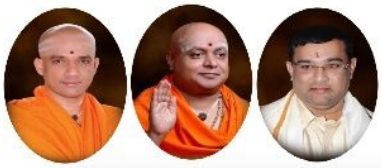

|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust (R)

# SJB Institute of Technology

An AUTONOMOUS INSTITUTION UNDER VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Approved by AICTE, 2(f) and 12(B) recognized by UGC, New Delhi
Accredited by NAAC, Accredited by NBA, Certified by ISO 9001 - 2015


## PG Autonomous Scheme & Syllabus

# Programme: MCA

SCHEME
2023

## I to IV Semester

SERVICE TO MANKIND IS SERVICE TO GOD

**His Divine Soul Padmabhushana**

**Sri Sri Sri Dr.Balagangadharanath Maha Swamiji**

*Founder President, Sri Adichunchanagiri Shikshana Trust®*

**Belief in God is not ignorance or illusion. It is a belief that there is an unseen, ineffable Power that transcends all our powers of muscles, mind and lives.**

**His Holiness Parama Pujya**

**Sri Sri Sri Dr. Nirmalanandanatha Maha Swamiji**

*President, Sri Adichunchanagiri Shikshana Trust®*

**True richness is the generosity of heart. Cultivate it and work to help the less fortunate ones in life.**

**Revered Sri Sri Dr. Prakashanatha Swamiji**

**Managing Director, BGS & SJB Group of Institutions & Hospitals**

**People and prosperity follow the path which the leaders take. So the elders and leaders should make sure that they give the right lead and take the right path.**

|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust (R)

# SJB Institute of Technology

BGS Health and Education City, Dr. Vishnuvardhana Road, Kengeri, Bengaluru-560060
Approved by AICTE, New Delhi.
Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi
Accredited by NAAC with 'A+'grade, Certified by ISO 9001 - 2015
Recognized by UGC, New Delhi with 2(f) & 12 (B)

## AUTONOMOUS SCHEME (Tentative) PG - MCA 1st year

**SCHEME:** 2023 **Aca. Year.: 2023-24** **Date** 22.01.2024

**SEM:** I

| SL No | Course Type | Course type Count | Course Code | Course Title | Teaching Dept. | QP setting dept | Credits | Teaching Hrs/Week | | | | Examinations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | L | T | P | O | | SEE | | | |
| | | | | | | | | Lecture | Tutorial | Practical | PBL/ABL/ SLotkm. | CIE Marks | Dur. | Th. Mrks | Lab. Mrks. | Tot. Marks |
| 1 | BSC | 1 | 23MCAT101 | Mathematical Foundation for Computer Applications | MCA | MCA | 3 | 3 | 0 | – | | 50 | 3 | 50 | - | 100 |
| 2 | IPCC | 1 | 23MCAI102 | Operating Systems - Linux | | | 4 | 3 | 0 | 2 | | 50 | 3 | 50 | - | 100 |
| 3 | IPCC | 2 | 23MCAI103 | Computer Networks | | | 4 | 3 | 0 | 2 | | 50 | 3 | 50 | - | 100 |
| 4 | PCC | 1 | 23MCAT104 | Programming in Python | | | 3 | 3 | 0 | – | | 50 | 3 | 50 | - | 100 |
| 5 | PCC | 2 | 23MCAT105 | Database Systems & Modeling | | | 3 | 3 | 0 | – | | 50 | 3 | 50 | - | 100 |
| 6 | PCCL | 1 | 23MCAL106 | Python Programming Laboratory | | | 2 | – | 2 | 2 | | 50 | 3 | - | 50 | 100 |
| 7 | PCCL | 2 | 23MCAL107 | Database Systems & Modeling | | | 2 | – | 2 | 2 | | 50 | 3 | - | 50 | 100 |
| 8 | AEC | 1 | 23MCAAE11 | Ability Ennhancement course-1 | IE | IE | 2 | – | 2 | 2 | | 50 | 3 | 50 | - | 100 |
| Total | | | | | | | 23 | 15 | 6 | 10 | 0 | 400 | | 300 | - | 800 |
| 9 | MAC | 1 | 23MCAM108 | Basics of Programming & Computer Organization | MCA | | PP | 2 | 2 | | | 50 | | - | - | 50 |

BSC-Basic Science Courses, PCC: Professional core. IPCC-Integrated Professional Core Courses, PCCL - Professional Core Course Laboratory, MAC - Mandatory Audit course for non Computer Science students only.Each Course (PCC/PCE) shall have case study discussion and may be considered as a part of assignment. AEC: Ability Enhancement Course,

SLC : 10 courses shall be defined at the begining of the course. The student should select any one course of their interest and mentors will be alloted to them to guide through the course. Weekly assignment reviews shall be done by mentors. The sudent should complete the course by end of 3rd semester. Rubrics and methodology will be defined separately. SLC will be credited in 4th Semester

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## AUTONOMOUS SCHEME (Tentative) PG - MCA 1st year

**SCHEME: 2023** **Aca. Year.: 2023-24** **Dat 22.01.2024**

**SEM: II**

| Sl No | Course Type | Course type Count | Course Code | Course Title | Teaching Dept. | QP setting dept | Credits | Teaching Hrs/Week | | | | Examinations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | L | T | P | O | | SEE | | | |
| | | | | | | | | Lecture | Tutorial | Practical | PBL/ABL/ SL/others. | CIE Marks | Dur. | Th. Marks | Lab. Marks. | Tot. Marks |
| 1 | PCC | 3 | 23MCAT201 | Data Structures & Analysis of Algorithms | MCA | MCA | 3 | 3 | -- | -- | | 50 | 3 | 50 | - | 100 |
| 2 | PCC | 4 | 23MCAT202 | Object Oriented Programming | | | 3 | 3 | -- | -- | | 50 | 3 | 50 | - | 100 |
| 3 | PCC | 5 | 23MCAT203 | Software Engineering & Product Management | | | 3 | 3 | -- | -- | | 50 | 3 | 50 | - | 100 |
| 4 | IPCC | 3 | 23MCAI204 | Web Technologies -1 | | | 4 | 3 | -- | 2 | | 50 | 3 | 50 | - | 100 |
| 5 | PEC | 1 | 23MCAE205 | Professional Elective 1 | | | 3 | 2 | 2 | -- | | 50 | 3 | 50 | - | 100 |
| 6 | PEC | 2 | 23MCAE206 | Professional Elective 2 | | | 3 | 2 | 2 | -- | | 50 | 3 | 50 | - | 100 |
| 7 | PCCL | 3 | 23MCAL207 | DSA Laboratory | | | 2 | -- | 2 | 2 | | 50 | 3 | | 50 | 100 |
| 8 | PCCL | 4 | 23MCAL208 | Object Oriented Programming Laboratory | | | 2 | -- | 2 | 2 | | 50 | 3 | | 50 | 100 |
| 9 | PCC | 6 | 23MCAM209 | Research Methodology & IPR | | | 2 | 2 | -- | -- | | 50 | 3 | 50 | | 100 |
| 10 | AEC | 2 | 23MCAAE21 | Ability Enhancement course-2 | IE | IE | 2 | -- | 2 | 2 | | 50 | 3 | 50 | | 100 |
| | Total | | | | | | 27 | 18 | 10 | 6 | | 500 | | 400 | 100 | 1000 |

PCC: Professional core courses, PEC: Professional Elective Courses, IPCC-Integrated Professional Core Courses, PCCL - Professional Core Course Laboratory, AEC- Ability Enhancement Course.
SLC : 10 courses shall be defined at the begining of the course. The student should select any one course of their interest and mentors will be alloted to them to guide through the course. Weekly assignment reviews shall be done by mentors. The sudent should complete the course by end of 3rd semester. Rubrics and methodology will be defined separately. SLC will be credited in 4th Semester

| Professional Elective 1 | | Professional Elective 2 | |
|---|---|---|---|
| Course | Course title | Course Code | Course title |
| 23MCAE211 | Data Mining & Warehousing | 23MCAE221 | Artificial Intelligence & Machine Learning |
| 23MCAE212 | UI & UX Design | 23MCAE222 | Mobile Computing |
| 23MCAE213 | Cloud Computing | 23MCAE223 | Edge Computing |
| 23MCAE214 | Computer Vision | 23MCAE224 | Digital Marketing |

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## Table of Contents

**Master of Computer Applications (MCA)**

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **I** | **Course Type:** | BSC | | |
| **Course Title:** Mathematical Foundation for Computer Applications | | | | | |
| **Course Code:** | 23MCAT101 | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 3:0:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Understand Discrete Mathematics Principles.
- Develop Numerical Problem-Solving Skills.
- Explore Linear Algebra Applications in Computer Science.
- Build Competence in Probability and Statistics.
- Gain Proficiency in Sampling Theory and Statistical Inference.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

### III(a). Theory PART

| | |
|---|---|
| **Module-1: Discrete Mathematics**<br>Propositional and First-Order Logic, Set Theory and Operations, Functions and Relations, Combinatorics (Permutations, Combinations, Pigeonhole Principle), Graph Theory (Basics, Graph Representations, Connectivity) | 8 Hrs |
| **Textbook1** | |
| **RBT Levels: 1,2** | |
| **Module-2: Numerical Methods and Optimization**<br>Introduction to Numerical Methods, Solving Equations (Root-finding methods), Interpolation and Extrapolation, Basics of Numerical Differentiation and Integration, Optimization Techniques (Gradient Descent, Newton's Method) | 8 Hrs |
| **Textbook5** | |
| **RBT Levels: 1,2** | |
| **Module-3: Linear Algebra**<br>Vectors and Matrices,Matrix Operations (Addition, Subtraction, Multiplication), Determinants and Inverses, Eigenvalues and Eigenvectors, Linear Transformations, Applications of Linear Algebra in Computer Science. | 8 Hrs |
| **Textbook2** | |
| **RBT Levels:2,3,4** | |
| **Module-4: Probability and Statistics**,<br>Probability Basics (Sample Spaces, Events, Probability Laws)- Introduction, Random Variables and Probability Distributions, Descriptive Statistics (Mean, Median, Variance), Discrete Probability Distributions – Binomial and Poisson distributions, Continuous Probability Distributions- Exponential and normal distribution. | 8 Hrs |
| **Textbook3** | |
| **RBT Levels:2,3,4** | |
| **Module-5: Sampling Theory**,<br>Sampling distribution, **standard error**, Statistical Inference (Hypothesis Testing, Confidence Intervals), Test of significance for large samples, comparison of large samples, Test of Significance for means of two small samples, Students 't' distribution, Chi-square distribution as a test of goodness of fit. | 8 Hrs |
| **Textbook4** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Apply Discrete Math Concepts in Problem-Solving. |
| **CO2** | Demonstrate Effective Numerical Problem-Solving Techniques. |
| **CO3** | Understand the concept Linear Algebra for Practical Applications. |
| **CO4** | Apply Statistical Analysis for Informed Decision-Making in Computer Science. |

**V. CO-PO-PSO MAPPING** (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | | | | | | | | | | | 1 | | |
| CO2 | 2 | 2 | | | | | | | | | | | | 1 | 1 | |
| CO3 | 2 | 2 | | | | | | | | | | | | 2 | | |
| CO4 | 2 | 2 | | | | | | | | | | | | 2 | | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) : Refer** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Discrete Mathematics and Its Applications | Rosen K H | 2019 | McGraw-Hill Education |
| 2 | Linear Algebra and Its Applications | Lay, D. C., Lay, S. R., & McDonald, J. J | 2019 | Pearson |
| 3 | Introduction to Probability and Statistics for Engineers and Scientists | Ross, S. M | 2017 | Academic Press |
| 4 | Information Theory, Inference, and Learning Algorithms | David MacKay | 2003 | Cambridge University Press |
| 5 | Numerical Methods for Engineers and Scientists | Amos Gilat, VishSubramaniam | 2017 | Wiley |

**VII(b): Web links and Video Lectures (e-Resources):**

1. https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/
2. https://www.khanacademy.org/math/statistics-probability
3. Crash Course: Information Theory - https://www.youtube.com/watch?v=Q0dsa6OtMpA
4. MIT OpenCourseware 18.03, Introduction to Numerical Methods: https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/5. Khan Academy, Computer Science Discrete Mathematics: https://support.khanacademy.org/hc/en-us/community/posts/201470924-Discrete-Mathematics

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | I | **Course Type:** | IPCC | | |
| **Course Title:** Operating Systems - Linux | | | | | |
| **Course Code:** | 23MCAI102 | | | **Credits:** | 4 |
| **Teaching Hours/Week (L:T:P:O)** | | | 3:0:2:0 | **Total Hours:** | 40 hours+ Lab sessions |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3Hrs |

## I. Course Objectives:

- Understand the fundamental concepts and principles of operating systems, with a focus on Linux.
- Gain hands-on experience in working with Linux-based systems.
- Develop proficiency in system administration tasks and troubleshooting on Linux platforms.
- Explore advanced features of the Linux operating system, such as shell scripting and security.
- Acquire the skills necessary to deploy and manage Linux servers in a networked environment.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

| III(a). Theory PART | |
|---|---|
| **Module-1:** Overview of Linux OS, Linux File System Hierarchy, Basic Shell Commands, Process Management in Linux, Introduction to System Administration | 8 Hrs |
| **Textbook1: Chapter1- 4** | |
| **RBT Levels: 2** | |
| **Module-2:** Advanced File Operations, Shell Scripting Basics, System Initialization and Services, Linux Networking Basics, Process Automation and Cron Jobs. | 8 Hrs |
| **Textbook1 : Chapter 4 - 7** | |
| **RBT Levels: 2,3** | |
| **Module-3:** Linux Security Principles, Firewalls and Network Security, Security Best Practices, Encryption and Data Security, User Access Control. | 8 Hrs |
| **Textbook 2: Chapter 8, 9, 10, 14** | |
| **RBT Levels:2,3,4** | |
| **Module-4:** Introduction to Linux Servers, Web and FTP Servers, Database Servers, Introduction to Virtualization, Managing Virtual Machines. | 8 Hrs |
| **Texbook2: Chapter 1,6, 10, 11** | |
| **RBT Levels:2,3,4** | |
| **Module-5:** System Logging and Log Analysis, Performance Monitoring and Tuning Troubleshooting Network Issues, Backup and Recovery Strategies, Case Studies | 8 Hrs |
| **Textbook 1: Chapter 11-15**<br>**Texbook2: Chapter 15-19** | |
| **RBT Levels:2,3,4** | |

| III(b). PRACTICAL PART | |
|---|---|
| **Sl. No.** | **Experiments / Programs / Problems** |
| **1** | Write a shell script to display the current date and time. |
| **2** | Create a script that lists all files in a specified directory along with their sizes. |
| **3** | Develop a shell script that automates the backup of a designated directory. |
| **4** | Write a script to configure a static IP address on a Linux machine. |
| **5** | Create a script to retrieve and display information about the network interfaces on a system. |
| **6** | Develop a script that changes the permissions of a file or directory based on user input. |
| **7** | Set up a basic firewall using iptables to allow or block specific ports. |
| **8** | Configure and deploy an Apache web server to serve a simple webpage. |
| **9** | Write a script to check and display the available disk space on the system. |
| **10** | Develop a script that adds a new user to the system and sets up a home directory. |
| **11** | Create a script that monitors a specific log file and alerts the user if certain conditions are met. |
| **12** | Implement a script that allows the user to input a process name and terminates all instances of that process. |

| | |
|---|---|
| **13** | Write a script that continuously monitors system resources (CPU, memory, disk) and logs the information at regular intervals. |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Understand Linux OS fundamentals. |
| **CO2** | Administer Linux systems proficiently. |
| **CO3** | Develop shell scripts for automation. |
| **CO4** | Configure and manage Linux servers. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | | | | | | | | | | 1 | | | |
| CO2 | 2 | 2 | 1 | | | | | | | | | | | 1 | | |
| CO3 | 2 | 1 | 1 | | | | | | | | | | | 2 | | |
| CO4 | 2 | 1 | 1 | | | | | | | | | | | | 1 | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 2

**Assessment Details (both CIE and SEE):** Refer Annexure section 2

**Semester End Examination (SEE):** Refer Annexure section 2

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| **1** | Linux Administration: A Beginner's Guide | Wale Soyinka | 2020, | McGraw-Hill Education |
| **2** | Linux Bible, | Christopher Negus | 2019 | Wiley |

**VII(b): Web links and Video Lectures (e-Resources):**

1. Crash Course for Beginners: https://www.youtube.com/watch?v=ROjZy1WbCIA: https://www.youtube.com/watch?v=ROjZy1WbCIA
2. Linux Journey Resources: https://linuxjourney.com/: https://linuxjourney.com/
3. NPTEL Introduction to Linux: https://nptel.ac.in/courses/117106113: https://nptel.ac.in/courses/117106113
4. MIT OpenCourseware Introduction to Linux: https://ocw.mit.edu/courses/6-829-computer-networks-fall-2002/: https://ocw.mit.edu/courses/6-829-computer-networks-fall-2002/ (Focuses on networking aspects)
5. FreeCodeCamp Linux Crash Course: https://www.freecodecamp.org/news/tag/python/: https://www.freecodecamp.org/news/tag/python/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

**Master of Computer Applications (MCA)**

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | I | **Course Type:** | IPCC | | |
| **Course Title:** Computer Networks | | | | | |
| **Course Code:** | 23MCAI103 | | | **Credits:** | 4 |
| **Teaching Hours/Week (L:T:P:O)** | | | 3:0:2:0 | **Total Hours:** | 40 Hrs + Lab sessions |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Demonstration of application layer protocols
- Disseminate the Wireless and Mobile Networks covering IEEE 802.11 Standard
- Explain routers, IP and Routing Algorithms in network layer
- Discuss transport layer services and understand UDP and TCP protocol.
- Illustrate concepts of Multimedia Networking, Security and Network Management

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

### III(a). Theory PART

| | |
|---|---|
| **Module-1:** Applications, Requirements, Network Architecture, Implementing Network Software, Performance. | 8 Hrs |
| **Textbook: Chapter** | |
| **RBT Levels: 1** | |

| | |
|---|---|
| **Module-2:** Perspectives on Connecting, Encoding (NRZ, NRZI, Manchester, 4B/5B), Framing, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks (802.3), Wireless. | 8 Hrs |
| **Textbook : Chapter** | |
| **RBT Levels: 1,2** | |
| **Module-3:** Internetworking and Advanced Internetworking Switching and Bridging, Basic Internetworking (IP), Routing, The Global Internet, Routing among Mobile Devices | 8 Hrs |
| **Textbook :** | |
| **RBT Levels:2,3,4** | |
| **Module-4:** End-to-End Protocols and Congestion Control Simple Demultiplexer (UDP), Reliable Byte Stream (TCP), Queuing Disciplines, TCP Congestion Control, Congestion-Avoidance Mechanisms | 8 Hrs |
| **Textbook :** | |
| **RBT Levels:2,3,4** | |
| **Module-5:** Network Security and Applications Cryptographic Building Blocks, Key Pre-distribution, Firewalls, Traditional Applications, Infrastructure Services. | 8 Hrs |
| **Textbook : Chapter** | |
| **RBT Levels:2,3,4** | |

| **III(b). PRACTICAL PART** | |
|---|---|
| **Sl. No.** | **Experiments / Programs / Problems** |
| **1** | Write a program for distance vector algorithm to find suitable path for transmission. |
| **2** | Using TCP/IP sockets, write a client-server program to make the client send the file name and to make the server send back the contents of the requested file if present |
| **3** | Write a program for Hamming code generation for error detection and correction |
| **4** | Write a program for congestion control using leaky bucket algorithm |
| **5** | Simulate a three nodes point — to — point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped. |
| **6** | Simulate the network with five nodes n0, n1, n2, n3, n4, forming a star topology. The node n4 is at the centre. 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 |
| **7** | Simulate to study transmission of packets over Ethernet LAN and determine the number of packets drop destination |
| **8** | Simulate working of multicasting routing protocol and analyze the throughput of the network/protocol |
| **9** | Simulate the different types of internet traffic such as FTP and TELNET over a wired network and analyze the packet drop and packet delivery ratio in the network |

| **IV. COURSE OUTCOMES** | |
|---|---|
| **CO1** | Apply the basic concepts of networking and to analyze different parameters such as bandwidth, delay, throughput of the networks for the given problem. |
| **CO2** | Apply different techniques to ensure the reliable and secured communication in wired |

| | |
|---|---|
| | and wireless communication |
| **CO3** | Analyze the networking concepts of TCP/IP for wired and wireless components |
| **CO4** | Identify the issues of Transport layer to analyze the congestion control mechanism |

**V. CO-PO-PSO MAPPING** (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | | | | | | | | | | | 1 | | |
| CO2 | 2 | 1 | 2 | | | | | | | | | | | 2 | | |
| CO3 | 1 | 2 | 2 | | | | | | | | | | | 1 | | |
| CO4 | 1 | | 1 | | | | | | | | | | | 1 | | |

VI. **Assessment Details (CIE & SEE)**

**General Rules:** Refer Annexure section 2

**Assessment Details (both CIE and SEE):** Refer Annexure section 2

**Semester End Examination (SEE):** Refer Annexure section 2

**VII. Learning Resources**

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| **1** | Computer Networks A Systems Approach | Larry L Peterson and Bruce S Davie | 5th Edition, 2012 | ----- |

VII(b): Reference Books:

| | | | | |
|---|---|---|---|---|
| **1** | Computer Networking– A Top-Down Approach Featuring the Internet | James F. Kurose, Keith W. Ross | 5th Edition, 2009 | Pearson Education |
| **2** | Computer and Communication Networks | Nader. F. Mir | 2010 | Pearson Prentice Hall Publishers |
| **3** | Computer Networks: An Open Source Approach | Ying-Dar Lin, Ren-Hung Hwang, Fred Baker | 2011 | Mc Graw Hill Publisher |
| **4** | Data Communication and Networking | Behrouz A. Forouzan | Fourth Edition-2011 | Tata McGraw – Hill |

**VII(c): Web links and Video Lectures (e-Resources):**

1. https://www.digimat.in/nptel/courses/video/106105183/L01.html
2. http://www.digimat.in/nptel/courses/video/106105081/L25.html
3. https://nptel.ac.in/courses/106105081
4. VTU e-Shikshana Program

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **I** | **Course Type:** | PCC | | |
| **Course Title:** Programming in Python | | | | | |
| **Course Code:** | 23MCAT104 | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 3:0:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Establish a strong foundation in Python programming from basic to intermediate concepts.
- Develop practical programming skills through hands-on exercises and projects.
- Understand Python's syntax, data structures, and best practices for coding.
- Explore intermediate topics like file handling, error handling, and Python modules.
- Apply Python programming skills to solve real-world problems.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

| | |
|---|---|
| **Module-1:** Introduction to Python, Introduction to Python and its applications, Setting up Python environment (IDEs, Jupyter notebooks), Python basic syntax: variables, data types, and operators, Control flow: conditional statements and loops. | 8 Hrs |



**Textbook1: Chapter 1-4**

| | |
|---|---|
| **RBT Levels: 2** | |
| **Module-2:** Data Structures in Python, Lists, tuples, and sets, Dictionaries and their applications, Working with strings and string manipulation, List comprehensions and generators. | 8 Hrs |
| **Textbook1: Chapter 5-7** | |
| **RBT Levels: 2,3** | |
| **Module-3:** Functions and Modules, Defining and calling functions, Scope and lifetime of variables, Introduction to Python modules, Importing and using modules. | 8 Hrs |
| **Textbook1: Chapter 8-10** | |
| **RBT Levels:2,3,4** | |
| **Module-4:** File Handling and Error Handling, Reading and writing files in Python Understanding exceptions and error handling, Try-except blocks for robust code, Using the with statement for file handling. | 8 Hrs |
| **Textbook3: Chapter 11-14** | |
| **RBT Levels:2,3,4** | |
| **Module-5:** Intermediate Python Concepts, Introduction to regular expressions, Working with dates and times, Introduction to Python's standard library, Overview of third-party libraries (e.g., NumPy, Pandas). | 8 Hrs |
| **Textbook2 : Chapter 1-3** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Apply practical programming skills through hands-on exercises and projects. |
| **CO2** | Understand Python's syntax, data structures, and coding best practices. |
| **CO3** | Explore intermediate topics like file handling, error handling, and Python modules. |
| **CO4** | Apply Python programming skills to solve real-world problems effectively. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | | | | | | | | | | 1 | | | |
| CO2 | 2 | 2 | | | | | | | | | | | | 2 | | |
| CO3 | 2 | 2 | | | | | | | | | | | | 2 | | |
| CO4 | 2 | 2 | 2 | | | | | | | | | | | | | 1 |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Python Crash Course | Eric Matthes | 2019 | No Starch Press, 2019 |
| 2 | Fluent Python | Luciano Ramalho | 2015 | O'Reilly Media |

**VII(b): Web links and Video Lectures (e-Resources):**

1. FreeCodeCamp: Learn Python - Full Course for Beginners: https://www.youtube.com/watch?v=ROjZy1WbCIA: https://www.youtube.com/watch?v=ROjZy1WbCIA
2. Crash Course Python by FreeCodeCamp: https://www.freecodecamp.org/news/tag/python/: https://www.freecodecamp.org/news/tag/python/
3. Python for Everybody Specialization by University of Michigan on Coursera: https://www.coursera.org/specializations/python: https://www.coursera.org/specializations/python
4. Automate the Boring Stuff with Python by Al Sweigart: https://automatetheboringstuff.com/: https://automatetheboringstuff.com/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | 1 | **Course Type:** | PCC | | |
| **Course Title:** Database Systems &Modelling | | | | | |
| **Course Code:** | 23MCAT105 | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 3:0:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 |

## I. Course Objectives:

- Grasp fundamental concepts of Database Management Systems (DBMS).
- Apply SQL for data retrieval and manipulation in RDBMS.
- Understand advanced database concepts like indexing and normalization.
- Create Entity-Relationship Diagrams (ERD) for effective data modelling.
- Explore and implement NoSQL databases for varied data requirements.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## COURSE CONTENT

| | |
|---|---|
| Module-1:Introduction to Database Management Systems (DBMS) Definition and importance of DBMS Data models: relational, hierarchical, and network Components of a DBMS Types of databases: operational, analytical, distributed | 8 Hrs |

| | |
|---|---|
| **Textbook: Chapter 1, 2, 3** | |
| **RBT Levels: 2** | |
| **Module-2:**Relational Database Management System (RDBMS) Relational model concepts SQL: Data Definition Language (DDL) and Data Manipulation Language (DML) Normalization and denormalization Integrity constraints and keys | 8 Hrs |
| **Textbook : Chapter 1, 2** | |
| **RBT Levels: 2, 3** | |
| **Module-3:**Advanced Database Concepts Indexing and hashing Transaction management and concurrency control Recovery and backup strategies Query optimization and execution plans | 8 Hrs |
| **Textbook : Chapter 6, 18** | |
| **RBT Levels:2,3,4** | |
| **Module-4:**Data Modeling and Entity-Relationship Diagrams (ERD) Basics of data modeling Entity-Relationship model Cardinality and relationships Attribute types and constraints | 8 Hrs |
| **Textbook: Chapter 1, 5** | |
| **RBT Levels:2,3,4** | |
| **Module-5:**Advanced Data Modeling and NoSQL Databases Advanced ERD concepts Database normalization techniques Introduction to NoSQL databases Comparison of SQL and NoSQL databases | 8 Hrs |
| **Textbook : Chapter 1, 4, 8, 9** | |
| **RBT Levels:2,3,4** | |

## IV.COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Demonstrate proficiency in using and managing Database Management Systems (DBMS). |
| **CO2** | Execute SQL queries and normalize databases for efficient data management. |
| **CO3** | Implement advanced database techniques, including indexing and query optimization. |
| **CO4** | Design effective data models using Entity-Relationship Diagrams (ERD) and NoSQL databases. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | | | | | | | | | | | 2 | | |
| CO2 | 2 | 1 | 1 | | | | | | | | | | | | 1 | |
| CO3 | 2 | 1 | 1 | | | | | | | | | | | 2 | | |
| CO4 | 2 | 1 | 1 | | | | | | | | | | | 1 | | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

| VII. Learning Resources | | | | |
|---|---|---|---|---|
| **VII(a): Textbooks:** | | | | |
| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
| 1 | Database System Concepts | AviSilberschatz<br>Henry F. Korth<br>S. Sudarshan | 7th edition, 2019 | McGraw-Hill |
| **VII(b): Reference Books:** | | | | |
| 1 | Database Design<br>(E-book, Online Read) | Adrienne Watt and Watt, Adrienne | 2nd Edition, 2021 | BCampus, OpenEd |
| **VII(c): Web links and Video Lectures (e-Resources):** | | | | |
| 1.https://www.coursera.org/learn/advanced-data-modeling<br>2. https://www.coursera.org/projects/database-creation-and-modeling-using-mysql-workbench3.https://www.udemy.com/course/data-modelling-and-relational-database-design/ | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | |
| Activity Based Learning (Suggested Activities in Class)/ Practical Based learning<br>• Quizzes<br>• Assignments<br>• Seminar | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | 1 | **Course Type:** | PCCL | | |
| **Course Title:** Python Programming Laboratory | | | | | |
| **Course Code:** | 23MCAL106 | | | **Credits:** | 2 |
| **Teaching Hours/Week (L:T:P:O)** | | | 0:2:2:0 | **Total Hours:** | Lab sessions |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Laboratory | | | **Exam Hours:** | 3 |

## I. Course Objectives:

- Enhance problem-solving capabilities by tackling real-world scenarios with Python programming.
- Sharpen Python programming skills through practical exercises covering diverse concepts.
- Apply theoretical Python concepts to create functional programs, reinforcing understanding.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. Practical Component - Experiments

| | |
|---|---|
| 1 | Basic Calculator:<br>Implement a simple calculator that can perform basic arithmetic operations. |
| 2 | List Operations:<br>Create a Python program to perform operations like sorting, reversing, and finding the sum of elements in a list. |
| 3 | String Manipulation: |

| | |
|---|---|
| | Develop a program that manipulates strings, including tasks like reversing, counting characters, and checking for palindromes. |
| 4 | Function Practice:<br>Write Python functions to calculate factorial, find prime numbers, and generate Fibonacci series. |
| 5 | File Handling:<br>Create a program that reads data from a file, performs some operations, and writes the results to a new file. |
| 6 | Exception Handling:<br>Develop a program that uses try-except blocks to handle exceptions, ensuring robust error handling. |
| 7 | Module Exploration:<br>Explore and use built-in Python modules such as math, random, and datetime in practical scenarios. |
| 8 | Regular Expressions:<br>Write a program that utilizes regular expressions to validate and manipulate strings. |
| 9 | Date and Time Operations:<br>Develop a Python program that performs operations on dates and times, such as calculating age and time differences. |
| 10 | List Comprehensions:<br>Use list comprehensions to create and manipulate lists efficiently. |
| 11 | Dictionary Operations:<br>Implement a program to perform operations on dictionaries, including merging and sorting. |
| 12 | Recursive Functions:<br>Write recursive functions to solve problems like calculating factorials and Fibonacci series. |
| 13 | Reading and Writing Files:<br>Create a program that reads data from one file, processes it, and writes the results to another file. |
| 14 | Advanced String Handling:<br>Build a program that utilizes advanced string handling functions, such as formatting and regular expressions. |
| 15 | Working with CSV Files:<br>Develop a program that reads data from a CSV file, performs analysis, and presents the results. |
| 16 | Using Third-Party Libraries:<br>Explore and use third-party libraries like NumPy or Pandas for basic data manipulation. |
| 17 | Web Scraping:<br>Write a program that extracts information from a website using web scraping techniques. |
| 18 | Database Interaction:<br>Develop a program that interacts with a simple database, performing operations like insertion, retrieval, and updating. |
| 19 | API Consumption:<br>Create a Python program that consumes data from a public API and presents it in a meaningful way. |
| 20 | Capstone Project:<br>Combine multiple concepts learned throughout the course to create a comprehensive Python program, solving a real-world problem. |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Develop effective debugging skills for identifying and fixing coding errors. |
| **CO2** | Apply third-party Python libraries for efficient and practical problem-solving. |
| **CO3** | Strengthen self-reliance in problem-solving by tackling coding challenges individually. |
| **CO4** | Demonstrate practical understanding by integrating concepts into a final project for real-world scenarios. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | | | | | | | | | | 1 | | | |
| CO2 | 2 | 2 | | | | | | | | | | | | 2 | | |
| CO3 | 2 | 2 | | | | | | | | | | | | 2 | | |
| CO4 | 2 | 2 | 2 | | | | | | | | | | | | | 1 |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 3

**Assessment Details (both CIE and SEE):** Refer Annexure section 3

**Semester End Examination (SEE):** Refer Annexure section 3

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | 1 | **Course Type:** | PCCL | | |
| **Course Title:** Database Systems & Modeling Laboratory | | | | | |
| **Course Code:** | 23MCAL107 | | | **Credits:** | 2 |
| **Teaching Hours/Week (L:T:P:O)** | | | 0:2:2:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Laboratory | | | **Exam Hours:** | 3 |

## I. Course Objectives:

- Install and configure a Database Management System (DBMS) software.
- Perform SQL operations and database management tasks.
- Design a database model for various use cases.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. Practical Component - Experiments

| | |
|---|---|
| 1 | Install a DBMS software (e.g., MySQL, Oracle, or PostgreSQL) |
| 2 | Set up a sample employee database and execute basic SQL queries |
| 3 | Write SQL queries for data retrieval and manipulation. |
| 4 | Perform normalization on a given set of tables |

| | |
|---|---|
| 5 | Implement indexing and hashing techniques |
| 6 | Design and execute transactions with concurrency controlOptimize SQL queries |
| 7 | Demonstrate SQL query optimization on bank transaction database |
| 8 | Create an ERD for a given scenario, identify cardinality and relationships and apply attribute constraints |
| 9 | Set up and work with a NoSQL database (e.g., Postgres) |
| 10 | Design and implement a schema in a NoSQL database |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Demonstrate proficiency in DBMS installation and setup procedures. |
| **CO2** | Execute SQL queries for data manipulation and retrieval. |
| **CO3** | Apply normalization techniques to ensure data integrity. |
| **CO4** | Design and implement a database schema using Entity-Relationship Diagrams (ERD). |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | | | | | | | | | | 1 | | | |
| CO2 | 2 | 2 | | | | | | | | | | | | 2 | | |
| CO3 | 2 | 2 | | | | | | | | | | | | 2 | | |
| CO4 | 2 | 2 | 2 | | | | | | | | | | | | | 1 |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 3

**Assessment Details (both CIE and SEE):** Refer Annexure section 3

**Semester End Examination (SEE):** Refer Annexure section 3

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | I | **Course Type:** | AEC | | |
| **Course Title:** Cyber Security Essential | | | | | |
| **Course Code:** | 23MCAAE11 | | | **Credits:** | 2 |
| **Teaching Hours/Week (L:T:P:O)** | | | 0:1:2:1 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory/practical/other assessment (Practical) | | | **Exam Hours:** | 2 |

## I. Course Objectives:

1.**Introduction to Cybersecurity:**

Understand the importance of cybersecurity in today's digital landscape.

Define key terms and concepts related to cybersecurity.

2.**Networking Fundamentals:**

Gain knowledge of basic networking protocols, devices, and services.

Understand common network vulnerabilities and attacks.

3.**Legal and Ethical Considerations:**

Explore legal and ethical aspects of cybersecurity.

Understand the importance of compliance with regulations and standards.

4.**Emerging Threats and Trends:**

Stay updated on the latest cybersecurity threats and trends.

Discuss the evolving nature of cyber threats and the importance of continuous learning.

5. **Hands-on Labs and Practical Exercises:**

Provide hands-on experience through labs and practical exercises.

Allow students to apply theoretical knowledge to real-world scenarios.

## II. 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) need 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 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 analysed 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.

## III. COURSE CONTENT

### III(a).Theory PART

| **Module-1** | Hrs 8 |
|---|---|

**Heading: Essential Security Principles**

1. Define essential security principles.
2. Explain common threats and vulnerabilities.
3. Explain access management principles.
4. Explain encryption methods and applications.

**Textbook: Chapter: sections**

1. Network Security Essentials, 6e - by William Stallings (Author)

**Pre-requisites (Self Learning)**

**RBT Levels: L2& L3**

| **Module-2** | Hrs 8 |
|---|---|

**Heading: Basic Network Security Concepts**

1. Describe TCP/IP protocol vulnerabilities.
2. Explain how network addresses impact network security.
3. Describe network infrastructure and technologies.
4. Set up a secure wireless SoHo network.
5. Implement secure access technologies.

**Textbook: Chapter: sections**

Network Security Essentials, 6e - by William Stallings (Author)

**Pre-requisites (Self Learning): Security Principals**

**RBT Levels: L2& L3**

| **Module-3** | Hrs 8 |
|---|---|

**Heading: Endpoint Security Concepts**

1. Describe operating system security concepts.
2. Demonstrate familiarity with appropriate endpoint tools that gather security assessment information.
3. Verify that endpoint systems meet security policies and standards.
4. Implement software and hardware updates.
5. Interpret system logs.
6. Demonstrate familiarity with malware removal.

**Textbook:Chapter:sections**

1. Endpoint Security - by Mark Kadrich (Author)

**Pre-requisites (Self Learning): Network Basics**

**RBT Levels: L2 & L 3**

| **Module-4** | Hrs 8 |
|---|---|

**Heading:Vulnerability Assessment and Risk Management**

1. Explain vulnerability management.
2. Use threat intelligence techniques to identify potential network vulnerabilities.
3. Explain the importance of disaster recovery and business continuity planning.

**Textbook:Chapter:sections**

1. Security Risk Management Program from the Ground Up - by Evan Wheeler (Author)

**Pre-requisites (Self Learning): System Security**

**RBT Levels: L3**

| **Module-5** | Hrs 8 |
|---|---|

**Heading:Incident Handling**

1. Monitor security events and know when escalation is required.
2. Explain digital forensics and attack attribution processes.
3. Explain the impact of compliance frameworks on incident handling.
4. Describe the elements of cybersecurity incident response.

**Textbook:Chapter:sections**

1. Incident Handling and Response: A Holistic Approach for an efficient Security Incident Management. - by Jithin Alex (Author)

**Pre-requisites (Self Learning): Vulnerability Management**

**RBT Levels: L2 & L3**

## III(b). PRACTICAL PART

| Sl. No. | Experiments / Programs |
|---|---|
| **1** | Website Penetration Testing |
| **2** | Cookie Injection Testing |
| **3** | Working with Bash Scripting |
| **4** | Working with Virtual Machine and Kali Linux |
| **5** | Working with Various tools like, Burp Suite & Port Swigger. |
| **6** | Working with Sender Policy Frame Work |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Describe the fundamentals of cybersecurity, including the threat landscape and common attack vectors. |
| **CO2** | Develop proficiency in network security principles, protocols, and best practices. |
| **CO3** | Interpret knowledge of cryptography and its role in securing data and communications. |
| **CO4** | Evaluate to implement and manage access controls to safeguard systems and sensitive information. |
| **CO5** | Design a small project using emerging cybersecurity trends, technologies, and compliance requirements to ensure effective defence strategies. |

## V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | PEO 1 | PEO 2 | PEO 3 |
|---|---|---|---|---|---|---|---|
| CO1 | 2 | | 2 | | 2 | | |
| CO2 | 2 | | 2 | | 2 | | |
| CO3 | 2 | | 2 | | 2 | | |
| CO4 | 2 | | 2 | | | 2 | |
| CO5 | 2 | | 2 | | | | 2 |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 4

**Continuous Internal Evaluation (CIE):** Refer Annexure section 4

**Semester End Examination (SEE):** Refer Annexure section 4

## VII. Learning Resources

| **VII(c): Web links and Video Lectures (e-Resources):** |
| --- |
| 1. Cyber Security Full Course https://www.youtube.com/watch?v=lpa8uy4DyMo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_<br>2. https://www.youtube.com/watch?v=hXSFdwIOfnE |
| **VIII: Activity Based Learning / Practical Based Learning/Experiential learning:** |
| Working with Kali Linux, Penetration Testing, SQL Injection, Cookie Injection etc |

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **I** | **Course Type:** | MAC | | |
| **Course Title:** Basics of Programming & Computer Organization | | | | | |
| **Course Code:** | 23MCAM108 | | | **Credits:** | - |
| **Teaching Hours/Week (L:T:P:O)** | | | 2:2:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | - | **Total Marks:** | 50 |
| **SEE Type:** | Theory | | | **Exam Hours:** | - |

## I. Course Objectives:

- Master C Programming Fundamentals: Decision Making, Control Structures, Arrays, and Functions.
- Comprehend Structures, Pointers, Binary Systems, Logic, and Computer Hardware and Software Basics.
- Develop Proficiency in Applying C Programming and Utilizing Pointers Effectively.
- Apply Binary Systems, Logic, and Understand Computer Hardware and Software Basics in Problem-Solving.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

| | |
|---|---|
| Module-1:C Programming: decision making, control structures and arrays C Structure, Data Types, Input-Output Statements, Decision making with if statement, simple if statement, the if..else statement, nesting of if..else statements, the else-if ladder, the switch statement, the ?: operator, the 'goto' statement, the break statement, programming examples. The while statement, the do...while statement, the 'for' statement, nested loops, jumps in loops, the continue statement, programmingexamples.One-dimensionalandtwo-dimensionalarrays,declarationandinitializationofarrays,reading,writing and manipulation of above types of arrays. | 8 Hrs |
| **Textbook1: Chapter 1-3** | |
| **RBT Levels: 2** | |
| **Module-2:**Structures Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures. | 8 Hrs |
| **Textbook2: Chapter 1-5** | |
| **RBT Levels: 2, 3** | |
| **Module-3:**Pointers in C, Declaring and accessing pointers in C, Pointer arithmetic, Functions , Call by value, Call by reference, Pointer as function arguments, recursion, Passing arrays to functions, passing strings to functions, Functions returning pointers, Pointers to functions, Programming Examples. | 8 Hrs |
| **Textbook1: Chapter 4-7** | |
| **RBT Levels: 2,3** | |
| **Module-4:**Binary Systems and Combinational Logic, Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, subtraction using r's and r-1 complements, Binary Code, Binary Storage and Registers, Binary Logic, Integrated Circuits, Digital Logic Gates. | 8 Hrs |
| **Textbook3: Chapter 1-4** | |
| **RBT Levels:2,3** | |
| **Module-5:**Basic Structure of Computer Hardware and Software Computer Types, Functional Units, Basic Operational Concepts,Bus structure, Software, Performance, Multiprocessing and Multi computers, Machine Instruction: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Interrupts. | 8 Hrs |
| **Textbook3 : Chapter 7-11** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Apply C Programming to Solve Problems: Decision Making, Arrays, and Structures. |
| **CO2** | Effectively Use Pointers in C Programming for Arithmetic, Functions, and Recursion. |

| | |
|---|---|
| **CO3** | Apply Binary Systems, Logic, and Grasp Computer Hardware and Software Basics. |
| **CO4** | Understand and Apply Computer Hardware and Software Basics in Practical Contexts. |

**V. CO-PO-PSO MAPPING** (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | | | | | | | | | | | | 1 | | |
| CO2 | 2 | 1 | | | | | | | | | | | | 1 | | |
| CO3 | 2 | 2 | 1 | | | | | | | | | | | | | 1 |
| CO4 | 2 | 2 | 1 | | | | | | | | | | | 1 | | |

VI. **Assessment Details (CIE & SEE)**

**General Rules:** Refer Annexure section 5

**Assessment Details (both CIE and SEE) :** Refer Annexure section 5

**Semester End Examination (SEE):** Refer Annexure section 5

**VII. Learning Resources**

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Programming in ANSI | C. Balaguruswamy | 2018 | 1. McGraw HillEducation |
| 2 | C : The Complete Reference | Herbert Schild | 2000 | 1. McGraw HillEducation |
| | Let us C | YashwantKanetkar | 2008 | BPBPublications |

**VII(b): Reference Books:**

| | | | | |
|---|---|---|---|---|
| **1** | Digital Logic and Computer Design | M.Morris Mano | 2012 | Pearson |
| **2** | Computer Organization | Carl Hamacher, ZvonkoVranesic SafwatZaky | 5th edition,2011 | Tata McGraw-Hill |

**VII(c): Web links and Video Lectures (e-Resources):**

1. Harvard's CS50's Introduction to Computer Science: https://learning.edx.org/course/course-v1:HarvardX+CS50+X/home
2. MIT OpenCourseware's Introduction to Computer Science and Programming: https://ocw.mit.edu/courses/6-00sc-introduction-to-computer-science-and-programming-spring-2011/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

# II Semester MCA Syllabus

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | **PCC** | | |
| **Course Title:** Data Structures & Analysis of Algorithms | | | | | |
| **Course Code:** | **23MCAT201** | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 3:0:0:0 | **Total Hours:** | 40 Hrs |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Understand fundamental data structures and algorithms.
- Gain practical knowledge in implementing and using data structures.
- Develop algorithmic problem-solving skills.
- Analyze time and space complexity of algorithms.
- Apply data structures and algorithms in solving real-world problems.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

| III. COURSE CONTENT | |
|---|---|
| **Module-1:** Introduction to Data Structures and Algorithms, Definition and Importance of Data Structures, Types of Data Structures: Arrays, Linked Lists, Stacks, Queues, Basics of Algorithm Analysis, Asymptotic Notations: Big O, Omega, Theta, Introduction to Algorithm Design. | 8 Hrs |
| **Textbook1: Chapter 1-4** | |
| **RBT Levels: 2** | |
| **Module-2:** Array and Linked List, Arrays: Declaration, Initialization, Operations, Linked Lists: Singly Linked Lists, Doubly Linked Lists, Operations on Linked Lists, Comparison of Arrays and Linked Lists, Solving Problems using Arrays and Linked Lists. | 8 Hrs |
| **Textbook2: Chapter 3-4** | |
| **RBT Levels: 2, 3, 4** | |
| **Module-3:** Stacks and Queues, Stack: Definition, Operations, Applications, Queue: Definition, Operations, Applications, Implementing Stacks and Queues using Arrays and Linked Lists, Solving Problems using Stacks and Queues. | 8 Hrs |
| **Textbook2: Chapter 5-6** | |
| **RBT Levels:2,3,4** | |
| **Module-4:** Trees and Graphs, Trees: Binary Trees, Binary Search Trees (BST), AVL Trees, Tree Traversal Algorithms: Inorder, Preorder, Postorder, Graphs: Definitions, Representations, Graph Traversal Algorithms: BFS, DFS, Solving Problems using Trees and Graphs. | 8 Hrs |
| **Textbook2: Chapter 7-9** | |
| **RBT Levels:2,3,4** | |
| **Module-5:** Sorting and Searching Algorithms, Sorting Algorithms: Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Searching Algorithms: Linear Search, Binary Search, Analysis and Comparison of Sorting Algorithms, Solving Problems using Sorting and Searching Algorithms. | 8 Hrs |
| **Textbook1 : Chapter 2, 6-9** | |
| **RBT Levels:2,3,4** | |

| IV. COURSE OUTCOMES | |
|---|---|
| **CO1** | Expertise in the implementation of advanced data structures. |
| **CO2** | Design and optimize algorithms with a focus on efficiency. |
| **CO3** | Apply dynamic programming and greedy algorithms effectively. |
| **CO4** | Analyze algorithmic performance through comprehensive assessments. |

**V. CO-PO-PSO MAPPING** (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | 1 | | | |
| CO2 | 2 | 1 | | | | | | | | | | | | 2 | | |
| CO3 | 2 | 1 | | | | | | | | | | | | 2 | | |
| CO4 | 2 | 2 | | | | | | | | | | | | | 2 | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Introduction to Algorithms | Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein | 2009 | MIT Press |
| 2 | Data Structures and Algorithms in Java | Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser | 2014 | Wiley |

**VII(c): Web links and Video Lectures (e-Resources):**

1. FreeCodeCamp: Learn Data Structures and Algorithms (DSA) - Full Course for Beginners: https://www.freecodecamp.org/news/learn-data-structures-and-algorithms/
2. MIT OpenCourseware Introduction to Algorithms (6.006): https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-spring-2020/
3. Crash Course Data Structures: https://m.youtube.com/watch?v=jQqQpPMYPXs
4. Stanford CS106L: Programming Methodology: https://cs106l.stanford.edu/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | PCC | | |
| **Course Title:** Object Oriented Programming | | | | | |
| **Course Code:** | 23MCAT202 | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 3:0:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 |

## I. Course Objectives:

- Understand the principles of object-oriented programming (OOP).
- Develop skills in designing and implementing object-oriented solutions.
- Gain proficiency in using OOP concepts such as classes, objects, inheritance, polymorphism, and encapsulation.
- Apply design patterns to solve common programming problems.
- Explore advanced topics in OOP, including generics and exception handling.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

| | |
|---|---|
| **Module-1:** Introduction to Object-Oriented Programming, Evolution of Programming Paradigms, Basics of Procedural Programming vs Object-Oriented Programming, Key Concepts: Classes, Objects, Methods, and Attributes Benefits of Object-Oriented Programming. | 8 Hrs |

| | |
|---|---|
| **Textbook1: Chapter 1- 4** | |
| **RBT Levels: 2** | |
| Module-2: Classes and Objects, Defining Classes and Objects in Java, Constructors and Destructors, Class Methods and Instance Methods, Access Modifiers: Public, Private, Protected, Class Relationships: Association, Aggregation, Composition. | 8 Hrs |
| **Textbook2: Chapter 4 - 6** | |
| **RBT Levels: 2, 3** | |
| Module-3: Inheritance and Polymorphism, Inheritance: Types and Implementation, Method Overloading and Overriding, Polymorphism: Compile-Time and Runtime, Abstract Classes and Interfaces. | 8 Hrs |
| **Textbook1: Chapter 5 - 8** | |
| **RBT Levels:2,3,4** | |
| Module-4: Encapsulation and Design Patterns, Encapsulation and Information Hiding, Design Principles: SOLID, Design Patterns: Singleton, Factory, Observer Applying Design Patterns to Real-World Problems. | 8 Hrs |
| **Textbook3: Chapter 1 - 5** | |
| **RBT Levels:2,3,4** | |
| Module-5: Advanced OOP Concepts, Generics: Generic Classes and Methods, Exception Handling: Try-Catch Blocks, Custom Exceptions, Reflection and Metadata, Advanced Topics in OOP: Reflection and Metadata | 8 Hrs |
| Textbook2 : Chapter 18, 19, 21 | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Understand the principles of object-oriented programming. |
| **CO2** | Develop skills in designing and implementing object-oriented solutions. |
| **CO3** | Gain proficiency in using OOP concepts such as classes, objects, inheritance, polymorphism, and encapsulation. |
| **CO4** | Apply design patterns to solve common programming problems. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | | | | |
| CO2 | 2 | 2 | | | | | | | | | | | | | | |
| CO3 | 2 | 2 | 1 | | | | | | | | | | | | | |
| CO4 | 2 | 2 | 1 | | | | | | | | | | | | | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| **1** | Head First Java | Kathy Sierra and Bert Bates | 2020 | O'Reilly Media |
| **2** | Java: The Complete Reference | Herbert Schildt | 2018 | McGraw-Hill Education |

| | | | | |
|---|---|---|---|---|
| **3** | Head First Design Patterns | Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra | 2020 | O'Reilly Media |

**VII(c): Web links and Video Lectures (e-Resources):**

1. Crash Course Object Oriented Programming: https://m.youtube.com/watch?v=SiBw7os-_zI
2. MIT OpenCourseware Introduction to Object-Oriented Programming: https://ocw.mit.edu/courses/6-01sc-introduction-to-electrical-engineering-and-computer-science-i-spring-2011/pages/unit-1-software-engineering/object-oriented-programming/
3. University of California, Berkeley CS61A: Introduction to Object-Oriented Programming: https://m.youtube.com/watch?v=CoHCUimLmdM
4. freeCodeCamp: Learn Object Oriented Programming (OOP) - Full Course for Beginners: https://www.freecodecamp.org/news/object-oriented-programming-crash-course/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | PCC | | |
| **Course Title:** Software Engineering & Product Management | | | | | |
| **Course Code:** | 23MCAT203 | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 3:0:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 |

## I. Course Objectives:

- Understand the principles and practices of software engineering.
- Develop skills in managing the entire software development lifecycle.
- Gain insights into product management strategies and methodologies.
- Apply industry-standard practices for effective software development and product management.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

| | |
|---|---|
| **Module-1:** Introduction to Software Engineering, Definition and Scope of Software Engineering, Software Development Life Cycle (SDLC), Roles and Responsibilities in Software Development, Introduction to Agile Methodologies Overview of Scrum Framework. | 8 Hrs |

| | |
|---|---|
| **Textbook: Chapter 1-5** | |
| **RBT Levels: 2** | |
| **Module-2**: Requirements Engineering, Importance of Requirements Engineering Elicitation and Documentation of Requirements, Use Case Modeling and User Stories, Requirements Validation and Verification, Traceability and Change Management. | 8 Hrs |
| **Textbook1: Chapter 6-10** | |
| **RBT Levels: 2,3** | |
| **Module-3**: Software Design and Architecture, Principles of Software Design Architectural Styles and Patterns, Design Notations and Documentation Design Quality Attributes, Introduction to Microservices Architecture. | 8 Hrs |
| **Textbook1: Chapter 11-15** | |
| **RBT Levels:2,3,4** | |
| **Module-4:** Software Testing and Quality Assurance, Importance of Testing in SDLC, Types of Testing: Unit, Integration, System, Acceptance, Automated Testing and Continuous Integration, Software Quality Assurance (SQA) Metrics and Measurement in Software Quality. | 8 Hrs |
| **Textbook1: Chapter 16-20** | |
| **RBT Levels:2,3,4** | |
| **Module-5:** Product Management Strategies, Introduction to Product Management Product Lifecycle Management, Lean Product and Lean StartupMinimum Viable Product (MVP) and Prototyping, Introduction to Scrum, Agile Product Management. | 8 Hrs |
| **Textbook : Chapter 16-19, 21** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Understand the principles and practices of software engineering. |
| **CO2** | Develop skills in managing the entire software development lifecycle. |
| **CO3** | Gain insights into product management strategies and methodologies. |
| **CO4** | Apply industry-standard practices for effective software development and product management. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | | | | |
| CO2 | 2 | 1 | 1 | | | | | | | | | | | | | |
| CO3 | 2 | 1 | 1 | | | | | | | | | | | | | |
| CO4 | 2 | 1 | 1 | | | | | | | | | | | | | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Software Engineering: A Practitioner's Approach | Roger S. Pressman | 2020 | McGraw-Hill Education |
| 2 | Inspired: How To Create Products Customers Love | Marty Cagan | 2018 | Wiley |

**VII(b): Reference Books:** (Insert or delete rows as per requirement)

| | | | | |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |

**VII(c): Web links and Video Lectures (e-Resources):**

1. Software Engineering for Product Management: https://www.coursera.org/courses?query=software%20product%20management
2. Introduction to Software Engineering: https://ocw.mit.edu/courses/6-01sc-introduction-to-electrical-engineering-and-computer-science-i-spring-2011/pages/unit-1-software-engineering/
3. Software Engineering (CSC705C): https://onlinecourses.nptel.ac.in/noc20_cs68/preview
4. Software Design (CSE2106): https://onlinecourses.nptel.ac.in/noc20_cs68/preview
5. UDEMY:
6. The Complete Software Engineer Bootcamp 2023: https://www.udemy.com/course/the-complete-developer-bootcamp/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | IPCC | | |
| **Course Title:** Web Technologies - 1 | | | | | |
| **Course Code:** | 23MCAI204 | | | **Credits:** | 4 |
| **Teaching Hours/Week (L:T:P:O)** | | | 3:0:2:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Understand the foundational concepts of web technologies.
- Develop skills in building and designing dynamic web applications.
- Gain proficiency in front-end and back-end web development.
- Acquire knowledge of web security and best practices.
- Explore emerging trends and technologies in the field of web development.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

### III(a). Theory PART

| | |
|---|---|
| **Module-1:** Introduction to Web Technologies, Evolution of the World Wide Web, Basics of HTML and CSS, Overview of Client-Server Architecture, Introduction to Web Browsers, Web Standards and Validation | 8 Hrs |
| **Textbook:** Chapter 1-5 | |

| | |
|---|---|
| **RBT Levels: 2** | |
| **Module-2:** Front-End Web Development, JavaScript Fundamentals, Document Object Model (DOM), CSS Frameworks (e.g., Bootstrap), Responsive Web Design, Front-End Build Tools (e.g., npm, webpack) | 8 Hrs |
| **Textbook : Chapter 1 – 4** | |
| **RBT Levels: 2,3** | |
| **Module-3:** Back-End Web Development, Introduction to Server-Side Programming, Server-Side Scripting (e.g., PHP), Database Basics and Integration, RESTful APIs and Web Services, Server-Side Frameworks (e.g., Express.js) | 8 Hrs |
| **Textbook : Chapter 2 – 6** | |
| **RBT Levels: 2,3,4** | |
| **Module-4:** Web Security and Best Practices, Common Web Security Threats, HTTPS and SSL/TLS, Cross-Site Scripting (XSS) and Cross-Site Request Forgery (CSRF), Web Application Security Best Practices, Introduction to Web Application Firewalls (WAF) | 8 Hrs |
| **Textbook : 2 – 5** | |
| **RBT Levels:2,3,4** | |
| **Module-5:** Emerging Trends in Web Development, Progressive Web Apps (PWAs) ,Single Page Applications (SPAs), WebAssembly and JavaScript Frameworks (e.g., React, Angular, Vue), Microservices Architecture in Web Development, Introduction to Web 3.0 and Beyond | 8 Hrs |

**III(b). PRACTICAL PART**

| Sl. No. | Experiments / Programs / Problems |
|---|---|
| **1** | HTML and CSS Basics:<br>• Create a simple webpage with HTML and apply CSS styles for formatting.<br>• Design a webpage layout using CSS flexbox or grid. |
| **2** | JavaScript Interaction:<br>• Develop a JavaScript program that prompts the user for input and displays it on the webpage.<br>• Use JavaScript to manipulate the Document Object Model (DOM) dynamically. |
| **3** | Bootstrap Integration:<br>• Build a responsive webpage using Bootstrap components (e.g., navigation bar, cards).<br>• Customize the appearance of Bootstrap components using CSS. |
| **4** | PHP and MySQL Integration:<br>• Create a PHP script that connects to a MySQL database and retrieves data.<br>• Implement a simple registration form using PHP and validate user input. |
| **5** | RESTful API Interaction:<br>• Use JavaScript to make asynchronous requests to a RESTful API and display the results.<br>• Develop a basic CRUD (Create, Read, Update, Delete) application using a RESTfulAPI |
| **6** | Web Security Practices:<br>• Implement a simple login form with secure password hashing in PHP.<br>• Integrate HTTPS into a web application and understand its impact on security. |

| | |
|---|---|
| **7** | JavaScript Framework Exploration:<br>• Create a basic React component and render it in a webpage.<br>• Build a single-page application (SPA) using Angular or Vue.js. |
| **8** | Microservices Architecture:<br>• Design a microservices architecture for a web application using a diagram.<br>• Implement a simple communication mechanism between microservices. |
| **9** | WebAssembly Experimentation:<br>• Write a basic program in a language like C or Rust and compile it to WebAssembly.<br>• Integrate a WebAssembly module into a web application. |
| **10** | Web Application Security Audit:<br>• Conduct a security audit for a given web application, identifying potential vulnerabilities.<br>• Implement security best practices to address the identified issues. |
| **11** | Web Application Firewall Setup:<br>• Configure and test a web application firewall (WAF) to protect against common attacks.<br>• Analyze the WAF logs for detected security events. |
| **12** | Progressive Web App (PWA) Implementation:<br>• Convert a basic web application into a Progressive Web App with offline capabilities.<br>• Test the PWA on different devices and browsers. |
| **13** | Responsive Design Enhancement:<br>• Enhance an existing webpage's responsiveness using media queries.<br>• Ensure a seamless user experience on various screen sizes. |
| **14** | Implementing Single Sign-On (SSO):<br>• Integrate a single sign-on authentication mechanism using OAuth or OpenID Connect.<br>• Test and verify the SSO implementation in a multi-application environment. |
| **15** | Web 3.0 Exploration:<br>• Explore and implement a basic feature or concept related to Web 3.0 (e.g., decentralized applications).<br>• Reflect on the potential impact of Web 3.0 on future web development. |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Understand foundational concepts of web technologies. |
| **CO2** | Develop skills in building and designing dynamic web applications. |
| **CO3** | Gain proficiency in front-end and back-end web development. |
| **CO4** | Acquire knowledge of web security and best practices. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | | | | |
| CO2 | 2 | 2 | 2 | | | | | | | | | | | | | |
| CO3 | 2 | 1 | 1 | | | | | | | | | | | | | |
| CO4 | 2 | 1 | 2 | | | | | | | | | | | | | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 2

**Assessment Details (both CIE and SEE):** Refer Annexure section 2

**Semester End Examination (SEE):** Refer Annexure section 2

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| **1** | HTML and CSS: Design and Build Websites | Jon Duckett | 2011 | Wiley |
| **2** | JavaScript and jQuery: The Missing Manual | David Sawyer McFarland | 2014 | O'Reily Media |
| **3** | PHP and MySQL Web Development | Luke Welling, Thomson | 2016 | Addison-Wesley |
| **4** | Web Application Security: A Beginner's Guide | Bryan Sullivan | 2018 | McGraw-Hill Education |

**VII(b): Reference Books:**

| | | | | |
|---|---|---|---|---|
| **1** | Bootstrap Documentation | Official Website | | |
| **2** | JavaScript | Official Website | | |

**VII(c): Web links and Video Lectures (e-Resources):**

1. Introduction to Web Technologies by University of Michigan: https://www.udemy.com/course/web-technology-for-entrepreneurs/
2. Web Technologies (CSE206C) by IIT Bombay: https://onlinecourses.nptel.ac.in/
3. Introduction to HTML5 || Web Technologies Tutorial: https://www.youtube.com/watch?v=DgRngrWG59o
4. FreeCodeCamp Web Development playlist: https://www.freecodecamp.org/news/tag/web-development/
5. Crash Course Web Technologies: https://www.youtube.com/watch?v=RkAXDGnz0FQ
6. The Complete Web Developer Bootcamp 2023: https://www.udemy.com/course/web-development-complete-bootcamp-2023/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | **PEC** | | |
| **Course Title:** Data Mining & Warehousing | | | | | |
| **Course Code:** | 23MCAE211 | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 2:2:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 |

## I. Course Objectives:

- Understand the fundamental concepts of data mining and data warehousing.
- Develop skills in extracting valuable patterns and knowledge from large datasets.
- Gain proficiency in designing and implementing data warehouses.
- Apply data mining techniques to support decision-making processes.
- Explore real-world applications and challenges in data mining and warehousing.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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.
7. Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.

## III. COURSE CONTENT

| | |
|---|---|
| Module-1: Introduction to Data Mining, Definition and Objectives of Data Mining, Data Mining Process and Techniques, Data Exploration and Pre-processing, Data Mining Algorithms Overview, Applications of Data Mining. | 8 Hrs |

**Textbook1: Chapter 1 - 5**

| | |
|---|---|
| **RBT Levels: 2** | |
| Module-2: Data Warehousing Concepts, Definition and Purpose of Data Warehousing, Components of Data Warehouses, Data Warehouse Architecture, Data Marts and OLAP (Online Analytical Processing), ETL (Extract, Transform, Load) Processes. | 8 Hrs |
| **Textbook2: Chapter 1 - 6** | |
| **RBT Levels: 2, 3** | |
| Module-3: Data Warehouse Design and Implementation, Dimensional Modeling Techniques, Fact and Dimension Tables, Star and Snowflake Schemas, Data Warehouse Design Best Practices, Case Studies in Data Warehouse Design. | 8 Hrs |
| **Textbook2: Chapter 7 - 11** | |
| **RBT Levels:2,3,4** | |
| Module-4: Data Mining Algorithms, Classification and Prediction Algorithms, Clustering Algorithms, Association Rule Mining, Outlier Detection Techniques, Evaluation and Validation of Data Mining Models. | 8 Hrs |
| **Textbook1: Chapter 6 - 9** | |
| **RBT Levels:2,3,4** | |
| Module-5: Advanced Topics and Applications, Text and Web Mining, Time-Series Analysis, Data Mining in Big Data Environments, Challenges and Ethical Issues in Data Mining, Real-world Applications and Case Studies. | 8 Hrs |
| **Textbook1: Chapter 10 -13** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Understand the fundamental concepts of data mining and data warehousing. |
| **CO2** | Develop skills in extracting valuable patterns and knowledge from large datasets. |
| **CO3** | Gain proficiency in designing and implementing data warehouses. |
| **CO4** | Apply data mining techniques to support decision-making processes. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | | | | | | | | | | | | | |
| CO2 | 2 | 2 | 1 | | | | | | | | | | | | | |
| CO3 | 1 | 1 | 1 | | | | | | | | | | | | | |
| CO4 | 2 | 1 | 1 | | | | | | | | | | | | | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| **1** | Data Mining: Concepts and Techniques | Jiawei Han and Micheline Kamber, | 2011 | Morgan Kaufmann |
| **2** | The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling | Ralph Kimball and Margy Ross | 2013 | Wiley |

**VII(c): Web links and Video Lectures (e-Resources):**

1. https://www.coursera.org/courses?query=data%20mining
2. https://www.coursera.org/specializations/data-mining
3. https://onlinecourses.nptel.ac.in/noc21_cs06/preview
4. https://onlinecourses.swayam2.ac.in/cec19_cs01/preview
5. https://ocw.mit.edu/courses/15-062-data-mining-spring-2003/
6. https://ocw.mit.edu/courses/15-062-data-mining-spring-2003/
7. https://www.youtube.com/watch?v=Dr4nW64TFAI
8. https://www.tutorialspoint.com/data_mining/index.htm

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | **PEC** | | |
| **Course Title:** UI & UX Design | | | | | |
| **Course Code:** | **23MCAE212** | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 2:2:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Understand the principles and fundamentals of User Interface (UI) and User Experience (UX) design.
- Develop practical skills in creating visually appealing and user-friendly interfaces.
- Gain insights into user-centered design methodologies.
- Apply usability principles and conduct effective user testing.
- Explore the latest trends and technologies in UI & UX design.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to

| | |
|---|---|
| improve the student's understanding. | |
| **III. COURSE CONTENT** | |
| **Module-1:**Introduction to UI & UX Design, Definition and Importance of UI & UX Design, Differences between UI and UX, The Design Process: Ideation to Implementation, Roles and Responsibilities in UI & UX Design, Overview of Design Tools and Software | 8 Hrs |
| **Textbook1: Chapter 1-3** | |
| **RBT Levels: 2** | |
| **Module-2:** Principles of Visual Design, Color Theory and Psychology, Typography Basics and Font Pairing, Layout and Composition Principles, Imagery and Iconography, Designing for Different Devices and Platforms. | 8 Hrs |
| **Textbook2: Chapter 1-5** | |
| **RBT Levels: 2** | |
| **Module-3:** User-Centered Design, Understanding User Needs and Goals, Persona Creation and User Research, Information Architecture and Wireframing, Prototyping Techniques, Design Thinking in UI & UX. | 8 Hrs |
| **Textbook1: Chapter 4-7** | |
| **RBT Levels:2,3,4** | |
| **Module-4:** Usability Testing and Feedback, Importance of Usability Testing, Conducting Usability Tests, Analyzing User Feedback, Iterative Design and Continuous Improvement, Accessibility in UI & UX Design. | 8 Hrs |
| **Textbook3: Chapter 1-4** | |
| **RBT Levels:2,3,4** | |
| **Module-5:** Emerging Trends and Technologies, Responsive Design and Mobile-first Approach, Voice User Interface (VUI) Design, Augmented Reality (AR) and Virtual Reality (VR), AI and Machine Learning in UI & UX, Future Directions in UI & UX Design. | 8 Hrs |
| **Textbook3 : Chapter 7-11** | |
| **RBT Levels:2,3,4** | |

**IV. COURSE OUTCOMES**

| | |
|---|---|
| **CO1** | Understand the principles and fundamentals of User Interface (UI) and User Experience (UX) design. |
| **CO2** | Develop practical skills in creating visually appealing and user-friendly interfaces. |
| **CO3** | Gain insights into user-centered design methodologies. |
| **CO4** | Apply usability principles and conduct effective user testing. |

**V. CO-PO-PSO MAPPING** (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | | | | | | | | | | 1 | | | |
| CO2 | 2 | 2 | 1 | | | | | | | | | | | 2 | | |
| CO3 | 2 | 2 | 1 | | | | | | | | | | | 2 | | |
| CO4 | 2 | 2 | 1 | | | | | | | | | | | | 1 | |

VI. **Assessment Details (CIE & SEE)**

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability | Steve Krug | 2014 | New Riders |
| 2 | The Non-Designer's Design Book | Robin Williams | 2014 | Peachpit Press |
| | Rocket Surgery Made Easy: The Do-It-Yourself Guide to Finding and Fixing Usability Problems | Steve Krug | 2009 | New Riders |

**VII(c): Web links and Video Lectures (e-Resources):**

1. https://www.figma.com/resource-library/
2. https://www.coursera.org/professional-certificates/google-ux-design
3. https://onlinecourses.nptel.ac.in/noc21_ar05/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | **PEC** | | |
| **Course Title:** Cloud Computing | | | | | |
| **Course Code:** | **23MCAE213** | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 2:2:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Understand the fundamental concepts and principles of cloud computing.
- Gain practical knowledge of cloud service models (IaaS, PaaS, SaaS) and deployment models (public, private, hybrid).
- Develop skills in designing and implementing cloud-based solutions.
- Explore security, scalability, and performance considerations in cloud computing.
- Stay informed about emerging trends and technologies in cloud computing.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

| | |
|---|---|
| Module-1:Introduction to Cloud Computing, Definition and Characteristics of Cloud Computing, Historical Evolution and Milestones, Cloud Service Models: IaaS, PaaS, SaaS, Cloud Deployment Models: Public, Private, Hybrid, Key Players in the Cloud Computing Industry. | 8 Hrs |

| | |
|---|---|
| **Textbook1: Chapter 1-4** | |
| **RBT Levels: 2** | |
| Module-2:Cloud Infrastructure and Virtualization, Virtualization Fundamentals, Virtual Machines and Hypervisors, Cloud Infrastructure Components, Containerization and Orchestration, Cloud Storage and Networking. | 8 Hrs |
| **Textbook2: Chapter 5-9** | |
| **RBT Levels: 2,3** | |
| Module-3:Cloud Service Providers and Platforms, Overview of Major Cloud Service Providers (AWS, Azure, Google Cloud), Cloud Platform Services: Databases, AI/ML, IoT, Managing and Monitoring Cloud Resources, Billing and Cost Management in the Cloud. | 8 Hrs |
| **Textbook2: Chapter 1-5** | |
| **RBT Levels:2,3,4** | |
| Module-4:Cloud Security and Compliance, Security Challenges in Cloud Computing, Identity and Access Management, Data Encryption and Privacy, Regulatory Compliance in the Cloud, Incident Response and Cloud Security Best Practices. | 8 Hrs |
| **Textbook3: Chapter 1-5** | |
| **RBT Levels:2,3,4** | |
| Module-5:Advanced Topics and Emerging Trends, Serverless Computing and Function-as-a-Service (FaaS), Edge Computing and Fog Computing, Blockchain in Cloud Computing, Green Computing and Sustainability, Future Directions in Cloud Computing. | 8 Hrs |
| **Textbook1 : Chapter 9**<br>**Textbook2 : Chapter 11, 12**<br>**Textbook3 : Chapter 11, 13, 14** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Understand the fundamental concepts and principles of cloud computing. |
| **CO2** | Gain practical knowledge of cloud service models (IaaS, PaaS, SaaS) and deployment models (public, private, hybrid). |
| **CO3** | Develop skills in designing and implementing cloud-based solutions. |
| **CO4** | Explore security, scalability, and performance considerations in cloud computing. |

**V. CO-PO-PSO MAPPING** (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO2 | 2 | 1 | 1 | | | | | | | | | | | | | |
| CO3 | 2 | 1 | 1 | | | | | | | | | | | | | |
| CO4 | 2 | 2 | 1 | | | | | | | | | | | | | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Cloud Computing: Concepts, Technology & Architecture | Thomas Erl, Zaigham Mahmood, and Ricardo Puttini | 2013 | Pearson |
| 2 | Mastering Cloud Computing: Foundations and Applications Programming | RajkumarBuyya, Christian Vecchiola, and S. ThamaraiSelvi | 2013 | Morgan Kaufmann |
| | Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance | Tim Mather, Subra Kumaraswamy, and Shahed Latif | 2009 | O'Reilly Media |

**VII(c): Web links and Video Lectures (e-Resources):**

1. https://onlinecourses.nptel.ac.in/noc21_cs14
2. https://www.coursera.org/learn/introduction-to-cloud
3. https://aws.amazon.com/education/awseducate
4. https://azure.microsoft.com/en-in/resources/training-and-certifications#self-directed-training
5. https://cloud.google.com/learn/training/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | **PEC** | | |
| **Course Title:** Computer Vision | | | | | |
| **Course Code:** | **23MCAE214** | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 2:2:0:0 | **Total Hours:** | 40 hrs |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 50 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3Hrs |

## I. Course Objectives:

- Understand the fundamental principles and techniques of computer vision.
- Gain practical knowledge in image processing and feature extraction.
- Develop skills in object recognition, tracking, and scene understanding.
- Explore advanced computer vision topics such as deep learning and applications.
- Stay informed about the latest research trends in computer vision.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

| | |
|---|---|
| **Module-1:**Introduction to Computer Vision, Definition and Scope of Computer Vision, Historical Development and Milestones, Human Vision vs. Computer Vision, Basic Concepts: Pixels, Images, and Color Spaces, Image Acquisition and Preprocessing Techniques | 8 Hrs |
| **Textbook1: Chapter 1-4** | |

| | |
|---|---|
| **RBT Levels: 2** | |
| **Module-2:** Image Processing and Filtering, Image Enhancement and Restoration, Spatial and Frequency Domain Filtering, Edge Detection and Feature Extraction, Histogram Processing, Morphological Operations. | 8 Hrs |
| **Textbook2: Chapter 3-7** | |
| **RBT Levels: 2,3** | |
| **Module-3:**Object Recognition and Tracking, Object Representation and Recognition Techniques, Template Matching and Feature Matching, Object Tracking Methods, Multiple Object Tracking and Kalman Filters, Optical Flow and Motion Analysis | 8 Hrs |
| **Textbook1: Chapter 5-8** | |
| **RBT Levels:2,3,4** | |
| **Module-4:**Deep Learning in Computer Vision, Introduction to Deep Learning and Neural Networks, Convolutional Neural Networks (CNNs) for Image Recognition, Object Detection and Localization with CNNs, Transfer Learning in Computer Vision, Generative Adversarial Networks (GANs) in Vision. | 8 Hrs |
| **Textbook3: Chapter 9-11** | |
| **RBT Levels:2,3,4** | |
| Module-5:Applications and Future Trends, Computer Vision Applications: Robotics, Medical Imaging, Augmented Reality, Ethical Considerations in Computer Vision, Challenges and Opportunities in the Field, Latest Research Trends and Conferences. | 8 Hrs |
| **Textbook1 : Chapter 10, 11**<br>**Textbook2 : Chapter 10**<br>**Textbook3 : Chapter 12, 13, 14** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Understand the fundamental principles and techniques of computer vision. |
| **CO2** | Gain practical knowledge in image processing and feature extraction. |
| **CO3** | Develop skills in object recognition, tracking, and scene understanding. |
| **CO4** | Explore advanced computer vision topics such as deep learning and applications. |

**V. CO-PO-PSO MAPPING** (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | 1 | | | |
| CO2 | 2 | 1 | 1 | | | | | | | | | | | 2 | | |
| CO3 | 1 | 1 | 1 | | | | | | | | | | | 2 | | |
| CO4 | 1 | 1 | 2 | | | | | | | | | | | 1 | | |

VI. **Assessment Details (CIE & SEE)**

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE): Graduation**

**VII. Learning Resources**

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Computer Vision: Algorithms and Applications | Richard Szeliski | 2010 | Springer |
| 2 | Digital Image Processing | Rafael C. Gonzalez and Richard E. Woods | 2017 | Pearson |
| 3 | Deep Learning | Ian Goodfellow, YoshuaBengio, and Aaron Courville | 2016 | MIT Press |

**VII(c): Web links and Video Lectures (e-Resources):**

1. https://nptel.ac.in/courses/106106224
2. https://www.coursera.org/learn/introduction-computer-vision-watson-opencv
3. https://www.youtube.com/watch?v=l_Mhv0rxbQk&list=PLaHodugB5x-Ddy_H951h0VHjOjfzZNCBh&ab_channel=AskItLoud

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | PEC | | |
| **Course Title:** Artificial Intelligence & Machine Learning | | | | | |
| **Course Code:** | 23MCAE221 | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 2:2:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Understand the fundamental concepts and principles of Artificial Intelligence (AI) and Machine Learning (ML).
- Gain practical knowledge in basic ML algorithms and techniques.
- Develop skills in problem-solving using AI and ML approaches.
- Explore real-world applications and ethical considerations in AI and ML.
- Stay informed about the latest trends and technologies in the field.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

### III(a). Theory PART

| | |
|---|---|
| **Module-1:**Introduction to Artificial Intelligence, Definition and Scope of Artificial Intelligence, Historical Development and Milestones, Types of AI: Narrow vs. | 8 Hrs |

| | |
|---|---|
| General, Problem-solving Approaches in AI, Overview of AI Applications. | |
| **Textbook1: Chapter 1-3** | |
| **RBT Levels: 2** | |
| **Module-2:**Basics of Machine Learning, Introduction to Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning, Data Representation and Feature Engineering, Model Training and Evaluation, Overfitting and Underfitting. | 8 Hrs |
| **Textbook2: Chapter 1-4** | |
| **RBT Levels: 2,4** | |
| **Module-3:**Classical Machine Learning Algorithms, Linear Regression and Logistic Regression, Decision Trees and Random Forests, Support Vector Machines (SVM), k-Nearest Neighbors (k-NN), Clustering Algorithms: K-Means, Hierarchical Clustering | 8 Hrs |
| **Textbook2: Chapter 6-9** | |
| **RBT Levels:2,3,4** | |
| **Module-4:**Neural Networks and Deep Learning, Basics of Neural Networks, Introduction to Deep Learning, Building and Training Neural Networks, Convolutional Neural Networks (CNNs) for Image Recognition, Recurrent Neural Networks (RNNs) for Sequence Data. | 8 Hrs |
| **Textbook3: Chapter 1-10** | |
| **RBT Levels:2,3,4** | |
| **Module-5:**Applications and Ethical Considerations, Real-world Applications of AI and ML, Ethical Considerations and Bias in Machine Learning, Explainability and Interpretability in ML Models, AI and ML Regulations and Guidelines. | 8 Hrs |
| **Textbook1 : Chapter 27**<br>**Textbook2 : Chapter 11** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Understand the fundamental concepts and principles of Artificial Intelligence (AI) and Machine Learning (ML). |
| **CO2** | Gain practical knowledge in basic ML algorithms and techniques. |
| **CO3** | Develop skills in problem-solving using AI and ML approaches. |
| **CO4** | Explore real-world applications and ethical considerations in AI and ML. |

**V. CO-PO-PSO MAPPING** (mark H=3; M=2; L=1)

| PO/PS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O | | | | | | | | | | | | | | | | |
| CO1 | 2 | 2 | 2 | | | | | | | | | | | | | |
| CO2 | 2 | 2 | 2 | | | | | | | | | | | | | |
| CO3 | 2 | 2 | 2 | | | | | | | | | | | | | |
| CO4 | 2 | 2 | 2 | | | | | | | | | | | | | |

VI. **Assessment Details (CIE & SEE)**

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Artificial Intelligence: A Modern Approach | Stuart Russell and Peter Norvig | 2020 | Pearson |
| 2 | Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow | AurélienGéron | 2019 | O'Reilly Media |
| 3 | Deep Learning | Ian Goodfellow, YoshuaBengio, and Aaron Courville | 2016 | MIT Press |

**VII(c): Web links and Video Lectures (e-Resources):**

1. https://www.coursera.org/collections/best-machine-learning-ai
2. https://nptel.ac.in/courses/106105077
3. https://www.youtube.com/watch?v=5NgNicANyqM&ab_channel=freeCodeCamp.org

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | PEC | | |
| **Course Title:** Mobile Computing | | | | | |
| **Course Code:** | 23MCAE222 | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 2:2:0:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Understand the fundamental concepts and principles of mobile computing.
- Gain practical knowledge in mobile application development.
- Develop skills in mobile network communication and protocols.
- Explore mobile operating systems and their features.
- Stay informed about the latest trends and technologies in mobile computing.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

### III(a). Theory PART

| | |
|---|---|
| Module-1: Introduction to Mobile Computing , Definition and Scope of Mobile Computing, Evolution of Mobile Computing, Mobile Devices and Platforms, Mobile Applications and Services, Challenges in Mobile Computing. | 8 Hrs |

| | |
|---|---|
| **Textbook1: Chapter 1-3** | |
| **RBT Levels: 2** | |
| Module-2: Mobile Application Development, Basics of Mobile App Development, Native vs. Cross-Platform Development, Introduction to Android and iOS Development, App Deployment and Distribution, User Interface Design for Mobile Apps. | 8 Hrs |
| **Textbook2: Chapter 1-5** | |
| **RBT Levels: 2, 3** | |
| Module-3: Mobile Network Communication, Mobile Communication Technologies: 2G to 5G, Wireless Communication Protocols: Bluetooth, Wi-Fi, NFC, Mobile Sensing and Context Awareness, Location-Based Services, Mobile Cloud Computing. | 8 Hrs |
| **Textbook1: Chapter 4-7** | |
| **RBT Levels:2,3,4** | |
| Module-4: Mobile Operating Systems, Overview of Mobile Operating Systems, Android Architecture and Components, iOS Architecture and Components, Security in Mobile Operating Systems, Updates and App Stores. | 8 Hrs |
| **Textbook3: Chapter 1-4** | |
| **RBT Levels:2,3,4** | |
| Module-5: Advanced Topics and Emerging Trends, Wearable Computing and Internet of Things (IoT), Augmented Reality (AR) and Virtual Reality (VR), Mobile Edge Computing (MEC), Mobile Security Best Practices, Future Directions in Mobile Computing. | 8 Hrs |
| **Textbook3 : Chapter 7-11** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Understand the fundamental concepts and principles of mobile computing. |
| **CO2** | Gain practical knowledge in mobile application development. |
| **CO3** | Develop skills in mobile network communication and protocols. |
| **CO4** | Explore mobile operating systems and their features. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | | | | | | | | | | 1 | | | |
| CO2 | 2 | 1 | 2 | | | | | | | | | | 2 | | | |
| CO3 | 2 | 2 | 1 | | | | | | | | | | | 1 | | |
| CO4 | 2 | 1 | 2 | | | | | | | | | | | | 1 | |

VI. **Assessment Details (CIE & SEE)**

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

**VII. Learning Resources**

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Mobile Computing: Technology, Applications, and Service Creation | Asoke K. Talukder and RoopaYavagal | 2012 | McGraw-Hill Education |
| 2 | Mobile Application Development | Chris Haseman | 2010 | O'Reilly Media |

**VII(c): Web links and Video Lectures (e-Resources):**

1. https://www.coursera.org/learn/illinois-tech-mobile-computing-and-cloud
2.https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/
3. https://www.youtube.com/playlist?list=PLV8vIYTIdSnZMKTQSTxWbx4NGNfxyZq_N

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | PEC | | |
| **Course Title:** Edge Computing | | | | | |
| **Course Code:** | 23MCAE223 | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 2:2:0:0 | **Total Hours:** | 40 Hrs |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Understand the fundamental concepts and principles of edge computing.
- Gain practical knowledge in edge computing architectures and technologies.
- Develop skills in deploying and managing edge devices and networks.
- Explore real-world applications and challenges in edge computing.
- Stay informed about the latest trends and technologies in the field.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

### III(a). Theory PART

| | |
|---|---|
| **Module-1:**Introduction to Edge Computing, Definition and Scope of Edge Computing, Evolution and Motivation for Edge Computing, Key Components: Edge Devices, Edge Servers, Edge Networks, Edge vs. Cloud Computing, Applications and Use Cases of Edge Computing. | 8 Hrs |

**Textbook1: Chapter 1-3**

| | |
|---|---|
| **RBT Levels: 2** | |
| **Module-2:**Edge Computing Architecture, Architectural Components of Edge Computing, Fog Computing vs. Edge Computing, Edge Device Communication Protocols, Edge Server Configurations and Topologies, Security Considerations in Edge Architecture. | 8 Hrs |
| **Textbook1: Chapter 4-7** | |
| **RBT Levels: 2, 4** | |
| **Module-3:**Edge Device and Network Management, Edge Device Characteristics and Configurations, Device Management Protocols, Edge Network Configurations, QoS and Network Slicing in Edge Networks, Monitoring and Troubleshooting in Edge Environments. | 8 Hrs |
| **Textbook1: Chapter 8-11** | |
| **RBT Levels:2,3,4** | |
| **Module-4:**Applications of Edge Computing, Industrial IoT and Edge Computing, Smart Cities and Edge Computing, Healthcare Applications, Edge Computing in Autonomous Systems, Gaming and Entertainment at the Edge. | 8 Hrs |
| **Textbook3: Chapter 12-15** | |
| **RBT Levels:2,3,4** | |
| **Module-5:**Advanced Topics and Emerging Trends, Machine Learning at the Edge, Security and Privacy Challenges, Edge Computing in 5G Networks, Blockchain and Edge Computing, Future Directions in Edge Computing. | 8 Hrs |
| **Textbook3 : Chapter 16-18** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Understand the fundamental concepts and principles of edge computing. |
| **CO2** | Gain practical knowledge in edge computing architectures and technologies. |
| **CO3** | Develop skills in deploying and managing edge devices and networks. |
| **CO4** | Explore real-world applications and challenges in edge computing. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | | | | |
| CO2 | 2 | 1 | 1 | | | | | | | | | | | | | |
| CO3 | 2 | 1 | 1 | | | | | | | | | | | | | |
| CO4 | 2 | 2 | 2 | | | | | | | | | | | | | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Edge Computing: Models, Technologies, and Applications | Danda B. Rawat, Joel J.P.C. Rodrigues, and Ivan Stojmenović | 2021 | Wiley |

**VII(c): Web links and Video Lectures (e-Resources):**

1. https://onlinecourses.nptel.ac.in/noc24_cs66/preview
2. https://www.udemy.com/course/introduction-to-edge-computing/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | **PEC** | | |
| **Course Title:** Digital Marketing | | | | | |
| **Course Code:** | 23MCAE224 | | | **Credits:** | 3 |
| **Teaching Hours/Week (L:T:P:O)** | | | 2:2:0:0 | **Total Hours:** | 40 Hrs |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Develop a foundational understanding of digital marketing concepts for non-commerce students.
- Introduce basic digital marketing tools and platforms to computer application students.
- Familiarize students with fundamental principles of consumer behavior applicable to digital marketing.
- Provide introductory awareness of emerging trends and technologies in digital marketing.
- Emphasize ethical considerations and best practices relevant to the beginner level of digital marketing knowledge.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

### III(a). Theory PART

| | |
|---|---|
| **Module-1:**Introduction to Digital Marketing Evolution of Digital Marketing from traditional to modern era, Role of Internet; Current trends, Info-graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment; Digital marketing strategy; P.O.E.M. | 8 Hrs |

| | |
|---|---|
| framework, Digital landscape, Digital marketing plan, Digital marketing models. | |
| **Textbook1** | |
| **RBT Levels: 2** | |
| **Module-2:**Internet Marketing and Digital Marketing Mix – Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on IMC; Search Engine Advertising: - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing: - Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing. | 8 Hrs |
| **Textbook2: Chapter 1-5** | |
| **RBT Levels: 2, 3** | |
| **Module-3:**Social Media Marketing – Role of Influencer Marketing, Tools & Plan– Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: - Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools Linkedin Marketing: - Introduction and Importance of Linkedin Marketing, Framing Linkedin Strategy, Lead Generation through Linkedin, Content Strategy, Analytics and Targeting Twitter Marketing: - Introduction to Twitter Marketing, how twitter Marketing is different than other forms of digital marketing, framing content strategy, Twitter Advertising Campaigns Instagram and Snapchat: - Digital Marketing Strategies through Instagram and Snapchat Mobile Marketing: - Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics Introduction to social media metrics | 8 Hrs |
| **Textbook1: Chapter 4-7** | |
| **RBT Levels:2,3,4** | |
| **Module-4:**Mobile Usage, Mobile Advertising- Mobile Advertising Models, advantages of Mobile advertising, Mobile Marketing Toolkit, Mobile Marketing features- Location based services, Social marketing on mobile, QR Codes, Augmented Reality, Gamification, Tracking mobile campaigns- Mobile Analytics.<br><br>Live Project: Create a mobile advertising project. | 8 Hrs |
| **Textbook3: Chapter 1-4** | |
| **RBT Levels:2,3,4** | |
| Module-5:Search Engine Optimization: How search engines work, concept of search engine optimisation (SEO), On Page Optimisation, Off Page Optimisation, Social media Reach, Maintenance- SEO tactics, Google Search Engine, Web Analytics- Key Metrics- concepts only. | 8 Hrs |
| **Textbook3 : Chapter 7-11** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Apply foundational digital marketing knowledge to assess online promotional strategies. |
| **CO2** | Demonstrate familiarity with essential digital marketing tools and their basic functionalities. |
| **CO3** | Understand basic consumer behavior principles relevant to digital marketing practices. |
| **CO4** | Identify current trends in digital marketing within the context of introductory-level understanding. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | 1 | | | |
| CO2 | 2 | 2 | 1 | | | | | | | | | | | 2 | | |
| CO3 | 1 | 2 | 2 | | | | | | | | | | | 2 | | |
| CO4 | 2 | 2 | 1 | | | | | | | | | | | | 2 | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE) :** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Digital Marketing: An Analytical Approach | Avinash Kaushik, Jerri L. Ledford | 2020 | Wiley |
| 2 | Digital Marketing: Strategy, Implementation, and Practice | Dave Chaffey, Fiona Ellis-Chadwick | 2021 | Pearson |

**VII(c): Web links and Video Lectures (e-Resources):**

1. https://nptel.ac.in/courses/110104070
2. https://www.youtube.com/watch?v=nU-IIXBWlS4&ab_channel=Simplilearn

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | II | **Course Type:** | PCCL | | |
| **Course Title:** DSA Laboratory | | | | | |
| **Course Code:** | 23MCAL207 | | | **Credits:** | 2 |
| **Teaching Hours/Week (L:T:P:O)** | | | 0:2:2:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Laboratory | | | **Exam Hours:** | 3 |

## I. Course Objectives:

- Demonstrate hands-on proficiency in implementing data structures and algorithms.
- Enhance problem-solving skills through diverse algorithmic challenges in a coding environment.
- Analyze and optimize algorithms, gaining practical insights into their efficiency.
- Apply data structures and algorithms to solve real-world problems, translating theory into practice.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. Practical Component – Experiments

| | |
|---|---|
| 1 | **Array Operations:**<br>Implement a function to find the maximum element in an array.<br>Write a program to reverse an array in-place. |
| 2 | **Linked List Manipulation:**<br>Create a singly linked list and implement a function to reverse it.<br>Implement a function to detect a cycle in a linked list. |
| 3 | **Stacks and Queues:**<br>Implement a stack using arrays and perform basic stack operations.<br>Design a queue using two stacks and demonstrate enqueue and dequeue operations. |

| | |
|---|---|
| 4 | **Binary Search Tree:**<br>Create a binary search tree and perform an in-order traversal.<br>Implement a function to find the height of a binary tree. |
| 5 | **Graph Traversal:**<br>Implement a depth-first search (DFS) algorithm for a graph.<br>Develop a breadth-first search (BFS) algorithm for graph traversal. |
| 6 | **Sorting Algorithms:**<br>Implement the quicksort algorithm to sort an array.<br>Write a program to perform merge sort on a given list. |
| 7 | **Searching Algorithms:**<br>Implement binary search for a sorted array.<br>Develop a linear search algorithm to find an element in an array. |
| 8 | **Dynamic Programming:**<br>Solve the Fibonacci sequence using dynamic programming.<br>Implement the Knapsack problem solution. |
| 9 | **Greedy Algorithms:**<br>Solve the Fractional Knapsack problem using a greedy approach.<br>Implement Dijkstra's algorithm for the shortest path in a graph. |
| 10 | **Hashing:**<br>Create a hash table and implement basic operations like insert and search.<br>Implement a program to detect duplicate elements in an array using hashing. |
| 11 | **Priority Queues:**<br>Develop a priority queue using a max-heap.<br>Implement a program to merge k sorted arrays using a priority queue. |
| 12 | **Advanced Data Structures:**<br>Implement a trie data structure for efficient string search.<br>Create and manipulate a self-balancing binary search tree (e.g., AVL tree). |
| 13 | **Algorithm Optimization:**<br>Optimize a basic sorting algorithm for small input sizes.<br>Develop an optimized algorithm to find the nth Fibonacci number. |
| 14 | **Algorithm Efficiency Analysis:**<br>Analyze the time and space complexity of a given algorithm.<br>Compare the performance of two sorting algorithms using real-world data. |
| 15 | **Real-world Applications:**<br>Implement an algorithm to find connected components in a social network graph.<br>Solve a real-world problem using a suitable data structure and algorithm combination. |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Develop coding agility by efficiently implementing algorithms within time constraints. |
| **CO2** | Collaborate with peers to solve complex programming challenges, fostering teamwork. |
| **CO3** | Acquire debugging skills to identify and rectify errors in algorithmic implementations. |
| **CO4** | Cultivate adaptability by applying various data structures to solve dynamic problem scenarios. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | 1 | | | |
| CO2 | 2 | 1 | | | | | | | | | | | | 2 | | |
| CO3 | 2 | 1 | | | | | | | | | | | | 2 | | |
| CO4 | 2 | 2 | | | | | | | | | | | | | 2 | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 3

**Assessment Details (both CIE and SEE):** Refer Annexure section 3

**Semester End Examination (SEE):** Refer Annexure section 3

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | II | **Course Type:** | PCCL | | |
| **Course Title:** Object Oriented Programming Laboratory | | | | | |
| **Course Code:** | 23MCAL208 | | | **Credits:** | 2 |
| **Teaching Hours/Week (L:T:P:O)** | | | 0:2:2:0 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Laboratory | | | **Exam Hours:** | 3 |

## I. Course Objectives:

- Understand the principles of object-oriented design and apply them effectively to design classes and objects
- Demonstrate a clear understanding of different class relationships such as association, aggregation, and composition.
- Apply SOLID principles (Single Responsibility, Open/Closed, Liskov Substitution, Interface Segregation, Dependency Inversion) to create modular and maintainable code.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. Practical Component – Experiments

| | |
|---|---|
| 1 | Create a Java program demonstrating the concept of classes and objects. |
| 2 | Implement a Java program showcasing constructors and destructors. |
| 3 | Develop a Java program illustrating class methods and instance methods. |

| | |
|---|---|
| 4 | Design a Java program using access modifiers for encapsulation. |
| 5 | Construct a Java program to demonstrate class relationships: association, aggregation, and composition. |
| 6 | Implement a Java program showcasing inheritance and method overriding. |
| 7 | Develop a Java program illustrating polymorphism through method overloading. |
| 8 | Design a Java program demonstrating polymorphism at runtime. |
| 9 | Construct a Java program using abstract classes and interfaces. |
| 10 | Implement a Java program showcasing encapsulation and information hiding. |
| 11 | Develop a Java program applying SOLID principles for better design. |
| 12 | Design a Java program implementing the Singleton design pattern. |
| 13 | Construct a Java program using the Factory design pattern. |
| 14 | Implement a Java program illustrating the Observer design pattern. |
| 15 | Develop a Java program applying generics for a generic class and method. |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Implement object-oriented programs in Java with clarity and efficiency. |
| **CO2** | Design effective object-oriented solutions using classes and objects. |
| **CO3** | Use design patterns (Singleton, Factory, Observer) to solve programming challenges. |
| **CO4** | Gain proficiency in advanced concepts like generics, reflection, and effective exception handling. |

## V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | 1 | | | |
| CO2 | 2 | 1 | | | | | | | | | | | | 2 | | |
| CO3 | 2 | 1 | | | | | | | | | | | | 2 | | |
| CO4 | 2 | 2 | | | | | | | | | | | | | 2 | |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 3

**Assessment Details (both CIE and SEE):** Refer Annexure section 3

**Semester End Examination (SEE):** Refer Annexure section 3

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | **II** | **Course Type:** | PCC | | |
| **Course Title:** Research Methodology & IPR | | | | | |
| **Course Code:** | 23MCAM209 | | | **Credits:** | 2 |
| **Teaching Hours/Week (L:T:P:O)** | | | 2:0:0:0 | **Total Hours:** | 25 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory | | | **Exam Hours:** | 3 Hrs |

## I. Course Objectives:

- Grasp Research Fundamentals and Problem Definition Skills.
- Attain Proficiency in Research Design and Data Collection Techniques.
- Develop Data Interpretation and Report Writing Skills.
- Gain Awareness of Intellectual Property Types and Relevant Acts.

## II. 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) 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 student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze 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 to improve the student's understanding.

## III. COURSE CONTENT

### III(a). Theory PART

| | |
|---|---|
| **Module-1:** Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, andProblems Encountered by Researchers in India. | 5 Hrs |

| | |
|---|---|
| **Textbook1** | |
| **RBT Levels: 2** | |
| **Module-2:**Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed | 5 Hrs |
| **Textbook1, 2** | |
| **RBT Levels: 2,3** | |
| **Module-3**: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. Design of Sample Surveys: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs. | 5 Hrs |
| **Textbook2** | |
| **RBT Levels:2,3,4** | |
| **Module4:**Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of 02.03.2021 updated 17/ 104 Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing aResearch Report, Precautions for Writing Research Reports. | 5 Hrs |
| **Textbook2** | |
| **RBT Levels:2,3,4** | |
| **Module-5:**Intellectual Property (IP) Acts: Introduction to IP: Introduction to Intellectual Property (IP), different types of IPs and its importance in the present scenario, Patent Acts: Indian patent acts 1970.Design Act: Industrial Design act 2000. Copy right acts: Copyright Act 1957. Trade Mark Act,1999. | 5 Hrs |
| **Textbook3** | |
| **RBT Levels:2,3,4** | |

## IV. COURSE OUTCOMES

| | |
|---|---|
| **CO1** | Apply Research Fundamentals in Problem Solving. |
| **CO2** | Demonstrate Effective Research Design and Data Collection Competence. |
| **CO3** | Apply Skills in Data Interpretation and Report Writing. |

| CO4 | Understand and Address Intellectual Property Issues in Practical Contexts. |
|---|---|

**V. CO-PO-PSO MAPPING** (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | 1 | | | |
| CO2 | 2 | 1 | 1 | | | | | | | | | | | 1 | | |
| CO3 | 1 | 2 | 1 | | | | | | | | | | | | 2 | |
| CO4 | 2 | 2 | 1 | | | | | | | | | | | | | 1 |

## VI. Assessment Details (CIE & SEE)

**General Rules:** Refer Annexure section 1

**Assessment Details (both CIE and SEE):** Refer Annexure section 1

**Semester End Examination (SEE):** Refer Annexure section 1

## VII. Learning Resources

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| 1 | Research Methodology: Methods and Techniques | C.R.Kothari,GauravGarg | 2018 | NewAgeInternational |
| 2 | Research Methodology a step-by- step guide for beginners | Ranjit Kumar | 2011 | Sage |
| | Intellectual property | Debirag E. Bouchoux | 2013 | Cengage learning |

**VII(b): Reference Books:**

| | | | | |
|---|---|---|---|---|
| **1** | Research Methods: the concise knowledge base | Trochim | 2005 | Atomic Dog Publishing |
| **2** | Conducting Research Literature Reviews: From the Internet to Paper Fink | | 2009 | Sage |

**VII(c): Web links and Video Lectures (e-Resources):**

1. https://onlinecourses.nptel.ac.in/noc22_ge08/preview
2. https://www.coursera.org/learn/research-methodologies

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

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

- Quizzes
- Assignments
- Seminar

| | | | | | |
|---|---|---|---|---|---|
| **Semester:** | 2 | **Course Type:** | AEC | | |
| **Course Title:** AWS Cloud Foundations | | | | | |
| **Course Code:** | 23MCAAE21 | | | **Credits:** | 2 |
| **Teaching Hours/Week (L:T:P:O)** | | | 0:1:2:1 | **Total Hours:** | 40 |
| **CIE Marks:** | 50 | **SEE Marks:** | 50 | **Total Marks:** | 100 |
| **SEE Type:** | Theory/practical/other assessment(mention) | | | **Exam Hours:** | 2 |

## I. Course Objectives:

1. Develop a foundational understanding of AWS Cloud services and their basic architectural principles.
2. Gain proficiency in navigating the AWS Management Console and using key AWS services.
3. Learn about cloud security and compliance, including shared responsibility models and best practices.
4. Acquire knowledge of billing, account management, and pricing models for efficient resource utilization.
5. Prepare for the AWS Certified Cloud Practitioner exam, demonstrating essential cloud skills and knowledge.

## II. 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) need 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 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 analysed 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.

## III. COURSE CONTENT

### III(a).Theory PART

| **Module-1** | Hrs 8 |
|---|---|

**Heading:Cloud Concepts**

1.1 Define the AWS Cloud and its value proposition.

- Define the benefits of the AWS cloud including:

o Security o Reliability
o High Availability
o Elasticity
o Agility
o Pay-as-you go pricing o Scalability
o Global Reach o Economy of scale

- Explain how the AWS cloud allows users to focus on business value o Shifting technical resources to revenue-generating activities as opposed to managing infrastructure

1.2 Identify aspects of AWS Cloud economics

- Define items that would be part of a Total Cost of Ownership proposal

o Understand the role of operational expenses (OpEx)
o Understand the role of capital expenses (CapEx)
o Understand labor costs associated with on-premises operations
o Understand the impact of software licensing costs when moving to the cloud

- Identify which operations will reduce costs by moving to the cloud

o Right-sized infrastructure
o Benefits of automation
o Reduce compliance scope (for example, reporting)
o Managed services (for example, RDS, ECS, EKS, DynamoDB)

1.3 Explain the different cloud architecture design principles

- Explain the design principles

o Design for failure
o Decouple components versus monolithic architecture
o Implement elasticity in the cloud versus on-premises
o Think parallel

**Textbook:Chapter:sections**
**AWS Portal**

**Pre-requisites (Self Learning)**

**RBT Levels: L2 & L3**

| **Module 2** | Hrs 8 |
|---|---|

**Heading:Security and Compliance**

2.1 Define the AWS shared responsibility model

- Recognize the elements of the Shared Responsibility Model
- Describe the customer's responsibly on AWS o Describe how the customer's responsibilities

may shift depending on the service used (for example with RDS, Lambda, or EC2)

- Describe AWS responsibilities 2.2 Define AWS Cloud security and compliance concepts
- Identify where to find AWS compliance information o Locations of lists of recognized available compliance controls (for example, HIPPA, SOCs) o Recognize that compliance requirements vary among AWS services
- At a high level, describe how customers achieve compliance on AWS o Identify different encryption options on AWS (for example, In transit, At rest)
- Describe who enables encryption on AWS for a given service
- Recognize there are services that will aid in auditing and reporting o Recognize that logs exist for auditing and monitoring (do not have to understand the logs) o Define Amazon CloudWatch, AWS Config, and AWS CloudTrail
- Explain the concept of least privileged access

2.3 Identify AWS access management capabilities

- Understand the purpose of User and Identity Management o Access keys and password policies (rotation, complexity)

o Multi-Factor Authentication (MFA) o AWS Identity and Access Management (IAM) • Groups/users • Roles

• Policies, managed policies compared to custom policies o Tasks that require use of root accounts Protection of root accounts

2.4 Identify resources for security support

- Recognize there are different network security capabilities o Native AWS services (for example, security groups, Network ACLs, AWS WAF) o 3 rd party security products from the AWS Marketplace
- Recognize there is documentation and where to find it (for example, best practices, whitepapers, official documents) o AWS Knowledge Center, Security Center, security forum, and security blogs o Partner Systems Integrators
- Know that security checks are a component of AWS Trusted Advisor

**Textbook:Chapter:sections**
**AWS Portal**

**Pre-requisites (Self Learning): Security and Compliance**

**RBT Levels: L2 & L3**

| **Module-3** | Hrs 8 |
|---|---|

**Heading:Technology**

a. Define methods of deploying and operating in the AWS Cloud
   - Identify at a high level different ways of provisioning and operating in the AWS cloud

   o Programmatic access, APIs, SDKs, AWS Management Console, CLI, Infrastructure as Code

   - Identify different types of cloud deployment models

   o All in with cloud/cloud native

   o Hybrid

   o On-premises

   - Identify connectivity options

   o VPN

o AWS Direct Connect
o Public internet

b. Define the AWS global infrastructure
- Describe the relationships among Regions, Availability Zones, and Edge Locations
- Describe how to achieve high availability through the use of multiple Availability Zones

o Recall that high availability is achieved by using multiple Availability Zones
o Recognize that Availability Zones do not share single points of failure
- Describe when to consider the use of multiple AWS Regions

o Disaster recovery/business continuity
o Low latency for end-users
o Data sovereignty
- Describe at a high level the benefits of Edge Locations o Amazon CloudFront o AWS Global Accelerator

3.3 Identify the core AWS services
- Describe the categories of services on AWS (compute, storage, network, database)
- Identify AWS compute services

o Recognize there are different compute families
o Recognize the different services that provide compute (for example, AWS Lambda compared to Amazon Elastic Container Service (Amazon ECS), or Amazon EC2, etc.)
o Recognize that elasticity is achieved through Auto Scaling o Identify the purpose of load balancers • Identify different AWS storage services
o Describe Amazon S3
o Describe Amazon Elastic Block Store (Amazon EBS)
o Describe Amazon S3 Glacier o Describe AWS Snowball o Describe Amazon Elastic File System (Amazon EFS)
o Describe AWS Storage Gateway
- Identify AWS networking services

o Identify VPC
o Identify security groups
o Identify the purpose of Amazon Route 53
o Identify VPN, AWS Direct Connect
- Identify different AWS database services

o Install databases on Amazon EC2 compared to AWS managed databases Version
o Identify Amazon RDS
o Identify Amazon DynamoDB
o Identify Amazon Redshift

c. Identify resources for technology support
- Recognize there is documentation (best practices, whitepapers, AWS Knowledge Center, forums, blogs)
- Identify the various levels and scope of AWS support

o AWS Abuse
o AWS support cases
o Premium support
o Technical Account Managers
- Recognize there is a partner network (marketplace, third-party) including Independent Software Vendors and System Integrators

- Identify sources of AWS technical assistance and knowledge including professional services, solution architects, training and certification, and the Amazon Partner Network
- Identify the benefits of using AWS Trusted Advisor

**Textbook:Chapter:sections**

**AWS Portal**

**Pre-requisites (Self Learning): Security and Compliance**

**RBT Levels: L2 & L4**

| **Module-4** | Hrs 8 |
|---|---|

**Heading:Billing and Pricing**

4.1 Compare and contrast the various pricing models for AWS (for example, On-Demand Instances, Reserved Instances, and Spot Instance pricing)

- Identify scenarios/best fit for On-Demand Instance pricing
- Identify scenarios/best fit for Reserved-Instance pricing

o Describe Reserved-Instances flexibility o Describe Reserved-Instances behavior in AWS Organizations • Identify scenarios/best fit for Spot Instance pricing

4.2 Recognize the various account structures in relation to AWS billing and pricing

- Recognize that consolidated billing is a feature of AWS Organizations
- Identify how multiple accounts aid in allocating costs across departments

**Textbook:Chapter:sections**

**AWS Portal**

**Pre-requisites (Self Learning): Technology**

**RBT Levels: L2 & L3**

| **Module-5** | Hrs 8 |
|---|---|

**Heading:Billing and Pricing**

5.1 Identify resources available for billing support

- Identify ways to get billing support and information

o Cost Explorer, AWS Cost and Usage Report, Amazon QuickSight, third-party partners, and AWS Marketplace tools

o Open a billing support case

o The role of the Concierge for AWS Enterprise Support Plan customers

- Identify where to find pricing information on AWS services

o AWS Simple Monthly Calculator

o AWS Services product pages

o AWS Pricing API

- Recognize that alarms/alerts exist
- Identify how tags are used in cost allocation

**Textbook:Chapter:sections**

**AWS Portal**

**Pre-requisites (Self Learning):Billing and Pricing**

**RBT Levels: L2 & L3**

**III(b). PRACTICAL PART**

| **Sl. No.** | **Experiments / Programs / Problems** |
|---|---|
| **1** | Lab 1 - Introduction to AWS IAM |

| | |
|---|---|
| **2** | Lab 2 - Build your VPC and Launch a Web Server |
| **3** | Lab 3 - Introduction to Amazon EC2 |
| **4** | Lab 4 - Working with EBS |
| **5** | Lab 5 - Build a Database Server |

**Instructions for conduction of practical part: AWS Portal registration.**

**IV. COURSE OUTCOMES**

| | |
|---|---|
| **CO1** | Attain a comprehensive understanding of AWS Cloud concepts and foundational services. |
| **CO2** | Demonstrate proficiency in navigating the AWS Management Console and utilizing key cloud services. |
| **CO3** | Develop skills in managing AWS resources efficiently and cost-effectively. |
| **CO4** | Acquire knowledge of cloud security best practices and compliance measures. |
| **CO5** | Gain insights into billing, pricing models, and effective account management for optimal cost control. |

**V. CO-PO-PSO MAPPING**(mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | PEO 1 | PEO 2 | PEO 3 |
|---|---|---|---|---|---|---|---|
| CO1 | 2 | | 2 | | 2 | | |
| CO2 | 2 | | 2 | | 2 | | |
| CO3 | 2 | | 2 | | 2 | | |
| CO4 | 2 | | 2 | | | 2 | |
| CO5 | 2 | | 2 | | | 2 | |

**VI. Assessment Details (CIE & SEE)**

**General Rules:** Refer Annexure section 4

**Continuous Internal Evaluation (CIE):** Refer Annexure section 4

**Semester End Examination (SEE):** Refer Annexure section 4

**VII. Learning Resources**

**VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---|---|---|---|---|
| **1.** | AWS Certified Cloud Practitioner Study Guide | Ben Piper&David Clinton | 1st edition (2 August 2019) | Sybex |

**VII(b): Reference Books:**

| | | | | |
|---|---|---|---|---|
| **1** | AWS Certified Cloud Practitioner (CLF-C01) Cert Guide | **Anthony J. Sequeira** | First Edition (15 August 2020) | Pearson Education |

**VII(c): Web links and Video Lectures (e-Resources):**

AWS PORTAL: https://awsacademy.instructure.com/courses/58071/

**VIII: Activity Based Learning / Practical Based Learning/Experiential learning:**

Refer AWS Portal for quiz and assessments.

## Program Outcomes (PO's) – Graduate Attributes

### MCA Graduates will be able to

**1.** Acquire knowledge of modern techniques, tools, and practices, including their limitations, for the software development process.

2. Demonstrate the application of mathematical and computer-based techniques to derive feasible solutions for problems within the computer applications domain.

3. Design and derive solutions for complex computer-based problems, and evaluate systems, components, or processes with due consideration for societal and environmental impact.

4. Develop a habit of self-learning for continuous career development, and professional skills to effectively conceive, design, and develop software applications, along with associated practices.

## CIE& SEE Evaluation Strategy for PG-MCA Autonomous Scheme 2023(Tentative)

| Sl. No. | CourseType/Credits | Continuous Internal Evaluation(CIE) | | | | | | | | | | | | | | | | | Semester End Examination(SEE) | | | | | | | | | Total Marks (CIE+ SEE) | Passing Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | I. Theory Component | | | | | | | II.Practical Component | | | | | | | | | | Theory | | | Practical | | | | | | |
| | | Total CIE marks | Min.Eligt | Marks | Min. Eligty. | A. Unit test | | B.Formative Assessments | | Tot. Theory marks (I) | Marks | Min Eligty. | C.Weekly Evaluation | | D. InternalTest | | | Tot. marks (II) | Total CIE marks | Dur.Inhrs. | Max. cond. marks | Max. considered marks | min. pass % | Max. cond. marks | Max considered marks | min. pass % | Total SEE marks | | |
| | | | | | | Nos. | Marks /Each | Nos. | Marks /Each | | | | Each week | Tot. marks | Nos. | Marks / Each | Total marks | | | | | | | | | | | | | |
| 1 | BSC/PCC/PEC (3or4 Credit Courses) | 50 | 50% | 50 | 50% | 2 | 50 | 1 | 50 | 50 (avg. of 3) | -- | -- | -- | -- | -- | -- | -- | -- | 50(I) | 03 | 100 | 50 | 40 % | -- | -- | -- | 50 | 100 | 50% |
| 2 | IPCC (4 Credit Courses) | 50 | 50% | 50 | 50% | 2 | 50 | -- | -- | 50 (avg. of 2) | 50 | 50% | 50 | 50 (Avg. ofall) | 1 | 50 | 50 | 50 (Avg.of C&D) | 50 (Avg.of I & II) | 03 | 100 | 50 | 40 % | -- | -- | -- | 50 | 100 | 50% |
| 3 | PCCL (2 Credit Courses) | 50 | 50% | -- | -- | -- | -- | -- | -- | -- | 50 | 50% | 50 | 50 (Avg. ofall) | 1 | 50 | 50 | 50 (Avg.of C&D) | 50(II) | 03 | -- | -- | -- | 100 | 50 | 40% | 50 | 100 | 50% |
| 4 | AEC (2 Credit Course) | 50 | 50% | 50 | 50% | 2 | 50 | 1 | 50 | 50(Avg. of3) | -- | -- | -- | -- | -- | -- | -- | -- | 50(I) | **03** | **100** | **50** | 40 % | -- | -- | -- | -- | 100 | 50% |
| 5 | MAC- (No Credit Course) | 50 | 50% | 50 | 50% | 2 | 50 | 1 | 50 | (Avg. of A+B) | -- | -- | -- | -- | -- | -- | -- | -- | 50 | -- | -- | -- | -- | -- | -- | -- | -- | 50 | 50% |

**Formative(Successive)Assessments:**Assignments/quiz/seminars/fieldsurveyandreportpresentation/courseproject/etc.basedonthefaculty&dept.planning

**Practical Conduction:** The conduction of each experiment/program per week should evaluate for 50 Marks and average of all shall be taken.

In case of Integrated course, minimum eligibility shall be attained as prescribed in both the theory and practical components.

**SelfLearningCourses(SLC)Courses, Internship, Miniproject & MajorProject: Rubrics & Methodology shall be defined separately.**

**CIE and SEE guidelines based on course Type for MCA Autonomous Scheme 2023**

- **The CIE conduction coordination will be done by the office of Controller of Examination (COE).**
- **The SEE will be conducted by the office of Controller of Examination (COE).**

| Continuous Internal Evaluation (CIE) | Semester End Examination (SEE) | Final Passing requirement |
|---|---|---|
| **1. BSC/PCC/ PEC– Theory Course (03 & 04 Credit courses)** | | |
| 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 (25 marks out of 50).<br><br>**Continuous Internal Evaluation:**<br>CIE will be conducted by the department and it will have only 01 component:<br><br>**I. Theory component.**<br>Theory Component will consist of<br><br>A. Internal Assessment Test<br>B. Formative assessments<br><br>**A. Internal Assessment Test:** | The minimum passing mark for SEE is 40% of the maximum marks (20 out of 50 marks).<br><br>**Semester-End Examination:**<br>Durationof 03 hours and total marks of 100.<br><br>• The question paper will have ten questions. Each question is set for 20 marks.<br>• 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 | The student is declared as a pass in the course if he/she secures a minimum of 50% (50 marks out of 100) in the sum total of the CIE and SEE taken together. |

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| • There are 02 tests each of 50 marks conducted during 6th week & 15th week, respectively.<br>• The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks.<br>• The student has to answer 2 full questions (one from 1st& 2nd questions and another from 3rd& 4th question).<br>• Internal Assessment Test question paper shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.<br><br>**B. Formative assessments:**<br><br>• 01 formative assessment of 50 marks shall be conducted by the course coordinator before 13th week.<br>• The syllabus content for the formative assessment shall be defined by the course coordinator.<br>• The formative assessments include Assignments/ Quiz/ seminars/case study/field survey/ report presentation/ course project/etc.<br>• The assignment QP or Quiz QP shall indicate marks of each question and the relevant COs & RBT levels.<br>• The rubrics required for the other formal assessments shall be defined by the departments along with mapping of relevant COs & POs.<br><br>**The final CIE marks will be 50:**<br>Average of all 03 events of Internal Assessment test and formative assessment. | under that module.<br>• The students have to answer 5 full questions, selecting one full question from each module.<br>• Marks scored shall be proportionally reduced to 50 marks. | |

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| **The documents of all the assessments shall be maintained meticulously.** | | |
| **2. IPCC – Integrated with Theory & Practical (04 credit courses)** | | |
| 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 (25 marks out of 50).<br>Minimum eligibility of 50% marks shall be attained separately in both the theory component and practical component.<br><br>**Continuous Internal Evaluation:**<br>CIE will be conducted by the department and it will have 02 component:<br><br>I. Theory Component.<br>II. Practical Component.<br><br>I. Theory Component will consist of<br><br>A. Internal Assessment Test<br>B. Formative assessments - No formative assessment for IPCC.<br><br>**A. Internal Assessment Test:** | The minimum passing mark for SEE is 40% of the maximum marks (20 out of 50 marks).<br><br>**Semester-End Examination:**<br>Only theory SEE for duration of 03 hours and total marks of 100.<br><br>• The question paper will have ten questions. Each question is set for 20 marks.<br>• 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.<br>• The laboratory content must be included in framing the theory question papers.<br>• The students have to answer 5 full questions, selecting one full question from | The student is declared as a pass in the course if he/she secures a minimum of 50% (50 marks out of 100) in the sum total of the CIE and SEE taken together. |

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| • There are 02 tests each of 50 marks conducted during 6th week & 15th week, respectively.<br>• The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks.<br>• It is suggested to include questions on laboratory content in the Internal Assessment test Question papers.<br>• The student have to answer 2 full questions (one from 1st & 2nd questions and another from 3rd & 4th question).<br>• Internal Assessment Test question paper shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.<br><br>**B. Formative assessments:**<br>No formative assessment in theory.<br><br>**II. Practical Component:**<br><br>**C.** Conduction of each experiment/program should be evaluated for 50 marks and average of all the experiments/programs shall be taken. (rubrics will be published by the lab conduction committee)<br>**D.** One laboratoryInternal Assessment test will be conducted during the 14th week for 50 marks. (rubrics will be published by the lab conduction committee)<br><br>**The final CIE marks will be 50 =**<br>Avg. {**I** [Avg. of (02 Internal assessment tests )] + **II** [Avg. of (C & D)]}<br>**The documents of all the assessments shall be maintained meticulously.** | each module.<br>• Marks scored shall be proportionally reduced to 50 marks.<br><br>**No Practical SEE for Integrated Course.** | |

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## 3. PCCL: Laboratory course (02 credit course)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

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| The minimum passing mark for the CIE is 50% of the maximum marks (25 marks out of 50).<br>**Continuous Internal Evaluation:**<br>CIE will be conducted by the department and it will have only 01 component:<br><br>I. Theory Component. (Not required for Laboratory course)<br>II. Practical Component.<br><br>**II. Practical Component:**<br><br>**C.** Conduction of each experiment/program should be evaluated for 50 marks and average of all the experiments/program shall be taken (rubrics will be published by the lab conduction committee).<br>**D.** One laboratory Internal Assessment test will be conducted for 50 marks (rubrics will be published by the lab conduction committee).<br><br>**The final CIE marks will be 50 =** Avg. of (C & D)<br><br>**The documents of all the assessments shall be maintained** | The minimum passing mark for SEE is 40% of the maximum marks (20 out of 50 marks).<br>**Semester-End Examination:**<br>Only laboratory SEE will be conducted jointly by the internal examiner and external examiner appointed by COE as per the scheduled timetable for duration of 03 hours.<br><br>• The examination shall be conducted for 100 marks and shall be reduced to 50 marks proportionately.<br>• All laboratory experiments/programs are to be included for practical examination.<br>• Breakup of marks (Rubrics) 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/program) from the questions lot prepared by the internal /external examiners jointly.<br>• Evaluation of test write-up/ conduction | The student is declared as a pass in the course if he/she secures a minimum of 50% (50 marks out of 100) in the sum total of the CIE and SEE taken together. |

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| **meticulously.** | procedure and result/viva will be conducted jointly by examiners.<br>• General rubrics suggested for SEE: writeup-20%, Conduction procedure and results - 60%, Viva-voce 20% of maximum marks.<br>• Change of experiment is allowed only once and shall be assessed only for 85% of the maximum marks. | |
| **4. AEC: Ability Enhancement Courses (2 credit courses)** | | |
| 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 50 marks out of 100).<br><br>**Continuous Internal Evaluation:**<br>CIE will be conducted by the department and it will have only 01 component:<br><br>**I. Theory component.**<br>Theory Component will consist of<br>A. Internal Assessment Test<br>B. Formative assessments<br><br>• **Internal Assessment Test:**<br>• There are 02 tests each of 50 marks conducted during 6th week & 15th week, respectively.<br>• The question paper will have Multiple Choice Questions (MCQ's)<br>• The student have to answer all the questions.<br>• Internal Assessment Test question paper shall be designed to attain | The minimum passing mark for SEE is 40% of the maximum marks (20 out of 50 marks).<br><br>**Semester-End Examination:**<br>**Theory SEE will be conducted by COE as per the scheduled timetable for duration of 3 hours and total marks of 50.**<br><br>• Multiple Choice Question Paper<br>• Student should answer all the questions. | The student is declared as a pass in the course if he/she secures a minimum of 50% (50 marks out of 100) in the sum total of the CIE and SEE taken together. |

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| the different levels of Bloom's taxonomy as per the outcome defined for the course.<br><br>**A. Formative assessments:**<br><br>• 01 formative assessment of 50 marks shall be conducted by the Course Coordinator based on the dept. planning before 14th week.<br>• The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc.<br>• The assignment QP shall indicate marks of each question and the relevant COs & RBT levels.<br>• The rubrics required for the other formal assessments shall be defined by the departments along with mapping of relevant COs &POs.<br>**The final CIE marks will be 50 =** Average of all 03 events (02 IA test and 01 formative assessment).<br><br>**The documents of all the assessments shall be maintained meticulously.** | | |
| **5. MAC: (0 credit courses)** | | |
| The weightage is only for Continuous Internal Evaluation (CIE) for 50 marks. | | |
| The minimum passing mark for the CIE is 50% of the maximum marks 50 marks out of 100).<br><br>**Continuous Internal Evaluation:**<br>CIE will be conducted by the department and it will have only 01 component:<br><br>**II. Theory component.**<br>Theory Component will consist of | • No Semester End Examination. | The student is declared as a pass in the course if he/she secures a minimum of 50% (50 marks out of 100 scaled down to 50) in the CIE. |

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| A. Internal Assessment Test<br>B. Formative assessments<br><br>**Internal Assessment Test:**<br><br>• There are 02 tests each of 50 marks conducted during 6th week & 15th week, respectively.<br>• The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks.<br>• The student have to answer 2 full questions (one from 1st & 2nd questions and another from 3rd& 4th question).<br>• The student have to answer all questions.<br>• Internal Assessment Test question paper shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course<br><br>**B. Formative assessments:**<br><br>• 01 formative assessments of 50 marks shall be conducted by the faculty based on the dept. planning during random times.<br>• The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc.<br>• The assignment QP shall indicate marks of each question and the relevant COs & RBT levels.<br>• The rubrics required for the other formal assessments shall be defined by the departments along with mapping of relevant COs & POs.<br>**The final CIE marks will be 50 =** Average of all 03 events (02 IA test and 01 formative assessment).<br><br>**The documents of all the assessments shall be maintained meticulously.** | | |

|| Jai Shree Gurudev ||
Sri Adichunchanagiri Shikshana Trust ®

# SJB Institute of Technology

BGS Health and Education City,
Dr. Vishnuvardhan Road, kengeri,
Bengaluru – 560060

+91-80-28612445 / 46

https://sjbit.edu.in/

Approved by AICTE, New Delhi

Affiliated to
Visvesvaraya Technological University, Belagavi

Accredited by NBA

Accredited by NAAC with A+

Recognized by UGC, New Delhi with 2(f) and 12(B)

Certified by ISO 9001 – 2015

ATAL Ranking:
Band Performer

Band of 151 to 300 in
Innovation Category