MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

# Rajarajeswari College of Engineering

(An Autonomous Institution Under Visvesvaraya Technological University, Belagavi)
#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru - 560074


# Master of Computer Applications Scheme

# 2024-25

MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

# Rajarajeswari College of Engineering

(An Autonomous Institution Under Visvesvaraya Technological University, Belagavi)

## Master of Computer Applications

Scheme of Teaching and Examinations – 2024

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

**(Effective from the Academic Year 2024-25)**

**Sem: I**

| S. No | Course Category and Course Code | | Course Title | TD / PSB | Teaching Hours / Week | | | | Examination | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture | Practical / Seminar | Tutorial / SDA | Credits | Duration in Hours | CIE Marks | SEE Marks | Total Marks |
| | | | | | L | P | T/S | | | | | |
| 1. | BSC | P24MCA101 | Mathematical Foundation for Computer Applications | MCA | 3 | 0 | 2 | 4 | 3 | 50 | 50 | 100 |
| 2. | IPCC | P24MCA102 | Operating Systems with Linux Programming | MCA | 3 | 2 | 0 | 4 | 3 | 50 | 50 | 100 |
| 3. | PCC | P24MCA103 | Data Structures and Algorithms | MCA | 3 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 4. | PCC | P24MCA104 | Software Engineering | MCA | 3 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 5. | PCC | P24MCA105 | Computer Networks | MCA | 3 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |
| 6. | PCCL | P24MCL106 | Data Structures and Algorithms Lab | MCA | 0 | 2 | 0 | 1 | 3 | 50 | 50 | 100 |
| 7. | PCCL | P24MCL107 | Computer Networks Lab | MCA | 0 | 2 | 0 | 1 | 3 | 50 | 50 | 100 |
| 8. | NCMC | P24MCA108 | Research Methodology and IPR | MCA | Online courses (NPTEL) | | | PP | | | | |
| 9. | Bridge Course NCMC | P24MCA109A / P24MCA109B | C Programming / Mathematics - I | MCA | 2 | 0 | 2 | PP | | | | |
| | | | | TOTAL | 17 | 6 | 4 | 19 | 21 | 350 | 350 | 700 |

Note: BSC-Basic Science Courses, PCC: Professional core. IPCC-Integrated Professional Core Courses, PCC: Professional Core Courses, PCCL-Professional Core Course lab ,NCMC- Non Credit Mandatory Course, L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities(Hours are for Interaction between faculty and students) P24MCA108- Research Methodology & IPR (Online) for the students who have not studied this course in the Undergraduate level. This course is not counted for vertical progression; Students have to qualify for the award of the master's degree.

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BSC: Basic Science Courses: Courses like Mathematics/ Science are the prerequisite courses that the concerned engineering stream board of Studies will decide.
PCC: Professional Core Course: Courses related to the stream of Computer Applications, which will have both CIE and SEE components, students have to qualify in the course for the award of the degree.
Integrated Professional Core Course (IPCC): Refers to a Professional Theory Core Course Integrated with practical of the same course. The IPCC's theory part shall be evaluated by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.
Project Based Learning Course (PCC): Project Based Learning course is a professional core Course only Students have to complete a project out of learning from the course and SEE will be viva voce on project work. PCCL: Professional Core Course Laboratory: Practical courses whose CIE will be evaluated by the class teacher and SEE will be evaluated by the two examiners.
Skill development activities: Under Skill development activities in a concerning course, the students should
1. Interact with industry (small, medium, and large).
2. Involve in research/testing/projects to understand their problems and help creative and innovative methods to solve the problem.
3. Involve in case studies and field visits/ fieldwork.
4. Accustom to the use of standards/codes etc., to narrow the gap between academia and industry.
5. Handle advanced instruments to enhance technical talent.
6. Gain confidence in the modeling of systems and algorithms for transient and steady-state operations, thermal study, etc.
7. Work on different software/s (tools) to simulate, analyze and authenticate the output to interpret and conclude. All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc. Students and the course instructor/s are to be involved either individually or in groups to interact together to enhance the learning and application skills of the study they have undertaken. The students with the help of the course teacher can take up relevant technical –activities that will enhance their skills. The prepared report shall be evaluated for CIE marks.

P24MCA108- Research Methodology and IPR- None Credit Mandatory Course (NCMC) if students have not studied this course in their undergraduate program then he /she has to take this course at NPTEL and to qualify for this course is compulsory before completion of the minimum duration of the program (Two years), however, this course will not be considered for vertical progression.

Bridge Course: Non-Credit Mandatory Course P24MCA109B-Mathematics-I: Students who have not taken Mathematics at the 10+2 or degree level are required to study and pass this course in the 1st semester. P24MCA109A- C Programming: Students who have not taken Computer Subjects at the 10+2 or degree level are required to study and pass this course in the 1st semester. However, this course/subject will not be considered for vertical progression.

Dean Academics
Rajarajeswari College of Engineering
Bengaluru - 560 074.

Principal
Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Kambohalli Cross, Bengaluru-74

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# Master of Computer Applications Syllabus

## 2024-25

## I Semester

| **Master of Computer Applications** | | | | | |
|---|---|---|---|---|---|
| **Semester I** | | | | | |
| **Mathematical Foundation for Computer Applications**<br>**Theory** | | | | | |
| Course Code | : | P24MCA101 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:2:0 | SEE | : | 50 Marks |
| Total Hours | : | 42 | Total | : | 100 Marks |
| Credits | | 4 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1 | To introduce the concepts of sets, functions and perform the operations associated with sets and functions. |
| 2 | Define and differentiate between discrete and continuous random variables, and understand their properties and examples. |
| 3 | To introduce the concepts of mathematical logic. |
| 4 | To introduce the concepts, relations and perform the operations |
| 5 | To introduce Graphs and use Graph Theory for solving problems. |

| **Module - 1** | **No. of Hrs** |
|---|---|
| Basic Structures: Sets and subsets, Operations of Sets: Principle of Inclusion, Exclusion and Pigeonhole principle, Functions and Matrices: Eigenvalues and Eigenvectors. | 09 |
| **Module - 2** | **No. of Hrs** |
| Random variable and Probability distribution: Concept of random variable, discrete probability distributions, continuous probability distributions, Mean, variance and Co-variance and co-variance of random variables. Binomial and normal distribution, Exponential and normal distribution with mean and variables and problems | 09 |
| **Module - 3** | **No. of Hrs** |
| Mathematical Logic: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences Predicates and Quantifiers, Nested Quantifiers, Rules of Inference Introduction to Proofs. | 08 |
| **Module - 4** | **No. of Hrs** |
| Relations : Relations and Their Properties, n-ary Relations and Their Application, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings | 08 |
| **Module - 5** | **No. of Hrs** |
| Graphs: Graphs and Graphs models, Graph Terminology and special types of graphs, Representing graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path problems, Planar Graphs, Graph Coloring. | 08 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Apply the fundamentals of set theory and matrices for the given problem. |
| CO2 | Apply the types of distribution; evaluate the mean and variance for the given case study/problem. |
| CO3 | Solve the given problem by applying the Mathematical logic concepts. |
| CO4 | Model the given problem by applying the concepts of graph theory. |
| CO5 | Identify and list the different applications of discrete mathematical concepts in computer Applications |

| **Text Books** | |
|---|---|
| 1 | Kenneth H Rosen, “Discrete Mathematics and its Applications”, McGraw Hill publications, 7th edition. |
| 2 | Wolpole Myers Ye “Probability and Statistics for engineers and Scientist” Pearson Education, 8th edition. |
| **Reference Text Books** | |
| 1 | Richard A Johnson and C.B Gupta “Probability and statistics for engineers” Pearson Education. |
| 2 | J.K Sharma “Discrete Mathematics”, Mac Millian Publishers India, 3rd edition,2011. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. https://onlinecourses.nptel.ac.in/noc20_cs82/preview<br>2. https://www.nitt.edu/home/academics/departments/cse/programmes /mtech/curriculum/semester_2/mathematical_foundations_for_com/ |

| **RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)** | | |
|---|---|---|
| Sl. No | Components | Marks |
| 1 | **INTERNAL TESTS**: Students will be evaluated in test, descriptive questions with different complexity levels (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating).<br><br>THREE tests will be conducted. Each test will be evaluated for 50 Marks. Finally Test Marks Will Be Reduced To 30 Marks. | 30 |
| 2 | Assignment/Quiz/Seminar/Group Discussion/Case Studies/Practical orientation on Design Thinking/ problem Solving Exercises/Presentation of Research work/hack-a-thon/Code-a-thon conducted by reputed organizations/ any other. | Any two 20 |
| | MAXIMUM MARKS | 50 |

## Semester End Examination (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part –A and Part – B
3. **Part - A** should contain minimum **Two or Four** quiz questions from each module of 02 marks / 01 mark each. **Part - A is Compulsory** and carries 20 Marks.
4. **Part - B** contains two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. Question papers to be set as per the Blooms Taxonomy levels.

| **Rubrics for Semester End Examination (SEE)** | | |
|---|---|---|
| Q. No | CONTENTS | MARKS |
| | PART - A | |
| 1 | Two or Four Quiz questions from each module of 2 marks / 1 mark | 20 |
| | PART – B<br>(Minimum 3 subdivisions only) | |
| 2 or 3 | Module : 1 | 16 |
| 4 or 5 | Module : 2 | 16 |
| 6 or 7 | Module : 3 | 16 |
| 8 or 9 | Module : 4 | 16 |
| 10 or 11 | Module : 5 | 16 |
| | TOTAL | 100 |

**CO-PO Mapping**

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

| Master of Computer Applications | | | | | |
|---|---|---|---|---|---|
| **Semester I** | | | | | |
| **Operating Systems with LINUX Programming Integrated** | | | | | |
| Course Code | : | P24MCA102 | CIE | : | 50 Marks |
| Teaching Hours L:T:P | : | 3:0:2 | SEE | : | 50 Marks |
| Total Hours | : | 40 H L + 10H P | Total | : | 100 Marks |
| Credits | | 4 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1 | It provides the basics and essentials of operating system |
| 2 | It provides the concepts of Linux to solve computing problems |
| 3 | It provides advance shell programming concepts |
| 4 | It adds new coverage of interactive scripts using regular expressions in simple and advanced filters. |

| **Module - 1** | **No. of Hrs** |
|---|---|
| Introduction: operating system, history (1990s to 2000 and beyond), distributed computing, parallel computation. Process concepts: definition of process, process states-Life cycle of a process, process management- process state transitions, process control block(PCB), process operations , suspend and resume, context switching, Interrupts -Interrupt processing, interrupt classes, Inter process communication-signals, message passing. | 08 |
| **Module - 2** | **No. of Hrs** |
| Asynchronous concurrent processes: mutual exclusion- critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson's algorithm, software solutions to the mutual Exclusion Problem-, n-thread mutual exclusion- Lamports Bakery Algorithm. Semaphores – Mutual exclusion with Semaphores, thread synchronization with semaphores, counting semaphores, implementing semaphores. Concurrent programming: monitors, message passing. | 08 |
| **Module – 3** | **No. of Hrs** |
| Deadlock and indefinite postponement: Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra's Banker's algorithm, deadlock detection, deadlock recovery. | 08 |
| **Module - 4** | **No. of Hrs** |
| Job and processor scheduling: scheduling levels, scheduling objectives, scheduling criteria, preemptive vs non-preemptive scheduling, interval timer or interrupting clock, priorities, scheduling algorithms- FIFO scheduling, RR scheduling, quantum size, SJF scheduling, SRT scheduling, HRN scheduling, multilevel feedback queues, Fair share scheduling. | 08 |
| **Module - 5** | **No. of Hrs** |
| Real Memory organization and Management:: Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous vs non-contiguous memory allocation, single user contiguous memory allocation, fixed partition multiprogramming, variable partition multiprogramming, Memory swapping. Virtual Memory organization: virtual memory basic concepts, multilevel storage organization, block mapping, paging basic concepts, segmentation, Paging/segmentation systems. Virtual Memory Management: Demand Paging, Page replacement strategies. | 08 |

| **Course Outcomes: At the end of the course, the students will be able to** | |
|---|---|
| CO1 | Understand the basics and essentials of operating system. |
| CO2 | Apply the concepts of Linux to solve computing problems |
| CO3 | Implement advance shell programming concepts. |
| CO4 | Develop interactive scripts using regular expressions in simple and advanced filters. |
| CO5 | Analyze the different memory allocation strategies. |

| **Text Books** | |
|---|---|
| 1 | Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles – 10th Edition, John Wiley & Sons Inc., 2021. |
| 2 | EviNerneth, “Unix and Linux Handbook”, Pearson Education, Fifth Edition -2019 |
| **Reference Text Books** | |
| 1 | Eric Foster –Johnson, John C Welch, Micah Anderson, “Beginning Shell Scripting”, Wrox Publication, 2005 |
| 2 | Richard Peterson, “The Complete Reference- Linux”,Wiley Publication, Sixth Edition, 2017 . |
| 3 | Dhananjay M. Dhamdhere, “Operating Systems – A Concept – Based Approach”, Tata McGraw – Hill, 3rd Edition, 2017 |

| **Web links and Video lectures (e-Resources)** |
|---|
| https://onlinecourses.nptel.ac.in/noc21_cs72/preview |

| Sl.NO | Experiments |
|---|---|
| 1 | Write a shell script that takes a valid directory name as an argument and recursively discard all the subdirectories, find the maximum length of any file in that hierarchy and write its maximum value to the standard output. |
| 2 | Write a shell script that accepts a pathname and creates all the components in that pathname as directories. for example, if the script it named mpc, then the command mpc a/b/c/d should create directories a,a/b,a/b/c,a/b/c/d.. |
| 3 | Write a shell script that accepts two file names as arguments, check if the permissions for these files are identical and if the permissions are identical, output common permissions and otherwise output each file names followed by its permissions. |
| 4 | Write a shell script which accepts valid login names as arguments and print their corresponding home directories. if no arguments are specified, print a suitable error message |
| 5 | Create a script file called file properties that reads a filename entered and out its properties. |
| 6 | Write a shell script to implement terminal locking(similar to the lock command).It should prompt the user for a password. After accepting the password enter by the user, it must be prompt again for the matching password as conformation. And it the match occurs, it must lock the keyword until a matching password is enter again by the user. Note that the script must be written to disregard break, Ctrl-D. No time limit need be implemented for the lock duration. |
| 7 | Write a shell script that accepts one or more file name as arguments and convert all of them to uppercase provided they exists in current directory. |
| 8 | Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which the search is to begin. If the second argument is not present, the search is to begin in current working directory. In either case the starting directory as well as all its sub- directories at all levels must be searched. The script need not include any error checking. |
| 9 | Write a shell script that accepts as filename as argument and display its creation time if the file exists and if it does not send output error message |
| 10 | Write a shell script to display the calendar for current month with current date replaced by * or ** depending on whether the date has one or two digit. |
| 11 | Write a shell script to find a file/s that matches a pattern given as command line argument in the home directory, display the contents of the file and copy the file into the directory ~/mydir. |
| 12 | Write a shell script to list all the files in a directory whose file name is atleast 10 characters(Use expr command to check the length). |
| 13 | Write an awk script that accepts date argument in the form of dd- mm-yy and displays it in the form if month,day,year. The script should check the validity of the argument and in the case of error, display a suitable message. |
| 14 | Write an awk script to delete duplicated line from a text file. The order of the original lines must be remain unchanged. |

| **RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)** | | |
|---|---|---|
| **Sl. No** | **Components** | **Marks** |
| 1 | INTERNAL TESTS (Theory): Students will be evaluated in test, descriptive questions with different complexity levels (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating).<br>THREE tests will be conducted. Each test will be evaluated for 50 Marks. Finally Test Marks Will Be Reduced To 20 Marks.( Best of Two) | 20 |
| 2 | Assignment & Quiz | Any two<br>20 |
| 3 | Skill Development Activity | 20 |
| | Total | 60 |
| | Total 60 Marks, it will Scaled down to | 30 |
| 4 | INTERNAL TESTS (Practical):<br>On completion of every experiment/program in the laboratory, the students shall be | |

| | | |
|---|---|---|
| | evaluated and marks shall be awarded on the same day. The 10 marks are for conducting the experiment and preparation of the laboratory record, the other 10 marks shall be for the test conducted at the end of the semester.<br>The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments. Write- ups are added and scaled down to 10 marks.<br>The laboratory test at the end /after completion of all the experiments shall be conducted for 50 marks and scaled down to 10 marks. | 20 |
| | MAXIMUM MARKS | 50 |

## Semester End Examination (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part –A and Part – B
3. **Part - A** should contain minimum **Two or Four** quiz questions from each module of 02 marks / 01 mark each. **Part - A is Compulsory** and carries 20 Marks.
4. **Part - B** contains two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. Question papers to be set as per the Blooms Taxonomy levels.

| **Rubrics for Semester End Examination (SEE)** | | |
|---|---|---|
| Q. No | CONTENTS | MARKS |
| | PART - A | |
| 1 | Two or Four Quiz questions from each module of 2 marks / 1 mark | 20 |
| | PART – B<br>(Minimum 3 subdivisions only) | |
| 2 or 3 | Module : 1 | 16 |
| 4 or 5 | Module : 2 | 16 |
| 6 or 7 | Module : 3 | 16 |
| 8 or 9 | Module : 4 | 16 |
| 10 or 11 | Module : 5 | 16 |
| | TOTAL | 100 |

**CO-PO Mapping**

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

| Master of Computer Applications | | | | | |
|---|---|---|---|---|---|
| **Semester I** | | | | | |
| **Data Structures and Algorithms**<br>**Theory** | | | | | |
| Course Code | : | P24MCA103 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 40 | Total | : | 100 Marks |
| Credits | | 3 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1 | Analyze step by step and develop algorithms to solve real world problems |
| 2 | Evaluate the Expressions like postfix, prefix conversions. |
| 3 | Implementing various data structures viz. Stacks, Queues, Linked Lists, Trees and Graphs. |
| 4 | Understanding various searching & sorting techniques. |
| 5 | Be able to compare functions using asymptotic analysis and describe the relative merits of worst, average and best-case analysis. |

| **Module - 1** | **No. of Hrs** |
|---|---|
| **Basic Concepts:** Introduction to Arrays, Pointers and Dynamic Memory Allocation, Dynamic Array representations, Structures and Unions.<br>**Classification of Data Structures:** Primitive and Non- Primitive, Linear and Nonlinear; Data structure Operations,<br>**Stack:** Definition, Representation, Operations and Applications: Polish and reverse polish expressions, Infix to postfix conversion, evaluation of postfix expression, infix to prefix, postfix to infix conversion. | 08 |
| **Module - 2** | **No. of Hrs** |
| **Queue:** Definition, Representation, Queue Variants: Circular Queue, Priority Queue, Double Ended Queue; Applications of Queues and Programming Examples<br>**Linked List**: Limitations of array implementation, Types of Linked List, Operations of Linked List.<br>**Memory Management:** Static (Stack) and Dynamic (Heap), Memory Allocation, Memory management functions. Definition, Representation, Operations: getnode() and Freenode() operations. | 08 |
| **Module - 3** | **No. of Hrs** |
| **Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees,<br>**Binary Tree Traversals**: Inorder, postorder, preorder; Additional Binary tree operations. Threaded binary trees,<br>**Binary Search Trees :** Definition, Insertion, Deletion, Traversal, Searching, Application of Trees- Evaluation of Expression, Programming Examples. | 08 |
| **Module - 4** | **No. of Hrs** |
| **Fundamentals of the Analysis of Algorithm Efficiency**: Notion of Algorithm, Fundamentals of Algorithmic problem Solving, Important Problem Types, Fundamental data Structures, Analysis Framework, Asymptotic Notations and Basic efficiency classes, Brute-Force Algorithms - Bubble Sort, Insertion sort, Shell sort. | 08 |
| **Module - 5** | **No. of Hrs** |
| **Algorithms:** Divide and Conquer – Merge sort, Quick sort, Binary Search, Greedy method – Dijkstra's algorithm, Prim's and Kruskal algorithm, Decrease and Conquer – DFS, BFS. | 08 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understand the fundamental Data Structures |
| CO2 | Apply the operational aspects of stacks, Queues and linked list to solve recursive applications. |
| CO3 | Analyze various types of sorting and searching techniques and identify the optimal approach for a given scenario. |
| CO4 | Summarize the paradigms and approaches used to design and analyze algorithms by categorizing problems based on the popular domains. |
| CO5 | Discuss Divide & conquer algorithms, Greedy Methods and Decrease and Conquer and measure their performance. |

| **Text Books** | |
|---|---|
| 1 | Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014. |
| 2 | Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014 |
| **Reference Text Books** | |
| 1 | Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning, 2014. |
| 2 | Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013 |
| 3 | Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009. Pearson. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. NPTEL https://www.nitt.edu/home/academics/departments/cse/programmes<br>2. Introduction to Data Structures - GeeksforGeeks |

| **RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)** | | |
|---|---|---|
| Sl. No | Components | Marks |
| 1 | **INTERNAL TESTS**: Students will be evaluated in test, descriptive questions with different complexity levels (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating).<br><br>THREE tests will be conducted. Each test will be evaluated for 50 Marks. Finally Test Marks Will Be Reduced To 30 Marks. | 30 |
| 2 | Assignment/Quiz/Seminar/Group Discussion/Case Studies/Practical orientation on Design Thinking/ problem Solving Exercises/Presentation of Research work/hack-a-thon/Code-a-thon conducted by reputed organizations/ any other. | Any two 20 |
| | MAXIMUM MARKS | 50 |

## Semester End Examination (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part –A and Part – B
3. **Part - A** should contain minimum **Two or Four** quiz questions from each module of 02 marks / 01 mark each. **Part - A is Compulsory** and carries 20 Marks.
4. **Part - B** contains two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.

5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. Question papers to be set as per the Blooms Taxonomy levels.

| **Rubrics for Semester End Examination (SEE)** | | |
|---|---|---|
| Q. No | CONTENTS | MARKS |
| PART - A | | |
| 1 | Two or Four Quiz questions from each module of 2 marks / 1 mark | 20 |
| PART – B<br>(Minimum 3 subdivisions only) | | |
| 2 or 3 | Module : 1 | 16 |
| 4 or 5 | Module : 2 | 16 |
| 6 or 7 | Module : 3 | 16 |
| 8 or 9 | Module : 4 | 16 |
| 10 or 11 | Module : 5 | 16 |
| | TOTAL | 100 |

**CO-PO Mapping**

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

| **Master of Computer Applications** | | | | | |
|---|---|---|---|---|---|
| **Semester I** | | | | | |
| **Software Engineering**<br>**Theory** | | | | | |
| Course Code | : | P24MCA104 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 40 | Total | : | 100 Marks |
| Credits | | 3 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1 | Outline software engineering principles and activities involved in building large software programs. |
| 2 | Identify ethical and professional issues and explain why they are of concern to software engineers. |
| 3 | Explain the fundamentals of object oriented concepts. |
| 4 | Describe the process of requirements gathering, requirements classification, requirements specification and requirements validation. |
| 5 | Differentiate system models, use UML diagrams and apply design patterns. |
| 6 | Discuss the distinctions between validation testing and defect testing. |

| **Module – 1** | **No. of Hrs** |
|---|---|
| Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ACM code of software engineering ethics, case studies. Software Process and Agile Software Development Software Process models: waterfall, incremental development, reuses oriented, Process activities; coping with change, The Rational Unified Process. | 08 |
| **Module – 2** | **No. of Hrs** |
| Agile Methods, Plan-Driven and Agile Development, Extreme Programming, Agile Project Management, scaling agile methods. Requirement Engineering: Functional and non-functional requirements, The Software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirement validation, Requirement management | 08 |
| **Module – 3** | **No. of Hrs** |
| What is object orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history, modeling as design Technique: Modeling; abstraction; the three models. Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips. Advanced objects and class concepts; Associations ends; N-array association; Aggregation, Abstract class; Multiple inheritance; Metadata; Reification; Constraints; Derived data; packages; practical tips. | 08 |
| **Module – 4** | **No. of Hrs** |
| System Models: Context models, Interaction models. Structural models. Behavioural models. Model-driven Engineering Design and Implementation: Introduction to RUP, Design Principles. Object-oriented design using the UML. Design patterns. Implementation issues. Open source development. | 08 |
| **Module – 5** | **No. of Hrs** |
| Software Testing: Development testing, Test-driven development, Release testing, User testing. Test Automation. Software Evolution: Evolution processes. Program evolution dynamics. Software maintenance. Legacy system management | 08 |

| **Course Outcomes: At the end of the course, the students will be able to** | |
|---|---|
| CO1 | Design a software system, component or process to meet desired needs within realistic constraints |
| CO2 | Analyze the differences between plan-driven and Agile development approaches, evaluating their advantages, limitations, and suitability for various project types |
| CO3 | Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting |
| CO4 | Explore user-defined data structures like structures, unions and pointers in implementing solutions |

| | |
|---|---|
| CO5 | Design and Develop Solutions to problems using modular programming constructs using functions |

| **Text Books** | |
|---|---|
| 1 | Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012. |
| 2 | Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005. |

| Web links and Video lectures (e-Resources) |
|---|
| 1. https://onlinecourses.nptel.ac.in/noc24_ce107/preview<br>2. http://www.digimat.in/nptel/courses/video/106106126/L01.html |

| **RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)** | | |
|---|---|---|
| **Sl. No** | **Components** | **Marks** |
| 1 | **INTERNAL TESTS**: Students will be evaluated in test, descriptive questions with different complexity levels (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating).<br><br>THREE tests will be conducted. Each test will be evaluated for 50 Marks. Finally Test Marks Will Be Reduced To 30 Marks. | 30 |
| 2 | Assignment/Quiz/Seminar/Group Discussion/Case Studies/Practical orientation on Design Thinking/ problem Solving Exercises/Presentation of Research work/hack-a-thon/Code-a-thon conducted by reputed organizations/ any other. | Any two<br>20 |
| | MAXIMUM MARKS | 50 |

## Semester End Examination (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part –A and Part – B
3. **Part - A** should contain minimum **Two or Four** quiz questions from each module of 02 marks / 01 mark each. **Part - A is Compulsory** and carries 20 Marks.
4. **Part - B** contains two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. Question papers to be set as per the Blooms Taxonomy levels.

| **Rubrics for Semester End Examination (SEE)** | | |
|---|---|---|
| Q. No | CONTENTS | MARKS |
| | PART - A | |
| 1 | Two or Four Quiz questions from each module of 2 marks / 1 mark | 20 |
| | PART – B<br>(Minimum 3 subdivisions only) | |
| 2 or 3 | Module : 1 | 16 |
| 4 or 5 | Module : 2 | 16 |
| 6 or 7 | Module : 3 | 16 |
| 8 or 9 | Module : 4 | 16 |
| 10 or 11 | Module : 5 | 16 |
| | TOTAL | 100 |

**CO-PO Mapping**

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

| Master of Computer Applications | | | | | |
|---|---|---|---|---|---|
| **Semester I** | | | | | |
| **Computer Networks**<br>**Theory** | | | | | |
| Course Code | : | P24MCA105 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 40 | Total | : | 100 Marks |
| Credits | | 3 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1 | Recognize computer networks. |
| 2 | List computer network topologies. |
| 3 | List required hardware to constitute computer network.. |
| 4 | Explain each computer network topology physically or logically. |

| **Module - 1** | **No. of Hrs** |
|---|---|
| Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media. | 08 |
| **Module - 2** | **No. of Hrs** |
| Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction. | 08 |
| **Module - 3** | **No. of Hrs** |
| Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth. | 08 |
| **Module - 4** | **No. of Hrs** |
| Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols. Introduction to NS2, Wired Script Components and Parameters. | 08 |
| **Module - 5** | **No. of Hrs** |
| Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography. | 08 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | To learn the basic concepts of Data communication and Computer network |
| CO2 | To learn about wireless Transmission. |
| CO3 | To learn about networking and data link layer. |
| CO4 | To study about Network communication. |
| CO5 | To learn the concept of Transport layer. |

| **Text Books** | |
|---|---|
| 1 | A. S. Tanenbaum, “Computer Networks”, Prentice-Hall of India, |
| 2 | “Computer Networks A Systems Approach, Sixth Edition, 2021“ Larry L Peterson |
| **Reference Text Books** | |
| 1 | B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition,2017 |
| 2 | F. Halsall, Data Communications, Computer Networks and Open Systems”, Pearson Education, |
| 3 | D. Bertsekas and R. Gallagher, “Data Networks”, PHI,. |
| 4 | Lamarca, “Communication Networks”, Tata McGraw- Hill, |
| 5 | http://www.ietf.org/rfc.html relevant RFC document could be used to get more detailed information about any of the concepts prescribed in the syllabus like RFC 2460 can be referred to get detailed |

| | |
|---|---|
| | information about IPV6. |

| **Web links and Video lectures (e-Resources)** |
|---|
| https://archive.nptel.ac.in/courses/106/105/106105183/ |

| **RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)** | | |
|---|---|---|
| Sl. No | Components | Marks |
| 1 | **INTERNAL TESTS**: Students will be evaluated in test, descriptive questions with different complexity levels (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating).<br><br>THREE tests will be conducted. Each test will be evaluated for 50 Marks. Finally Test Marks Will Be Reduced To 30 Marks. | 30 |
| 2 | Assignment/Quiz/Seminar/Group Discussion/Case Studies/Practical orientation on Design Thinking/ problem Solving Exercises/Presentation of Research work/hack-a-thon/Code-a-thon conducted by reputed organizations/ any other. | Any two<br>20 |
| | MAXIMUM MARKS | 50 |

## Semester End Examination (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part –A and Part – B
3. **Part - A** should contain minimum **Two or Four** quiz questions from each module of 02 marks / 01 mark each. **Part - A is Compulsory** and carries 20 Marks.
4. **Part - B** contains two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. Question papers to be set as per the Blooms Taxonomy levels.

| **Rubrics for Semester End Examination (SEE)** | | |
|---|---|---|
| Q. No | CONTENTS | MARKS |
| | PART - A | |
| 1 | Two or Four Quiz questions from each module of 2 marks / 1 mark | 20 |
| | PART – B<br>(Minimum 3 subdivisions only) | |
| 2 or 3 | Module : 1 | 16 |
| 4 or 5 | Module : 2 | 16 |
| 6 or 7 | Module : 3 | 16 |
| 8 or 9 | Module : 4 | 16 |
| 10 or 11 | Module : 5 | 16 |
| | TOTAL | 100 |

**CO-PO Mapping**

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

| **Master of Computer Applications** | | | | | |
|---|---|---|---|---|---|
| **Semester I** | | | | | |
| **Data Structures and Algorithms Lab Practical** | | | | | |
| Course Code | : | P24MCL106 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 0:0:2 | SEE | : | 50 Marks |
| Total Hours | : | 40 | Total | : | 100 Marks |
| Credits | | 1 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1 | Evaluate the Expressions like postfix, prefix conversions. |
| 2 | Implementing various data structures viz. Stacks, Queues, Linked Lists, Trees and Graphs |

| **S.No** | **Experiments** |
|---|---|
| 1 | Implement a Program in C for converting an Infix Expression to Postfix Expression |
| 2 | Design, develop, and execute a program in C to evaluate a valid postfix expression using stack. Assume that the postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide). |
| 3 | Design, develop, and execute a program in C to simulate the working of a queue of integers using an array. Provide the following operations: a. Insert b. Delete c. Display |
| 4 | Write a C program to simulate the working of a singly linked list providing the following operations: a. Display & Insert b. Delete from the beginning/end c. Delete a given element |
| 5 | Write a C program to Implement the following searching techniques a. Linear Search b. Binary Search. |
| 6 | Write a C program to implement the following sorting algorithms using user defined functions: a. Bubble sort (Ascending order) b. Selection sort (Descending order). |
| 7 | Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm ( C programming) |
| 8 | From a given vertex in a weighted connected graph, find shortest paths to other vertices Using Dijkstra's algorithm (C programming) |
| | **Demonstration Experiments ( For CIE ) if any** |
| 9 | Using circular representation for a polynomial, design, develop, and execute a program in C to accept two polynomials, add them, and then print the resulting polynomial. |
| 10 | Design, develop, and execute a program in C to evaluate a valid postfix expression using stack. Assume that the postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide). |

| **Course Outcomes: At the end of the course, the students will be able to** | |
|---|---|
| CO1 | Implement the techniques for evaluating the given expression. |
| CO2 | Implement sorting / searching techniques, and validate input/output for the given problem. |
| CO3 | Implement data structures (namely Stacks, Queues, Circular Queues, Linked Lists, and Trees), its operations and algorithms. |
| CO4 | Implement the algorithm to find whether the given graph is connected or not and conclude on the performance of the technique implemented. |

| RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY) | | |
|---|---|---|
| **Sl. No** | **Contents** | **Marks** |
| | 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 50% of the maximum marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 40%of maximum marks in the semester-end examination (SEE). In total of CIE and SEE student has to secure 50% maximum marks of the course. | |
| 1 | **CIE marks for the practical course is 50 Marks.**<br>• The split-up of CIE marks for record/ journal and test are in the ratio 60:40.<br>• Each experiment to be evaluated for conduction with observation sheet and record write- up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.<br>• Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.<br>• Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).<br>• Weightage to be given for neatness and submission of record/write-up on time.<br>• Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14 week of the semester.<br>• In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.<br>• The suitable rubrics can be designed to evaluate each student's performance and learning ability.<br>The average of 02 tests is scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student. | 50 |
| | **Maximum Mark** | 50 |
| **RUBRIC FOR THE SEMESTER END EXAMINATION (SEE)** | | |
| 2 | **Semester End Evaluation (SEE):**<br>SEE marks for the practical course is 50 Marks. SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the University.<br>All laboratory experiments are to be included for practical examination. (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.<br>Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.<br>Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. General rubrics suggested for SEE is mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)<br>Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero.<br>The duration of SEE is 03 hours | 100 |
| | MAXIMUM MARKS | 100 |

**CO-PO Mapping**

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

| **Master of Computer Applications** | | | | | |
|---|---|---|---|---|---|
| **Semester I** | | | | | |
| **Computer Networks Lab Practical** | | | | | |
| Course Code | : | P24MCL107 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 0:0:2 | SEE | : | 50 Marks |
| Total Hours | : | 40 | Total | : | 100 Marks |
| Credits | | 2 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1 | Recognize computer networks. |
| 2 | List computer network topologies. |
| 3 | List required hardware to constitute computer network. |
| 4 | Explain each computer network topology physically or logically. |

| **S.No** | **Experiments** |
|---|---|
| 1 | Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped. |
| 2 | Implement the data link layer framing methods such as character, character-stuffing and bit stuffing. |
| 3 | Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP |
| 4 | Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism. |
| 5 | Implement Dijsktra's algorithm to compute the shortest path through a network |
| 6 | Implement data encryption and data decryption |
| 7 | Simulate the network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the center. Node n0 is a TCP source, which transmits packets to node n3 (a TCP sink) through the node n4. Node n1 is another traffic source, and sends UDP packets to node n2 through n4. The duration of the simulation time is 10 seconds. |
| 8 | Simulate to study transmission of packets over Ethernet LAN and determine the number of packets drop |

| RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY) | | |
|---|---|---|
| **Sl. No** | **Components** | **Marks** |
| | 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 50% of the maximum marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 40%of maximum marks in the semester-end examination (SEE). In total of CIE and SEE student has to secure 50% maximum marks of the course. | |
| 1 | **CIE marks for the practical course is 50 Marks.**<br>• The split-up of CIE marks for record/ journal and test are in the ratio 60:40.<br>• Each experiment to be evaluated for conduction with observation sheet and record write- up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.<br>• Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.<br>• Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).<br>• Weightage to be given for neatness and submission of record/write-up on time.<br>• Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14 week of the semester.<br>• In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.<br>• The suitable rubrics can be designed to evaluate each student's performance and learning ability.<br>• The average of 02 tests is scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student. | 50 |
| | | |
| | MAXIMUM MARKS | 50 |

| RUBRIC FOR THE SEMESTER END EXAMINATION (SEE) | | |
|---|---|---|
| **Sl. No** | **Contents** | **Marks** |
| 2 | **Semester End Evaluation (SEE):**<br>SEE marks for the practical course is 50 Marks. SEE shall be conducted jointly by the two examiners of the same institute; examiners are appointed by the University.<br>All laboratory experiments are to be included for practical examination. (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.<br>Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.<br>Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. General rubrics suggested for SEE is mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners) | 100 |

| | | |
|---|---|---|
| | Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero.<br><br>The duration of SEE is 03 hours | |
| | MAXIMUM MARKS | 100 |

| **Course Outcomes: At the end of the course, the students will be able to** | |
|---|---|
| CO1 | Implement data link layer farming methods. |
| CO2 | Analyze error detection and error correction codes. |
| CO3 | Implement and analyze routing and congestion issues in network design. |
| CO4 | Implement Encoding and Decoding techniques used in presentation layer. |
| CO5 | To be able to work with different network tools. |

**CO-PO Mapping**

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

| Master of Computer Applications | | | | | |
|---|---|---|---|---|---|
| **Semester I** | | | | | |
| **C Programming**<br>**Theory** | | | | | |
| Course Code | : | P24MCA109A | CIE | : | 100 Marks |
| Teaching Hours L : T : P | : | 2:2:0 | SEE | : | --- |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | | 0 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1 | Elucidate the basic architecture and functionalities of a computer. |
| 2 | Apply programming constructs of C language to solve real-world problems |
| 3 | Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems |
| 4 | Design and Develop Solutions to problems using modular programming constructs such as functions and procedures |

| Module - 1 | No. of Hrs |
|---|---|
| Introduction to C: Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C. | 06 |
| Module - 2 | No. of Hrs |
| Operators in C, Type conversion and typecasting. Decision control and Looping statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement. | 06 |
| Module - 3 | No. of Hrs |
| Functions: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions. Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions, | 06 |
| Module - 4 | No. of Hrs |
| Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, multidimensional arrays. Applications of arrays and introduction to strings: Applications of arrays, case study with sorting techniques. Introduction to strings: Reading strings, writing strings, summary of functions used to read and write characters. Suppressing input using a Scanset. | 06 |
| Module - 5 | No. of Hrs |
| Strings: String taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings. Pointers: Understanding the Computer's Memory, Introduction to Pointers, Declaring Pointer Variables Structures: Introduction to structures, Union , Files | 06 |

| **Course Outcomes: At the end of the course, the students will be able to** | |
|---|---|
| CO1 | Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts. |
| CO2 | Apply programming constructs of C language to solve the real world problem |
| CO3 | Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting |
| CO4 | Explore user-defined data structures like structures, unions and pointers in implementing solutions |
| CO5 | Design and Develop Solutions to problems using modular programming constructs using functions |

| **Text Books** | |
|---|---|
| 1 | Computer fundamentals and programming in c, "Reema Thareja", Oxford University, Second edition, 2017. |
| **Reference Text Books** | |
| 1 | E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill. |
| 2 | Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. https://onlinecourses.nptel.ac.in/noc24_cs02/ |

| **RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)** | | |
|---|---|---|
| **Sl. No** | **Components** | **Marks** |
| 1 | INTERNAL TESTS: Students will be evaluated in test, descriptive questions with different complexity levels (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating).<br><br>THREE tests will be conducted. Each test will be evaluated for 50 Marks. Finally Test Marks Will Be Reduced To 80 Marks. | 80 |
| 2 | Assignment/Quiz/Seminar/Group Discussion/Case Studies/Practical orientation on Design Thinking/ problem Solving Exercises/Presentation of Research work/hack-a-thon/Code-a-thon conducted by reputed organizations/ any other. | Any two 20 |
| | MAXIMUM MARKS | 100 |

**CO-PO Mapping**

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

| Master of Computer Applications | | | | | |
|---|---|---|---|---|---|
| **Semester I** | | | | | |
| **Mathematics - I**<br>**Theory** | | | | | |
| Course Code | : | P24MCA109B | CIE | : | 100 Marks |
| Teaching Hours L:T:P | : | 2:2:0 | SEE | : | -- |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | | 3 | SEE Duration | : | --- |

| **Course Objectives** | |
|---|---|
| 1 | The Curriculum supports the prerequisites to enhance their Mathematical knowledge towards understanding mathematical Concepts in the concerned fields. |
| 2 | Enhance problem-solving skills using mathematical models and algorithms. |
| 3 | Develop logical reasoning and analytical thinking |
| 4 | Understand the mathematical foundations of computer science, including discrete mathematics and graph theory |
| 5 | Apply mathematical concepts to computer science problems, such as algorithm design and analysis. |

| **Module – 1** | **No. of Hrs** |
|---|---|
| **Introduction to Number System:** Overview of number systems: Binary numbers, Number based conversion, Octal and hexadecimal numbers, Complements. | 06 |
| **Module – 2** | **No. of Hrs** |
| **Propositional Logics:** Mathematical logic introduction-statements Connectives-negation, conjunction, disjunction- statement formulas and truth tables- conditional and bi Conditional statements- tautology contradiction. | 06 |
| **Module – 3** | **No. of Hrs** |
| **Set Theory:** Operations on sets, power set, Venn diagram, Cartesian product, relations, functions- types of functions - composition of functions. | 06 |
| **Module – 4** | **No. of Hrs** |
| **Matrix algebra:** Introduction, Types of matrices-matrix operations, transpose of a matrix, determinant of matrix, inverse of a matrix, Cramer's rule. | 06 |
| **Module – 5** | **No. of Hrs** |
| **Differential calculus:** Functions and limits - Simple Differentiation of Algebraic Functions – Evaluation of First and Second Order Derivatives – Maxima and Minima. | 06 |

| **Text Books** | |
|---|---|
| 1 | Digital Logic and Computer Design, M. MORRIS MANO Professor of Engineering California State University, Los Angeles. |
| 2 | Discrete mathematics and its applications / Kenneth H. Rosen, Monmouth University (And formerly AT&T Laboratories). |

| **RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)** | | |
|---|---|---|
| **Sl. No** | **Components** | **Marks** |
| 1 | **INTERNAL TESTS**: Students will be evaluated in test, descriptive questions with different complexity levels (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating).<br>THREE tests will be conducted. Each test will be evaluated for 50 Marks. Finally Test Marks Will Be Reduced To 80 Marks. | 80 |
| 2 | Assignment/Quiz/Seminar/Group Discussion/Case Studies/Practical orientation on Design Thinking/ problem Solving Exercises/Presentation of Research work/hack-a-thon/Code-a-thon conducted by reputed organizations/ any other. | Any two<br>20 |
| | MAXIMUM MARKS | 100 |

| **Course Outcomes: At the end of the course, the students will be able to** | |
|---|---|
| CO1 | Understand and convert between binary, octal, and hexadecimal number systems |
| CO2 | Apply propositional logic to create and interpret truth tables |
| CO3 | Perform operations on sets and analyze functions using Venn diagrams |
| CO4 | Conduct matrix operations and solve linear equations using matrices |
| C05 | Differentiate algebraic functions and apply calculus to find maxima and minima. |

**CO-PO Mapping:**

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