Loop starts from head position. (ie. 0th
index of queue)
{
// Finding the difference between next position and current
position. difference = absolute Value(queue[j+1]-queue[j]);
// Adding difference to the current seek time
value seek = seek + difference;
// Displaying a message to show the movement of disk head
printf("Disk head moves from position %d to %d with Seek %d
\n", queue[j], queue[j+1], difference);
}
```

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

CO1. Explain the structure and functionality of operating system

CO2. Apply appropriate CPU scheduling algorithms for the given problem.

CO3. Analyse the various techniques for process synchronization and deadlock handling.

CO 4. Apply the various techniques for memory management

CO 5. Explain file and secondary storage management strategies.

CO6. Describe the need for information protection mechanisms

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

- Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
- Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Laboratory- 50 Marks

Weekly Evaluation 30 Marks

Weekly evaluation will be conducted for every experiment. Marks of each evaluation includes Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva for all the experiments. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks. (A)

Two CIE for 20 Marks each and take the average for 20 Marks (B)

Final CIE Marks will be calculated as A+B for 50 marks.

For IPCC Final CIE Marks will be calculated as Average of CIE and Lab CIE for 50 marks.

Semester End Examination (SEE)

SEE Theory Examination (100 Marks)

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50 (A)

SEE Laboratory Examination (50 Marks)

The laboratory SEE is also evaluated for 50 marks, distributed as follows:

Experiment Conduction with Results: 40 marks

Viva Voce: 10 marks Total 50 marks (B)
Textbooks: 1: Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 8th edition, Wiley-India, 2015
Reference books: 1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition 2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw-Hill, 2013 3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014 4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.
Web links and Video Lectures(e-Resources): 1. https://youtu.be/mXw9ruZaxzQ 2. https://youtu.be/vBURTt97EkA 3.https://www.youtube.com/watch?v=783KABtuE4&list=PLIemF3uozcAKTgsCIj82voMK3TMR0YE_ 4.https://www.youtube.com/watch?v=3-ITLMMeeXY&list=PL3pGy4HtqwD0n7bQfHjPnsWzke Rn6mkO Activity Based Learning (Suggested Activities in Class)/ Practical Based learning ● Assessment Methods o Case Study on UNIX Based Systems (10 Marks) Lab Assessment (25 Marks)

CO-PO Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	1	1	1			1	2		2
CO2	3	3	2	2	2			1	2		2
CO3	3	3	2	3	2			1	2		2
CO4	3	3	3	3	2			1	2		2
CO5											

3- High, 2- Moderate, 1- low

III Semester		
DIGITAL DESIGN AND COMPUTER ORGANISATION		
Course Code:	**MVJ22CG33**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. To demonstrate the functionalities of binary logic system
2. To explain the working of combinational and sequential logic system
3. To realize the basic structure of computer system
4. To illustrate the working of I/O operations and processing unit

Teaching-Learning Process (General Instructions) These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes. 1. Chalk and Talk 2. Live Demo with experiments 3. Power point presentation	
Module-1	
Introduction to Digital Design: Binary Logic, Basic Theorems And Properties Of Boolean Algebra, Boolean Functions, Digital Logic Gates, Introduction, The Map Method, Four-Variable Map, Don't-Care Conditions, NAND and NOR Implementation, Other Hardware Description Language – Verilog Model of a simple circuit. **Text book 1:** 1.9, 2.4, 2.5, 2.8, 3.1, 3.2, 3.3, 3.5, 3.6, 3.9	8 Hrs
Module-2	
Combinational Logic: Introduction, Combinational Circuits, Design Procedure, Binary Adder- Subtractor, Decoders, Encoders, Multiplexers. HDL Models of Combinational Circuits – Adder, Multiplexer, Encoder. Sequential Logic: Introduction, Sequential Circuits, Storage Elements: Latches, Flip-Flops. **Text book 1:** 4.1, 4.2, 4.4, 4.5, 4.9, 4.10, 4.11, 4.12, 5.1, 5.2, 5.3, 5.4	8Hrs
Module-3	
Basic Structure of Computers: Functional Units, Basic Operational Concepts, Bus structure, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. Machine Instructions and Programs: Memory Location and Addresses, Memory Operations, Instruction and Instruction sequencing, Addressing Modes. **Text book 2:** 1.2, 1.3, 1.4, 1.6, 2.2, 2.3, 2.4, 2.5	8 Hrs
Module-4	

Input/output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access: Bus Arbitration, Speed, size and Cost of memory systems. Cache Memories – Mapping Functions. Text book 2: 4.1, 4.2.1, 4.2.2, 4.2.3, 4.4, 5.4, 5.5.1	8Hrs
Module-5	
Basic Processing Unit: Some Fundamental Concepts: Register Transfers, Performing ALU operations, fetching a word from Memory, Storing a word in memory. Execution of a Complete Instruction. Pipelining: Basic concepts, Role of Cache memory, Pipeline Performance Text book 2: 7.1, 7.2, 8.1	8Hrs

Continuous Internal Evaluation (CIE):

- Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
- Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

Textbooks:

1. M. Morris Mano & Michael D. Ciletti, Digital Design With an Introduction to Verilog Design, 5e, Pearson Education.
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5 th Edition, Tata McGraw Hill.

Web links and Video Lectures(e-Resources): https://cse11-iiith.vlabs.ac.in/

Course Outcomes: At the end of the course, the student will be able to:
CO1: Apply the K–Map techniques to simplify various Boolean expressions

CO2: Design different types of combinational and sequential circuits along with Verilog programs
CO3: Describe the fundamentals of machine instructions, addressing modes and Processor performance
CO4: Explain the approaches involved in achieving communication between processor and I/O devices
CO5: Analyze internal Organization of Memory and Impact of cache/Pipelining on Processor Performance

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Assign the group task to Design the various types of counters and display the output accordingly Assessment Methods

- Lab Assessment (25 Marks)
- GATE Based Aptitude Test

CO-PO Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	1	1	1			1	2		2
CO2	3	3	2	2	2			1	2		2
CO3	3	3	2	3	2			1	2		2
CO4	3	3	2	3	2			1	2		2
CO5	3	3	3	2	3			1	2		2

III Semester		
DATA STRUCTURES AND APPLICATION		
Course Code:	**MVJ22CG34**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Teaching-Learning Process (General Instructions)

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Course Objectives: This course will enable the students to:

1.To explain fundamentals of data structures and their applications
2. To illustrate representation of Different data structures such as Stack, Queues, Linked Lists, Trees and Graphs.
3.To Design and Develop Solutions to problems using Linear Data Structures
4.To discuss applications of Nonlinear Data Structures in problem solving
5. To introduce advanced Data structure concepts such as Hashing and Optimal Binary Search Trees

Module-1	
INTRODUCTION TO DATA STRUCTURES: Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations Review of pointers and dynamic Memory Allocation, ARRAYS and STRUCTURES: Arrays, Dynamic Allocated Arrays, Structures and Unions, Polynomials, Sparse Matrices, representation of Multidimensional Arrays, Strings. STACKS: Stacks, Stacks Using Dynamic Arrays, Evaluation and conversion of Expressions. Text Book 1: Chapter-1:1.2 Chapter-2: 2.1 to 2.7 Chapter-3: 3.1,3.2,3.6	8HRS
Module-2	
QUEUES: Queues, Circular Queues, Using Dynamic Arrays, Multiple Stacks and queues. LINKED LISTS: Singly Linked, Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials. Text Book 1: Chapter-3: 3.3, 3.4, 3.7 Chapter-4: 4.1 to 4.4	8HRS
Module-3	
LINKED LISTS: Additional List Operations, Sparse Matrices, Doubly Linked List. TREES: Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees. Text Book 1: Chapter-4: 4.5,4.7,4.8 Chapter-5: 5.1 to 5.3, 5.5	8HRS
Module-4	
TREES(Cont..): Binary Search trees, Selection Trees, Forests, Representation of Disjoint sets, Counting Binary Trees, GRAPHS: The Graph Abstract Data Types, Elementary Graph Operations	8HRS

Text Book 1: Chapter-5: 5.7 to 5.11 Chapter-6: 6.1, 6.2	
Module-5	
HASHING: Introduction, Static Hashing, Dynamic Hashing PRIORITY QUEUES: Single and double ended Priority Queues, Leftist Trees INTRODUCTION TO EFFICIENT BINARY SEARCH TREES: Optimal Binary Search Trees Text Book 1: Chapter 8: 8.1 to 8.3 Chapter 9: 9.1, 9.2 Chapter 10: 10.1	8HRS

Textbooks:

1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014

Reference Books:

1. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014
2. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014
3. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012
4. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2 nd Ed, McGraw Hill, 2013
5. A M Tenenbaum, Data Structures using C, PHI, 1989
6. Robert Kruse, Data Structures and Program Design in C, 2 nd Ed, PHI, 1996

Weblinks and Video Lectures (e-Resources):

http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html

https://nptel.ac.in/courses/106/105/106105171/

http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html

https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s

https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html
https://nptel.ac.in/courses/106/102/106102064/

https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html

https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html

https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html

https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html

https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first-traversal/dft-practice.html
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01350159542807 7568125 59/overview

Course Outcomes: At the end of the course, the student will be able to:
CO1: Explain different data structures and their applications
CO2: Apply Arrays, Stacks and Queue data structures to solve the given problems.
CO3: Use the concept of linked list in problem solving.
CO4: Develop solutions using trees and graphs to model the real-world problem
CO5: Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees.

CIE ASSESSMENT:

Continuous Internal Evaluation (CIE):

- Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
- Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)

o Case Study

o Programming Assignment

o MOOC Assignment for selected Module

o Gate Based Aptitude Test

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	1	2			1	1		2
CO2	3	2	3	2	3			1	2		3
CO3	3	3	3	2	2			1	2		3
CO4	3	2	3	2	2			2	2		3
CO5											

III Semester		
DATA STRUCTURES LABORATORY		
Course Code:	**MVJ22CGL35**	**CIE Marks: 50**
L: T:P:S	**0:0:2:0**	**SEE Marks: 50**
Credits:	**1**	**Total :100**
Hours:	**24 hours practical**	**SEE Duration: 3 Hrs.**

Course Objectives: This laboratory course enables students to get practical experience in design, develop, implement, analyze and evaluation/testing of
Dynamic memory management
Linear data structures and their applications such as stacks, queues and lists
Non-Linear data structures and their applications such as trees and graphs

Descriptions (if any):
● Implement all the programs in "C" Programming Language and Linux OS.

Program list	
1	Develop a Program in C for the following: a) Declare a calendar as an array of 7 elements (A dynamically Created array) to represent 7 days of a week. Each Element of the array is a structure having three fields. The first field is the name of the Day (A dynamically allocated String), The second field is the date of the Day (A integer), the third field is the description of the activity for a particular day (A dynamically allocated String). b) Write functions create (), read() and display(); to create the calendar, to read the data from the keyboard and to print weeks activity details report on screen
2	Develop a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.
3	Develop a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations
4	Develop 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.
5	Develop a Program in C for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b. Solving Tower of Hanoi problem with n disks
6	Develop a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations
7	Develop a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Programme, Sem, PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) e. Exit
8	Develop 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
9	Develop 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
10	Develop a menu driven Program in C 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 in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exit

11	Develop 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
12	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. Develop a Program in C that uses Hash function H: K →L as H(K)=K mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing

Laboratory Outcomes: At the end of the course, The student should be able to:
CO1:Analyze various linear and non-linear data structures
CO2:Demonstrate the working nature of different types of data structures and their applications
CO3:Use appropriate searching and sorting algorithms for the give scenario
CO4: Apply the appropriate data structure for solving real world problems.

CONDUCTION OF PRACTICAL EXAMINATION:

CIE Laboratory (50 Marks)
Weekly Evaluation 30 Marks
Weekly evaluation will be conducted for every experiment. Marks of each evaluation include Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva all the experiments. The total of all these evaluated marks are added and the total marks will scaled to 30 marks. (A)
Two CIE for 20 Marks each and take the average for 20 Marks (B)
Final CIE Marks will be calculated as (A+B) for 50 marks
SEE Laboratory Examination (50 Marks)
The laboratory SEE is also evaluated for 50 marks, distributed as follows: Experiment Conduction with Results: 40 marks Viva Voce: 10marks Total 50 marks
The final score for the course out of 100 is the SumTotal of SEE and CIE.

CO- PO Mapping

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

III Semester		
FUNCTIONAL PROGRAMMING USING JAVA		
Course Code:	**MVJ22CG361**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**
Note- Students who have undergone "Basics of Java Programming" BPLCK105C/205C" in first year are not eligible to opt this course		
Course Objectives: This course will enable the students to: To learn primitive constructs JAVA programming language. To understand Object Oriented Programming Features of JAVA To gain knowledge on packages, multithreaded programming and exceptions.		
Teaching-Learning Process (General Instructions) These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective 1. UseOnline Java Compiler IDE: https://www.jdoodle.com/online-java-compiler/ or any other. 2. Demonstration of programming examples. 3. Chalk and board, power point presentations 4. Online material (Tutorials) and video lectures.		
Module-1		
An Overview of Java: Object-Oriented Programming (Two Paradigms, Abstraction, The Three OOP Principles), Using Blocks of Code, Lexical Issues (Whitespace, Identifiers, Literals, Comments, Separators, The Java Keywords). Data Types, Variables, and Arrays: The Primitive Types (Integers, Floating-Point Types, Characters, Booleans), Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, Introducing Type Inference with Local Variables. Operators: Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses. Control Statements: Java's Selection Statements (if, The Traditional switch), Iteration Statements (while, do-while, for, The For-Each Version of the for Loop, Local Variable Type Inference in a for Loop, Nested Loops), Jump Statements (Using break, Using continue, return).		8HRS
Module-2		
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection. Methods and Classes: Overloading Methods, Objects as Parameters, Argument Passing, Returning Objects, Recursion, Access Control, Understanding static, Introducing final, Introducing Nested and Inner Classes.		8HRS

Module-3	
Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, Local Variable Type Inference and Inheritance, The Object Class. Interfaces: Interfaces, Default Interface Methods, Use static Methods in an Interface, Private Interface Methods	8HRS
Module-4	
Packages: Packages, Packages and Member Access, Importing Packages. Exceptions: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions	8HRS
Module-5	
Multithreaded Programming: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Interthread Communication, Suspending, Resuming, and Stopping Threads, Obtaining a Thread's State. Enumerations, Type Wrappers and Autoboxing: Enumerations (Enumeration Fundamentals, The values() and valueOf() Methods), Type Wrappers (Character, Boolean, The Numeric Type Wrappers), Autoboxing (Autoboxing and Methods, Autoboxing/Unboxing Occurs in Expressions, Autoboxing/Unboxing Boolean and Character Values).	8HRS
Textbooks: Java: The Complete Reference, Twelfth Edition, by Herbert Schildt, November 2021, McGraw-Hill, ISBN: 9781260463422	
Reference Books: Programming with Java, 6th Edition, by E Balagurusamy, Mar-2019, McGraw Hill Education, ISBN: 9789353162337. Thinking in Java, Fourth Edition, by Bruce Eckel, Prentice Hall, 2006 (https://sd.blackball.lv/library/thinking_in_java_4th_edition.pdf)	
Web links and Video Lectures (e-Resources): • Java Tutorial: https://www.geeksforgeeks.org/java/ • Introduction To Programming In Java (by Evan Jones, Adam Marcus and Eugene Wu): https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-javajanuary-iap-2010/ • Java Tutorial: https://www.w3schools.com/java/ • Java Tutorial: https://www.javatpoint.com/java-tutorial	
Activity Based Learning (Suggested Activities)/ Practical Based learning 1. Installation of Java (Refer: https://www.java.com/en/download/help/index_installing.html)	

2. Demonstration of online IDEs like geeksforgeeks, jdoodle or any other Tools

3. Demonstration of class diagrams for the class abstraction, type visibility, composition and inheritance

Assessment Method

- Programming Assignment/ Course Project

Course Outcomes: At the end of the course, the student will be able to:
CO1: Demonstrate proficiency in writing simple programs involving branching and looping structures.
CO2: Design a class involving data members and methods for the given scenario.
CO3: Apply the concepts of inheritance and interfaces in solving real world problems.
CO4: Use the concept of packages and exception handling in solving complex problem
CO5: Apply concepts of multithreading, autoboxing and enumerations in program development

CIE ASSESSMENT:
Continuous Internal Evaluation (CIE):
Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)
Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks
Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.
Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	1	2				1		2
CO2	3	3	3	2	3			1	2		3
CO3	3	3	3	2	3			2	2		3
CO4											
CO5											

III semester		
Python programming for AI &ML		
Course Code:	**MVJ22CG362**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. To understand Python constructs and use them to build the programs.
2. To analyse different conditional statements and their applications in programs
3. To learn and use basic data structures in python language
4. To learn and demonstrate array manipulations by reading data from files
5. To understand and use different data in a data analytics context.

Module-1	
Introduction to python: Elements of python language, python block structure, variables and assignment statement, data types in python, operations, simple input/output print statements, formatting print statement Text Book 1: Chapter 3 (3.2, 3.3, 3.4, 3.6, 3.7, 3.9 and 3.10)	8HRS
Module-2	
Decision structure: forming conditions, if statement, the if-else and nested if-else, looping statements: introduction to looping, python built in functions for looping, loop statements, jump statement. Text Book 1: Chapter 4 (4.2 to 4.6) , Chapter 5 (5.1 to 5.4)	8HRS
Module-3	
Lists: lists, operation on list, Tuples: introduction, creating, indexing and slicing, operations on tuples. sets: creating, operation in sets, introduction dictionaries, creating, operations, nested dictionary, looping over dictionary. Text Book 1: Chapter 7 (7.2 to 7.3) , Chapter 8 (8.1 to 8.4) and Chapter 9(9.1 to 9.3, 9.7 to 9.12)	8HRS
Module-4	
The NumPy Library: Ndarray: the heart of the library, Basic operations, indexing, slicing and iterating, conditions and boolean arrays, array manipulation, general concepts, reading and writing array data on files. The pandas Library: an introduction to Data structure, other functionalities on indexes, operations between data structures, function application and mapping. Text Book 2: Chapter 3 and Chapter 4.	8HRS
Module-5	
The pandas : Reading and Writing data: i/o API tools, CSV and textual files, Reading data in CSV or text files, reading and writing HTML files, reading data from XML files, Microsoft excel files, JSON data, Pickle python	8HRS

object serialization. Pandas in Depth : data manipulation: data preparation, concatenating data transformation discretization binning, permutation, string manipulation, data aggregation group iteration. Text Book 2: Chapter 5 and Chapter 6	

Textbooks:

1. S. Sridhar, J. Indumathi, V.M. Hariharan "Python Programming" Pearson publishers, 1st edition 2023.
2. Fabio Nelli, "Python Data Analytics", Apress, Publishing, 1st Edition, 2015.

Reference Books:

1. Paul Deitel and Harvey deitel,"Intro to Python for Computer Science and Data science", 1st edition Pearson Publisher 2020.

Course Outcomes: At the end of the course1, the student will be able to:

CO1: Describe the constructs of python programming
CO2: Use looping and conditional constructs to build programs
CO3: Apply the concept of data structure to solve the real-world problem
CO4: Use the NumPy constructs for matrix manipulations
CO5: Apply the Panda constructs for data analytics.

CIE ASSESSMENT:

- Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
- Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	2	3						2
CO2	3	2	3	2	3						2
CO3	3	3	2	2	3						2
CO4	3	2	3	2	3						2
CO5	3	3	3	3	3						2

Semester: III		
Social Connect & Responsibility		
Course Code:	**MVJ22SCR37**	**CIE Marks: 100**
L: T:P:S	**0:0:2:1**	**SEE Marks: ---**
Credits:	**1**	**Total :100**
Hours:	**40 hour Practical Session +15 hour Planning**	
Examination nature (No SEE – Only CIE)	**For CIE Assessment- Activities Report Evaluation by College NSS Officer / HOD / Sports Dept / Any Dept**	

Course Objectives: This course will enable the students to:

1. Provide a formal platform for students to communicate and connect to the surrounding.
2. create a responsible connection with the society
3. Understand the community in general in which they work
4. Identify the needs and problems of the community and involve them in problem –solving
5. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems
6. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes

General Instructions- Pedagogy :

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied social and cultural skills.
2. State the need for activities and its present relevance in the society and Provide real-life examples.
3. Support and guide the students for self-planned activities
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
5. Encourage the students for group work to improve their creative and analytical skills

Contents:

The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large.

The course will engage students for interactive sessions, open mic, reading group, storytelling sessions, and semester-long activities conducted by faculty mentors.

In the following a set of activities planned for the course have been listed:	
Part 1	
Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - – Objectives, Visit, case study, report, outcomes.	4 Hrs
Part 2	
Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - – Objectives, Visit, case study, report, outcomes.	4 Hrs
Part 3	
Organic farming and waste management: Usefulness of organic farming, wet waste management in neighbouring villages, and implementation in the campus – Objectives, Visit, case study, report, outcomes.	4 Hrs
Part 4	
Water conservation: Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes	4 Hrs
Part 5	
Food walk: City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study, report, outcomes.	4 Hrs
Course Outcomes: At the end of the course, the student will be able to: CO1: Communicate and connect to the surrounding. CO2: Create a responsible connection with the society CO3: Involve in the community in general in which they work CO4: Notice the needs and problems of the community and involve them in problem –solving CO5: Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems CO6: Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.	
ACTIVITITES: Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art	

PEDAGOGY: The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector? **COURSE TOPICS:** The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversional will culminate in developing an actual, idea for problem- based intervention, based on an in-depth understanding of a key social problem. Duration: A total of 40 - 50 hrs engagement per semester is required for the 3rd semester of the B.E. /B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions openmic ,and poetry) Faculty mentors has to design the evaluation system as per VTU guidelines of scheme & syllabus.
Continuous Internal Evaluation (CIE): After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50. Planning and scheduling the social connect Information/Data collected during the social connect Analysis of the information/data and report writing Considering all above points allotting the marks as mentioned below Excellent: 80 to 100 Good: 60 to 79 Satisfactory: 40 to 59 Unsatisfactory and fail : <39
Special Note: NO SEE – Semester End Exam – Completely Practical and activities-based evaluation
Pedagogy – Guidelines: It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution

SL NO	Topic	GROUP SIZE	LOCATION	ACTIVITY EXECUTION	REPORTING	EVALUATION OF TOPIC
1	**Plantation and adoption of a tree**	May be individual or team	Farmers land/ parks / Villages / roadside/ community area / College campus etc…	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Ofscheme and syllabus by Faculty
2	**Heritage walk and crafts corner:**	May be individual or team	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc….	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
3	**Organic farming and waste management:**	May be individual or team	Farmers land / parks / Villages visits / roadside/ community area / College campus etc….	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
4	**Water conservation: & conservation techniques**	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers / campus etc….	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluatio	Evaluation as per the rubrics Of scheme and syllabus by Faculty

					n authority	
5	**Food walk: Practices in society**	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc….	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty

Plan of Action (Execution of Activities)

Sl.NO	Practice Session Description
1	Lecture session in field to start activities
2	Students Presentation on Ideas
3	Commencement of activity and its progress
4	Execution of Activity
5	Execution of Activity
6	Execution of Activity
7	Execution of Activity
8	Case study-based Assessment, Individual performance
9	Sector/ Team wise study and its consolidation
10	Video based seminar for 10 minutes by each student at the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion.
- At last consolidated report of all activities from 1 st to 5 th , compiled report should be submitted as per the instructions and scheme.

Assessment Details for CIE (both CIE and SEE)

Weightage	CIE – 100%	• Implementation strategies of the project (NSS work).
Field Visit, Plan, Discussion	**10 Marks**	
Commencement of activities and its progress	**20 Marks**	

Case study-based Assessment Individual performance with report	**20 Marks**	• The last report should be signed by NSS Officer, the HOD and principal. • At last report should be evaluated by the NSS officer of the institute. • Finally, the consolidated marks sheet should be sent to the university and also to be made available at LIC visit
Sector wise study & its consolidation 5*5 = 25	**25 Marks**	
Video based seminar for 10minutes by each student at the end of semester with Report. Activities 1 to 5, 5*5 = 25	**25 Marks**	
Total marks for the course in each semester	**100 Marks**	
For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.		
Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general through activities		

	Semester: III		
	ADDITIONAL MATHEMATICS-I		
	Course Code:	**MVJ22MATDIP-I**	**CIE Marks: 100**
	L: T:P:S	**2:0:0:0**	**SEE Marks: ---**
	Credits:	**0**	**Total :100**
	Hours:	**24 hours theory**	**SEE Duration: ---**
	Course Learning Objectives: The students will be able to		
	To familiarize the important and introductory concepts of Differential calculus, Integral calculus, Vector differentiation, Probability, ordinary differential equations of first order, and analyze the engineering problems.		

UNIT 1	
Differential calculus: Recapitulation of successive differentiation -nth derivative -Leibnitz theorem (without proof) and Problems, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation, Taylor's and Maclaurin's series expansions- Illustrative examples. Self study: Radius of curvature.	**5 Hrs.**
UNIT 2	
Integral Calculus: Statement of reduction formulae for the integrals of sinn (x) , cosn (x) , sinn (x) cosn (n) and evaluation of these integrals with standard limits-problems. Double and triple integrals-Simple examples. Self study: Volume revolution, Surface area of revolution.	**5 Hrs.**
UNIT 3	
Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and Vector point functions, Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields. **Vector identities** - $div(\phi \vec{A})$, $curl(\phi \vec{A})$, $curl(grad(\phi))$, $div(curl \vec{A})$. Self study: Line integrals, Green's theorem, Gauss and stokes theorem.	**5 Hrs.**

UNIT 4	
Probability: Basic terminology, Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability – illustrative examples. Bayes theorem-examples. Self study: Applications of Bayes' Theorem.	**5 Hrs.**
UNIT 5	
Ordinary Differential Equations of First Order: Introduction – Formation of differential equation, solutions of first order and first degree differential equations: variable separable form, homogeneous, exact, linear differential equations. Some special first order equations: Bernoulli equation, Clairaut's equation Self study: Applications of differential equations (ODE): Newton's law cooling.	**5 Hrs.**

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the knowledge of calculus to solve problems related to polar curves and its Applications
CO2	Apply the concept of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.
CO3	Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.
CO4	Understand the basic Concepts of Probability
CO5	Recognize and solve first-order ordinary differential equations occurring in different branches of engineering.
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.

IV SEMESTER

4TH SEMESTER		
Analysis and Design of Algorithms		
Course Code:	**MVJ22CG41**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. To learn the methods for analyzing algorithms and evaluating their performance.
2. To demonstrate the efficiency of algorithms using asymptotic notations.
3. To solve problems using various algorithm design methods, including brute force, greedy,
4. divide and conquer, decrease and conquer, transform and conquer, dynamic programming, backtracking, and branch and bound.
5. To learn the concepts of P and NP complexity classes.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but different types of teaching methods may be adopted to achieve the outcomes.

2. Utilizevideo/animation filmsto illustrate the functioning of various concepts.

3. Promotecollaborative learning (Group Learning) in the class.

4. Pose at least three HOT (Higher Order Thinking) questions in the class to stimulate critical thinking.

5. Incorporate Problem-Based Learning (PBL) to foster students' analytical skills and develop their ability to evaluate, generalize, and analyze information rather than merely recalling it.

6. Introduce topicsthroughmultiple representations.

7. Demonstrate various ways to solve the same problem and encourage students to devise their own creative solutions.

8. Discussthe real-world applications of every concept to enhance students' comprehension.

Module-1

INTRODUCTION: What is an Algorithm? Fundamentals of Algorithmic Problem Solving. FUNDAMENTALS OF THE ANALYSIS OF ALGORITHM EFFICIENCY: Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non recursive Algorithms, Mathematical Analysis of Recursive Algorithms.	8 hrs

BRUTE FORCE APPROACHES: Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching. Chapter 1 (Sections 1.1,1.2), Chapter 2(Sections 2.1,2.2,2.3,2.4), Chapter 3(Section 3.1,3.2)	
Module-2	
BRUTE FORCE APPROACHES (contd..): Exhaustive Search (Travelling Salesman probem and Knapsack Problem). DECREASE-AND-CONQUER: Insertion Sort, Topological Sorting. DIVIDE AND CONQUER: Merge Sort, Quick Sort, Binary Tree Traversals, Multiplication of Large Integers and Strassen's Matrix Multiplication Chapter 3(Section 3.4), Chapter 4 (Sections 4.1,4.2), Chapter 5 (Section 5.1,5.2,5.3, 5.4)	8 hrs
Module-3	
TRANSFORM-AND-CONQUER: Balanced Search Trees, Heaps and Heapsort. SPACE-TIME TRADEOFFS: Sorting by Counting: Comparison counting sort, Input Enhancement in String Matching: Horspool's Algorithm. Chapter 6 (Sections 6.3,6.4), Chapter 7 (Sections 7.1,7.2)	8 hrs
Module-4	
DYNAMIC PROGRAMMING: Three basic examples, The Knapsack Problem and Memory Functions, Warshall's and Floyd's Algorithms. THE GREEDY METHOD: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes. Chapter 8 (Sections 8.1,8.2,8.4), Chapter 9 (Sections 9.1,9.2,9.3,9.4)	8 hrs
Module-5	
LIMITATIONS OF ALGORITHMIC POWER: Decision Trees, P, NP, and NP-Complete Problems. COPING WITH LIMITATIONS OF ALGORITHMIC POWER: Backtracking (n-Queens problem, Subset- sum problem), Branch-and-Bound (Knapsack problem), Approximation algorithms for NP-Hard problems (Knapsack problem). Chapter 11 (Section 11.2, 11.3), Chapter 12 (Sections 12.1,12.2,12.3)	8 hrs

Textbooks

1. Introduction to the Design and Analysis of Algorithms, By Anany Levitin, 3rd Edition (Indian), 2017, Pearson.

Reference books:

1. Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.
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)

Course Outcomes: At the end of the course,the students will be able to

CO1: Apply Greedy and dynamic programming method to solve computational problem and backtracking using approximation methods.

CO2: Analyze the performance of the algorithm in terms of time complexity for asymptotic notational method and for various classes of problems such as P, NP hard and NP complete.

CO3:Compare and evaluate conquer approaches to solve computational problems.
CO4:Design a code by using modern tools (PyCharm, Visual Studio Code).

CIE ASSESSMENT:

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C) Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.
Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

Suggested Learning Resources:

Textbooks

1. Introduction to the Design and Analysis of Algorithms, By Anany Levitin, 3rd Edition (Indian), 2017, Pearson. Reference books 1. Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.

2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.

3. Designand Analysis of Algorithms, S. Sridhar,Oxford (Higher Education)

Web links and Video Lectures(e-Resources):

- Design and Analysis of Algorithms:
https://nptel.ac.in/courses/106/101/106101060/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Promote real-world problem-solving and competitive problem solving through group discussions to engage students actively in the learning process.

- Encourage students to enhance their problem-solving skills by implementing algorithms and solutions through programming exercises, fostering practical application of theoretical concepts.

Assessment Methods

1. Problem-solving Assignments (Hacker Rank/ Hacker Earth / Lead code)

2. Gate Based Aptitude Test

CO- PO MAPPING

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

4TH SEMESTER		
COMPUTER GRAPHICS AND VISUALIZATION		
Course Code:	**MVJ22CG42**	**CIE Marks: 50**
L: T:P:S	**3:0:2:0**	**SEE Marks: 50**
Credits:	**4**	**Total :100**
Hours:	**40 hours theory+24 hours practical**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. Understand concepts of Computer Graphics along with its applications
2. Exploring mathematics for 2D and 3D graphics along with Open GLAPI's
3. Use of Computer graphics inanimation and GUI design.
4. Demonstrate Geometric transformations, viewing on both2Dand3Dobjects
5. Infer the representation of curves, surfaces, Color and Illumination models

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1	
Computer Graphics: Application of Computer Graphics. **OpenGL:** Introduction to OpenGL, coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL fill area functions, OpenGL Vertex arrays, Line drawing algorithm- Bresenham's. Textbook2:Chapter-1[1.1]	**8 hrs**

Textbook1:Chapter-3[3.5],4[4.1-4.5,4.8,4.9],5[5.1]	
Module-2	
2Dand 3D graphics with OpenGL: 2DGeometric Transformations: Basic2DGeometricTransformations, matrix representations and homogeneous coordinates, OpenGL raster transformations, Transformation between 2D coordinate systems, OpenGL geometric transformation functions. **3DGeometricTransformations:**3DTranslation,rotation,scaling, OpenGLgeometrictransformations functions.	**8 hrs**
Module-3	
Interactive Input Methods and Graphical User Interfaces: Graphical Input Data , LogicalClassification of Input Devices, Input Functions for Graphical Data, OpenGL Interactive Input-Device Functions, OpenGL Menu Functions, Designing a Graphical User Interface. **Computer Animation:** Design of Animation Sequences, Traditional Animation Techniques, General Computer- Animation Functions, Computer-Animation Languages, Character Animation, Periodic Motions, OpenGL Animation Procedures. Textbook1:Chapter-18[18.1-18.4,18.7,18.8],11[11.2-11.5,11.8-11.10]	**8 hrs**
Module-4	
Clipping:clippingwindow,normalizationandviewporttransformations,clippingalgorithms,2Dpointclipping,2D line clipping algorithms: cohen-sutherland line clipping. **Color Models:** Properties of light, color models ,RGB and CMY color models. **IlluminationModels:**Lightsources,basicilluminationmodels-Ambientlight,diffusereflection,specularand phong model. Textbook 1:Chapter-7[7.2,7.3,7.5-7.7],15[15.1,15.3],17[17.1,17.2,17.4,17.6]	**8 hrs**
Module-5	
3DViewing:3Dviewingconcepts,3Dviewingpipeline,Transformationfromworldtoviewingcoordinates, Projection transformation, orthogonal projections, perspective projections, OpenGL 3D viewing functions. **VisibleSurfaceDetectionMethods:**ClassificationofvisiblesurfaceDetectionalgorithms,depthbuffer method. Textbook 1: Chapter - 9[9.1,9.2,9.4-9.6,9.8,9.10],14[14.1,14.3]	**8 hrs**
Course Outcomes: At the end of the course,the students will be able to At the end of The course,the student will be able to: 1. Applyvariouspredefinedfunctionsfordrawinggeometricprimitivesin OpenGL. 2. Explore projections andvisible surfacedetectiontechniquesfordisplayof3Dsceneson2Dscreen.	

3. Assess various mathematical concepts such as matrices,and geometric transformations used to design 3D objects, 2D clipping and color models.
4. Designanddevelopcomputergraphicsprogramsforreal-world applications such as gaming,animation, simulations, GUI, and visualizations.

PRACTICAL COMPONENT – 24 hours practical

1. DevelopOpenGLprogramtodrawalineusingBresenham'salgorithmforalltypesof slopes.

2. DevelopOpenGLprogramtocreateandrotateatriangleabouttheoriginandafixed point.

3. DevelopaOpenGLprogramtoimplementtorecursivelysubdivideatetrahedrontof orm3Dsierpinskigasket.Thenumberofrecursivestepsistobespecifiedbytheuser.

4. DevelopaOpenGLprogramtoSpin3DsierpinskigasketusingOpenGLtransformati onmatrices.

5. DevelopaOpenGLprogramtoClip2DlinesusingCohen-Sutherlandalgorithm.

6. Developamenudrivenprogramtoanimatethepolygonusing3Dgeometrictransfo rmations.

7. DevelopaOpenGLprogramtodrawacolorcubeandallowtheusertomovethecamer asuitablyto
experimentwith perspectiveviewing.

8.DevelopaOpenGLprogramtodrawasimpleshadedsceneconsistingofateapotonatabl e.Define suitablythepositionandpropertiesofthelightsourcealongwiththe propertiesof the surfacesofthe solid
object used in the scene.

9. DevelopaOpenGLprogramtodrawasimplescenecontainingfew3Dobjectsandprovide dayandnight effect. Define suitably the position and properties of the light source used in the scene.

Continuous Internal Evaluation (CIE):

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

Three CIE Will be conducted for 50 marks each and average of three will

be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum

of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments

will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Laboratory- 50 Marks

Weekly Evaluation 30 Marks

Weekly evaluation will be conducted for every experiment. Marks of each evaluation includes Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva for all the experiments. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks. (A)

Two CIE for 20 Marks each and take the average for 20 Marks (B)

Final CIE Marks will be calculated as A+B for 50 marks

For IPCC Final CIE Marks will be calculated as Average of CIE and Lab CIE for 50 marks.

Semester End Examination (SEE)

SEE Theory Examination (100 Marks)

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50 (A)

SEE Laboratory Examination (50 Marks)

The laboratory SEE is also evaluated for 50 marks, distributed as follows:

Experiment Conduction with Results: 40 marks

Viva Voce: 10 marks

Total 50 marks (B)

The score for the SEE is A+B of total 100 marks

Suggested Learning Resources:

Text Books:

1. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008.

Reference Books:

1. Raghunandan.G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 2019.

2. Insider's Guide to the ARM7 based microcontrollers, Hitex Ltd.,1st edition, 2005

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

Assign the group task to demonstrate the Installation and working of Keil Software

CO-PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	2	2				1		2
CO2	3	3	3	2	3			1	2		3
CO3	3	3	3	3	2			1	2		3
CO4	3	3	3	2	3			1	2		3
CO5											

4TH SEMESTER		
DATABASE MANAGEMENT SYSTEM		
Course Code:	**MVJ22CG43**	**CIE Marks: 50**
L: T:P:S	**3:0:2:0**	**SEE Marks: 50**
Credits:	**4**	**Total :100**
Hours:	**40 hours theory+24 hours practical**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. Provide a strong foundation in database concepts, technology, and practice.
2. Practice SQL programming through a variety of database problems.
3. Understand the relational database design principles.
4. Demonstrate the use of concurrency and transactions in database.
5. Design and build database applications for real world problems.
6. become familiar with database storage structures and access techniques.

Teaching-Learning Process

These are sample Strategies, which teachers can use to accelerate the attainment ofthe various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask Allestree HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information rather than simply recall it.

6. Introduce Topics in manifold representations.

7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding

9. Use any of these methods: Chalk and board, Active Learning, Case Studies

Module-1

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets and structural constraints, Weak entity types, ER diagrams, Specialization and Generalization. Textbook 1: Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10	8 hrs
Module-2	
Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping. Textbook 1: Ch 5.1 to 5.3, Ch 8.1 to 8.5; Ch 9.1 to 9.2 Textbook 2: 3.5	8 hrs
Module-3	
Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. SQL: SQL data definition and data types, Schema change statements in SQL, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL Textbook 1: Ch 14.1 to 14.7, Ch 6.1 to 6.5	8 hrs
Module-4	
SQL: Advanced Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL. Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, characterizing schedules based on recoverability, characterizing schedules based on Serializability, Transaction support in SQL. Textbook 1: Ch 7.1 to 7.3, Ch 20.1 to 20.6	8 Hrs
Module-5	
Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Mult version Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. NOSQL Databases and Big Data Storage Systems: Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems	8 hrs

and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j Textbook 1: Chapter 21.1 to 21.5, Chapter 24.1 to 24.6	
Practical Experiments	**24P**

1. Create a table called Employee & execute the following.

Employee (EMPNO, ENAME, JOB, MANAGER_NO, SAL, COMMISSION)

1. Create a user and grant all permissions to the user.
2. Insert the any three records in the employee table contains attributes EMPNO, ENAME JOB, MANAGER_NO, SAL, COMMISSION and use rollback.
   Check the result.
3. Add primary key constraint and not null constraint to the employee table. Insert null values to the employee table and verify the result.

2. Create a table called Employee that contain attributes EMPNO, ENAME, JOB, MGR, SAL & execute the following.

1. Add a column commission with domain to the Employee table.
2. Insert any five records into the table.
3. Update the column details of job
4. Rename the column of Employ table using alter command.
5. Delete the employee whose Empno is 105.

3. Queries using aggregate functions(COUNT,AVG,MIN,MAX,SUM),Group by, Orderby.

Employee(E_id, E_name, Age, Salary)

1. Create Employee table containing all Records E_id, E_name, Age, Salary.
2. Count number of employee names from employee table
3. Find the Maximum age from employee table.
4. Find the Minimum age from employee table.
5. Find salaries of employee in Ascending Order.

Find grouped salaries of employees.

4. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old & new Salary CUSTOMERS(ID,NAME,AGE,ADDRESS,SALARY)

5. Create cursor for Employee table & extract the values from the table. Declare the variables,Open the cursor & extrct the values from the cursor. Close the cursor.

Employee(E_id, E_name, Age, Salary)

6. Write a PL/SQL block of code using parameterized Cursor, that will merge the data availablein the newly created table N_RollCall with the data available in the table O_RollCall. If the data in the first table already exist in the second table then that data should be skipped.

7. Install an Open Source NoSQL Data base MongoDB & perform basic CRUD(Create, Read, Update & Delete) operations. Execute MongoDB basic Queries using CRUD operations.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Laboratory- 50 Marks

Weekly Evaluation 30 Marks Weekly evaluation will be conducted for every experiment. Marks of each evaluation includes Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva for all the experiments. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks. (A)

Two CIE for 20 Marks each and take the average for 20 Marks (B)

Final CIE Marks will be calculated as A+B for 50 marks

For IPCC Final CIE Marks will be calculated as Average of CIE and Lab CIE for 50 marks.

Semester End Examination (SEE)

SEE Theory Examination (100 Marks)

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for

16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50 (A)

SEE Laboratory Examination (50 Marks)

The laboratory SEE is also evaluated for 50 marks, distributed as follows:

Experiment Conduction with Results: 40 marks

Viva Voce: 10 marks

Total 50 marks (B)

The score for the SEE is A+B of total 100 marks

Textbooks

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

Course Outcomes: At the end of the course,the students will be able to
CO1:Apply the concepts, models, operations, and techniques to query, manage, and optimize databases effectively for real-world applications.
CO2: Analyze the components, relationships, and constraints across database models, operations, and architectures to understand their inter dependencies and applications.
CO3: Construct and implement database systems by using concepts, architectures, models, and techniques to create efficient solutions for diverse applications.
CO4: Evaluate and validate the effectiveness, reliability, and scalability of database systems by critically assessing the application such as normalization, concurrency control, and transaction processing within real-world scenarios.
CO5: Design and develop innovative database systems using advanced tools, techniques, and technologies like mongodb to address modern data management challenges efficiently and effectively.

CO-PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	1	1	2				1		2
CO2	3	3	3	2	3				2		3
CO3	3	3	3	3	2			1	2		3
CO4	3	3	3	3	3			2	3		3
CO5											

SEMESTER IV		
Analysis and Design of Algorithms lab		
Course Code:	**MVJ22CGL44**	**CIE Marks: 50**
L: T:P:S	**0:0:2:0**	**SEE Marks: 50**
Credits:	**1**	**Total :100**
Hours:	**24 hours practical**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:
To design and implement various algorithms in C/C++ programming using suitable development tools to address different computational challenges.
To apply diverse design strategies for effective problem-solving.
To Measure and compare the performance of different algorithms to determine their efficiency and suitability for specific tasks.

Sl No	Experiment List
1	Design and implement C/C++ Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm.
2	Design and implement C/C++ Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
3	Design and implement C/C++ Program to solve All-Pairs Shortest Paths problem using Floyd's algorithm. Design and implement C/C++ Program to find the transitive closure using Warshal's algorithm.
4	Design and implement C/C++ Program to find shortest paths from a given vertex in a weighted connected graph to other vertices using Dijkstra's algorithm.
5	Design and implement C/C++ Program to obtain the Topological ordering of vertices in a given digraph.
6	Design and implement C/C++ Program to solve 0/1 Knapsack problem using Dynamic Programming method.
7	Design and implement C/C++ Program to solve discrete Knapsack and continuous Knapsack problems using greedy approximation method.
8	Design and implement C/C++ Program 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.
9	Design and implement C/C++ Program to sort a given set of n integer elements using Selection 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 n. The elements can be read from a file or can be generated using the random number generator.
10	Design and implement C/C++ Program to sort a given set of n integer elements using Quick 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 n. The elements can be read from a file or can be generated using the random number generator.

11	Design and implement C/C++ Program to 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 n. The elements can be read from a file or can be generated using the random number generator.
12	Design and implement C/C++ Program for N Queen's problem using Backtracking.

Course outcomes: At the end of the course, the student will be able to
CO1: Apply fundamental algorithmic techniques like divide-and-conquer, dynamic programming, greedy algorithms, backtracking, and branch-and-bound to solve computational problems.
CO2: Analyze the time and space complexity of algorithms using Big O notation and optimize algorithms to improve performance.
CO3: Evaluate different algorithmic approaches and select the most appropriate one based on problem constraints and efficiency.
CO4: Develop programs to solve computational problems be choosing appropriate design techniques to develop solutions for computational and complex problems.
CO5: Design and implement algorithms to solve real-world problems efficiently using programming languages such as Python, Java, or C++.

CIE Laboratory (50 Marks)

Weekly Evaluation 30 Marks

Weekly evaluation will be conducted for every experiment. Marks of each evaluation includes Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva for all the experiments. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks. (A)

Two CIE for 20 Marks each and take the average for 20 Marks (B)

Final CIE Marks will be calculated as (A+B) for 50 marks

SEE Laboratory Examination (50 Marks)

The laboratory SEE is also evaluated for 50 marks, distributed as follows: Experiment Conduction with Results: 40 marks Viva Voce: 10marks Total 50 marks

The final score for the course out of 100 is the SumTotal of SEE and CIE.

Suggested Learning Resources:

- Virtual Labs (CSE): http://cse01-iiith.vlabs.ac.in/

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	1	1	2				1		2
CO2	3	3	3	2	3				2		3
CO3	3	3	3	3	2			1	2		3
CO4	3	3	3	3	3			2	3		3
CO5											

SEMESTER IV		
DISCRETE MATHEMATICAL STRUCTURES		
Course Code:	MVJ22CG451	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course objectives:

1. To help students to understand discrete and continuous mathematical structures.
2. To impart basics of relations and functions.
3. To facilitate students in applying principles of Recurrence Relations to find the generating functions and solve the Recurrence relations.
4. To have the knowledge of groups and their properties to understand the importance of algebraic properties relative to various number systems.

Teaching-Learning Process Pedagogy

(General Instructions):

These are sample Strategies, teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will assign homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways: • As an introduction to new topics (pre-lecture activity). • As a revision of topics (post-lecture activity). • As additional examples (post-lecture activity). • As an additional material of challenging topics (pre-and post-lecture activity). • As a model solution for some exercises (post-lecture activity).

Module-1	
Fundamentals of Logic : Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of	8 hrs

Inference. The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems. (RBT Levels: L1, L2 and L3)	
Module-2	8 hrs
Properties of the Integers : Mathematical Induction, The Well Ordering Principle – Mathematical Induction, Recursive Definitions. Fundamental Principles of Counting: The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition. (RBT Levels: L1, L2 and L3)	8 hrs
Module-3	
Relations and Functions : Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions. The Pigeonhole Principle, Function Composition and Inverse Functions. Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions. (8 hours) (RBT Levels: L1, L2 and L3)	8 hrs
Module-4	
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. (8 Hours) (RBT Levels: L1, L2 and L3)	8 hrs
Module-5	
Introduction to Groups Theory : Definitions and Examples of Particular Groups Klein 4-group, Additive group of Integers modulo n, Multiplicative group of Integers modulo-p and permutation groups, Properties of groups, Subgroups, cyclic groups, Cosets, Lagrange's Theorem. (RBT Levels: L1, L2 and L3	8 hrs
Course outcome (Course Skill Set) Atte end of the course, the student will be able to: 1. Apply concepts of logical reasoning and mathematical proof techniques in proving theorems and statements. 2. Demonstrate the application of discrete structures in different fields of computer science. 3. Apply the basic concepts of relations, functions and partially ordered sets for computer representations. 4. Solve problems involving recurrence relations and generating functions. 5. Illustrate the fundamental principles of Algebraic structures with the problems related to computer science & engineering.	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE, the minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the	

course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

Three CIE Will be conducted for 50 marks each and average of three will be taken (A) ☐ Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The theory exam consists of a written paper structured into two parts: Part A: Carries 20 marks which include either objective-type or short descriptive questions. It is designed to cover the entire syllabus comprehensively.

Part B: This section carries a total of 80 marks and consists of 5 questions, with Either or choices.

Students are required to answer one full question per module, selecting from the choices. Each question is valued at 16 marks and may include up to two sub-parts.

The Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined forth course.

Semester-End Examination: Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (duration 03 hours).

1. The question paper will have ten questions. Each question is set for 20 marks.

2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

3. The students have to answer 5 full questions, selecting one full question from each module. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books (Name of the author/Title of the Book/Name of the publisher/Edition and Year)

Text Books:

1. Ralph P. Grimaldi, B V Ramana: "Discrete Mathematical Structures an Applied Introduction", 5th Edition, Pearson Education, 2004.

2. Ralph Grimaldi: "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education. 2004.

Reference Books:

1. Basavaraj S Anami andVenakanna S Madalli: "Discrete Mathematics – A Concept-based approach", Universities Press, 2016

2. KennethH. Rosen: "Discrete Mathematics and its Applications", 6th Edition, McGraw Hill, 2007. 3. JayantGanguly: "A Treatise on Discrete Mathematical Structures", Sanguine-Pearson, 2010. 4. D.S.Malik and M.K. Sen: "Discrete Mathematical Structures Theory and Applications, Latest Edition, Thomson, 2004. 5. Thomas Koshy: "Discrete Mathematics with Applications", Elsevier, 2005, Reprint 2008.

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program.
- http://www.themathpage.com/
- http://www.abstractmath.org/
- http://www.ocw.mit.edu/courses/mathematics/

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Seminar

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

SEMESTER IV		
GRAPH THEORY		
Course Code:	**MVJ22CG452**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

- • Understand the basic concepts of graphs and their properties, and operations of graphs.
  • Hamiltonian and Euler graphs, trees, and matrix representation of the graph.
  • Apply the concepts of a planar graph, matching, and colouring in computer science engineering.

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies, teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.

2. State the need for Mathematics with Engineering Studies and Provide real-life examples.

3. Support and guide the students for self–study.

4. You will assign homework, grading assignments and quizzes, and documenting students' progress.

5. Encourage the students to group learning to improve their creative and analytical skills.

6. Show short related video lectures in the following ways: • As an introduction to new topics (pre-lecture activity). • As a revision of topics (post-lecture activity). • As additional examples (post-lecture activity). • As an additional material of challenging topics (pre-and post-lecture activity). • As a model solution for some exercises (post-lecture activity).

Module-1	
Introduction to Graphs: Introduction-Basic definition–Application of graphs–finite, infinite and bipartite graphs – Incidence and Degree – Isolated vertex, pendant vertex and Null graph. Paths and circuits–Isomorphism, sub-graphs, walks, paths and circuits, connected graphs, disconnected graphs and components. **(RBT Levels: L1, L2 and L3)**	8 hrs
Module-2	
Eulerian and Hamiltonian graphs: Euler graphs, Operations on graphs, Hamiltonian paths and circuits, Travelling salesman problem. Directed graphs – types of digraphs, Digraphs and binary relation.	8 hrs

(RBTLevels: L1,L2and L3)	
Module-3	
Trees–properties,pendantvertex,Distanceandcentresinatree-Rootedandbinarytrees, counting trees, spanning trees. **ConnectivityGraphs**:VertexConnectivity,EdgeConnectivity,CutsetandCutVertices, Fundamental circuits. **(RBTLevels:L1,L2and L3)**	8 hrs
Module-4	
PlanarGraphs:Planargraphs,Kuratowski'stheorem(proofnotrequired),Different representations of planar graphs, Euler's theorem, Geometric dual. Graph Representations: Matrix representation of graphs-Adjacency matrix, Incidence Matrix, Circuit Matrix, Path Matrix. **(RBTLevels:L1,L2and L3)**	8 hrs
Module-5	
Graph Colouring: Colouring-number, Chromatic polynomial, Chromatic Matchings, Coverings, Four colour problem andFivecolourproblem. Greedy colouring algorithm. **(RBTLevels:L1,L2and L3)**	8 hrs

Textbooks

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2004.

2. Kenneth H. Rosen: Discrete Mathematics and its Applications, 7th Edition, McGraw Hill, 2010.

3. Jayant Ganguly: A Treatise on Discrete Mathematical Structures, Sanguine-Pearson, 2010.

4. P B. Bhattacharya, S K. Jain & P. Nagpaul, "Basic Abstract Algebra", Cambridge University Press , Second edition ,1994.

Course Outcomes: At the end of the course, the students will be able to

1. Demonstrate knowledge of trees structures, spanning trees, and shortest path algorithms in optimization problems.
2. Apply fundamental counting principles, permutations, andcombinationstosolve combinatorial problems.
3. UtilizethePrincipleofInclusion-Exclusion, rookpolynomialstosolveallotmentoriented problems.
4. Solverecurrencerelationsusingdifferentmethods, includinggeneratingfunctionsand characteristic equations.
5. Evaluateanddesignmathematicalmodelsforreal-worldproblemsusinggraphtheory, trees, and combinatorial methods.

Continuous Internal Evaluation (CIE):

☐ Three CIE Will be conducted for 50 marks each and average of three will

be taken (A)

☐ Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)

☐ Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

Suggested Learning Resources:

Books (Name of the author/Title of the Book/Name of the publisher/Edition and Year)

Text Books:

1. NarsinghDeo,Graph theory with the applicationsto engineering &Computer Science, Dovers Publications, 2016 2. J.A. Bondy and U.S.R. Murty. Graph theory with Applications, Springer, 1st edition, 2008. Reference Books: 1. GarryChartand and Ping Zhang, Introduction toGraph Theory, Tata McGraw-Hill, 2006.

2. FrankHarary, Graph Theory, Narosa Publishing House, Latest edition.

3. R.Diestel, Graph Theory, free online edition, 2016: diestel-graph-theory.com/basic.html.

4. Douglas B. West, Introduction to Graph Theory, Prentice Hall India Ltd.,2001 5. RobinJ. Wilson, Introduction to Graph Theory, Longman Group Ltd.,2010
Web links and Video Lectures (e-Resources):
•http://nptel.ac.in/courses.php?disciplineID=111 • http://www.class-central.com/subject/math(MOOCs) • http://academicearth.org/ • VTU e-Shikshana Program • VTUEDUSAT Program.
Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning • Quizzes • Assignments • Seminar

CO -PO MAPPING

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

SEMESTER IV		
OPTIMIZATIONTECHNIQUE		
Course Code:	**MVJ22CG453**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: The objectives of the course are to fecilitate the learners to:
• Appreciate the importance of linear algebra in computer science and allied engineering science. • Gain the knowledge of linear algebra tools and concepts to implement them in their core domain.
• Improve their mathematical thinking and acquire skills required for sustained lifelong learning.

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies, teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.

2. State the need for Mathematics with Engineering Studies and Provide real-life examples.

3. Support and guide the students for self–study.

4. You will assign homework, grading assignments and quizzes, and documenting students' progress.

5. Encourage the students to group learning to improve their creative and analytical skills.

6. Show short related video lectures in the following ways: • As an introduction to new topics (pre-lecture activity). • As a revision of topics (post-lecture activity). • As additional examples (post-lecture activity). • As an additional material of challenging topics (pre-and post-lecture activity). • As a model solution of some exercises (post-lecture activity).

Teaching-Learning Process Pedagogy (General Instructions):

These are sample Strategies, teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.

2. State the need for Mathematics with Engineering Studies and Provide real-life examples.

3. Support and guide the students for self–study.

4. You will assign homework, grading assignments and quizzes, and documenting students' progress. 5. Encourage the students to group learning to improve their creative and analytical skills. 6. Show short related video lectures in the following ways: • As an introduction to new topics (pre-lecture activity). • As a revision of topics (post-lecture activity). • As additional examples (post-lecture activity). • As an additional material of challenging topics (pre-and post-lecture activity). • As a model solution for some exercises (post-lecture activity).	
Module-1	
VECTOR CALCULUS :Functions of several variables, Differentiation and partial differentials, gradients of vector valued functions, gradients of matrices, useful identities for computing gradients, linearization and multivariate Taylor series. (RBT Levels: L1, L2 and L3)	8 hrs
Module-2	8 hrs
APPLICATIONS OF VECTOR CALCULUS : Backpropagation and automatic differentiation, gradients in a deep network, The Gradient of Quadratic Cost, Descending the Gradient of Cost, The Gradient of Mean Squared Error. (RBT Levels: L1, L2 and L3)	8 hrs
Module-3	
Convex Optimization-1 : Local and global optima, convex sets and functions separating hyperplanes, application of Hessian matrix in optimization, Optimization using gradient descent, Sequential search 3-point search and Fibonacci search. (RBT Levels: L1, L2 and L3)	8 hrs
Module-4	
Convex Optimization-2 : Unconstrained optimization -Method of steepest ascent/descent, NR method, Gradient descent, Mini batch gradient descent, Stochastic gradient descent. (RBT Levels: L1, L2 and L3)	8 hrs
Module-5	
Advanced Optimization : Momentum-based gradient descent methods: Adagrad, RMSprop and Adam. Non-Convex Optimization: Convergence to Critical Points, Saddle-Point methods. (RBT Levels: L1, L2 and L3)	8 hrs
Course outcome (Course Skill Set) At the end of the course, the student will be able to: 1. Apply the concepts of vector calculus to solve the given problem. 2. Apply the concepts of partial differentiation in machine learning and deep neural networks. 3. Analyze the convex optimization algorithms and their importance in computer science & engineering. 4. Apply the optimization algorithms to solve the problem. 5. Analyze the advanced optimization algorithms for machine learning .	

Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE):

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

Suggested Learning Resources:

Books (Name of the author/Title of the Book/Name of the publisher/Edition and Year)

Text Books:

1. Mathematics for Machine learning, Marc PeterDeisennroth, A. Aldo Faisal, Cheng Soon Ong, 2020, Cambridge University Press.
2. S. Bubeck, Convex Optimization: Algorithms and Complexity, Foundations and Trends in Optimization, 2015.
3. S. Boyd,N. Parikh, and E. Chu," Distributed optimization and statistical learning via the alternating direction method of multipliers", Foundations and Trends in Machine Learning, Now Publishers Inc.

Reference Books:

1. Linear Algebra and Optimization for Machine Learning, Charu C. Aggarwal, Springer, 2020.
2. A. Beck, First-Order Methods in Optimization, MOS-SIAM Series on Optimization, 2017.

3. F. Bach, "Learning with Submodular Functions: A Convex Optimization Perspective", Foundations and Trends in Machine Learning, Now Publishers Inc.
Web links and Video Lectures(e-Resources):
• https://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall2011/index.htm • https://www.math.ucdavis.edu/~linear/linear.pdf • https://www.coursera.org/learn/linear-algebra-machine-learning • https://nptel.ac.in/syllabus/111106051/ • https://github.com/epfml/OptML_course • https://www.youtube.com/playlist?list=PL4O4bXkI-fAeYrsBqTUYn2xMjJAqlFQzX
Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning • Quizzes • Assignments • Seminar

CO -PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	2	3			2			2
CO2	3	3	3	2	3			2			2
CO3	3	3	2	2	3			2			2
CO4	3	2	3	2	3			2			2
CO5	3	3	3	3	3			2			2

SEMESTER IV		
Data Visualization with python		
Course Code:	**MVJ22CG454**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course objectives:

- To equip the students with standard concepts and tools in Linear algebra which will find them useful in their disciplines.
- Gain the knowledge of linear algebra tools and concepts to implement them in their core domain.
- Improve their mathematical thinking and acquire skills required for sustained lifelong learning.

Teaching-Learning Process

Pedagogy (General Instructions):

These are sample Strategies, teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.

2. State the need for Mathematics with Engineering Studies and Provide real-life examples.

3. Support and guide the students for self–study.

4. You will assign homework, grading assignments and quizzes, and documenting students' progress.

5. Encourage the students to group learning to improve their creative and analytical skills.

6. Show short related video lectures in the following ways: • As an introduction to new topics (pre-lecture activity). • As a revision of topics (post-lecture activity). • As additional examples (post-lecture activity). • As an additional material of challenging topics (pre-and post-lecture activity). • As a model solution of some exercises (post-lecture activity)

Module-1	
VECTOR SPACES : Introduction, Vector spaces, Subspaces, Linear Combinations, Linear Spans, row space and column space of a Matrix, Linear Dependence and Independence, Basis and Dimension, Coordinates. (RBT Levels: L1, L2 and L3)	8 hrs
Module-2	8 hrs
LINEAR TRANSFORMATIONS : Introduction, Linear Mappings, Geometric linear transformation of i2, Kernel and Image of a linear transformations, Rank-Nullity Theorem (No proof), Matrix representation of linear	8 hrs

transformations, Singular and Non-singular linear transformations, Invertible linear transformations. (RBT Levels: L1, L2 and L3)	
Module-3	
EIGENVALUES AND EIGENVECTORS : Introduction, Polynomials of Matrices, Applications of Cayley-Hamilton Theorem, Eigen spaces of a linear transformation, Characteristic and Minimal Polynomials of Block Matrices, Jordan Canonical form. (RBT Levels: L1, L2 and L3)	8 hrs
Module-4	
INNER PRODUCT SPACES : Inner products, inner product spaces, length and orthogonality, orthogonal sets and Bases, projections, Gram-Schmidt process, QR-factorization, least squares problem and least square error. (RBT Levels: L1, L2 and L3)	8 hrs
Module-5	8 hrs
OPTIMIZATION TECHNIQUES IN LINEAR : Diagonalization and Orthogonal diagonalization of real symmetric matrices, quadratic forms and its classifications, Hessian Matrix, Method of steepest descent, Singular value decomposition. Dimensionality reduction – Principal component analysis.	
Course outcome (Course Skill Set) At the end of the course, the student will be able to: 1. Explain the concepts of vector spaces, subspaces, bases, dimension and their properties. 2. Use matrices and linear transformations to solve the given problem. 3. Compute Eigenvalues and Eigenvectors forth linear transformations 4. Determine orthogonality of inner product spaces. 5. Apply the optimization techniques to solve the problems	
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE, the minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.	
Continuous Internal Evaluation (CIE): Three CIE Will be conducted for 50 marks each and average of three will be taken (A) Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B) Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)	

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

Suggested Learning Resources:

Books (Name of the author/Title of the Book/Name of the publisher/Edition and Year)

Text Books:

1. David C. Lay, Steven R. Lay, Judi J Mc. Donald: "Linear Algebra and its applications", Pearson Education, 6th Edition, 2021.

2. Gilbert Strang: "Linear Algebra and its applications", Brooks Cole, 4 the edition, 2005.

Reference Books:

1. Richard Bronson & Gabriel B. Costa: "Linear Algebra: An Introduction", 2nd edition. Academic Press, 2014.

2. Seymour Lipschutz, Marc Lipson: "Theory and problems of linear algebra", Schaum's outline series - 6th edition, 2017, McGraw-Hill Education.

3. Marc Peter Deisennroth, A. Aldo Faisal, Cheng Soon Ong: "Mathematics for Machine learning", Cambridge University Press, 2020.

CO -PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	2	3			2			2
CO2	3	3	3	2	3			2			2
CO3	3	3	2	2	3			2			2
CO4	3	2	3	2	3			2			2
CO5	3	3	3	3	3			2			2

SEMESTER IV		
BIOLOGY FOR ENGINEERS		
Course Code:	**MVJ22BI47**	**CIE Marks: 50**
L: T:P:S	**2:0:0:0**	**SEE Marks: 50**
Credits:	**2**	**Total :100**
Hours:	**24 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:
To familiarize the students with the basic biological concepts and their engineering applications.
To enable the students with an understanding of biodesign principles to create novel devices and structures.
To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.
To motivate the students to develop interdisciplinary vision of biological engineering.

Module-1	
CELL BASIC UNIT OF LIFE Introduction. Structure and functions of a cell. Stem cells and their application. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, proteins, lipids. Importance of special biomolecules: Properties and functions of enzymes, vitamins and hormones.	5Hrs
Module-2	
APPLICATION OF BIOMOLECULES Carbohydrates in cellulose-based water filters production, PHA and PLA in bioplastics production, Nucleic acids in vaccines and diagnosis, Proteins in food production, lipids in biodiesel and detergents production, Enzymes in biosensors fabrication, food processing, detergent formulation and textile processing.	5 Hrs
Module-3	
ADAPTATION OF ANATOMICAL PRINCIPLES FOR BIOENGINEERING DESIGN Brain as a CPU system. Eye as a Camera system. Heart as a pump system. Lungs as purification system. Kidney as a filtration system	5Hrs
Module-4	
NATURE-BIOINSPIRED MATERIALS AND MECHANISMS: Echolocation, Photosynthesis. Bird flying, Lotus leaf effect, Plant burrs, Shark skin, Kingfisher beak. Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs).	5Hrs
Module-5	
TRENDS IN BIOENGINEERING: Muscular and Skeletal Systems as scaffolds, scaffolds and tissue engineering, Bioprinting techniques and materials. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Bioconcrete. Bioremediation. Biomining.	5Hrs

Textbooks

1. Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.
2. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
3. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
4. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
5. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
6. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
7. Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
8. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
9. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N GeethaA C Udayashankar Lambert Academic Publishing, 2019

Course Outcomes: At the end of the course,the students will be able to

CO1: Elucidate the basic biological concepts via relevant industrial applications and case studies.

CO2: Evaluate the principles of design and development, for exploring novel bioengineering projects.

CO3: Corroborate the concepts of biomimetics for specific requirements.

CO4: Think critically towards exploring innovative biobased solutions for socially relevant problems

Continuous Internal Evaluation (CIE)

50 Marks The CIE for the mandatory credit courses common across all disciplines comprises of two components as follows:

Internal Assessment Tests (30 Marks): Two Internal Assessment tests will be conducted, each comprising 50 multiple choice questions for a total of 50 marks. The average of the two test scores will be scaled down to 30 marks.

Assignments(20 Marks): Students are required to complete two assignments, each carrying 10 marks. These assignments may include projects*, poster presentations*, seminars*, or similar academic activities. The marks of the two assignments are added to get 20 marks. *Each assignment will undergo two rounds of evaluation to assess progress and quality At the beginning of the semester, the instructor/faculty

teaching the course has to announce the methods of Assignment for the course. Together, these two components are added to get the Final CIE marks of 50.

Semester End Examination (SEE) – 50 Marks :A Semester End Examination is conducted for 50 marks comprising of multiple-choice questions (MCQ) type each of one mark

Web links and Video Lectures (e-Resources):

https://nptel.ac.in/courses/121106008

https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists

https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009

https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006

https://www.coursera.org/courses?query=biology

https://onlinecourses.nptel.ac.in/noc19_ge31/preview

https://www.classcentral.com/subject/biology

https://www.futurelearn.com/courses/biology-basic-concepts

Activity Based Learning (Suggested Activities in Class)/Practical Based learning

Group Discussion of Case studies , Model Making and seminar/poster presentations Design of novel device/equipment like Cellulose-based waterfilters, Filtration system

Final score for the course out of 100 is the SumTotal of SEE and CIE. Please follow the following allocation of number of hours to be taken per semester and the credits for different subjects.

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

SEMESTER IV		
UNIVERSAL HUMAN VALUES		
Course Code:	**MVJ22UHV48**	**CIE Marks: 50**
L: T:P:S	**1:0:0:0**	**SEE Marks: 50**
Credits:	**1**	**Total :100**
Hours:	**12 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. Appreciate the essential complementarily between "values and "skills" to ensure sustained happiness and prosperity which are the core aspirants of all human beings
2. Facilitate the development of holistic perspective among the students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the human reality and the rest of existence. Such a holistic perspective forms the basis of universal human values and movement towards value-based living in a natural way
3. Highlight plausible implications of such a holistic understanding in terms of ethical human conduct , trustful and mutually enriching interaction with nature

Module-1	
Review on right understanding, Relationship and Physical Facility (Holistic Development and the role of Education), Self-exploration as the process for value Education, Happiness and Prosperity - current Scenario Value Education: Understanding value Education, Continuous Happiness and prosperity -the basic human Aspirants, Method to fulfil the basic human Aspirants. Practical Session: Sharing about oneself (tutorial 1), Exploring Human Consciousness (tutorial 2), Exploring Natural Acceptance (tutorial 3)	**3Hrs**
Module-2	
Review on Understanding Human being as the Co-existence of the self and the body, The Body as an instrument of the self, Harmony of the self with the body Harmony in the human Being: Distinguishing between the needs of the self and the body, understanding harmony in the self, Program to ensure self-regulation and health Practical Session: Exploring the difference of needs of self and Body (Tutorial 4), Exploring Sources of Imagination in the self (tutorial 5), Exploring Harmony of self with the body (tutorial 6)	**3Hrs**
Module-3	
Review on harmony in the family-the basic unit of human Interaction, other feeling, justice in human-to-human relationship, understanding harmony in the society Harmony in the Family and society: Trust -the foundational value in the relationship, Respect - as the right education, vision for the universal human order Practical session: exploring the feeling of trust (tutorial 7), Exploring the feeling of Respect (tutorial 8), Exploring system to fulfil human goal (tutorial 9)	**3Hrs**
Module-4	

Harmony in the Nature/Existence: Understanding Harmony in the Nature, Interconnection, self-regulation and mutual Fulfilment among the four orders of Nature, Realizing Existence as Co-existence at all levels, The Holistic Perception of harmony in Existence Practical Session: Exploring the four orders of Natures (Tutorial 10), Exploring Co-existence in Existence (Tutorial 11)	
Module-5	
Review on natural Acceptance of human values, Basics for Humanistic Education, Humanistic constitution and Universal Human order, Holistic Technologies, Production System and Management Models, Typical Case studies Implication of Holistic Understanding- a Look at professional Ethics: Definitiveness of Human Conduct, Competence in professional Ethics, Strategies for transition towards Value-based life and profession	**3 Hrs**

Textbooks

- AICTE SIP UHV-I teaching materials, https://fdp-si.aicte.india.org/AicteSipUHV_download.php
- Human values and professional ethics by RR Garr Singal P Bagaria,Excel books,New Delhi,2010
- A foundation Course in Human values and Professional Ethics,R R Gaur, R Asthana, G P bagaria, 2nd Revised Edition,Excel books, New Delhi, 2019, ISBN-978-93-87034-47-1

Reference Books

Teachers' Manual for A Foundation Course in Human Values and Professional Ethics
Ethics – R. R. Gaur, R. Asthana, G. P. Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN: 978-93-87034-53-2
Human Values – A. N. Tripathi, New Age International Publishers, New Delhi, 2004
The Story of Stuff (Book)
The Story of My Experiments with Truth – *by Mohandas Karamchand Gandhi

Course Outcomes: At the end of the course,the students will be able to
CO1: Explore themselves, get comfortable with each other and with the teacher.
CO2: Enlist their desires and the desires are not vague
CO3: Restate that natural acceptance is always for living in harmony only competence is lacking
CO4: Differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them
CO5: Present sustainable solutions to the problems in society and nature

Continuous Internal Evaluation (CIE) – 50 Marks

The CIE for the mandatory credit courses common across all disciplines comprises of two components as follows:

Internal Assessment Tests (30 Marks):

Two Internal Assessment tests will be conducted, each comprising 50 multiple choice

questions for a total of 50 marks. The average of the two test scores will be scaled down to 30 marks.

Assignments (20 Marks):

Students are required to complete two assignments, each carrying 10 marks. These assignments may include projects*, poster presentations*, seminars*, or similar academic activities. The marks of the two assignments are added to get 20 marks.

Each assignment will undergo two rounds of evaluation to assess progress and quality

At the beginning of the semester, the instructor/faculty teaching the course has to announce the methods of Assignment for the course.

Together, these two components are added to get the Final CIE marks of 50.

Semester End Examination (SEE) – 50 Marks

A Semester End Examination is conducted for 50 marks comprising of multiple-choice questions (MCQ) type each of one mark.

The final score for the course out of 100 is the SumTotal of SEE and CIE

CO-PO Mapping

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

Semester: 3/4/5/6		
NATIONAL SERVICE SCHEME(NSS)		
Course Code:	**MVJ22NSS 39/49/59/69**	**CIE Marks: 50**
L: T:P:S	**0:0:2:0**	**SEE Marks: -------**
Credits:	**0**	**Total :100**
Hours:	**24 hrs practical**	**SEE Duration: ---------**

Course Objectives: National Service Scheme (NSS) will enable the students to:

1. Understand the community in general in which they work.
2. Identify the needs and problems of the community and involve them in problem–solving.
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
5. Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

General Instructions – Pedagogy

These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes:

1. Use innovative teaching methods along with lectures to help students build both theoretical and practical social and cultural skills.
2. Explain the importance of NSS activities today with real-life examples like cleanliness drives or blood donation camps.
3. Motivate and guide students to plan and carry out their own activities.
4. Give homework, grade assignments and quizzes, and keep records of students' progress in real-life field activities.
5. Encourage students to work in groups to improve their creativity and problem-solving skills.

National Service Scheme (NSS) – Contents

Organic farming, Indian Agriculture (Past, Present and Future), Connectivity for marketing.

Waste management – Public, Private and Govt organization, 5R's.

Setting of the information imparting club for women leading to contribution in social and economic issues.

Water conservation techniques – Role of different stakeholders – Implementation.

Preparing an actionable business proposal for enhancing the village income and approach for implementation.

Helping local schools to achieve good results and enhance their enrolment in Higher/technical/vocational education.

Developing Sustainable Water management system for rural areas and implementation approaches.

Contribution to any national level initiative of Government of India. For e.g. Digital India, Skill India, Swatch Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.

Spreading public awareness under rural outreach programs. (Minimum 5 programs).

Plantation and adoption of plants. Know your plants.

Organize National integration and social harmony events/workshops/seminars. (Minimum 02 programs).

Govt. school rejuvenation and helping them to achieve good infrastructure.

NOTE:

Distribution of Activities

Sem	Topics/Activities to be Covered
25 Marks	1. Organic farming, Indian Agriculture (Past, Present and Future), Connectivity for marketing. 2. Waste management – Public, Private and Govt organization, 5R's. 3. Setting of the information imparting club for women leading to contribution in social and economic issues.
25 Marks	1. Water conservation techniques – Role of different stakeholders – Implementation. 2. Preparing an actionable business proposal for enhancing the village income and approach for implementation. 3. Helping local schools to achieve good results and enhance their enrolment in Higher/technical/vocational education.
25 Marks	1. Developing Sustainable Water management system for rural areas and implementation approaches. 2. Contribution to any national level initiative of Government of India. For e.g. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc. 3. Spreading public awareness under rural outreach programs. (Minimum 5 programs). 4. Plantation and adoption of plants. Know your plants
25 Marks	1. Organize National integration and social harmony events/workshops/seminars. (Minimum 02 programs). 2. Govt. school rejuvenation and helping them to achieve good infrastructure.

Pedagogy–Guidelines, it may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution

Sl No	**Topic**	**Group size**	**Location**	**Activity execution**	**Reporting**	**Evaluation of the Topic**
1.	Organic farming, Indian Agriculture(Past, Present and Future) Connectivity for marketing.	May be individual or team	Farmers land/Villages/roadside / Community area/ College campus etc.	Site selection /Proper consultation/Continuous monitoring/ Information	Report should be submitted by individuals to the concerned	Evaluation as per the rubrics of scheme and syllabus

				board	evaluation authority	by NSS officer
2.	Waste management– Public, Private and Govt organization, 5 R's.	May be individual or team	Villages/City Areas/ Grama panchayat/public associations/Government t Schemes officers/ campus etc.	Site selection /Proper consultation/Continuous monitoring/ Information board	Report should be submitted by individuals to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
3.	Setting of the information imparting club for women leading to contribution in social and economic issues.	May be individual or team	Women empowerment groups/ Consulting NGO's & Govt. Teams/ College campuses etc.	Group selection/proper consultation/Continuous monitoring/ information board	Report should be submitted by individuals to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
4.	Water conservation techniques – Role of different stake holders– Implementation.	May be individual or team	Villages/city Areas/ Grama panchayat/public associations/Government t Schemes officers/ campuses etc.	site selection / proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individuals to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
5.	Preparing an actionable business proposal for enhancing the village income and approach for implementation.	May be individual or team	Villages/city Areas/ Grama panchayat/public associations/Government t Schemes officers/ campuses.	Group selection/proper consultation/Continuous monitoring/ Information board	Report should be submitted by individuals to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer

6.	Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.	May be individual or team	Local government/ private/ aided schools/Government Schemes officers/ etc….	School selection/proper consultation/Continuous monitoring/ Information board	Report should be submitted by individuals to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
7.	Developing Sustainable Water management system for rural areas and implementation approaches.	May be individual a lot Team	Villages/City Areas/ Grama panchayat/public associations/Government Schemes officers/ campusetc….	Site selection/proper consultation/Continuous monitoring/ Information board	Report should be submitted by individuals to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
8.	Contribution to any national level initiative of Government of India. For e.g. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.	May be individual a lot team	Villages/City Areas/ Grama panchayat/public associations/Government Schemes officers/ campus etc.	Group selection/proper consultation/Continuous monitoring / Information board	Report should be submitted by individuals to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
9.	Spreading public awareness under rural outreach programs. (minimum5programs).	May be individual alotteam	Villages /CityAreas / Grama panchayat/public associations/Government	Group selection/proper consultation/ Continuous monitoring / Information board	Report should be submitted by individuals to the concerned	Evaluation as per the rubrics of scheme and syllabus by NSS officer

	Socials connect and responsibilities.		Schemes officers/ campusetc….		evaluation authority	
10.	Plantation and adoption of plants. Know your plants.	May be individual alortea m	Villages/CityAreas/ Grama panchayat/public associations/Government nt Schemes officers/ campusetc….	Place selection/proper consultation/Continuous monitoring / Information board	Report should be submitted by individualsto the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
11.	Organize National integration and social harmonyevents /Workshops /Seminars.(Minimum 02 programs).	May be individual alortea m	Villages/CityAreas/ Grama panchayat/public associations/Government Schemes officers/ campusetc….	Place selection/proper consultation/Continuous monitoring / Information board	Report should be submitted by individuals to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer
12.	Govt. school Rejuvenation and helping them to achieve good infrastructure.	May be individual alortea m	Villages/CityAreas/ Grama panchayat/public associations/Government nt Schemes officers/ Campus etc….	Place selection/proper consultation/Continuous monitoring / Information board	Report should be submitted by individuals to the concerned evaluation authority	Evaluation as per the rubrics of scheme and syllabus by NSS officer

Plan of Action (Execution of Activities)

Sl.NO	Practice Session Description
1	**Lecture session by NSS Officer**
2	**Students' Presentation Topics**

3	**Presentation-1, Selection of topic, PHASE-1**
4	**Commencement of activity and its progress-PHASE-2**
5	**Execution of Activity**
6	**Execution of Activity**
7	**Execution of Activity**
8	**Execution of Activity**
9	**Execution of Activity**
10	**Case study-based Assessment, Individual performance**
11	**Sector wise study and its consolidation**
12	**Video based seminar for 10minutes by each student at the end of semester with Report.**

- In semester end, each student should do activities according to the scheme and syllabus.
- At the end of the semester, student performance must be evaluated by the NSS officer for the assigned activity progress and its completion.
- Finally, at the end of the semester, a consolidated report of activities should be compiled and submitted as per the instructions.

Course Outcomes (Course Skill Set)

At the end of the course, the student will be able to:

CO1: Understand the importance of his/her responsibilities towards society.

CO2: Analyze the environmental and societal problems/issues and will be able to design solutions for the same.

CO3: Evaluate the existing system and propose practical solutions for the same for sustainable development.

CO4: Implement government or self-driven projects effectively in the field.

CO5: Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general

Assessment Details for CIE(both CIE and SEE)

Weightage	**CIE– 100%**	• Implementation strategies of the project(NSS work).
Presentation-1 Selection of topic, PHASE-1	10 Marks	

	Commencement of activity and its progress-PHASE-2	10 Marks	• The last report should be signed by NSSOfficer ,the HOD and principal. • Finally, the report should be evaluated bythe NSS officer of the institute. • Finally,the consolidated marks sheet should be sent to the university and to be made available at LIC visit.	
	Case study-based Assessment Individual performance	10 Marks		
	Sector wise study and its consolidation	10 Marks		
	Video based seminar for 10minutes by each Student at the end of semester with Report.	10 Marks		
	Total marks for the course in end semester	**50Marks**		
	Marks scored for 50 by the students should be Scale down to 25 Marks in end semester **For CIE entry in the VTU portal.** **CIE (50 Marks)** Weekly Evaluation 30 Marks Weekly evaluation will be conducted for each activity. Marks of each evaluation includes Weekly Attendance & activities performed			

	by students. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks.(A) Two CIE for 20 Marks each and take the average for 20 Marks (B) **Final CIE Marks will be calculated as (A+B) for 50 marks**	

Suggested Learning Resources:

Books:

1. **NSS Course Manual,** Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities report and its manual.
3. Government of India, NSS cell, Activities reports and its manual.

Course Outcomes (COs)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO9**	**PO 10**	**PO 11**
CO1: Understand the importance of social responsibility and civic engagement	2	2	-	-	-	3	3	2	2	2	-
CO2: Develop leadership qualities and democratic attitudes	-	2	-	-	-	2	2	3	3	2	-
CO3: Work effectively as an individual and as a team in diverse fields of community	2	-	-	-	-	3	2	3	3	2	-
CO4: Acquire skills in mobilizing community											

participation and local resources	-	-	2	-	1	3	3	2	2	2	2
CO5: Understand and apply health, hygiene, and environmental conservation knowledge	-	-	1	-	1	3	3	2	-	-	-
CO6: Demonstrate ethical values, empathy, and compassion in social work	-	-	-	-	-	3	3	3	2	-	-

SEMESTER 3/4/5/6		
PHYSICAL EDUCATION (SPORTS & ATHLETICS)		
Course Code:	**MVJ22PE39/49/59/69**	**CIE Marks: 100**
L: T:P:S	**0:0:2:0**	**SEE Marks: -**
Credits:	**0**	**Total :100**
Hours:	**24 hours theory**	**SEE Duration: -**

Course Objectives: the student will be able to

1	Understand the meaning and importance of the fitness and the benefits of fitness
2	Types of fitness and fitness tips.
3	Importance of Sports, and Yoga in a day-to-day life.
4	Understand the importance of aerobics and other activities for healthy lifestyle.
5	Know about the different roles of organization and administration in sports events.

Topics / Activities to be Covered (100Marks)

Module 1	**6 Hours**
Orientation ➢ Lifestyle ➢ Fitness ➢ Food & Nutrition: Sports diet. ➢ Stress Management	
Module 2	**4 Hours**
General Fitness & Components of Fitness ➢ Warming up (Free Hand Exercises). ➢ Strength—Push-up/Pull-ups ➢ Speed—30MtrDash. ➢ Agility—Shuttle Run ➢ Flexibility—Sit and Reach	
Module 3	**6 Hours**
Specific Games (Anyone to be selected by the student)	

- Volleyball— Attack, Block, Service, Upper Hand Pass and Lower Hand and Pass.
- Throw ball—Service, Receive, Spin attack, Net Drop & Jump throw.
- Kabaddi— Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.
- Basketball-dribbling, passing, shooting etc.
- Table Tennis—Service (Fore Hand & Back Hand)
- Receive (Fore Hand & Back Hand)
- Smash, Athletics (Track / Field Events) -Running, Jumping, Throwing.

Module 4 **6Hours**

Role of Organization and administration

- Planning.
- Organizing.
- Staffing.
- Directing.
- Coordinating & controlling.
- Reporting & Recording.
- Budgeting.

Module 5 **4 Hours**

Aerobics

- Dance Aerobics
- Sport Aerobics
- Warm up Aerobics
- Cardiovascular Aerobics

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

CO1	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness.
CO2	Familiarization of health-related Exercises, Sports for overall growth and development.
CO3	Create a foundation for the professionals in physical Education and Sports.
CO4	Participate in the competition at regional / state / national / international levels.
CO5	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

Assessment Details for CIE (both CIE and SEE)		
Weight age	**CIE – 100%**	• Implementation strategies of the project (PE work). • The last report should be signed by PED, the HOD and principal. • At last report should be evaluated by the PED of the institute. • Finally, the consolidated marks sheet should be sent to the Controller of Examinations office.
Participation of student in all the modules	50 Marks	
Final presentation / exhibition / Participation In competitions / practical on specific tasks Assigned to the students	50 Marks	
Total marks for the course in each semester	**100 Marks**	
Marks scored for 100 by the students should be Scale to 50 marks in each semester.		
Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general.		

CO/PO Mapping											
CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
CO 1	-	-	-	-	-	-	-	2	2	-	-
CO 2	-	-	-	-	-	-	-	2	2	-	-
CO 3	-	-	-	-	-	-	-	2	2	-	-
CO 4	-	-	-	-	-	-	-	2	2	-	-
CO 5	-	-	-	-	-	-	-	3	3	-	-

SEMESTER IV		
ADDITIONAL MATHEMATICS-II		
Course Code:	**MVJ22MATDIP-II**	**CIE Marks: 100**
L: T:P:S	**2:0:0:0**	**SEE Marks: ---**
Credits:	**0**	**Total :100**
Hours:	**24 hours theory**	**SEE Duration: ---**

Course Objectives: This course will enable the students to:
To familiarize the important tools Linear Algebra, differential Calculus, Beta and Gamma functions, Three-dimensional Geometry and higher order ODE's and PDE's for analyzing the engineering problems.

Module-1	
Introduction - Rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations - Gauss elimination method. Eigen values and eigen vectors of a square matrix. Diagonalization of a square matrix of order two. Self study: Application of Cayley-Hamilton theorem (without proof) to compute the inverse of a matrix- Examples.	5 Hrs
Module-2	
Differential calculus: Indeterminate forms: L-Hospital rule (without proof), Total derivatives, Composite functions. Maxima and minima for a function of two variables. Jacobians- simple examples. **Beta and Gamma functions:** Beta and Gamma functions, Relation between Beta and Gamma function- simple problems. Self study: Asymptotes, Curve tracing.	5 Hrs
Module-3	
Analytical solid geometry: Introduction –Directional cosine and Directional ratio of a line, Equation of line in space- different forms, Angle between two line, shortest distance between two line, plane and equation of plane in different forms and problems.	5 hrs
Module-4	

Differential Equations of higher order: Linear differential equations of second and higher order equations with constant coefficients. Inverse Differential operator, Operators methods for finding particular integrals, Method of variation of parameters, and Euler – Cauchy equation. Self study: Undetermined coefficients	5 hrs
Module-5	
Partial differential equation: Introduction- Classification of partial differential equations, formation of partial differential equations. Method of elimination of arbitrary constants and functions. Solutions of non-homogeneous partial differential equations by direct integration. Solution of Lagrange's linear PDE. Self-study: One dimensional heat and wave equations and solutions by the method of separable of variable	5 hrs

Textbooks: 1. B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.

2. Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.

Course Outcomes: At the end of the course, the students will be able to

CO1: Make use of matrix theory for solving system of linear equations and compute eigenvalues and eigen vectors required for matrix diagonalization process.

CO2: Learn the notion of partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and Jacobians.

CO3: Understand the Three-Dimensional geometry basic, Equation of line in space-different forms, Angle between two line and studying the shortest distance.

CO4: Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.

CO5: Construct a variety of partial differential equations and solution by exact methods.

CIE ASSESSMENT:

- Two CIE Will be conducted for 50 marks each and average of two will be taken (A)
- Two Quizzes will be conducted along with CIE for 10 Marks Each and scaled to 15 marks each. Sum of two quizzes will be considered for 30 marks (B)
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C) for 100 marks

CO-PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	-	2	-	-	-	-	-	-	1
CO2	3	3	-	2	-	-	-	-	-	-	1
CO3	3	3	-	3	-	-	-	-	-	-	-
CO4	2	2	-	3	-	-	-	-	-	-	1
CO5	2	2	-	2	-	-	-	-	-	-	-

V SEMESTER

SEMESTER V		
SOFTWARE ENGINEERING AND PROJECT MANAGEMENT		
Course Code:	**MVJ22CG51**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. Outline software engineering principles and activities involved in building large software programs and identify ethical and professional issues faced by Software Engineers.
2. Describe the process of requirement gathering, requirement classification, requirement specification and requirements validation.
3. Infer the fundamentals of object-oriented concepts, differentiate system models, use UML diagrams, apply design patterns and explain the role of DevOps in Agile Implementation.
4. Discuss various types of software testing practices and software evolution processes. Recognize the importance of Project Management with its methods and methodologies and identify software quality parameters and quantify software using measurements and metrics. List software quality standards and outline the practices involved.

Module-1	
Introduction: The evolving role of software, Software, The changing nature of software, Software engineering, A Process Framework, Process Patterns, Process Assessment, Personal and Team Process Models, Process Technology, Product and Process. Process Models: Prescriptive models, Waterfall model, Incremental process models, Evolutionary. process models, Specialized process models.	8 Hrs

Requirements Engineering: Requirements Engineering Task, Initiating the Requirements Engineering process, Eliciting Requirements, Developing use cases, Building the analysis model, Negotiating Requirements, Validating Requirements, Software Requirement Document.	
Module-2	
Introduction, Modelling Concepts and Class Modelling: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling, abstraction, The Three models. Class Modelling: Object and Class Concept, Link and associations concepts, Generalization and Inheritance, A sample class model, Navigation of class models, Introduction to RUP and UML diagrams. Building the Analysis Models: Requirement Analysis, Analysis Model Approaches, Data modelling Concepts, Object Oriented Analysis, Scenario-Based modelling, Flow-Oriented Modelling, class Based modelling, Creating a Behavioural Model.	8 Hrs
Module-3	
Software Testing: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object -Oriented Software, Validation Testing, System Testing, The Art of Debugging. Agile Methodology & DevOps: Before Agile – Waterfall, Agile Development. What is DevOps? DevOps Importance and Benefits, DevOps Principles and Practices, 7 C's of DevOps Lifecycle for Business Agility, DevOps and Continuous Testing, How to Choose Right DevOps Tools?, Challenges with DevOps Implementation	8 hrs
Module-4	
Introduction to Project Management: Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, Traditional versus Modern Project Management Practices.	8 hrs
Module-5	
Activity Planning: Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass, Identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks. Software Economics: Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts.	8 hrs
Course outcomes:	
CO1 Understand the activities involved in software engineering and analyze the role of various process models	

CO2 Explain the basics of object-oriented concepts and build a suitable class model using modelling. Techniques. CO3 Describe various software testing methods and to understand the importance of agile methodology and DevOps. CO4 Illustrate the role of project planning and quality management in software development. CO5 Understand the importance of activity planning and different planning models.	

Textbooks

1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw
2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML, 2nd Edition, Pearson Education, 2005.
3. Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018
4. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012
5. Management and Entrepreneurship VR Naidu, T Krishna Rao 4th reprint Willey Publications
6. Schaum's outline of theory and problems of software engineering, David A. Gustafson, McGraw-Hill's

Reference Books

1. Law relating to Intellectual Property rights, B. L. Wadhera,5thedition,Universal Law Publishing, 2011

2.. Principles of Management, P C Tripathi, P N Reddy, 5th edition, Tata McGraw Hill, 2012

3. Dynamics of Entrepreneurial Development & Management, Vasant Desai, Himalaya publishing house, 2009

Continuous Internal Evaluation (CIE):

Continuous Internal Evaluation (CIE):

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

COPO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	2	3	2	3					2	3
CO2	1	3	3	2	2					2	3
CO3	2	2	2	2	3					2	3
CO4	2	2	2	2	2					2	3
CO5	1	2	3	2	2					2	3

SEMESTER V		
COMPUTER NETWORKS		
Course Code:	**MVJ22CG52**	**CIE Marks: 50**
L: T:P:S	**3:0:2:0**	**SEE Marks: 50**
Credits:	**4**	**Total :100**
Hours:	**40 hours Theory+24 hours practical**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1.To develop an understanding of modern network architectures from a design and performance perspective.

2. To introduce the student to the major concepts involved in network protocols.

3. Get details about Functions of Network layer, Router and delivery of data to host network.

4.Learn the function of mobile networking and switching.

5. Multimedia data transmission in network

Module-1	
Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division.	8 hrs
Module-2	
Data Link Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ. Medium Access Sub Layer: Switching, Random Access, Multiple access protocols - Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA, IEEE802 standard protocol	8 hrs
Module-3	
The Network Layer: Network layer design issues, Logical Addressing: IPV4, IPV6; Address mapping, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.	8 hrs
Module-4	
Transport Layer: Elements of Transport protocols: Addressing, Connection establishment, Connection release, Crash recovery, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.	8 hrs

Module-5	
Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls; AI in network infrastructure, Self-Healing Networks.	8 hrs

LABORATORY EXPERIMENTS – 24hrs

1. Learn to use commands like tcpdump, netstat, ifconfig, lookup and trace route. Capture ping and trace route PDUs using a network protocol analyzer and examine. Screen effectiveness studies.
2. Write a program for error detecting code using CRC-CCITT (16- bits).
3. Write a program to find the shortest path between vertices using the Bellman-ford algorithm.
4. Applications using TCP and UDP sockets like: a) Chat b) File Transfer
5. Simulation of DNS using UDP sockets.
6. Write a code for simulating ARP /RARP protocols.
7. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
8. Write a program for congestion control using a leaky bucket algorithm.
9. Implement three nodes point – to- point networks with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped using NS 2 .
10. Simulate the transmission of ping messages/traceroute over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion using NS 2.

Textbooks :

1. Computer Networks:5th ed by Andrew. S. Tanenbaum PHI Publication.

2. Data Communications and Networks: 3 rd ed byBehrouz A. Forouzan. TataMcGraw Hill publication.

Course Outcomes: At the end of the course,the students will be able to

CO1:Analyze and compare different methods of bandwidth utilization to optimize data transfer efficiency.

CO2:Select the specific IEEE 802 standard protocols to be implemented in the network environment.

CO3:Apply theoretical knowledge of network layer design issues to real-world networking scenarios and troubleshoot network problems effectively.

CO4:Analyze metrics such as throughput, delay, and packet loss rate to see how the protocols behave in each scenario.

CO5:create a user-friendly website that meets modern standards in terms of navigation, design, and performance.

Continuous Evaluation :

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

Three CIE Will be conducted for 50 marks each and average of three will

be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Laboratory- 50 Marks

Weekly Evaluation 30 Marks

Weekly evaluation will be conducted for every experiment. Marks of each evaluation includes Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva for all the experiments. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks. (A)

Two CIE for 20 Marks each and take the average for 20 Marks (B)

Final CIE Marks will be calculated as A+B for 50 marks

For IPCC Final CIE Marks will be calculated as Average of CIE and Lab CIE for 50 marks.

Semester End Examination (SEE)

SEE Theory Examination (100 Marks)

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50 (A)

SEE Laboratory Examination (50 Marks)

The laboratory SEE is also evaluated for 50 marks, distributed as follows:
Experiment Conduction with Results: 40 marks
Viva Voce: 10 marks
Total 50 marks (B)

CO-PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	2	2	2				2	1	2
CO2	3	2	2	2	2				1	1	2
CO3	3	3	2	2	3				1		2
CO4	3	2	2	2	3				1	1	2
CO5	3	3	3	3	3				1	1	2

SEMESTER V		
THEORY OF COMPUTATION		
Course Code:	**MVJ22CG53**	**CIE Marks: 50**
L: T:P:S	**4:0:0:0**	**SEE Marks: 50**
Credits:	**4**	**Total :100**
Hours:	**50 hours Theory**	**SEE Duration: 2 Hrs.**

Course Objectives: This course will enable the students to:

Acquiring knowledge of Automata Theory as the basis of all computer science languages design.
Understand the concept of Context Free Grammars and Languages.
Understand the concepts of Turing Machine and Chomskian Languages.
Acquire knowledge of Decidability.
Enrich the knowledge in various phases of compiler and its use.

Module-1	
Finite Automata: Mathematical preliminaries and notations – Central concepts of automata theory – Finite automata -Deterministic Finite Automata - Nondeterministic Finite Automata – Equivalence of DFA and NFA –Finite Automata with Epsilon transitions - Application of FA	**8 hrs**
Module-2	
Regular Expressions: Regular languages: Regular Expressions – Finite Automata and Regular Expression. Properties of regular expression, Applications of regular expression.	**8 hrs**
Module-3	
Regular Languages: Properties of regular languages: Pumping lemma for regular languages – Closure properties of regular languages –Equivalence and Minimization of Finite Automata.	**8 hrs**
Module-4	
Context Free Grammar: Context Free languages: Context Free Grammars – Parse Trees - Ambiguity in Grammars and languages– Applications of Context Free Grammars – Pushdown automata (PDA) – Languages of a PDA - Equivalence of PDA 's and CFG's, Conversion of PDA to CFG and CFG's to PDA	**8 hrs**
Module-5	
Context Free Languages: Properties of Context Free Languages: Normal Forms (CNF, GNF) for Context Free Grammars - Pumping lemma for CFL 's - Closure properties of CFL Turing Machines: Turing Machines- Programming Techniques for Turing Machines – Multi tape Turing Machines.	8 hrs

Textbooks:

1.Hopcroft J E, MotwaniR and Ullman J D, Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2012.

Reference Books :

1.Hopcroft, Motwani, Ullman: Introduction to Automata Theory, Languages, and Computation, and

2.Sipser: Introduction to the Theory of Computation.

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

CO1: Analyze and design finite Automata for solving computational problems.

CO2: Design and implement regular expression, Analyze regular grammars, and optimize deterministic finite Automata

CO3: Analyze and prove the properties of regular languages using pumping lemma and closure properties.

CO4: Design and Analyze context- free languages, Parse trees and pushdown automata for efficient language recognition and processing

CO5: Design and implement optimized turing machines for complete computational problems.

CIE ASSESSMENT:

Internal Assessment Tests (30 Marks): Two Internal Assessment tests will be conducted, each comprising 50 multiple choice questions for a total of 50 marks. The average of the two test scores will be scaled down to 30 marks.

Assignments (20 Marks): Students are required to complete two assignments, each carrying 10 marks. These assignments may include projects*, poster presentations*, seminars*, or similar academic activities. The marks of the two assignments are added to get 20 marks. *Each assignment will undergo two rounds of evaluation to assess progress and quality

At the beginning of the semester, the instructor/faculty teaching the course has to announce the methods of Assignment for the course. Together, these two components are added to get the Final CIE marks of 50.

Semester End Examination (SEE) – 50 Marks A Semester End Examination is conducted for 50 marks comprising of multiple- choice questions (MCQ) type each of one mark.

The final score for the course out of 100 is the SumTotal of SEE and CIE.

CO-PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	2	2	2						
CO2	3	2	2	2	2						
CO3	3	3	2	2	3						
CO4	3	2	2	2	3						
CO5	3	3	3	3	3						

SEMESTER V		
OODESIGN PATTERN LAB		
Course Code:	**MVJ22CGL54**	**CIE Marks: 50**
L: T:P:S	**0:0:2:0**	**SEE Marks: 50**
Credits:	**1**	**Total :100**
Hours:	**24 hours practical**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. To capture the requirements specification for an intended software system
2. To draw the UML diagrams for the given specification
3. To map the design properly to code
4. To test the software system thoroughly all scenarios
5. To improve the design by applying appropriate design patterns.

Draw standard UML diagrams using an UML Modelling tool for a given case study and mapdesigntocodeandimplementa3layeredarchitecture.Testthe developedcodeand validate whether the SRS is satisfied. 1.Identify a software system that needs to be developed. 2.Document the Software Requirements Specification (SRS)for the identified system. 3.Identify use cases and develop the Use Case model. 4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that. 5.Using the identified scenarios, find the interaction between objects and represent them Using UML Sequence and Collaboration Diagrams 6.Draw relevant State chart and Activity Diagrams for the same system. 7.Implement the system as per the detailed design 8.Test the software system for all the scenarios identified as per the use case diagram 9.Improve the reusability and maintainability of the software system by applying appropriate design patterns. 10. Implement The Modified System and Test it for various scenarios	**24P**

Sl No	List of Experiments
1	Passport automation system
2	Exam registration
3	Online course reservation system
4	Airline reservation system
5	Credit card processing
6	Student information system
7	Library management system
8	e-book management system
9	Software per sonnel management system
10	BPO Management System
11	Recruitment system
12	Foreign trading system

Course Outcomes: Students will be able to

CO1 Apply object-oriented analysis and design principles in software development while familiarizing oneself with UML concepts.

CO2 Develop static conceptual models of the system using object-oriented approaches.

CO3 Generate dynamic behavioural models of the system to meet user needs.

CO4 Design object-oriented architecture models for software applications.

CO5 Evaluate the scalability and maintainability of object-oriented software architectures by applying design patterns and refactoring techniques to enhance long-term usability and efficiency.

CIE Assessment:

CIE Laboratory (50 Marks)
Weekly Evaluation 30 Marks

Weekly evaluation will be conducted for every experiment. Marks of each evaluation includes Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva for all the experiments. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks. (A)

Two CIE for 20 Marks each and take the average for 20 Marks (B)

Final CIE Marks will be calculated as (A+B) for 50 marks
SEE Laboratory Examination (50 Marks)
The laboratory SEE is also evaluated for 50 marks, distributed as follows:
Experiment Conduction with Results: 40 marks
Viva Voce: 10 marks

Total 50 marks
The final score for the course out of 100 is the SumTotal of SEE and CIE.

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

High-3, Medium-2, Low-1

SEMESTER V		
Video Processing		
Course Code:	**MVJ22CG551**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course objective is to: Students will be able to

1. Compresence the image processing fundamentals and enhancement techniques in spatial and frequency domain.
2. Describe the colour image fundamentals, models and various restoration techniques.
3. Design and Analyse the image compression systems.
4. Outline the various image segmentation and morphology operations.
5. Comprehend the basics of video processing and video coding

Module-1	
Fundamentals of Image Processing and Image Transforms: Basic steps of Image Processing System, Sampling and Quantization of an image, Basic relationship between pixels. **Image Segmentation:** Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region-based segmentation.	8 hrs
Module-2	
Image Enhancement: **Spatial Domain Methods:** Histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters. **Frequency Domain Methods:** Basics of filtering in the frequency domain, image smoothing, image sharpening, selective filtering.	8 hrs
Module-3	
Image Compression: Image compression fundamentals – Coding redundancy, spatial and temporal redundancy.	8 hrs

Compression Models: Lossy & lossless, Huffman coding, bit-plane coding, transform coding, predictive coding, wavelet coding, lossy predictive coding, JPEG standards. **Image Morphology:** Introduction to morphology, dilation and erosion, opening and closing, hit-or-miss transformation, some basic morphological algorithms.	
Module-4	
Basic Steps of Video Processing: Analog video, digital video. **Time-Varying Image Formation Models:** Three-dimensional motion models, geometric image formation, photometric image formation, sampling of video signals, filtering operations.	8 hrs
Module-5	
2-D Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multiresolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.	8 hrs

Textbooks:

Gonzalez andWoods,"DigitalImageProcessing",3rdEdition.Pearson.
YaoWang,JoemOstermannandYaquinZhang,"VideoProcessingandCommunication",1stEdition.PH Int.

REFRENCEBOOKS:

Gonzalez and Woods, "Digital Image Processing using MATLAB", 2nd Edition., Mc Graw Hill, 2010

MilanSonka,VaclanHlavac,"ImageProcessingAnalysisandMachineVision",3rdEdition.,CENGAGE, 2008

AMuratTekalp,"DigitalVideoProcessing",PERSON,2010

S.Jayaraman,S.Esakkirajan,T.VeeraKumar, "DigitalImageProcessing",TMH,2009

COURSE OUTCOMES: Students will be able to

CO1Explain the basic elements and applications of image processing

CO2Analyze images ampling and quantization requirements and implications

CO3Designandimplementtwodimensionalspatialandfrequencyfiltersforimageenhancement

CO4Design Model and learn the basics of video domains

CO5Design 2D echo and also learn the image morphology and contents in the video.

CIE ASSESSMENT:

Continuous Internal Evaluation (CIE):

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-POMapping											
CO/ PO	PO1	PO 2	P O 3	P O 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11
CO1	3	--	--	--	1	--	--	--	--	--	--
CO2	2	3	--	--	2	--	--	--	--	--	--
CO3	3	3	2	2	--	--	--	--	--	--	--
CO4	3	3	3	--	--	--	--	--	1	--	--
CO5	2	2	2	1	3	--	--	--	--	--	--

SEMESTER V		
Artificial Intelligence		
Course Code:	**MVJ22CG552**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objectives: Students will be able to:

1. Understand fundamental concepts in Artificial Intelligence.
2. Understand the problem-solving techniques and knowledge representation.
3. Design intelligent components or programs to meet desired needs.
4. Implement and evaluate computer-based intelligent systems.

Module-1	
Introduction: AI problems, foundation of AI and history of AI, Intelligent agents: Agents and Environments The concept of rationality, The nature of environments, Structure of agents, Problem s Solving agents, Problem formulation.	8 hrs
Module-2	
Knowledge Representation & Reasons : Knowledge–Based Agents, The Wumpusworld. Propositional Logic: Reasoning patterns in propositional logic - Resolution, Forward & Backward Chaining. **Inference in First order logic:** Propositional vs. first order inference, Unification &lifting, Forwardchaining, Backward chaining, Resolution.	8 hrs
Module-3	
Searching: Searching for solutions, uniformed search strategies – Breadth first search, depth first search, Dept limited search, Iterative deepening depth FirstSearch bi-direction search, Comparing uninformed search strategies Search with partial information (Heuristic search), Greedy best first search, A*search, Memory bounded heuristic search, Heuristic functions. **Local search Algorithms:** Hill climbing, Simulated annealing search, Local beam search, Genetic algorithms.	8 hrs
Module-4	

Constrain satisfaction problems: Backtracking search for CSPs local search for constraint satisfaction problems. Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic Effective Propositional Model Checking, Agents Based on Propositional Logic. **Game Playing:** Games, Minimax algorithm, Optimal decisions in multiplayer games, Alpha-Beta pruning Evaluation functions, Cutting of search.	8 hrs
Module-5	
Planning: Classical planning problem, language of planning problems, expressiveness and extensions, planning with state-space search, forward state-space search, backward state-space search, heuristics for state-space search, partial order planning, planning graphs. **Learning:** What is learning, forms of learning, inductive learning, learning decision trees.	8 hrs
Textbooks: 1.StuartRussel,PeterNorvig,(2009),ArtificialIntelligence–AModernApproach,3rdEdition,Pearson Education. 2. E.RichandKnight,(2008),ArtificialIntelligence,3rdEdition,TataMcGraw Hill.	
Course outcomes: At the end of the course, the students will be able to CO1 Recognize the various types and working units of an expert systems. CO2Interpret the logic behind the building of knowledgebase and knowledge representation. CO3Deploy Searching Techniques to design intelligent agents CO4Choose various Constraint Satisfaction Problem, Game Playing techniques to use in various intelligent system designs. CO5Apply suitable learning methodology while designing systems based on their applications.	
CIE Assessment Continuous Internal Evaluation (CIE): Three CIE Will be conducted for 50 marks each and average of three will be taken (A) Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum	

of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO Mapping

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	1	1	-	1	1	2	-	-	-	-
CO2	3	3	3	3	2	-	-	-	-	-	-
CO3	1	-	-	1	1	-	2	3	3	3	3
CO4	3	3	2	2	2	-	-	-	-	-	-
CO5	3	3	3	3	3	2	-	-	3	3	3

SEMESTER V		
Unix System Programming		
Course Code:	**MVJ22CG553**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Learning Objectives: Students will be able to:

1. Understand fundamental concepts in Unix programming.
2. Understand the problem-solving techniques and knowledge representation.
3. Design intelligent components or programs to meet desired needs.
4. Demonstrate the ability to understand and reason out the working of Unix systems.
5. Build an application or service over a Unix system.

Module-1	
UNIX and ANSI Standards: The ANSICStandard,The ANSI/ISOC++ Standards, Difference between ANS CandC++,ThePOSIXStandards,ThePOSIX.1FIPSStandard,TheX/OpenStandards.UNIXandPOSIXAPI The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics. **IntroductiontoUNIX**- Introduction,History,Architecture,ExperiencetheUnixenvironment,Basiccommands ls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, and bc.	8 hrs
Module-2	
UNIXFilesandAPIs: FileTypes,TheUNIXandPOSIXFileSystem,TheUNIXandPOSIXFileAttributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, RelationshipofCStreamPointersandFileDescriptors,DirectoryFiles,HardandSymbolicLinks.UNIXFile APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.	8 hrs

Module-3	
UNIX Processes and Process Control: The Environment of a UNIX Process: Introduction, main function, ProcessTermination,Command- LineArguments,EnvironmentList,MemoryLayoutofaCProgram,Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions,UNIXKernelSupportforProcesses.ProcessControl:Introduction,ProcessIdentifiers,fork,vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions,execFunctions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection.ProcessRelationships:Introduction,TerminalLogins,NetworkLogins, ProcessGroups,Sessions, ControllingTerminal,tcgetpgrpandtcsetpgrpFunctions,JobControl,ShellExecutionofPrograms,Orphaned Process Groups.	8 hrs
Module-4	
Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers. DaemonProcesses: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.	8 hrs
Module-5	
Interprocess Communication : Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs,SystemVIPC,MessageQueues,Semaphores.SharedMemory,Client-ServerProperties,StreamPipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.	8 hrs

Textbooks:

1.UnixSystemProgrammingUsingC++-TerrenceChan,PHI, 1999.

2.AdvancedProgrammingintheUNIXEnvironment-
W.RichardStevens,StephenA.Rago,3nd Edition, Pearson Education / PHI, 2005.

COURSE OUTCOMES:Studentswillbeable to

CO1simulateandimplementoperatingsystemconceptssuchasscheduling,deadlockmanagement, file management and memory management.

CO2Learntheunixcommandsandalsounixprocessesandprocesscontrols

CO3Able to implement C programs using Unix system calls

CO4Abletoimplementunixkernelsandpost API's

CO5Applysuitablecommandsinunixanddeveloptheinterprocesscoummnication

CIE Assessment

Continuous Internal Evaluation (CIE):

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions.

Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

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

SEMESTER V		
Designing Human Centered System		
Course Code:	**MVJ22CG554**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objective: Students will be able to:

1. Gain hands-on and real-world experience in the development of innovative and realistic customer-driven engineered products, services, or systems.
2. Learn design methods and tools, and develop their design abilities through a capstone design project or an equivalent experience.
3. Apply tools and methods of professional practice to evaluate the social, economic, and environmental implications of their products, services, or systems.

Module-1	
Introduction to Design and Innovation and Entrepreneurship **Processes and Methods:** Sustainable design strategies, the role of industrial design and innovation, opportunities for startups, design context and strategy, product planning	8 hrs
Module-2	
Design Research: Team launch and project planning, customer and user needs assessment, research methods on translating customer interviews and card sorting, research methods on personas and scenarios.	8 hrs
Module-3	
Analysis&SynthesisMethods: FrameworksforUnderstandingCustomerNeeds,TranslatingtheVoiceof the Customer (Creating Imperatives for Business Opportunities), Peer Review: Mission, Customer User Needs and Analysis	8 hrs
Module-4	
Concept Generation and Development: Concept Generation: Creativity & Brainstorming, Concept Generation: Structured Methods, Product Architecture, Product Platforms and TechnologyRoadmaps,Design for the Environment and Whole Systems Design, Concept Selection and Testing. **Case Study:**	8 hrs

Read: John Kolko, "Design Thinking Comes of Age," Harvard Business Review, September, 2015, https://hbr.org/2015/09/design-thinking-comes-of-age Scan: What is Industrial Design? Industrial Design Society of America (IDSA), http://www.idsa.org/education/what-is-id 5 Read:THRIVinginthe"Ageofthe Customer's, http://www.idsa.org/news/insights/thrive	
Module-5	
Prototyping and Building: Low-Fidelity Prototyping Workshop, Moving from Low to Medium and High Fidelity Prototyping, Prototyping at Jacobs Hall, Design and Prototyping for Impact, Autodesk and Fusion 360, Design Roadmaps, Solid Modeling Animation, Role-Playing Prototyping, CAD to Systems Design, Analysis and Control. **Case Study:** Read: Dym, C. L., A. M. Agogino, O. Eris, D. D. Frey, and L. J. Leifer, "Engineering Design Thinking, Teaching and Learning," *Journal of Engineering Education*, Jan. 2005, Vol. 94, No. 1, pp. 103-120. (bCourses) Read: Sara Beckman & Michael Barry, "Innovation as a Learning Process: Embedding Design Thinking," *California Management Review*. (bCourses) Watch: Video: Nightline, "The Deep Dive" (aka, "the IDEO Shopping Cart" Video)	8 hrs
CIE ASSESSMENT Continuous Internal Evaluation (CIE): Three CIE Will be conducted for 50 marks each and average of three will be taken (A) Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B) Two Assignments for 10 marks each and the sum of both the assignments	

will be taken for 20 Marks (C) Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks Semester End Examination (SEE): The question paper consists of two parts, A and B Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively. Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module. The SEE Theory marks of 100 will be scaled down to 50. The final score for the course in the ratio of 50:50 of CIE and SEE Marks	

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	2	2	2						2
CO2	3	2	2	2	2						2
CO3	3	3	2	2	3						2
CO4	3	2	2	2	3						2
CO5	3	3	3	3	3						2

SEMESTER V		
INNOVATION & ENTREPRENEURSHIP		
Course Code:	**MVJ22IE555**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This Course will enable the students to

1. Inspired; develop entrepreneurial mindset and attributes; entrepreneurial skill sets for venture creation and intrapreneurial leadership.
2. Apply the process of problem-opportunity identification and feasibility assessment by developing a macro perspective of the real market, industries, domains, and customers while using design thinking principles to refine and pivot their venture idea.
3. Analyze Customer and Market segmentation, estimate Market size, and develop and validate Customer Persona.
4. Initiate Solution design, develop MVP, and determine Product-Market fit prototypes.

Module 1	
Entrepreneurship Fundamentals & Context: Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. Gamified role play-based exploration aligned to one's short-term career aspiration and ambition. An understanding of how to build an entrepreneurial mindset, skillsets, attributes, and networks while on campus.**Core Teaching Tool:** Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity	8 hrs
Module 2	
Problem & Customer Identification: Understanding and analyzing the macro-problem and Industry perspective, technological, socio-economic, and urbanization trends and their implication on new opportunities. Identifying passion, identifying and defining problems using Design thinking principles. Analyzing problems and validating with the potential customer. Iterating problem-customer fit. Understanding customer segmentation, creating and validating customer personas. Competition and Industry trends mapping and assessing initial opportunity.**Core Teaching Tool:** Several types of activities including Class, game, Gen AI, 'Get out of the building', and Venture Activities.	8hrs
Module-3	

Solution design & Prototyping: Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customers' needs and create a strong value proposition. Developing Problem-solution fit iteratively. Understanding prototyping and MVP. Developing a feasibility prototype with differentiating values, features, and benefits. Initial testing for proof-of-concept and iteration on the prototype.**Core Teaching Tool:** Venture Activity, no code Innovation tools, Class activity	8 hrs
Module-4	
Opportunity Assessment and Sizing, Business & Financial Model: Assess relative market position via competition analysis, sizing the market, and assessing the scope and potential scale of the opportunity.**Core Teaching Tool**: Class and Venture Activity ,Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build–Measure–Lean approach. Business planning: components of Business plan- Sales plan, People plan, and financial plan.	8 hrs
Module-5	
Go-to-Market Plan, Scale Outlook, and Venture Pitch Readiness: Financial Planning: Types of costs, preparing a financial plan for profitability using a financial template, understanding the basics of Unit economics, and analyzing financial performance. Introduction to Marketing and Sales, Selecting the Right Channel, creating a digital presence, and building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options.**Core Teaching Tool:** Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities. **Scale Outlook and Venture Pitch readiness**: Understand and identify potential and aspiration for scale vis a vis your venture idea. Persuasive Storytelling and its key components. Build an Investor-ready pitch deck.**Core Teaching Tool**: Expert talks; Cases; Class activity and discussions; Venture Activities	8 hrs
Textbooks 1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition. 2. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business 3. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons. 4. Chowdhry Ajay, (2023) Just Aspire: Notes on Technology, Entrepreneurship and	

the Future.
5. Simon Sinek (2011) Start with Why, Penguin Books limited.
6. Brown Tim (2019) Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business
7. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited.

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

CO1: Understand Entrepreneurial Skillset and Mindset

CO2: Understand and analyze industry problems and Enhance customer person as based on market/other feedback.

CO3: Understand and develop MVPs

CO4: Understand and apply Business models and Business planning.

CO5: Develop a go-to-market strategy and build a Persuasive sales pitch.

CIE ASSESSMENT:

- Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
- Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:

The question paper consists of two parts, A and B
Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.
Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO MAPPING

CO/PO	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1
CO1	2	2	2						2		
CO2			2	2	2						
CO3			2		2	2			2		
CO4			2		2				2		
CO5			2			2	2	2		2	

SEMESTER V		
Research Methodology and IPR		
Course Code:	**MVJ22RMI57**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1.Give an overview of the research methodology and explain the technique of defining research problem.

2. Explain various research designs and their characteristics.

3.Explain the details of sampling designs, measurement and scaling techniques and also different methods of data collections.

4.Explain several parametric tests of hypotheses

5.Discuss leading International Instruments concerning Intellectual Property Rights

Module-1	
Research Methodology: Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.	8 hrs
Module-2	
Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. Reviewing the literature: Place of the literature review in research, bringing clarity and focus to research problem, improving research methodology, broadening knowledge base in research area, enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed	8 hrs
Module-3	
Design of Sample Surveys: Design of Sampling: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs. Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement, Techniques of Developing Measurement Tools, Scaling, Scale Classification Bases, Scaling Technics, Multidimensional Scaling, Deciding the Scale. Data Collection: Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data.	8 hrs
Module-4	

Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis	8 hrs
Module-5	
Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999,The Designs Act, 2000,TheGeographical Indications of Goods (Registration and Protection) Act1999, Copyright Act,1957,TheProtection of Plant Varieties and Farmers' Rights Act, 2001,The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity, The Convention on Biological Diversity (CBD) 1992, Co, Leading International Instruments Concerning IPR, World Intellectual Property Organisation (WIPO),WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Berne Convention for the Protection of Literary and Artistic Works, Basic Principles, Duration of Protection, Trade Related Aspects of Intellectual Property Rights(TRIPS) Agreement, Covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents, Other Use without Authorization of the Right Holder, Layout-Designs of Integrated Circuits, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO.	8 hrs
Textbooks: 1.Research Methodology: Methods and Techniques, C.R. Kothari, GauravGarg, New Age International, 4th Edition, 2018 2. Study Material (For the topic Intellectual Property under module 5) Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013. 3.Research Methods: the concise knowledge base, Trochim, Atomic DogPublishing,2005.	
Course outcomes: At the end of the course, the students will be able to CO1: overview of the research methodology and explain the technique of defining a research problem. CO2: explain various research designs and their characteristics CO3: explain the details of sampling designs, measurement and scaling techniques and also different methods of data collections CO4: explain several parametric tests of hypotheses CO5: discuss leading International Instruments concerning Intellectual Property Rights	

CIE ASSESSMENT:

- Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
- Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
- Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO1 0	PO1 1
CO1	3	2	-	1	2	2	-	-	1	1	1
CO2	3	2	3	2	2	2	-	1	1	1	-
CO3	1	2	3	3	2	2	-	1	1	1	-
CO4	1	2	3	3	3	2	-	1	1	-	1
CO5	1	1	1	2	2	1	-	-	-	-	-

SEMESTER V		
Environmental Studies		
Course Code:	**MVJ22ENV58**	**CIE Marks: 50**
L: T:P:S	**2:0:0:0**	**SEE Marks: 50**
Credits:	**2**	**Total :100**
Hours:	**24 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1.Relate interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences including geo-systems, biology, chemistry, economics, political science and international processes.

2.Study drinking water quality standards and to illustrate qualitative analysis of water.

3.Critically evaluate the science and policy ramifications of diverse energy portfolios on air and water quality, climate, weapons proliferation, and societal stability.

Module-1	
Introduction to environmental studies, Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development. Ecosystems (Structure and Function): Forest, Desert, Rivers, Ocean Biodiversity: Types, Hotspots; Threats and Conservation of biodiversity, Deforestation.	8 hrs
Module-2	
Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, Tidal and Wind. Natural Resource Management (Concept and case-study): Disaster Management, Sustainable Mining and Carbon Trading.	8 hrs
Module-3	
Environmental Pollution: Surface and Ground Water Pollution, Noise pollution, Soil Pollution and Air Pollution. Waste Management & Public Health Aspects: Bio-medical Waste, Solid waste, Hazardous waste and E-waste.	8 hrs
Module-4	
Global Environmental Concerns (Concept, policies, and case-studies): Global Warming, Climate Change, Acid Rain, Ozone Depletion and Fluoride problem in drinking water.	8 hrs
Module-5	
Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.I.S.& Remote Sensing, Environment Impact Assessment, Environmental Management Systems.	8 hrs

Textbooks:

1.Raman Siva kumar, "Principals of Environmental Science and Engineering", 2ndEdition, Cengage learning, Singapur.

2.G. Tyler Miller, "Environmental Science – working with the Earth", 11thEdition, Jr. Thomson Brooks /Cole publications, California

3.Pratiba Singh, Anoop Singh & Piyush Malaviya, "Environmental and Ecology", 1st Edition, ACME Learning Pvt. Ltd. New Delhi.

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

CO1: Describe the principles of ecology and environmental issues that apply to air,

land, and water issues on a global scale.
CO2: Develop critical thinking and/or observation skills and apply them to the analysis of a problem or question related to the environment.
CO3: Demonstrate ecology knowledge of a complex relationship between biotic and Abiotic components.
CO4: Apply their ecological knowledge to illustrate and graph a problem.
CO5: Describe the realities that managers face when dealing with complex issues.

CIE ASSESSMENT:

The CIE for the mandatory credit courses common across all disciplines comprises of two components as follows:

Internal Assessment Tests (30 Marks):Two Internal Assessment tests will be conducted, each comprising 50 multiple choice questions for a total of 50 marks. The average of the two test scores will be scaled down to 30 marks.

Assignments (20 Marks):Students are required to complete two assignments, each carrying 10 marks. These assignments may include projects*, poster presentations*, seminars*, or similar academic activities. The marks of the two assignments are added to get 20 marks.

*Each assignment will undergo two rounds of evaluation to assess progress and quality

At the beginning of the semester, the instructor/faculty teaching the course has to announce the methods of Assignment for the course. Together, these two components are added to get the Final CIE marks of 50.

Semester End Examination (SEE) – 50 Marks

A Semester End Examination is conducted for 50 marks comprising of multiple-choice questions (MCQ) type each of one mark. The final score for the course out of 100 is the Sum Total of SEE and CIE

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

VI SEMESTER

SEMESTER VI		
MACHINE LEARNING		
Course Code:	**MVJ22CG61**	**CIE Marks: 50**
L: T:P:S	**3:0:2:0**	**SEE Marks: 50**
Credits:	**4**	**Total :100**
Hours:	**40 hours theory +24 hours practical**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

- Define machine learning and problems relevant to machine learning.
- Differentiate supervised, unsupervised, and reinforcement learning.
- Apply neural networks, Bayes classifier, and k-nearest neighbour for problems appearing in machine learning.
- Perform statistical analysis of machine learning techniques.
- Design, build, and deploy smart contracts and distributed applications

Module-1	
Introduction: Well-Posed learning problems, Basic concepts, Designing a learning system, Issues in machine learning. Types of machine learning: Learning associations, Supervised learning, Unsupervised learning, a Reinforcement learning. **Data Pre-processing:** Need of Data Pre-processing, Data Pre-processing Methods: Data Cleaning, Data Integration, Data Transformation, Data Reduction; Feature Scaling (Normalization and Standardization), Splitting dataset into Training and Testing set.	8 hrs
Module-2	
Regression: Linear Regression, Multiple Linear Regression and Polynomial Regression, Evaluating Regression Model's Performance (RMSE, Mean Absolute Error, Correlation, RSquare), Regularization Methods **Classification:** Need and Applications of Classification, Logistic Regression, Decision tree.	8 hrs
Module-3	
Classification: Tree induction algorithm– split algorithm based on	8 hrs

Information theory, split algorithm based on Gini index; RandomForest classification, NaïveBayesalgorithm; K-Nearest Neighbour's (K-NN), Support Vector Machine, Evaluating Classification Model's Performance (Sensitivity, Specificity, Precision, Recall, etc.) **Clustering:** Need and Applications of Clustering, Partitioned methods, Hierarchical methods, Density-based methods	
Module-4	
AssociationRulesLearning: NeedandApplicationofAssociationRulesLearning, BasicconceptsofAssociation Rule Mining, Naïve algorithm, Apriori algorithm. **Artificial Neural Networks:** Introduction, Neural Network representation, Appropriate problems, Perceptron, back propagation algorithm	8 hrs
Module-5	
Reinforcement Learningand Deep Learning: Reinforcement Learning: Introduction, Learning Task, Q Learning. **DeepLearning**: IntroductiontoDeepLearning-ReasonstogoDeepLearning, IntroductiontoConvolutionNetworks ,RestrictedBoltzmannMachines,DeepBeliefNets,RecurrentNets.	8 hrs
Textbooks: 1. TomM.Mitchell,MachineLearning,IndiaEdition2013,McGrawHillEducation.	
Course outcomes: **CO1** Understand the design steps and features of different machine learning models. **CO2** Apply classification algorithms such as decision trees, clustering algorithms like K-Means, and preprocessing techniques to extract meaningful patterns. **CO3** Interpret the evaluation metrics for different machine learning models to assess performance and accuracy. **CO4** Create a real-world application using supervised and unsupervised learning methods. **CO5** Optimize machine learning models using hyperparameter tuning, feature engineering, and ensemble methods to enhance performance and generalization across diverse applications.	
CIE Assessment Continuous Internal Evaluation (CIE): Theory for 50 Marks	

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Laboratory- 50 Marks

Weekly Evaluation 30 Marks

Weekly evaluation will be conducted for every experiment. Marks of each evaluation includes Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva for all the experiments. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks. (A)

Two CIE for 20 Marks each and take the average for 20 Marks (B)

Final CIE Marks will be calculated as A+B for 50 marks

For IPCC Final CIE Marks will be calculated as Average of CIE and Lab CIE for 50 marks.

Semester End Examination (SEE)

SEE Theory Examination (100 Marks)

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for

16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50 (A)

SEE Laboratory Examination (50 Marks)

The laboratory SEE is also evaluated for 50 marks, distributed as follows:
Experiment Conduction with Results: 40 marks
Viva Voce: 10 marks
Total 50 marks (B)
The score for the SEE is A + B of total 100 marks

SL.NO	EXPERIMENT	24 hours
1	Implementanddemonstratethe**FIND-Salgorithm**forfindingthemostspecifichypothesisbasedona given set of training data samples. Read the training data from a .CSV file.	
2	Implementanddemonstratethe**FIND-Salgorithm**forfindingthemostspecifichypothesisbasedonagi ven set of training data samples. Read the training data from a .CSV file.	
3	Developaprogramtodemonstratethepredictionofvaluesofagi vendatasetusing**Linearregression**.	
4	Writeaprogramtodemonstratetheworkingofthedecisiontreeb ased**ID3algorithm**.Useanappropriate data set for building the decision tree and apply this knowledge to classify a newsample.	
5	BuildanArtificialNeuralNetworkbyimplementingthe**Backp ropagationalgorithm**andtestthesame using appropriate data sets.	
6	Writeaprogramtoimplementthe**naïveBayesianclassifi er**forasampletrainingdatasetstoredasa.CSV file. Compute the accuracy of the classifier, considering few test data sets.	

7	Assumingasetofdocumentsthatneedtobeclassified,usethe**naïve BayesianClassifier** modeltoperform this task. Built-in Java classes/APIcan beused to write the program. Calculate the accuracy, precision, and recall for your data set.	
8	Write a program to construct a **Bayesian network** considering medical data. Use this model to demonstrat the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML librar classes/API.	
9	Apply**EMalgorithm**toclusterasetofdatastoredina.CSVfile.Usethesamedatasetforclusteringusing ***k*-Meansalgorithm**.Comparetheresultsofthesetwoalgorithms andcommentonthequalityofclustering. YoucanaddJava/ Python MLlibrary classes/API in the program.	
10	Write a program to implement ***k*-Nearest Neighbouralgorithm**toclassify theirisdataset.Printbothcorrectand wrongpredictions.Java/PythonMLlibraryclassescanbeused	
11	Implementthenon-parametric**LocallyWeightedRegressionalgorithm**in ordertofitdata points. Select appropriate data set for your experiment and draw graphs.	
12	Apply**EMalgorithm**toclusterasetofdatastoredina.CSVfile.Usethesamedatasetforclusteringusing ***k*Meansalgorithm**.Comparetheresultsofthesetwoalgorithm sandcommentonthequalityofclustering. YoucanaddJava/ Python MLlibrary classes/API in the program.	

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO9**	**PO1 0**	**PO1 1**
CO1	3		-		1	2	-	-			
CO2	3	3	3			2	-		1		1
CO3	2	2	2	1	3	2	-				1
CO4	3	2	3			2	-			2	3
CO5	3	2	3			1	-	-	-	2	3

SEMESTER VI		
Design processes and Perspectives		
Course Code:	**MVJ22CG62**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

1.Outline the concept of interactive graphical and web interfaces for designing modern UI/UX frameworks
2.Apply visual hierarchy, accessibility standards (WCAG), and responsive design techniques, such as grids and flexible images, to create web interfaces.
3.Conduct usability testing and heuristic evaluations to identify efficiency improvements and enhance user experience.
4.Design interfaces based on cognitive load, human interaction speeds, and user behavior analytics for optimized usability.

Module-1	
The User Interface: Introduction, Overview, the importance of user interface – Defining the user interface, The importance of Good design, Characteristics of graphical and webuserinterfaces,Principles of userinterface design	8 hrs
Module-2	
TheUserInterfaceDesign process-Obstacles, Usability, Human characteristics in Design, Human Interaction speeds,Businenctions-Business definition and requirement analysis, Basic business functions, Design standards.	8 hrs
Module-3	
SystemmenusandnavigationschemesStructuresofmenus,Functionsofmenus,Contentsofmenus,Formattingofmenus,Phrasingthemenu,Selecting menu choices, Navigating menus, Kinds of graphical menus	8 hrs
Module-4	
Windows–Characteristics: Windows -Characteristics, Components ofwindow, Windowpresentationstyles, Types of window, Window management, Organizing window functions, Window operations, Web systems, Characteristics of device based controls.	8 hrs

Module-5	
Screenbasedcontrols: Operablecontrol,Textcontrol,Selectioncontrol,Customcontrol,Presentationcontrol,WindowsTests-prototypes, kinds of tests.	8 hrs

Textbooks:

1.WilbertO.Galitz,"TheEssentialGuidetoUserInterfaceDesign",JohnWiley & Sons, Second Edition 2002.

2. BenSheiderman,"DesigntheUserInterface",PearsonEducation,1998.

Reference Books :

1.Laws of UX: Design Principles for Persuasive and Ethical Products,Author: Jon Yablonski

COURSE OUTCOMES:

CO1 Outline the concept of interactive graphical and web interfaces for designing modern UI/UX frameworks.

CO2 Apply visual hierarchy, accessibility standards (WCAG), and responsive design techniques, such as grids and flexible images, to create web interfaces.

CO3 Conduct usability testing and heuristic evaluations to identify efficiency improvements and enhance user experience.

CO4 Design interfaces based on cognitive load, human interaction speeds, and user behavior analytics for optimized usability.

CO5 Integrate emerging technologies such as AI-driven design tools, voice interfaces, and augmented reality to create innovative and future-ready UI/UX solutions.

Continuous Internal Evaluation (CIE):

Continuous Internal Evaluation (CIE):

Three CIE Will be conducted for 50 marks each and average of three will

be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum

of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments

will be taken for 20 Marks (C

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

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

SEMESTER VI		
MULTIMEDIA SYSTEM DESIGN		
Course Code:	**MVJ22CG631**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Courseobjectives: Thecourseenablesthestudenttolearn

- Identifyvarioususesandapplicationsofmultimediaindifferentfields.
- Identifytheskillsandtrainingneededformultimediaproduction.
- Understandaboutvarious latestinteractivemultimediadevices,thebasicconcepts about images and image formats.
- Develop aninteractivemultimediapresentation byusing multimediadevices andmultimedia applications surrounding the emergence of multimedia technology.
- Analyzedatacompressiontechniques,imagecompression techniqueslike JPEG,video compression techniques like MPEG, and the basic concepts of multimedia animation\

Module-1	
Introduction: Multimedia–Definitions,CD-ROMandtheMultimediaHighway,UsesofMultimedia Introductiontomakingmultimedia– TheStagesofproject,therequirementstomakegoodmultimedia Multimediaskillsandtraining,TrainingopportunitiesinMultimedia.Motivationformultimediausage Frequency domain analysis, Application Domain.	8 hrs
Module-2	
Multimedia-Hardware and Software: Multimedia Hardware – Macintosh and Windows productio Platforms, Hardware peripherals – Connections, Memory and storage devices, Media software– Basi tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards.	8 hrs
Module-3	
Multimedia:Howitwork–multimediabuildingblocks–Text,Sound,Images,AnimationandVideo	8 hrs

Digitization of Audio and Video objects, Data Compression: Different algorithms concern to text audio, video and images etc., Working Exposure on Tools like Dream Weaver, Flash, Photoshop.	
Module-4	
Multimedia and the Internet: History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW – Web Servers, Web Browsers, Web page makers and editors, Plug Ins and Delivery Vehicles, HTML, VRML, Designing for the WWW – Working on the Web MultimediaApplications– MediaCommunication,MediaConsumption,MediaEntertainment,Media games	8 hrs
Module-5	
Multimedia-looking towards Future: Digital Communication and New Media, Interactiv Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling and delivering a project- planningandcosting,DesigningandProducing, content andtalent, Delivering, CD-ROMtechnology.	8 hrs

Textbooks:

1. S.Heath,1999,Multimedia&CommunicationSystems,FocalPress,UK.
2. T.Vaughan,1999,Multimedia:Makingitwork,4thEdition,TataMcGrawHill,NewDelhi.
3. K.AndleighandK.Thakkar,2000,MultimediaSystemDesign,PHI,NewDelhi

COURSEOUTCOMES:Studentswillbeableto

CO1: Illustratethevarioususesandapplicationsofmultimediaincontemporarysettings.

CO2: Identify training opportunities and career paths in multimedia.

CO3: Apply multimedia production standards in their projects.

CO4: Applydatacompressiontechniquestomultimediacomponents.

CO5: Explainthefunctioningandsignificanceofinteractivetelevision,digitalbroadcasting,anddigitalradio.

CIE ASSESSMENT:

Continuous Internal Evaluation (CIE):

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:

Semester End Examination (SEE):

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO Mapping

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

SEMESTER VI		
CLOUD COMPUTING		
Course Code:	**MVJ22CG632**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. TounderstandthefundamentalideasbehindCloudComputing,theevolutionof the paradigm, its applicability; benefits, as well as current and future challenges;
2. Tounderstandandapplythebasicideasandprinciplesindatacenterdesign;cloudmanagement techniques and cloud software deployment considerations;
3. TounderstandandanalyzethedifferentCPU,memoryandI/Ovirtualizationtechniquesthatserve in offering software, computationand storageserviceson thecloud; Software Defined Networks (SDN) and Software Defined Storage (SDS);
4. Tounderstandandanalyzecloudstoragetechnologiesandrelevantdistributedfilesystems,No SQL databases and object storage;
5. Toanalyzeandcreatethevarietyofprogrammingmodelsanddevelopworkingexperienceinseveralof them.

Module-1	
IntroductiontoCloudComputing: CloudComputinginaNutshell,RootsofCloudComputing, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, InfrastructureasaServiceProviders,PlatformasaServiceProviders,ChallengesandRisks,Broad Approaches to Migrating into the Cloud, The Seven- Step Model of Migration into a Cloud Applications: MicrosoftAzure,AmazonWebServices	8 hrs

Module-2	
IntegrationasaService'ParadigmfortheCloudEra: An Introduction, The Onset of Knowledge Era, The Evolution of SaaS , The Challenges of SaaS Paradigm, Approaching the SaaS Integration Enigma, New Integration Scenarios, The Integration Methodologies, SaaS Integration Products and Platforms , SaaS Integration Services, Businesses-to Business Integration (B2Bi) Services, A Framework of Sensor- Cloud Integration, SaaS Integration Appliances, Issues for Enterprise Applications on the Cloud, Transition Challenges, Enterprise Cloud Technology and Market Evolution, Business Drivers Toward a Marketplace for Enterprise Cloud Computing, The Cloud Supply Chain LaboratorySessions/Experimentallearning: 1. Installation and Configuration of Hadoop. Applications:PAAS(Facebook,GoogleAppEngine)	8 hrs

Module-3	
VirtualMachinesProvisioningandMigration Services: Introduction and Inspiration- Background and Related Work-Virtual Machines Provisioning and Manageability- Virtual Machine Migration Services- VM Provisioning and Migration in Action– ProvisioningintheCloudContext- TheAnatomyofCloudInfrastructures-DistributedManagement ofVirtualInfrastructures - SchedulingTechniquesforAdvanceReservationofCapacity-Capacity Management to meet SLA Commitments- RVWS Design and Cluster as a Service: The Logical Design LaboratorySessions/Experimentallearning: ImplementationofPara-VirtualizationusingVMWare'sWorkstation/Oracle'sVirtualBoxand Guest O.S Applications: HardwareVirtualization,OperatingsystemVirtualization,ServerVirtualization,Stor age Virtualization	8 hrs
Module-4	
Platform and Software as a Service: Technologies and Tools for Cloud Computing- Aneka Cloud Platform- Aneka Resource Provisioning Service- Hybrid Cloud Implementation – Comet Cloud Architecture- Autonomic Behavior of Comet Cloud- Overview of Comet Cloud-based Applications- Implementation and Evaluation- Workflow Management Systems and Clouds- Architecture of WorkflowManagementSystems-UtilizingCloudsforWorkflowExecution- CaseStudy:Evolutionary Multi objective Optimizations- Visionary thoughts for Practitioners LaboratorySessions/Experimentallearning: Createanapplication(Ex:WordCount)usingHadoopMap/Reduce.	8 hrs
Module-5	
MapReduce Programming Model and Implementations: MapReduce Programming Model- Major MapReduce Implementations for the Cloud- The Basic Principles of Cloud Computing- A Model for FederatedCloudComputing-TraditionalApproachestoSLOManagement- TypesofSLA-LifeCycle of SLA- SLA Management in Cloud- Automated Policy-based Management- The Current State of DataSecurityintheCloud-DataPrivacyandSecurityIssues- ProducerConsumerRelationship-Cloud Service Life Cycle	8 hrs

LaboratorySessions/Experimentallearning: CreateyourresumeinaneatformatusinggoogleandzohocloudProgramsonPaaS Applications: Network Storage, Google Apps and Microsoft office online	

Textbooks:

1. CloudComputing,PrinciplesandParadigms,RajkumarBuyya,JamesBroberg,WileyPublication
2. DanCMarinescu:CloudComputingTheoryandPractice.Elsevier(MK) 2013.

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

CO1:Understand the fundamental concepts of cloud computing, including its origins, layers, types, desired features, and infrastructure management, and summarize the challenges and risks associated with cloud adoption and migration..

CO2: Apply cloud migration strategies, utilizing the seven-step migration framework, to transition applications onto platforms like Microsoft Azure and AWS.

CO3: Examine the architecture, service models, and infrastructure of cloud computing to analyze the challenges, risks, and migration strategies in business and technology adoption..

CO4: Assess the effectiveness of different cloud computing service models, migration strategies, and security frameworks in terms of their suitability for enterprise adoption, considering performance, scalability, and risk factors

CIE Assessment

Continuous Internal Evaluation (CIE):

Three CIE Will be conducted for 50 marks each and average of three will

be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum

of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments

will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Semester End Examination (SEE):

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the

entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO Mapping

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

SEMESTER VI		
BLOCKCHAIN		
Course Code:	**MVJ22CG633**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Courseobjectives: Thecourseenablesthestudenttolearn

- Familiarise the functional/operational aspects of cryptocurrency ecosystem.
- Understand emerging abstract models for Blockchain Technology.
- Understand how blockchain systems (mainly Bitcoin and Ethereum) work and how to securely interact with them.
- Identify major research challenges and technical gaps existing between theory and Practice in cryptocurrency domain.
- Design, build, and deploy smart contracts and distributed applications.

Module-1	
Basics: 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. Applications: Telecommunications, finance, universities Video link / Additional online information (related to module if any): https://coincentral.com/byzantine-generals-problem/ https://www.tutorialspoint.com/distributed_dbms/distributed_dbms_database s.htm https://blockonomi.com/merkle-tree/	8 hrs
Module-2	
Block chain: Introduction, Advantage over conventional distributed database, Block chain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Block chain application, Soft & Hard Fork, Private and Public block chain. Applications: Government, healthcare.	8 hrs
Module-3	
Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate. Applications: Decentralized Applications, Encrypted messaging applications Video link / Additional online information (related to module if any): https://blockonomi.com/nakamoto-consensus/ https://cointelegraph.com/explained/proof-of-work-explained	8 hrs
Module-4	
Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin. Applications: Peer - to - peer payment application. Video link / Additional online information (related to module if any): https://blockgeeks.com/guides/smart-contracts/	8 hrs

Module-5	
Cryptocurrency Regulation: 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.Video link / Additional online information (related to module if any): https://www.water-io.com/iot-vs-wot https://www.talend.com/resources/iot-cloud-architecture	8 hrs

Textbooks:

1 Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

2 Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies

3 Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System.

4 DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014. 5 Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

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

CO1 Basic Cryptography functions, digital signature, public key cryptosystems, zero- knowledge proof systems.
CO2 Policies and applications of Blockchain in Distributed databases.
CO3 Explain the Nakamoto consensus, List and describe differences between proof-of- work and proof-of-stake consensus.
CO4 Design, build, and deploy smart contracts and distributed applications.
CO5 Cryptocurrency governance, regulations and applications

CIE ASSESSMENT:

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

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

SEMESTER VI		
ADVANCED JAVA		
Course Code:	**MVJ22CG634**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Courseobjectives: Thecourseenablesthestudenttolearn

- Understand and use enumerations, type wrappers, and autoboxing in Java, Learn and applyannotations effectively in Java programming
- LearnaboutthefundamentalsofJavaCollections,suchascollectioninterfaces,classes,iterators, andalgorithms,aswellashowtousemaps,comparators,anduser-definedclassesincollections
- DescribehowtoeffectivelyuseStringandStringBuffermethods,includingsubstring,replace,trim, valueOf, and additional methods, to manipulate and manage strings in Java programming
- ApplytheuseofJavaServerPages(JSP)tocreatedynamicwebcontent,includingusingJSPtags,and understand how JSP works with Tomcat to handle requests and responses.
- Analyzetheworkoftransactionprocessing,metadata,datatypes,andexceptionsinJDBCtoeffectively interact with databases and handle errors in Java programming

Module-1	
Enumerations,AutoboxingandAnnotations(metadata): Enumerations,Enumerationfundamentals, the values() and valueOf() 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.	8 hrs
Module-2	
The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User DefinedClassesinCollections,TheRandomAccessInterface,WorkingWithMaps,Co	8 hrs

mparators,The CollectionAlgorithms,WhyGenericCollections?,ThelegacyClassesandInterfaces, PartingThoughts on Collections.	
Module-3	
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(),StringComparison,equals()andequalsIgnoreCase(),regionMatches( ) startsWith( ) and endsWith( ), equals( ) Versus == , compareTo( ) Searching Strings, Modifying a String,substring(),concat(),replace(),trim(),DataConversionUsingvalueOf(),ChangingtheCase of Characters Within a String, Additional String Methods, StringBuffer , StringBuffer Constructors, length( ) and capacity(),ensureCapacity(),setLength( ), charAt( ) and setCharAt( ), getChars( ),append(),insert(),reverse(),delete( )anddeleteCharAt(),replace(),substring(),AdditionalStringBufferMethods,StringBuilder	8 hrs
Module-4	
Background:TheLifeCycleofaServlet;UsingTomcatforServletDevelopment;AsimpleServlet; The Servlet API; The Javax.servlet Package;Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTPRequestsandResponses; Using Cookies; SessionTracking.JavaServerPages(JSP):JSP,JSPTags,Tomcat,RequestString,UserSessions, Cookies, Session Objects	8 hrs
Module-5	
TheConceptofJDBC:JDBCDriverTypes;JDBCPackages;ABriefOverviewoftheJDBCprocess; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions	8 hrs
Textbooks: 1 HerbertSchildt:JAVAtheCompleteReference,7th/9thEdition,TataMcGrawHill, 2007.	
Course outcomes: At the end of the course, the students will be able to CO1 Designandimplementenumerationtypestorepresentfixedsetsofconstants. CO2 Applytypewrappersandautoboxingtoworkwithprimitivetypesandobjects CO3 ManipulateandanalyzestringsusingvariousStringandStringBuffermethods. CO4 DevelopdynamicwebcontentusingJavaServer Pages(JSP)andTomcat CO5InteractwithdatabasesusingJDBC,includingperformingtransactions,queryingmetad	

ata,and handling exceptions.

CIE ASSESSMENT:

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO/PSOMapping

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

SEMESTER VI		
INTRODUCTION TO DATA STRUCTURES		
Course Code:	**MVJ22CG641**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. Discuss the fundamental concepts and principles of data structures.
2. Understand the importance of data structures in computer programming and problem solving.
3. A compressive overview of various data structures such as arrays, linked lists, stacks, queues, trees and graphs.
4. Prepare the students for advanced courses in algorithms, data analysis.

Module-1	
Introduction : Data Structures definition , classification of data structures , Arrays – Definition, Declaration , Types of arrays, Structures , Pointers. Textbook 2 : chapter 2	8 hrs
Module-2	
Stacks- definition , implementation of stacks using arrays, operations of stacks. Queues- Introduction, Types of queues, Linear queue using arrays, operations on linear queue, circular queue. Limitation of linear queue, Linear Queue vs circular queue. Textbook 2 : chapter 3	8 hrs
Module-3	
Linked List -Linked-list and its types- singly linked lists- doubly-linked lists- circular linked lists, Applications of Linear Data Structures. Textbook 1 : Chapter3:3.2.1, 3.2.2, 3	8 hrs
Module-4	
Non Linear Data Structures: Trees – Introduction , Terminologies, Representation of trees , Types of Trees, Application of trees , Binary Tree – Representation, Traversal techniques, Binary Search trees – Tree Construction, Expression trees. Application of Binary search tree. Textbook 1 : Chapter4:4	8 hrs
Module-5	
Graphs: Introduction , terminologies, Representation of graphs , Connected graph , graph traversal techniques, Application of graphs in data structures . Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extensible Hashing. 44 Textbook 1 : Chapter9: 9.1-9.3,9.5 , Chapter 5	8 hrs

Textbooks:
1 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2011 2 Fundamentals of Data structures , Ellis Horowitz, sartaj sahni,
3 Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures & Algorithms, Pearson Education, New Delhi, 2006.

Course outcomes: At the end of the course, the students will be able to
CO1 Evaluate the performance and efficiency of different operations on arrays, stacks, queues, and circular queues.
CO2 Understand the different types of linked list.
CO3 Implement basic operations on trees.
CO4 Demonstrate the representation and traversal techniques of graphs and their applications.
CO5 Use the concepts of Hashing.

CIE ASSESSMENT:
Continuous Internal Evaluation (CIE):
Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:
The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO/PSOMapping

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

SEMESTER VI		
FUNDAMENTALS OF OPERATING SYSTEMS		
Course Code:	**MVJ22CG642**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. Understanding the fundamental concepts of operating systems.
2. Analyse the exchanging data between different process.
3. Discuss the deadlock mechanism in operating systems.
4. Recognize the importance of process and memory management. Outline the features of files and file management systems.

Module-1	
The Basics: An overview: Introduction to operating systems, components of an operating systems, Evolution of operating system, architecture of operating system, Functions of operating system. Textbook 1: Chapter 1: 1.1-1.4	8 hrs
Module-2	
Operating system services, user and operating system interface, system calls and services, operating system structure, Process: Introduction, Process management, OS view of processes. Process states. Interrupts: Interrupts in operating systems, Interprocess communication, types of interprocess communications. Textbook 1: Chapter 2: 2.1- 2.8, Chapter 3: 3.1-3.6	8 hrs
Module-3	
Deadlocks: what is Deadlock, Deadlock Characteristics, resource management, conditions of deadlock – Handling Deadlocks, deadlock avoidance, Deadlock Detection, Deadlock Recovery. Textbook 1: Chapter 8: 8.3 to 8.8	8 hrs
Module-4	
Process scheduling: Concept of Process Scheduling, operation on Processes scheduling, Scheduling criteria. Memory Management: Memory organization in operating system, Memory Hierarchy, Memory Management Strategies. Contiguous Memory Allocation, Non-contiguous Memory Allocation. Textbook1: Chapter 3:3.3, Chapter 9: 9.1, 9.2	8 hrs
Module-5	
File and Database Systems: File concept, Access methods, Data Hierarchy, Directory Structure, File Protection, File System Structure. File access control. Textbook 1: Chapter 14:14.2- 14.	8 hrs

Textbooks:

1 "Operating System Concepts" by Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, 10 th ed.
2 "Modern Operating Systems" by Andrew S. Tanenbaum and Herbert Bos,5 th ed.
3"Operating Systems: Internals and Design Principles" by William Stallings,7 th ed.

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

1. understanding the fundamental concepts of operating systems.
2. Analyse the exchanging data between different process.
3. Discuss the deadlock mechanism in operating systems.
4. Recognize the importance of process and memory management. Outline the features of files and file management system

CIE ASSESSMENT:

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)
Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO/PSOMapping

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

SEMESTER VI		
MOBILE APPLICATION DEVELOPMENT		
Course Code:	**MVJ22CG643**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:
1. Understand system requirements for mobile applications.
2. Generate suitable design using specific mobile development frameworks. Implement the design using specific mobile development frameworks.
3. Deploy the mobile applications in marketplace for distribution.

Module-1	
Introduction: Introduction to mobile application - Market values for mobile applications System requirements for mobile application, Mobile application development architecture. Video link / Additional online information (related to module if any): https://www.tutorialspoint.com/android/ Online	8 hrs
Module-2	
Designing Applications using Android: Developing user interfaces -Layout - Input Controls and Events- Menus - Dialogs, Notifications and Toasts Applications: Design a Simple Calculator App Video link / Additional online information (related to module if any): http://www.androidhive.info/	8 hrs
Module-3	
Multimedia & Services: Lifecycle of a Service - Managing Services,GPS API Playing audio, video. Video link / Additional online information (related to module if any): https://nptel.ac.in/courses/106/106/106106147/	8 hrs
Module-4	
Technology I,Android:Introduction Establishing the development environment Android architecture Activities and views Interacting with UI Persisting data using SQLite Packaging and deployment. Video link / Additional online information (related to module if any): http://developer.android.com/develop/index.htm	8 hrs
Module-5	
Technology II IOS: Introduction to Objective C IOS features UI implementation Touch frameworks Data persistence using Core Data and SQLite.	8 hrs

Textbooks:
1.James Dovey and Ash Furrow ,"Beginning objective C",Apress,20212
2.Android in Practice",Dream Tech,2012 Charlie Collins,Michael Galpin and MatthiasKappler

Course outcomes: At the end of the course, the students will be able to
CO1:Demonstrate knowledge on basics of mobile application
CO2:Understand the framework of mobile application and design simple interfaces
CO3:Create an application using multimedia components.

CO4:Develop and deploy application with server side connectivity
CO5:Understand basic concepts of IOS

CIE ASSESSMENT:
Continuous Internal Evaluation (CIE):
Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:
The theory exam consists of a written paper structured into two parts:
Part A: Consist of 10 questions of 2 marks.It is designed to cover the entire syllabus comprehensively.
Part B: The question paper will have 10 questions . Each question is valued at 16 marks .Their will be 2 questions from each module with a maximum of 2 subdivision.Student have to answer any 5 question choosing one full question from each module .The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO/PSOMapping

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

SEMESTER VI		
INTRODUCTION TO ARTIFICIAL INTELLIGECE		
Course Code:	**MVJ22CG644**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours Theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students 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.

Module-1	
What is artificial intelligence, Problems, Problem Spaces and search, Heuristic search technique. Textbook 1,2	8 hrs
Module-2	
Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules. Textbook 1 :Chapter 3,4	8 hrs
Module-3	
Symbolic Reasoning under Uncertainty, Statistical reasoning, Weak Slot and Filter Structures Textbook 1 : Chapter 5,6,7	8 hrs
Module-4	
Strong slot-and-filler structures, Game Playing. Application: Designing Smart Games. Textbook 1 : Chapter 8,9,10	8 hrs
Module-5	
Learning, Expert Systems. TextBook1: Ch 17 and 20 RBT: L1, L2	8 hrs

Textbooks:

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.

Course outcomes: At the end of 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.

CIE ASSESSMENT:
Continuous Internal Evaluation (CIE):

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO/PSOMapping

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

SEMESTER VI			
PROJECT PHASE 1			
Course Code:	**MVJ22CGP65**	**CIE Marks: 100**	
L: T:P:S	**0:0:4:0**	**SEE Marks:**	
Credits:	**2**	**Total :100**	
Hours:	**48 hrs practical**	**SEE Duration: 3 Hrs.**	

Course Learning Objectives: Students will be able to

1 To support independent learning

2 To develop interactive, communication, organization, time management, and presentation skills.

3 To impart flexibility and adaptability.

4 To expand intellectual capacity, credibility, judgment, intuition.

5 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 - I: 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 ofthe course the student will be able to: CO1 Describe the project and be able to defend it. CO2 Learn to use modern tools and techniques. CO3 Develop skillsto work in a teamto 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.	

CIE Marks Breakup for Malor Project during VII Semester:

Relevanceofthe Topic	10 marks
Report	20 Marks
Evaluation by Guide	25 Marks
Presentation	30 Marks
Viva- Voce	15 Marks
Total	100 marks

CO-PO/PSOMapping											
CO/ P O	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 1 0	PO 1 1
CO1	2					1	1	2			
CO2	2					1	1	2			
CO3	2	2	2	2		1	1	2	2	1	
CO4	2	2	2	2		1	1	2	2	1	

SEMESTER VI		
UI/UXLAB		
Course Code:	**MVJ22CGL66**	**CIE Marks: 50**
L: T:P:S	**0:0:2:0**	**SEE Marks: 50**
Credits:	**1**	**Total :100**
Hours:	**24 HOURS PRACTICAL**	**SEE Duration: 3 Hrs.**

Course Learning Objectives: Students will be able to

1 Understand the importance of adhering to comprehensive UI style guides and explain their role in maintaining design consistency and usability.

6 Apply the design thinking process to conceptualize and develop new products, focusing on user needs and iterative prototyping.

7 Analyze the components of pattern libraries, including mood boards, fonts, and color schemes, to evaluate their impact on user experience and visual coherence

8 Assess the effectiveness of flow diagrams and flow maps in project development, optimizing workflows for improved user interaction and navigation

Sl.No	EXPERIMENTS 24 Hrs
1	Designing a responsive layout for a societal application
2	Exploring various UI interaction patterns
3	Developing an interface with proper UI style guides
4	Developing a wireflow diagram for the application using open-source software
5	Exploring various open-source collaborative interface platforms
6	Hands-on design thinking process for a new product
7	Defining the look and feel of the new project
8	Brainstorming features for the proposed product
9	Creating a sample pattern library for the product (moodboard, fonts, colors based on UI principles)
10	Conducting end-to-end user research – user research, creating personas, ideation process (user stories, scenarios), flow diagrams, flow mapping
11	Sketching, designing with a popular tool, building a prototype, performing usability testing, and identifying improvements

CourseOutcomes: Studentswillbeableto	
CO 1	Understand the importance of adhering to comprehensive UI style guides and explain their role in maintaining design consistency and usability.
CO 2	Apply the design thinking process to conceptualize and develop new products, focusing on user needs and iterative prototyping.
CO 3	Analyze the components of pattern libraries, including mood boards, fonts, and color schemes, to evaluate their impact on user experience and visual coherence.
CO 4	Assess the effectiveness of flow diagrams and flow maps in project development, optimizing workflows for improved user interaction and navigation.

CIE Assessment:
CIE Laboratory (50 Marks)
Weekly Evaluation 30 Marks
Weekly evaluation will be conducted for every experiment. Marks of each evaluation includes Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva for all the experiments. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks. (A)

Two CIE for 20 Marks each and take the average for 20 Marks (B)
Final CIE Marks will be calculated as (A+B) for 50 marks
SEE Laboratory Examination (50 Marks)
The laboratory SEE is also evaluated for 50 marks, distributed as follows:
Experiment Conduction with Results: 40 marks
Viva Voce: 10 marks
Total 50 marks
The final score for the course out of 100 is the SumTotal of SEE and CIE.

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

SEMESTER VI		
INDIAN KNOWLEDGE SYSTEMS (Theory) (Common to All UG Programs)		
Course Code:	**MVJ22IKK68**	**CIE Marks: 50**
L: T:P:S	**0:0:1:0**	**SEE Marks: 50**
Credits:	**1**	**Total :100**
Hours:	**12 HOURS THEORY**	**SEE Duration: 2 Hrs.**

CourseLearningObjectives:

The students will be able to

1 To facilitate the students with the concepts ofIndian traditional knowledge and tomake

them understand the Importance of roots of knowledge system.

2 Tomake the students understand the traditional knowledge and analyse it and apply it to

their day-to-day life.

Unit-I	4 hrs
Introduction to Indian Knowledge Systems(IKS): Overview, Vedic Corpus, Philosophy, Character scope and importance, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge.	
Unit II	4 hrs
Traditional Knowledge in Humanities and Sciences: Lingistics, Number and measurements- Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology.	
Unit III	4 hrs
Traditional Knowledge in Professional domain: Town planning and architecture- Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals.	
Course Outcomes: After completing the course, the students will be able to	

CO1: Provide an overview of the concept of the Indian Knowledge System and its importance. CO2: Appreciate the need and importance of protecting traditional knowledge. CO3: Recognize the relevance of Traditional knowledge in different domains. CO4: Establish the significance of Indian Knowledge systems in the contemporary world.	

Reference Books

1

Introduction to Indian Knowledge System- concepts and applications, B Mahadevan,

Vinayak Rajat Bhat, Nagendra Pavana R N, 2022, PHI Learning Private Ltd, ISBN-978-93-

91818-21-0

Traditional Knowledge System in India, AmitJha, 2009, Atlantic Publishers and Distributors

(P) Ltd., ISBN-13: 978-8126912230,

2

Knowledge Traditions and Practices of India, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1,

2005, DK Print World (P) Ltd., ISBN 81-246-0334,

Suggested Web Links:

1. https://www.youtube.com/watch?v=LZP1StpYEPM

2. http://nptel.ac.in/courses/121106003/

3. http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63

(Centre of Excellence for Indian Knowledge System, IIT Kharagpur)

4. https://www.wipo.int/pressroom/en/briefs/tk_ip.html

5. https://unctad.org/system/files/official-document/ditcted10_en.pdf

6. http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf

7. https://unfoundation.org/what-we-do/issues/sustainable-development-goals/?gclid=EAIaIQobChMInp-Jtb_p8gIVTeN3Ch27LAmPEAAYASAAEgIm1vD_BwE

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50% (CIE)**	**50%(SEE)**
QUIZZES		
Quiz-I	Each quiz is evaluated for 05 marks adding up to **10 Marks.**	*****
Quiz-II		
THEORY COURSE - (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)		
Test – I	Each test will be conducted for 25 Marks adding upto 50 marks. Final test marks will be reduced to **20 Marks**	*****
Test – II		
EXPERIENTIAL LEARNING	**20**	*****
Case Study-based Teaching-Learning	--	*****
Sector wise study & consolidation (viz., Engg. Semiconductor Design, Healthcare & Pharmaceutical, FMCG, Automobile, Aerospace and IT/ ITeS)	--	
Video based seminar (4-5 minutes per student)	--	
Maximum Marks for the Theory	---	**50 Marks**
Practical	--	--
Total Marks for the Course	**50**	**50**

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

VII SEMESTER

SEMESTER VII		
ROBOTIC PROCESS AUTOMATION DESIGN& DEVELOPMENT		
Course Code:	**MVJ22CG71**	**CIE Marks: 50**
L: T:P:S	**3:0:2:0**	**SEE Marks: 50**
Credits:	**4**	**Total :100**
Hours:	**40 hours theory + 24 hours practical**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. Understand fundamental concepts of automation using UiPath StudioX.

2 Learn and Understand UI Automation activities.

3 Learn and Understand Mail Automation and Word Automation activities.

4 Learn and Understand Excel Automation activities.

5 Learn and Understand File Automation and Presentation Automation activities.

Module-1	
Robotic Process Automation: Overview: Return on Investment (ROI), Automation Types, UiPath StudioX. Common Concepts: Notebook, Activity Inputs, Activity Outputs, Common Properties, Common Activities, Write Line: Message Box, Input Dialog. Modify Text., Text to Left/Right, Delay, if, Switch., Repeat Number Of Times. , Skip Current, Exit Loop, Get Username/Password, Get Orchestrator Asset, Save For Later, Wait for Download, Group. Chapter 1 , Chapter 3	8 Hrs
Module-2	
UI Automation: Sample Overview, Activities Reference, Use Application/Browser, Go To URL, Navigate Browser, Highlight, Take Screenshot, Check App State, Click, Type Into, Select Item, Check/Uncheck, Get Text, Get Attribute, Extract Table Data, Hover, Keyboard Shortcuts, Get Active Window, Maximize Window, Minimize Window, Hide Window, Restore Window, Move Window. App/Web Recorder. Chapter 4	8 hrs
Module-3	
Mail Automation: Sample Overview: Desktop Outlook Setup, File System Structure, Activities Reference: Use Desktop Outlook App, Use Gmail, For Each Email, Mark Email As Read/Unread, Forward Email, Save Email Attachments, Save Email, Send Email, Send Calendar Invite, Move Email, Reply to Email, Archive Email, Delete Email. Word Automation: Sample Overview: Word Setup, File System Structure, Activities Reference: Use	8 hrs

Word File..., Save Document As, Read Text, Set Bookmark Content, Replace Text in Document, Append Text, Insert DataTable in Document, Replace Picture,Add Picture, Save Document as PDF. Chapter 5 , Chapter 6	
Module-4	
Excel Automation: Sample Overview, Activities Reference, Use Excel File, Insert Sheet, Rename Sheet, Duplicate Sheet, Delete Sheet, For Each Excel Sheet, Insert Column, Text To Columns..,Delete Column, Insert Rows, Delete Rows, Find First/Last Data Row, For Each Excel Row, Write Cell, Create Pivot Table, Format as Table, Change Pivot Data Source, Refresh Pivot Table, Append Range, Copy Range, Sort Range, Clear Sheet/Range/Table, Auto Fill, Fill Range, Write Range, Read Cell Formula.., Read Cell Value, Format Cells, Export to CSV.., Save Excel File, Save Excel File As...,Save Excel File As PDF, VLookup, Filter, Run Spreadsheet Macro. Chapter 7	8 hrs
Module-5	
File Automation: Sample Overview. Activities Reference: Get Folder Info, Folder Exists, Create Folder, Delete Folder, Copy Folder., Move Folder, For Each File In Folder, Compress/Zip Files, Extract/Unzip Files, Get File Info, File Exists, Create File, Delete File, Copy File, Move File, Write Text File, Append Line.., Read Text File. Presentation Automation: Sample Overview, File System Structure., Activities Reference, Use PowerPoint Presentation, Copy Paste Slide, Delete Slide, Add New Slide, Replace Text in Presentation, Add Text to Slide., Add Data Table to Slide, Add Image/Video to Slide, Add File to Slide., Run Presentation Macro, Save PowerPoint File As., Save Presentation as PDF. Chapter 9, Chapter 10	8 hrs
Laboratory Experiments: 1. Develop automation in UiPath StudioX to demonstrate the following activities: Write Line: Message Box, Input Dialog. Modify Text., Text to Left/Right and Delay. 2. Develop automation in UiPath StudioX to demonstrate the following activities: if, Switch., Repeat Number Of Times. , Skip Current, Exit Loop 3. Develop UI automation in UiPath StudioX to demonstrate the following activities: Use Application/Browser, Go To URL, Navigate Browser, Highlight and Take Screenshot 4. Develop UI automation in UiPath StudioX to demonstrate the following activities: Check App State, Click, Type Into, Select Item, Check/Uncheck, Get Text, Get Attribute, Extract Table Data and Hover 5. Develop UI automation in UiPath StudioX to demonstrate the following activities: Get Active Window, Maximize Window, Minimize Window, Hide Window, Restore Window and Move Window 6. Develop Word automation in UiPath StudioX to demonstrate the following activities: Use Word File.., Save Document As, Read Text, Replace Text in	

Document, Append Text, Replace Picture, Add Picture, Save Document as PDF

7. Develop Excel automation in UiPath StudioX to demonstrate the following activities: Use Excel File, Insert Sheet, Rename Sheet, Duplicate Sheet, Delete Sheet, For Each Excel Sheet, Insert Column, Text To Columns, Delete Column
8. Develop Excel automation in UiPath StudioX to demonstrate the following activities: Insert Rows, Delete Rows, Find First/Last Data Row, For Each Excel Row, Write Cell, Create Pivot Table., Save Excel File As..., Save Excel File As PDF
9. Develop File automation in UiPath StudioX to demonstrate the following activities: Get Folder Info, Folder Exists, , For Each File In Folder, Compress/Zip Files, Extract/Unzip Files, Get File Info, File Exists, Create File, Delete File, Copy File, Move File, Write Text File, Append Line.., Read Text File
10. Develop Excel automation in UiPath StudioX to demonstrate the following activities: Refresh Pivot Table, Append Range, Copy Range, Sort Range, Clear Sheet/Range/Table, Auto Fill, Fill Range, Write Range, Read Cell Formula.., Read Cell Value, Format Cells, Export to CSV

Textbooks:

1."Adeel Javed, Anum Sundrani, Nadia Malik, Sidney Madison, Prescott, Robotic Process Automation using UiPathStudioX:ACitizen Developer's Guide to Hyper automation "Press Publishing, 2021

2.Tom Taulli , The Robotic Process Automation Handbook : A Guide to Implementing RPA Systems, 2020, ISBN13 (electronic): 978-1-4842-5729-6, Publisher : Apress

3.Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing Release Date: March 2018 ISBN: 9781788470940

Reference Books :

1.Frank Casale, Rebecca Dilla, Heidi Jaynes ,Lauren Livingston,"Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation.

2.Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant.

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

- Demonstrate Common RPA concepts using UiPath StudioX.
- Develop UI automation in UiPath StudioX.
- Implement Mail automation and Word automation in UiPath StudioX.
- Develop Excel automation in UiPath StudioX.
- Implement File automation and Presentation automation in UiPath StudioX

CIE ASSESSMENT:

Theory for 50 Marks

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)

Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)

Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

Laboratory- 50 Marks

Weekly Evaluation 30 Marks

Weekly evaluation will be conducted for every experiment. Marks of each evaluation includes Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva for all the experiments. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks. (A)

Two CIE for 20 Marks each and take the average for 20 Marks (B)

Final CIE Marks will be calculated as A+B for 50 marks

For IPCC Final CIE Marks will be calculated as Average of CIE and Lab CIE for 50 marks.

SEE ASSESSMENT:

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.

The SEE Theory marks of 100 will be scaled down to 50 (A)

SEE Laboratory Examination (50 Marks)

The laboratory SEE is also evaluated for 50 marks, distributed as follows:

Experiment Conduction with Results: 40 marks

Viva Voce: 10 marks

Total 50 marks (B)

The score for the SEE is A+B of total 100 marks

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	2							1	2	
CO2	3	2							2	2	
CO3	3	2	1						2	1	3
CO4	2	2	2								3
CO5	3	2	2					2		1	1

SEMESTER VII		
NATURAL LANGUAGE PROCESSING		
Course Code:	**MVJ22CG72**	**CIE Marks: 50**
L: T:P:S	**3:0:2:0**	**SEE Marks: 50**
Credits:	**4**	**Total :100**
Hours:	**40 hours theory + 24 hours practical**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

- Learn the importance of natural language processing
- Understand the Applications of natural language processing
- Study spelling, error detection and correction methods and parsing techniques in NLP
- Illustrate the information retrieval models in natural language processing

Module-1	
INTRODUCTION: What is Natural Language Processing? Origins of NLP, Language and Knowledge, The Challenges of NLP, Language and Grammar, Processing Indian Languages, NLP Applications. Language Modelling: Statistical Language Model - N-gram model (unigram, bigram), Paninion Framework, Karaka theory. Textbook 1: Ch. 1, Ch. 2.	8 Hrs
Module-2	
Word Level Analysis: Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and Correction, Words and Word Classes, Part-of Speech Tagging. Syntactic Analysis: Context-Free Grammar, Constituency, Top-down and Bottom-up Parsing, CYK Parsing. Textbook 1: Ch. 3, Ch. 4.	8 hrs
Module-3	
Naive Bayes, Text Classification and Sentiment: Naive Bayes Classifiers, Training the	8 hrs

Naive Bayes Classifier, Worked Example, Optimizing for Sentiment Analysis, Naive Bayes for Other Text Classification Tasks, Naive Bayes as a Language Model. Textbook 1: Ch. 4.	
Module-4	
Information Retrieval: Design Features of Information Retrieval Systems, Information Retrieval Models - Classical, Non-classical, Alternative Models of Information Retrieval - Custer model, Fuzzy model, LSTM model, Major Issues in Information Retrieval. Lexical Resources: WordNet, Frame Net, Stemmers, Parts-of-Speech Tagger, Research Corpora. Textbook 1: Ch. 9, Ch. 12	8 hrs
Module-5	
Machine Translation: Language Divergences and Typology, Machine Translation using Encoder Decoder, Details of the Encoder-Decoder Model, Translating in Low-Resource Situations, MT Evaluation, Bias and Ethical Issues. Textbook 2: Ch. 13.	8 hrs

Laboratory Experiments: 24P

1.Write a Python program for the following preprocessing of text in NLP: ● Tokenization ● Filtration ● Script Validation ● Stop Word Removal ● Stemming

2.Demonstrate the N-gram modelling to analyze and establish the probability distribution across sentences and explore the utilization of unigrams, bigrams, and trigrams in diverse English sentences to illustrate the impact of varying n-gram orders on the calculated probabilities.

3.Investigate the Minimum Edit Distance (MED) algorithm and its application in string comparison
and the goal is to understand how the algorithm efficiently
● Test the algorithm on strings with different type of variations (e.g., typos, substitutions, insertions,
deletions)
● Evaluate its adaptability to different types of input variations
4.Write a program to implement top-down and bottom-up parser using appropriate context free
grammar.
5.Given the following short movie reviews, each labeled with a genre, either comedy or action:
● fun, couple, love, love comedy
● fast, furious, shoot action

● couple, fly, fast, fun, fun comedy
● furious, shoot, shoot, fun action
● fly, fast, shoot, love action and A new document D: fast, couple, shoot, fly Compute the most likely
class for D. Assume a Naive Bayes classifier and use add-1 smoothing for the likelihoods.
6.Demonstrate the following using appropriate programming tool which illustrates the use of information retrieval in NLP: ● Study the various Corpus – Brown, Inaugural, Reuters, udhr with various methods like fields, raw, words, Sents, categories ● Create and use your own corpora (plaintext, categorical) ● Study Conditional frequency distributions ● Study of tagged corpora with methods like tagged Sents, tagged words ● Write a program to find the most frequent noun tags ● Map Words to Properties Using Python Dictionaries ● Study Rule based tagger, Unigram Tagger Find different words from a given plain text without any space by comparing this text with a given corpus of words. Also find the score of words.

7.Write a Python program to find synonyms and antonyms of the word "active" using WordNet.

8.Implement the machine translation application of NLP where it needs to train a machine translation
model for a language with limited parallel corpora. Investigate and incorporate techniques to improve
performance in low-resource scenarios.

Textbooks:
Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural
Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press
Cambridge, MA:1999
Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First
Edition, OReilly Media, 2009.
Reference Books:
1. Akshay Kulkarni, Adarsha Shivananda, "Natural Language Processing Recipes - Unlocking Text Data with Machine Learning and Deep Learning using Python", Apress, 2019. 2. T V Geetha, "Understanding Natural Language Processing – Machine Learning and Deep Learning Perspectives", Pearson, 2024.

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

CO1 :Apply the fundamental concepts of NLP, including grammar-based and

statistical-based language models..
CO2: Model morphological analysis using Finite State Transducers (FST) and parsing using context-free grammar and different parsing approaches.
CO3
Develop the Naïve Bayes classifier and sentiment analysis for NLP tasks such

as text classification.
CO4
Apply concepts of information retrieval, lexical semantics, lexical dictionaries (WordNet), computational semantics, and distributional word similarity.
CO5
To compare the use of different statistical approaches for different types of NLP applications

CIE ASSESSMENT:
Theory for 50 Marks
Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)
Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks
Laboratory- 50 Marks
Weekly Evaluation 30 Marks
Weekly evaluation will be conducted for every experiment. Marks of each evaluation includes Weekly Attendance + Experiment conduction along with Record / Observation + Weekly viva for all the experiments. The total of all these evaluated marks are added and the total marks will be scaled to 30 marks. (A)
Two CIE for 20 Marks each and take the average for 20 Marks (B)
Final CIE Marks will be calculated as A+B for 50 marks
For IPCC Final CIE Marks will be calculated as Average of CIE and Lab CIE for 50 marks.

SEE ASSESSMENT:THEORY – 100 MARKS
The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50 (A)

SEE Laboratory Examination (50 Marks)
The laboratory SEE is also evaluated for 50 marks, distributed as follows:
Experiment Conduction with Results: 40 marks
Viva Voce: 10 marks
Total 50 marks (B)

The score for the SEE is A+B of total 100 marks
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO MAPPING

CO/ PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
CO1	3	2	2	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-

SEMESTER VII		
CRYPTOGRAPHY AND NETWORK SECURITY		
Course Code:	**MVJ22CG73**	**CIE Marks: 50**
L: T:P:S	**4:0:0:0**	**SEE Marks: 50**
Credits:	**4**	**Total :100**
Hours:	**50 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

- **Understanding** basic principles of classical encryption and number theory.
- **Identifying** the security properties of hash functions and MACs.
- **Identify** and mitigate common threats to email and web security.
- **classifying** the principles and practices of authentication, firewall design, and intrusion detection.
- **Executing** principles of classical encryption and number theory to solve cryptographic problems.

Module-1	
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-Modulararithmetic-Euclid"salgorithm-Finitefields-PolynomialArithmetic–Prime numbers- Fermat's and Euler's theorem- Testing for primality-The Chinese remainder theorem-Discrete algorithms. **Applications:** Developing cryptographic algorithms	8Hrs
Module-2	
BLOCKCIPHERS&PUBLICKEY CRYPTOGRAPHY: Data Encryption Standard-Block cipher principles- block cipher modes of operation-Advanced Encryption Standard (AES)-Blowfish- RC5 algorithm. Public key cryptography: Principlesofpublickeycryptosystems-TheRSAalgorithm-Keymanagement-DiffieHellmanKey exchange- Elliptic curve arithmetic-Elliptic curve cryptography.	8 hrs
Module-3	
HASH FUNCTIONS ANDDIGITAL 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 :**Cyberforensic	8 hrs
Module-4	
SECURITY PRACTICE& SYSTEMSECURITY: Authentication applications–Kerberos–X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology-TypesofFirewalls-	8 hrs

Firewalldesigns-SETforE-CommerceTransactions.Intruder–Intrusion detection system – Virus and related threats – Countermeasures. **Applications:** Antivirus/Malware detecting software	
Module-5	
E-MAIL,IP&WEBSECURITY: E-mail Security: Security Services for E-mail-attacks possible through E-mail- establishing keys privacy-authenticationofthesource-MessageIntegrity-Non-repudiation-PrettyGood Privacy- S/MIME. IP Security: 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	8 hrs

Textbooks:

1.WilliamStallings, Cryptography and NetworkSecurity,6thEdition,PearsonEducation,March2013
2.CharlieKaufman, RadiaPerlmanandMikeSpeciner,"NetworkSecurity",PrenticeHallofIndia, 2002
3.BehrouzA.Ferouzan,"Cryptography&NetworkSecurity",TataMcGrawHill,2007
4.ManYoungRhee,"Internet Security: Cryptographic Principles", " Algorithms and Protocols", Wiley Publications, 2003
5.CharlesPfleeger,"SecurityinComputing",4thEdition,PrenticeHallofIndia,2006
6.UlysessBlack,"InternetSecurityProtocols",PearsonEducationAsia,2000

Reference Books :

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyay, Mc-GrawHill, 3rd Edition, 2015
2. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition
3. Cyber Law simplified- Vivek Sood, Mc-GrawHill, 11th reprint , 2013 4. Cyber security and Cyber Laws, Alfred Basta, Nadine Basta, Mary brown, ravindra kumar, Cengage learning

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

CO1 : Understand Classical Encryption Methods and Number Theory Concepts for Cryptographic Problem-Solving

CO2 : Demonstrate the process of constructing secure cryptographic protocols using mathematical rigor, ensuring confidentiality, integrity, and authentication in secure communication systems.

CO3: Analyze the structural integrity, cryptographic strength, and real-world applications of hash functions and message authentication codes (MD5, SHA, HMAC, CMAC) by evaluating their effectiveness in securing data transmission

CO4 :Assess the effectiveness of PGP and S/MIME for secure email communication, focusing on authentication, encryption, and risk mitigation strategies for enterprise security.

CO5 : Implement quantum-resistant cryptographic techniques and post-quantum algorithms to future-proof security measures against evolving computational threats.
CIE ASSESSMENT: Three CIE Will be conducted for 50 marks each and average of three will be taken (A) Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B) Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C) Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks
SEE ASSESSMENT: The question paper consists of two parts, A and B Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively. Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module. The SEE Theory marks of 100 will be scaled down to 50. The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO MAPPING

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

SEMESTER VII		
VIRTUAL REALITYAND AUGMENTED REALITY		
Course Code:	**MVJ22CG741**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Module-1	
Introduction toAugmented-Virtual and MixedReality,Taxonomy,technologyandfeaturesofaugmented reality,differencebetweenAR,VRandMR,ChallengeswithAR,ARsystemsand functionality ,Augmented reality methods, visualization techniques for augmented reality. **VR systems:** VRasadiscipline, Basicfeature of VRsystems, Architecture of VRsystems .**VRinput hardware**: trackingsystems,motioncapturesystems,datagloves.**VRoutputhardware**:visualdisplays	8 Hrs
Module-2	
Computer Graphics and Geometric Modelling-The Virtual world space, positioning the virtual observer, th perspective projection, human vision, stereo perspective projection, Colour theory, Conversion From 2D to 3D space curves,3Dboundaryrepresentation, Simple3Dmodelling,3Dclipping, Illumination Models Reflection models, shading algorithms, **Geometrical Transformations:** Introduction, Frames of reference Modelling transformations, Instances, Picking, Flying, Collision detection.	8 hrs
Module-3	
Input/Output Devices: Input (Tracker, Sensor, Digital Gloves, Movement Capture, Video based Input, 3D Menus & 3D Scanner), Output (Visual/Auditory/Haptic Devices) **Generic VR system**: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system. **Physical Simulation**: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions projectiles, simple pendulum, springs, Flight dynamics of an aircraft.	8 hrs
Module-4	
Augmented Reality (AR): Taxonomy , Technology and Features of Augmented Reality , ARVsVR Challenges with AR, AR systems and functionality ,Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments ,Evaluating ARsystemsD	8 hrs

Module-5	
Development Tools and Frameworks Human factors: Introduction, theeye, theear, thesomaticsenses**.** **Hardware**:Introduction,sensorhardware,Head-coupleddisplays,AcousticHardware-IntegratedVRsystems. **Software**: Introduction, Modelling virtual world, Physicals imulation, VRtoolkits	8 hrs

CIE ASSESSMENT:
Continuous Internal Evaluation (CIE):
Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:
Semester End Examination (SEE):
The question paper consists of two parts, A and B
Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.
Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.
The final score for the course in the ratio of 50:50 of CIE and SEE Marks

Courseoutcomes:	
CO1	LearnthefundamentalComputerVision,ComputerGraphicsandHuman-Computer interaction Techniques related to VR/AR
CO2	Review the Geometric Modeling Techniques &Review the Virtual Environment
CO3	Discuss and Examine VR/ARTechnologies
CO4	Use of various types of Hardware and Software in Virtual Reality systems
CO5	SimulateandApplyVirtual/AugmentedRealitytovarietiesofApplications

Textbooks	
1	[1].Coiffet,P.,Burdea,G.C.,(2003),"VirtualRealityTechnology,"Wiley-IEEEPress,ISBN: 9780471360896
2	[2].Schmalstieg,D.,Höllerer,T.,(2016),"AugmentedReality:Principles&Practice," Pearson,ISBN: 9789332578494
3	[1].Norman,K.,Kirakowski,J.,(2018),"WileyHandbookofHumanComputer Interaction,"Wiley- Blackwell, ISBN: 9781118976135
4	2].LaViolaJr.,J.J.,Kruijff,E.,McMahan,R.P.,Bowman,D.A.,Poupyrev,I.,(2017), "3DUser Interfaces: Theory and Practice," Pearson, ISBN: 9780134034324
5	[3].Fowler,A.,(2019),"BeginningiOSARGameDevelopment:DevelopingAugmentedReality Apps with Unity and C#," Apress, ISBN: 9781484246672
6	[4].Hassanien,A.E.,Gupta,D.,Khanna,A.,Slowik,A.,(2022),"VirtualandAugmentedRealityfor Automobile Industry: Innovation Vision and Applications," Springer, ISBN: 9783030941017

Reference Books

1. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.

2. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005.

3. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005.

CO-PO/PSOMapping

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

SEMESTER VII		
MULTIMEDIA DATABASE SYSTEM		
Course Code:	**MVJ22CG742**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:
1.To learn the fundamentals database system.
2.To learn the fundamentals of multimedia.
3. To Learn about multidimensional data structures within database systems.
4. To learn about text document databases.
5. To learn about audio/video databases.

Module-1	
BASICS OF DATABASE MANAGEMENT SYSTEMS :Databa[1]seManagementSystems-Relationa Model– SQL,FunctionalDependencies-NormalForms– MultivaluedDependencies,JoinDependencies – Examples - An introduction to Object-oriented Databases	8hrs
Module-2	
MULTIDIMENSIONALDATASTRUCTURES MultidimensionalDataStructures:k-dTrees-PointQuadtrees-TheMX-Quadtree-R-Trees– comparison of DifferentData Structures	8 hrs
Module-3	
TEXT/DOCUMENTDATABASES Text/DocumentDatabases-PrecisionandRecall-StopLists-WordStemsandFrequencyTables-Laten SemanticIndexing-TV-Trees-OtherRetrievalTechniquesImageDatabases-RawImages-Compressed Image Representations - Similarity-Based Retrieval - Alternative Image DB Paradigms - Represent in ImageDBs with Relations- Representing Image DBs with R-Trees- Retrieving Images By Spatial Layout -Implementations.	8 hrs
Module-4	
TEXT/DOCUMENTDATABASES Text/DocumentDatabases-PrecisionandRecall-StopLists-WordStemsandFrequencyTables-Laten SemanticIndexing-TV-Trees-OtherRetrievalTechniquesImageDatabases-RawImages-Compressed Image Representations - Similarity-Based Retrieval - Alternative Image DB Paradigms - Represent in ImageDBswithRelations- Representing ImageDBswithR-Trees- Retrieving Images By Spatial Layout - Implementations	8 hrs
Module-5	
AUDIOANDVIDEODATABASES Audio Databases - A General Model of Audio Data - Capturing Audio Content through Discrete Transformation - Indexing	8 hrs

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Audio Data. Video Databases - Organizing Content of a Single Video Querying Content of Video Libraries - Video Segmentation	

Textbooks:

B.`Prabhakaran',"Multimediadatabasemanagementsystems"Departmentofcomputer science and engineering , IIT Madras.
KingsleyC.Nwosu(Editor),B.Thuraisingham(Editor),P.BruceBerra(Editor)
Principles of multimedia database systems |v.s.subramanian|elsevier

CIE ASSESSMENT:

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks
Semester End Examination (SEE):
The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
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CO-PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	**3**	**3**	**1**	**2**	**2**						
CO2	**3**	**3**		**2**	**2**						
CO3	**3**	**3**	**2**	**2**	**3**						
CO4	**3**	**2**	**3**	**2**	**3**						
CO5	**3**	**3**	**3**	**3**	**3**						

SEMESTER VII		
DEEP LEARNING		
Course Code:	**MVJ22CG743**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: The students will be able to
Learn feed forward deep networks
Understand convolutional networks and sequence modelling
Study probabilistic models and auto encoders
Expose the students to various deep generative models
Study the various applications of deep learning

Module-1	
DEEP NETWORKS: Machine Learning Basics: Learning Algorithms – Supervised and Unsupervised learning – Feed forward Deep networks – regularization – Optimization for training Deep models. Video link :http://www.deeplearning.net RBT Level L1,L2 , L3	8hrs
Module-2	
CONVOLUTIONAL NETWORKS AND SEQUENCE MODELLING : Convolutional Networks – Convolution operation – Motivation Pooling – Basic Convolution function – Algorithms – Recurrent and recursive nets : Recurrent neural networks – Bidirectional RNN – Recursive Neural networks – Auto regressive networks – Long term dependencies – Temporal dependencies – Approximate search Video link :www.cs.toronto.edu/~fritz/absps/imagenet.pdf RBT Level L2 , L3	8 hrs
Module-3	
PROBABILISTIC MODELS AND AUTO ENCODERS : Structured Probabilistic models : Challenges of unstructured modelling – using graphs to describe model structure – Learning about dependencies – inference – Deep learning approach – Monte carlo models – Linear Factor models and Auto encoders Video link :https://www.youtube.com/watch?v=wPz3MPl5jvY	8 hrs

RBT Level L2,L3 , L4	
Module-4	
DEEP GENERATIVE MODELS : Restricted Boltzmann Machines – Deep Belief networks – Deep Boltzmann machine – Convolutional Boltzmann machine Video link :https://www.youtube.com/watch?v=W3_yaf3HvHU RBT Level L3,L4 , L6	8 hrs
Module-5	
APPLICATIONS: Speech, Audio and Music processing – Language modelling and Natural language processing – information retrieval – object recognition and computer vision – Multi modal and multi task learning Videolink: http://www.deeplearning.net RBT Level L4,L5 ,L6	8 hrs
Textbooks: 1 Yoshua Bengio and Ian Goodfellow and Aaron Courville, & quot ;Deep Learning & quot;, MIT Press, 2015 2 Li Deng, Dong Yu, &quot ;Deep Learning: Methods and Applications & quot;, now publishers, 2014 Reference Books : 1. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville 2. "Understanding Deep Learning" by Shai Ben-David and Shai Shalev-Shwartz	
Course outcomes: At the end of the course, the students will be able to CO1 Use feed forward deep networks CO2 Apply convolutional networks and sequence modelling for problem solving CO3 Use probabilistic models and auto encoders CO4 Use deep generative models for problem solving CO5 Apply the deep learning techniques	
CIE ASSESSMENT: Three CIE Will be conducted for 50 marks each and average of three will be taken (A) Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B) Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C) Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks	
SEE ASSESSMENT: The question paper consists of two parts, A and B Part A: consists of 10 questions of 2 marks each. It is designed to cover the	

entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	1						1		1	2
CO2	3	2	2	1						2	2
CO3	2	3	1	3		1		1		1	2
CO4	3	2	2	1		2				2	2
CO5	2	2	3	3		1		1	2		2

SEMESTER VII		
ANIMATION PRINCIPLES AND DESIGN		
Course Code:	**MVJ22CG744**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3Hrs.**

Course Objectives: This course will enable the students to:

- Identify the fundamental animation features and functions
- Produce key drawings for animation
- Create2D digital animation
- Developvectorgraphicsand2Danimations, making use of various tools and animation techniques provided by Flash
- Develop animation using action scrip to flash

Module-1	
INTRODUCTION OFANIMATION: **History of Animation**: Stop Motion Photo Animation, Zoetrope,Thaumatrope,Celand Paper Animation, early Disney's Cel Animation Processes. **TypesofAnimation**:CelAnimation ,StopMotion Animation, Computer Animation,2-DAnimation,3- D Animation. 4. **SkillsforanAnimationArtist**:VisualandcreativedevelopmentofanArtist,importanceofobservation withminutedetails,efficiencytodrawgestures,facialexpressions,goodlistener,hardworkandpatience, creative and innovative.	8hrs
Module-2	
BASICPRINCIPLESOFANIMATION: Illusion ofLife, straight action and poseto pose Timing, Exaggeration, Drama and Psychological Effect, Fade in and Fade out, Squash and Stretch, Anticipation, staging, follow through and overlapping action, Arcs, Solid Drawing ,Appeal, slow in and slow out, Secondary Action	8 hrs
Module-3	
VARIOUSTERMS: AnimationDrawings/Cels,RoughDrawings,Cleanups,Colorreferencedrawings,Layout,ModelSheet, Key Drawings and in Betweens, Master Background, Concept Piece, Character drawing , Story Board	8 hrs
Module-4	
Level Design: Introduction to the tools and concepts used to create levels for games and simulations. Incorporates level design, architecture theory,	8 hrs

concepts of critical path and flow, balancing, playtesting, and storytelling. Includes utilization of toolsets from industry titles	
Module-5	
Introduction to 2D Game Art :Introduce industry software tools used in the creation of2Dgameand simulation art. Includes the concepts, commands and interfaces of industry standard raster and vector graphics. Learn to edit and manipulate existing art. **Introductionto3DGameModeling**:Introduce industrysoftwaretoolsusedincreating3Dmodels for gamesandsimulations.Includestheconcepts,commands,andinterfacesofthetool .Includestechniques for building, texturing, and lighting a game level for real-time processing.	8 hrs

Textbooks:

1.The Complete Animation Course by Chris Patmore.
Publisher: Baron's Educational Series, New York.

2.Animation Unleashed by Ellen Bessen.
Publisher: Michael Wiese Productions, 2008, U.S.A.

3.The Animator's Survival Kit by Richard Williams.
Publisher: Farrar, Straus & Giroux, U.S.A.

4.Anatomy of the Artist by Thompson & Thompson.

5.The Encyclopedia of Animation Techniques by Richard Taylor.
Publisher: 1996, India.

Reference Books :

Character Animation Fundamentals – Steve Roberts
The Art of 3D Computer Animation and Effects – Isaac V. Kerlow

Course Outcomes (CO):

- **CO1:** Identify the fundamental animation features and functions.
- **CO2:** Produce key drawings for animation.
- **CO3:** Create 2D digital animation.
- **CO4:** Develop vector graphics and 2D animations using various tools and animation techniques provided by Flash.
- **CO5:** Develop animation using ActionScript in Flash.

CIE ASSESSMENT:

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)
Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT: The question paper consists of two parts, A and B Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively. Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module. The SEE Theory marks of 100 will be scaled down to 50. The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	1	-	-	-	-	-	1	-	2	-
CO2	3	2	2	1	-	-	-	-	-	2	-
CO3	2	3	1	3	-	1	1	1	-	1	-
CO4	3	2	2	1	-	2	-	-	-	-	2
CO5	2	2	3	3	-	1	2	1	2	-	1

SEMESTER VII		
INTRODUCTION TO DBMS		
Course Code:	**MVJ22CG751**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 2 Hrs.**

Course Objectives: This course will enable the students to:

· To learn the fundamentals of data models.

· To conceptualize and depict a database system using ER diagram.

· To make a study of SQL and relational database design.

· To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.

· To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.

Module-1	
INTRODUCTIONAND CONCEPTUALMODELING: Introduction to File and Database systems- Database system structure – Data Models – Introduction to Network and Hierarchical Models – ER model – Relational Model – Relational Algebra.	
Module-2	
RELATIONAL MODEL: SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design – Functional dependencies and Normalization for Relational Databases (up to BCNF).	8 hrs
Module-3	
NON-RELATIONAL MODEL: Introduction to NOSQL Systems ,The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases	8 hrs
Module-4	
DATA STORAGE AND QUERY PROCESSING: Record storage and Primary file organization- Secondary storage Devices- Operations on Files Heap File- Sorted Files- Hashing Techniques – Index Structure for files –Different types of Indexes- B-Tree - B+ Tree – Query Processing.	8 hrs
Module-5	
TRANSACTION MANAGEMENT: Transaction management -Transaction Processing – Introduction- Need for Concurrency control- Desirable properties of Transaction- Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Time stamp-based concurrency control – Recovery Techniques – Concepts- Immediate Update- Deferred Update - Shadow Paging	8 hrs
Textbooks:	

1 Abraham Silberschatz, Henry F. Korth and S. Sudarshan- "Database System Concepts", Seventh Edition, McGraw-Hill, 2022
REFERENCE BOOKS: 1. Fundamentals of Database Systems, Elmasri Navathe Pearson Education. 2. An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson, Eight Edition for UNIT III.

Course outcomes: At the end of the course, the students will be able to
CO1 To learn the fundamentals of data models
CO2 To conceptualize and depict a database system using ER diagram.
CO3 To make a study of SQL and relational database design.
CO4 To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
CO5 To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure

CIE ASSESSMENT:
Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO/ PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
CO1	**3**	**2**	**2**	**1**	**2**						**1**
CO2	**3**		**2**	**2**	**2**						**1**
CO3	**3**	**1**	**2**	**1**	**3**						**1**
CO4	**3**	**2**	**2**	**2**	**3**						**2**
CO5	**3**	**2**	**3**	**1**	**3**						**1**

SEMESTER VII		
INTRODUCTION TO ALGORITHMS		
Course Code:	**MVJ22CG752**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:
1. Learn the basics Algorithms
2. Learn to write algorithms and its performance.
3. Learn the different functions of algorithms.
4. Understand the concept of recurrence algorithms
5. Understand probabilistic analysis..

Module-1	
Module 1: The Role of Algorithms in Computing: Algorithms, kinds of problems are solved by algorithms, Algorithms as a technology, Efficiency, Data structures, Technique, Hard problems Textbook 1: Chapter 1	8 Hrs
Module-2	
Module 2: Getting Started Insertion sort, Analyzing algorithms, Analysis of insertion sort, Worst-case and average-case analysis, Designing algorithms Textbook 1:Chapter 2,3	8 hrs
Module-3	
Module 3: Growth of Functions Growth of Functions, Asymptotic notation, Comparison of functions, Standard notations and common functions, Functional iteration Textbook 1: Chapter 4,5,6	8 hrs
Module-4	
Module 4: Recurrences The substitution method, The recursion-tree method, The master method, Proof of the master theorem, The proof for exact powers Textbook 1 Chapter 7,8,9	8 hrs
Module-5	
Module 5: Probabilistic Analysis and Randomized Algorithms The hiring problem, Indicator random variables, Randomized algorithms, Probabilistic analysis and further uses of indicator random variables Textbook 1: Chapter 10,11	8 hrs

Textbooks:
1 Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2 Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.
3 Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education).
4 Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson. Links: https://archive.nptel.a

Reference Books :

Algorithms" by Robert Sedgewick and Kevin Wayne

Course outcomes: At the end of the course, the students will be able to
CO1 Explain the basic algorithm and its characteristics
CO2 Understanding of sorting algorithm
CO3 Analysis of algorithm and performance
CO4 Illustrate Recurrence algorithms
CO5 Probablilistic Analysis and randomized algorithms.

CIE ASSESSMENT:
Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:
Semester End Examination (SEE):
The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO/ PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
CO1	**2**	**3**	**2**	**1**	**2**						
CO2	**2**	**2**	**2**	**2**	**2**						
CO3	**3**	**3**	**2**	**1**	**3**						
CO4	**2**	**2**	**2**	**3**	**3**						
CO5	**2**	**3**	**3**	**3**	**3**						

SEMESTER VII		
COMPUTER GRAPHICS		
Course Code:	**MVJ22CG753**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40 hours theory**	**SEE Duration: 2 Hrs.**

Course Objectives: This course will enable the students to:

- Understand concepts of Computer Graphics along with its applications.
- Explore mathematics for 2D and 3D graphics along with OpenGL APIs.
- Use computer graphics in animation and GUI design.
- Demonstrate geometric transformations and viewing on both 2D and 3D objects.
- Infer the representation of curves, surfaces, color, and illumination models.

Module-1	
Computer Graphics: Application of Computer Graphics. **OpenGL:** Introduction to OpenGL, coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL fill area functions, OpenGL Vertex arrays, Line drawing algorithm- Bresenham's. Textbook2:Chapter-1[1.1] Textbook1:Chapter-3[3.5],4[4.1-4.5,4.8,4.9],5[5.1]	8 Hrs
Module-2	
2D and 3D graphics with OpenGL: 2D Geometric Transformations: Basic 2D Geometric Transformations, matrix representations, homogeneous coordinates, OpenGL raster transformations, Transformation between 2D coordinate systems, OpenGL geometric transformation functions. **3D Geometric Transformations:**3D Translation, rotation, scaling, OpenGL geometric transformations functions.	8 hrs
Module-3	
Interactive Input Methods and Graphical User Interfaces: Graphical Input Data , Logical Classification of Input Devices, Input Functions for Graphical Data, OpenGL Interactive Input- Device Functions, OpenGL Menu Functions, Designing a Graphical User Interface. **Computer Animation:** Design of Animation Sequences, Traditional Animation Techniques ,General Computer- Animation Functions,	8 hrs

Computer-Animation Languages, Character Animation, Periodic Motions, OpenGL Animation Procedures. Textbook1:Chapter-18[18.1-18.4,18.7,18.8],11[11.2-11.5,11.8-11.10]	
Module-4	
Clipping: Clipping window, normalization and viewport transformations, clipping algorithms, 2D point clipping, 2D line clipping algorithms: Cohen–Sutherland line clipping. **Color Models:** Properties of light, color models, RGB and CMY color models. **Illumination Models:** Light sources, basic illumination models – ambient light, diffuse reflection, specular reflection, and Phong model. **Textbook 1:** Chapter 7 [7.2, 7.3, 7.5–7.7], Chapter 15 [15.1, 15.3], Chapter 17 [17.1, 17.2, 17.4, 17.6]	8 hrs
Module-5	
Input & interaction, Curves and Computer Animation: Input and Interaction: Input devices, clients and servers, Display Lists, Display Lists and Modeling, Programming Event Driven Input, Menus Picking, Building Interactive Models, Animating Interactive programs, Design of Interactive programs, Logic operations .Curved surfaces, quadric surfaces, OpenGL Quadric-Surface and Cubic-Surface Functions, Bezier Spline Curves, Bezier surfaces, OpenGL curve functions. Corresponding openGL functions. Text-1:Chapter :8-3 to 8-6 (Excluding 8-5),8-9,8-10,8-11,3-8,8-18,13-11,3-2,13-3,13- 4,13-10 Text-2:Chapter 3: 3-1 to 3.11: Input& interaction	8 hrs
Textbooks: 1.DonaldHearn&PaulineBaker:ComputerGraphicswithOpenGLVersion,3rd/4th Edition, Pearson Education,2011 2..EdwardAngel:InteractiveComputerGraphics-ATopDownapproachwithOpenGL,5th edition. Pearson Education, 2008 3.JamesDFoley,AndriesVanDam,StevenKFeiner,JohnFHugesComputergraphicswithOpenG L: pearson education 4.Xiang,Plastock:ComputerGraphics,sham“soutlineseries,2ndedition, TMG. 5.KelvinSung,PeterShirley,stevenBaer:InteractiveComputerGraphics,conceptsand applications, Cengage Learning 6.MMRaikar&ShreedharaKSComputerGraphicsusingOpenGL, Cengage publication Reference Books	

Computer Graphics: Principles and Practice" by Foley, van Dam, Feiner, and Hughes, and "Computer Graphics" by Zhigang Xiang and Roy Plastock (Schaum's Outline).
Course outcome CO1: Understand and implement coordinate reference frames in OpenGL. CO2: Implement basic 2D geometric transformations using matrix representations and homogeneous coordinates. CO3: Design and develop user-friendly graphical user interfaces. CO4: Understand and use different color models and properties of lighting in graphics. CO5: Apply basic illumination models to create realistic lighting in graphics.
CIE ASSESSMENT: Three CIE Will be conducted for 50 marks each and average of three will be taken (A) Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B) Two Assignments for 10 marks each and the sum of both the assignments will be taken for 20 Marks (C) Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks
SEE ASSESSMENT: The question paper consists of two parts, A and B Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively. Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module. The SEE Theory marks of 100 will be scaled down to 50. The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO MAPPING

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1			1	-	-	-	-	-	1	-	2
CO2			2	2	1	-	-	-	-	-	2
CO3			3	1	3	-	1	1	1	-	1
CO4			2	2	1	-	2	-	-	-	-
CO5			2	3	3	-	1	2	1	2	-

SEMESTER VII		
CYBERSECURITY		
Course Code:	**MVJ22CG754**	**CIE Marks: 50**
L: T:P:S	**3:0:0:0**	**SEE Marks: 50**
Credits:	**3**	**Total :100**
Hours:	**40**	**SEE Duration: 3 Hrs.**

Course Objectives: This course will enable the students to:

1. Understanding of cybercrime, its definition, types, and global perspectives, as well as the legal frameworks and regulations in India and around the world, to prepare them to address cybercrime challenges effectively.
2. Understand the methods and tactics used by cybercriminals to plan and execute cyber offenses, including social engineering, cyber stalking, and botnet attacks, to enable students to develop effective strategies for prevention and mitigation.
3. Analyze various tools and methods used by cybercriminals to perpetrate cybercrimes, including proxy servers, anonymizers, malware, and other malicious techniques, to enable students to detect, prevent, and respond to cyber threats effectively.
4. Analyze the techniques and methods used by cybercriminals to carry out phishing attacks and identity theft, and to provide students with the knowledge and skills to develop effective countermeasures and prevention strategies.
5. Understand the principles and practices of cyber forensics ,including the collection, analysis ,and preservation of digital evidence, to enable them to conduct effective digital investigations and prosecutions.

Module-1	
Introduction to Cybercrime: **Cybercrime :**Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives Textbook:1Chapter1(1.1to1.5,1.7-1.9)	8 Hrs
Module-2	
Cyber Offenses: **How Criminals Plan Them:** Introduction ,How criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercafe & cybercrimes. **Botnets:**Thefuelforcybercrime,AttackVector.Textbook:1Chapter2(2.1to2.7)	8 hrs
Module-3	
Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers, Phishing, Password	8 hrs

Cracking ,KeyLoggers and Spywares,VirusandWorms,TrozenHorsesandBackdoors,Steganography,DoS andDDOSAttacks,Attackson Wireless networks. Textbook:1Chapter4(4.1to4.9,4.12)	
Module-4	
Phishing and Identity Theft : Introduction, methods of phishing, phishing, phishing techniques, spear phishing ,types of phishing scams, phishing toolkits and spyphishing , countermeasures, IdentityTheft Textbook:1Chapter5(5.1.to5.3)	8 hrs
Module-5	
UnderstandingComputerForensics: Introduction,HistoricalBackground of Cyberforensics, Digital forensics Science ,Need for Computer forensics ,CyberForensics and Digital Evidence, DigitalForensic Life cycle, Chain of Custody Concepts, network forensics. Textbook:1Chapter7(7.1.to7.5,7.7to7.9)	8 hrs

Textbooks:

1.Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics AndLegalPerspectives",WileyIndiaPvtLtd,ISBN:978-81-265-21791,2011,FirstEdition(Reprinted 2018)

Reference Books :

"Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives" by Sunit Belapure and Nina Godbole, and "Cryptography and Network Security Principles and Practice" by William Stallings

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

CO1: Comprehensive understanding of cybercrime and its related legal frameworks, enabling students to effectively identify, analyze, and respond to cybercrime challenges in India and globally.

CO2: Analyze and anticipate cybercriminal tactics, and design effective strategies to prevent and mitigate cyber offenses, including social engineering, cyberstalking, and botnet attacks.

CO3: Identify, detect, and counter various cybercrime tools and methods, including proxy servers, anonymizers, and malware, to effectively prevent and respond to cyber threats.

CO4: Recognize and resist phishing attacks, and design effective countermeasures to prevent identity theft and protect sensitive information from cybercriminals.

CO5: Analyze and preserve digital evidence, and apply cyber forensic principles and practices to conduct thorough digital investigations and support successful prosecutions

CIE ASSESSMENT:

Three CIE Will be conducted for 50 marks each and average of three will be taken (A)
Three Quizzes will be conducted along with CIE for 10 Marks Each. Sum of three quizzes will be considered for 30 marks (B)
Two Assignments for 10 marks each and the sum of both the assignments will be taken

for 20 Marks (C)

Final CIE Marks will be calculated as (A+B+C)/3 for 50 marks

SEE ASSESSMENT:

The question paper consists of two parts, A and B

Part A: consists of 10 questions of 2 marks each. It is designed to cover the entire syllabus comprehensively.

Part B: The question paper will have 10 questions. Each question is set for 16 marks. There will be 2 questions from each module, with a maximum of 2 subdivisions. Students have to answer any 5 questions choosing one full question from each module.
The SEE Theory marks of 100 will be scaled down to 50.

The final score for the course in the ratio of 50:50 of CIE and SEE Marks

CO-PO MAPPING

CO/ PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
CO1	3	1	-	-	-	-	-	1	-	2	-
CO2	3	2	2	1	-	-	-	-	-	2	-
CO3	2	3	1	3	-	1	1	1	-	1	-
CO4	3	2	2	1	-	2	-	-	-	-	2
CO5	2	2	3	3	-	1	2	1	2	-	1