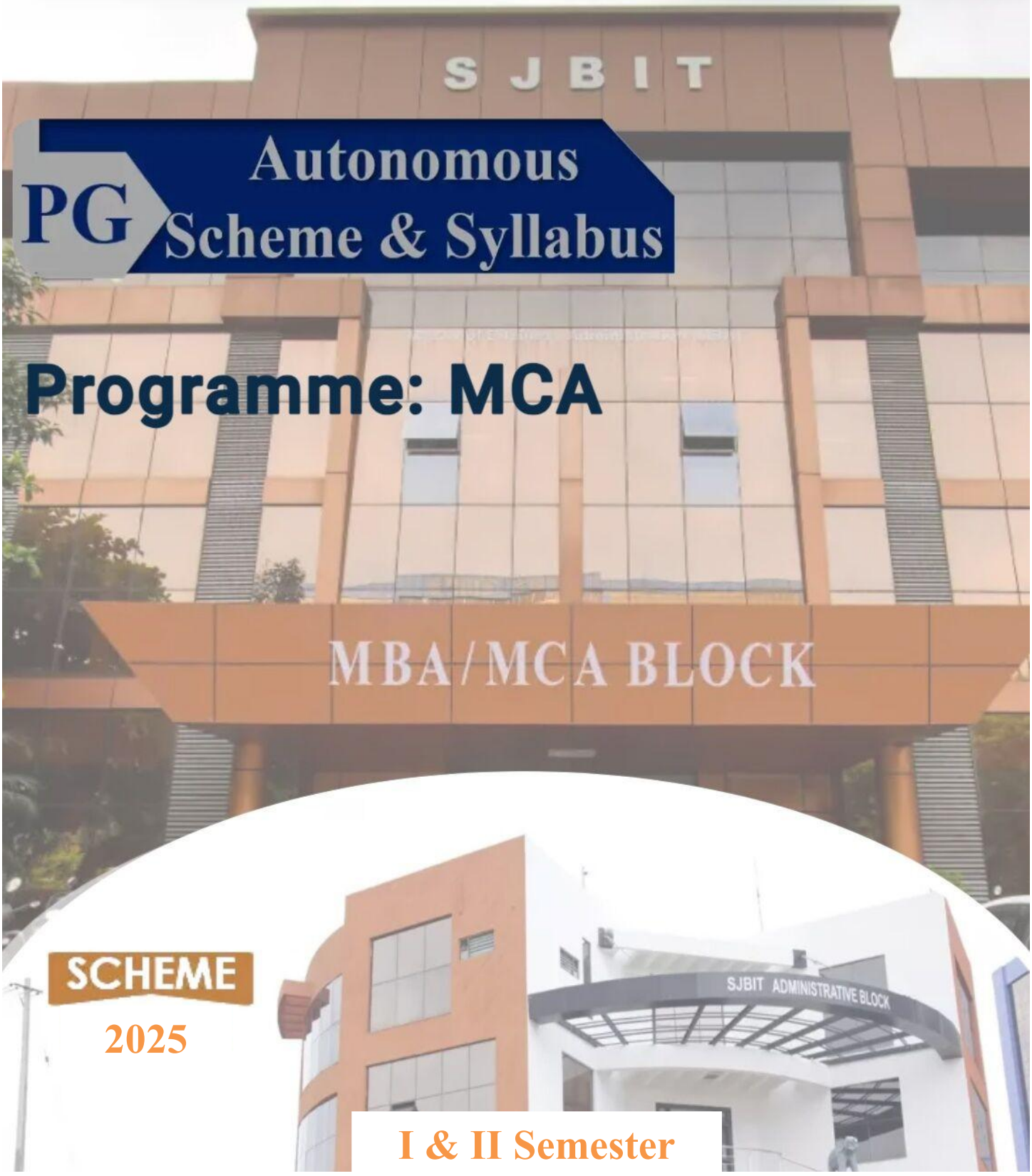
|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust (R)

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

2025

I & II Semester

SERVICE TO MANKIND IS SERVICE TO GOD

His Divine Soul Padmabhushana

SriSriSri Dr.BalagangadharanathMahaSwamiji

FounderPresident,SriAdichunchanagiriShikshanaTrust®

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 ParamaPujya

Sri Sri Sri Dr.NirmalanandanathaMahaSwamiji

President,Sri AdichunchanagiriShikshanaTrust®

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 leadand take the rightpath.

Syllabus for 1st & 2nd Semester	
The syllabus, scheme and guidelines are provided in detail. The syllabus, scheme and guidelines are subjected to changes if any needed. The updates will be done and intimated timely.	
The Syllabus book is available on	www.sjbit.edu.in
For any queries, please write to	academicdean@sjbit.edu.in

UPDATES

Release/ Revision	Date	Remarks
Version 1	03/09/2025	

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Sri Adichunchanagiri Shikshana Trust (R)

SJB Institute of Technology

BGS Health and Education City, Dr. Vishnuvardhana Road, Kengeri, Bengaluru-560060
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AUTONOMOUS SCHEME OF TEACHING & EXAMINATIONS (STE)

PG - MCA 1st year

SCHEME: 2025 **SEM : I** **Date 12.07.2025**

SL No	Course Type	Course type Count	Course Code	Course Title	BOS	Credits	Teaching Hrs/Week				Examinations				
							L	T	P	S	CIE Marks	SEE			Tot. Marks
							Lecture	Tutorial	Practical	SAAE		Dur.	Th. Mrks	Lab. Mrks.	
1	IPCC	1	25MCAI101	Programming in Python	MCA	4	3	0	2	1	50	3	50	-	100
2	BSC	1	25MCAT102	Mathematical Foundations for Computer Applications		3	3	0	0	1	50	3	50	-	100
3	PCC	1	25MCAT103	Computer Networks		3	3	0	0	1	50	3	50	-	100
4	PCC	2	25MCAT104	Database Management Systems		3	3	0	0	1	50	3	50	-	100
5	PCC	3	25MCAT105	Web Technologies		3	3	0	0	1	50	3	50	-	100
6	PCC	4	25MCAT106	Software Engineering		3	3	0	0	1	50	3	50		100
7	PCCL	1	25MCAL107	Laboratory		1	--	--	2	1	50	3	-	50	100
8	PCC	1	25MCAT108	Research Methodology & IPR		3	3	--	--	1	50	3	50	-	100
				Total		23	21	0	4	8	400		350	50	800

Note: **BSC**-Basic Science Courses, PCC: Professional core. **IPCC**-Integrated Professional Core Courses, **PCCL** - Professional Core Course Laboratory. Each Course (PCC/PCE) shall have case study discussion and may be considered as a part of assignment.

SAAE : Students Academic Activity Engagement Hours- Self learning, Project based learning,activity based learning, peer learning etc.., Compulsory min hours to be adopted per week by the faculty is mentioned. More no. of hours may be planned by the faculty. Holistic planning shall be done by the HOD at the class level for effective & Productive Outcomes. However, allocation of these hours in the timetable is not required.

SLC : 10 to 15 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.

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AUTONOMOUS SCHEME OF TEACHING & EXAMINATIONS (STE)

PG - MCA 1st year

SCHEME: 2025 **SEM: II** **Date: 12.07.2025**

SL No	Course Type	Course type Count	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	S	CIE Marks	SEE			Tot. Marks
								Lecture	Tutorial	Practical	SAAE		Dur.	Th. Mrks	Lab. Mrks.	
1	IPCC	2	25MCAI201	Machine Learning	MCA	MCA	4	3	0	2	1	50	3	50	_	100
2	IPCC	3	25MCAI202	Internet of Things			4	3	0	2	1	50	3	50	_	100
3	PCC	5	25MCAT203	Object Oriented Programming using Java			3	3	0	0	1	50	3	50	_	100
4	PCC	6	25MCAT204	Data Structures & Algorithms			3	3	0	0	1	50	3	50	_	100
5	PCC	7	25MCAT205	Operating Systems-Linux			3	3	0	0	1	50	3	50	_	100
6	PCCL	2	25MCAL206	DSA Laboratory			1	--	--	2	1	50	3	_	50	100
7	PCCL	3	25MCAL207	Object Oriented Programming Laboratory			1	--	--	2	1	50	3	_	50	100
8	AEC	1	25MCAAE21	Data Visualization and Analysis with Power BI			1	0	1	1	1	50	2	50	_	100
Total							20	15	1	9	8	400		300	100	800

PCC: Professional core. **IPCC**-Integrated Professional Core Courses,**PEC**: Professional Elective Courses,**PCCL** - Professional Core Course Laboratory, AEC - Ability Enhancement course. **SLC** : 10 Courses shall be defined at the beginning of the course. Gthe 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 student should complete the course by end of 3rd semester. Rubrics and methodology will be defined separately. SLC will be creadited in 4th semester.

SAAE : Students Academic Activity Engagement Hours- Self learning, Project based learning, activity based learning, peer learning etc.., Compulsory min hours to be adopted per week by the faculty is mentioned. More no. of hours may be planned by the faculty. Holistic planning shall be done by the HOD at the class level for effective & Productive Outcomes. However, allocation of these hours in the timetable is not required.

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Department of Master of Computer Applications

Table of Contents

|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust (R)
SJB Institute of Technology
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Department of Master of Computer Applications

Semester:	**I**	**Course Type:**	**IPCC**		
Course Title: Programming in Python					
Course Code:	**25MCAI101**			**Credits:**	**4**
Teaching Hours/Week (L:T:P:S)			**3:0:2:1**	**Total Hours:**	**40**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3 Hrs.**

I. Course Objectives:

- To learn Python programming basics, object-oriented concepts, and advanced libraries for solving problems.
- To apply advance python data structures for solving problems efficiently.
- To use Python for data analysis, including data manipulation and visualization.
- To build Python-based solutions for real-world problems like file handling and web scraping.

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: Python Fundamentals and Environment Setup**,** Introduction to Python, Python ecosystem, Comparative programming paradigms, Advanced environment setup and development workflows, Professional IDE configurations (PyCharm, VSCode, Jupyter), Virtual environment management, Syntax and Data Handling, Comprehensive variable scoping, data type internals, Operator overloading, Memory management techniques, Type hinting and annotations.	8 Hrs.
Textbook1: Chapters 1-4, Text Book2: Chapter 1-2 **Reference Book1: Chapter 1-2**	
RBT Levels: 2, 3	
Module-2: Data Structures and Advanced Collections**,** Python Collection Techniques - lists, tuples, sets, dictionary operations, Performance characteristics of data structures, Immutable and mutable data structures, string manipulation techniques. Comprehensions and Generators, Itertools.	8 Hrs.
Textbook1: Chapters 5-7, Text Book2: Chapters 3-4 **Reference Book2: Chapter 2-3**	
RBT Levels: 2, 3, 4	
Module-3: Functions, Modules, and Advanced Programming Paradigms - Object-Oriented Programming (OOP) concepts, Python Function Techniques, First-class functions, Closures and decorators, Function and method argument handling, Context managers, Functional programming concepts -Lambda functions, Map(), Filter(), Reduce() functions practical applications, Module and Package Development, Package distribution.	8 Hrs.
Textbook 1: Chapters 8-10, Text Book2: Chapters 5-6 **Reference Book1: Chapter 7-8**	
RBT Levels: 2,3,4	
Module-4: Error Handling and File Processing, File Handling, Comprehensive file I/O techniques, working with various file formats, Streaming and large file processing, Binary and text file manipulations, Error Management, exception handling, custom exception creation, Logging and error tracking.	8 Hrs.
Text Book1: Chapters 11-14, Text Book2: Chapters 14-15 **Reference Book2: Chapter 4**	
RBT Levels: 2,3,4	
Module-5: Advanced Python Ecosystem and Practical Applications - Advanced Standard and Third-Party Libraries, Comprehensive standard library exploration, Database Integration, Regular expressions usage, Datetime and time manipulation, Introduction to scientific computing libraries - NumPy and Pandas, Practical Integration and Real-world Techniques, Library selection and best practices, Data processing workflows.	8 Hrs.
Text Book1: Supplementary Chapters, Text Book2: Chapters 16-18 **Reference Book1: Chapter 13-14**	
RBT Levels: 2,3,4	

III(b). PRACTICAL PART	
Sl. No.	**Experiments / Programs / Problems**
	PART – A
1	Create a simple program to manage student grades • Allows input of student names and their subject grades • Calculates average grade for each student • Determines pass/fail status • Prints a formatted grade report • Stores student information in a list or dictionary
2	Design a basic expense tracking application Record daily expenses Categorize expenses (food, transport, utilities, etc.) Calculate total expenses Find expenses in each category Generate a simple expense summary Allow adding and removing expense entries
3	Develop a basic library book tracking system • Add new books to the library • Display all available books • Search for books by title or author • Track book borrowing and return dates • Maintain a list of borrowed and available books
4	Create a comprehensive temperature conversion tool • Convert temperatures between Celsius, Fahrenheit, and Kelvin • Create functions for each conversion type • Handle user input and validation • Display conversions in a neat format • Include error handling for invalid inputs
5	Design a simple contact information management program • Add new contacts (name, phone number, email) • Display all contacts • Search for a contact by name • Delete a contact • Update contact information • Store contacts in a file
6	Develop an interactive quiz program • Stores multiple-choice questions • Allows user to take the quiz • Keeps track of correct and incorrect answers • Provides final score • Offers option to retry the quiz • Randomizes question order
7	Create a simple product inventory tracking system • Add new products with details (name, price, quantity)

	• Update product quantity • Calculate total inventory value • Generate low stock alerts • Remove products from inventory • Display current inventory status
8	Design a secure password generation tool • Generates random passwords • Allows user to specify password length • Include options for character types (uppercase, lowercase, numbers, symbols) • Provide password strength assessment • Option to save generated passwords • Implement basic password validation
9	Develop a basic task management system • Add new tasks • Mark tasks as complete • Remove tasks • Display all tasks • Prioritize tasks • Persist tasks between program runs
10	Create a simple weather information program Simulate weather data retrieval Display current temperature Show weather conditions Provide basic weather forecast Allow searching by city/location Handle potential input errors
	PART – B (Make a group of two students per batch and work on the following mini project problem)
11	Machine Learning Data Preprocessor - Develop a data preprocessing pipeline
12	Social Media Sentiment Analyzer - Develop a text sentiment analysis tool

IV. COURSE OUTCOMES

CO1	Demonstrate an understanding of Python programming constructs and object-oriented principles for writing modular and reusable code.
CO2	Apply Python libraries such as NumPy, Pandas, Matplotlib, and Seaborn for data processing, analysis, and visualization tasks.
CO3	Analyze datasets and design solutions for real-world problems, leveraging file handling techniques and web scraping tools.
CO4	Create efficient Python-based solutions for data-driven applications, demonstrating an ability to solve complex problems through code implementations.

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

PO/PSO	1	2	3	4	5	6	7	8	S1	S2	S3	S4
CO1	2									2	1	
CO2	1		2							1	2	

CO3		2	1							1	2	2
CO4	2	1	2							2	1	1

VI. Assessment Details (CIE & SEE)

General Rules:

Assessment Details (both CIE and SEE):
Refer to Annexure - CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure - CIE & SEE Guidelines.

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

1	Python Cookbook	David Beazley and Brian K. Jones	2013	O'Reilly Media
2	Effective Python: 90 Specific Ways to Write Better Python	Brett Slatkin	2019	Addison-Wesley Professional

VII(c): 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

Department of Master of Computer Applications

Semester:	**I**	**Course Type:**	**BSC**		
Course Title: Mathematical Foundations for Computer Applications					
Course Code:	**25MCAT102**			**Credits:**	**3**
Teaching Hours/Week (L:T:P:S)			**3:0:0:1**	**Total Hours:**	**40**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3 Hrs.**

I. Course Objectives:

- Analyze basic concepts of mathematical logic for analyzing propositions and proving theorems
- Apply sets and their operations algebraically to solve real world problems.
- Examine the basics of graph theory and their various properties.
- Model problems using graphs and to solve these problems algorithmically.
- To facilitate the students with a concrete foundation of probability distributions

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

Module1	8 Hrs

Basic Structures: Sets, Principle of Inclusion, Exclusion and pigeon hole principle Functions and Matrices: Eigen values and Eigen vectors.

Text Book 1

Module2	8 Hrs

Fundamentals of Logic: Propositions- Logical connectives, Tautologies, contradictions. Logical equivalence- The Laws of Logic, inverse, converse and contra positive. Logical Implication – Rules of Inference, Quantifiers- Types and uses of quantifiers.

Text Book 1

Module3	8 Hrs

Introduction to Graphs: Application of graphs finite, infinite and bipartite graphs Incidence and Degree Isolated vertex, pendant vertex and Null graph. Paths and circuits Isomorphism, sub graphs, walks, paths and circuits, connected graphs, disconnected graphs and components.

Text Book 1

Module4	8 Hrs

Euclidean and Hamiltonian graphs: Euler graphs, Operations on graphs, Hamiltonian paths and circuits, Travelling salesman problem. Directed graphs types of digraphs, Digraphs and binary relation.

Text Book 1

Module5	8 Hrs

Probability Distributions: Review of basic probability theory. Random Variables (Discrete and Continuous). Probability mass and density functions. Mathematical expectation, Mean and variance. Discrete probability distributions: Binomial, Poisson and Normal distributions (derivations for mean and standard deviation for Binomial and Poisson distributions only)- Illustrative examples. Applications to analyze the performance of the algorithms..

Text Book 2

IV.COURSE OUTCOMES

Sl.No.	**Description**
CO1	Understand basic concepts of mathematical logic for analyzing propositions and proving theorems and Use sets and its operations algebraically for solving real world problems.
CO2	Understand the basics of graph theory and their various properties
CO3	Model problems using graphs and to solve these problems Algorithmically.
CO4	Apply the knowledge of statistical techniques and probability distributions of Random variables.

V. CO/PO Mapping

PO/PSO	1	2	3	4	5	6	7	8	S1	S2	S3	S4
CO1	2									2	1	
CO2	1		2							1	2	
CO3		2	1							1	2	2
CO4	2	1	2							2	1	1

VI. Assessment Details (CIE & SEE)

General Rules:

Assessment Details (both CIE and SEE):

Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):

Refer to Annexure -CIE & SEE Guidelines.

VII. Learning Resources

VII (a). Text Books

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Discrete Mathematics & its Applications	Kenneth H Rosen	7th Edition	McGraw Hill
2.	Probability & Statistics for Engineers & Scientists	Ronald E. Walpole,Raymond H Myers, Sharon L Myers & Keying Ye	9th Edition, 2023	Pearson Education

VII(b). WeblinksandVideoLectures(eResources):

1. https://archive.nptel.ac.in/courses/111/106/111106086/
2. https://onlinecourses.nptel.ac.in/noc20_cs82/preview
3. http://nptel.ac.in/courses.php?disciplineID=111
4. http://www.class-central-central.com/subject/math(MOOCs)
5. http://academiccarth.org/

VIII. Skill Development Activities Suggested

1) **Translating English Sentences into logical statements.**
2) **Applying Graph theory concepts to design State and National highways across the Country.**

Department of Master of Computer Applications

Semester:	**I**	**Course Type:**	**PCC**		
Course Title: Computer Networks					
Course Code:	**25MCAT103**			**Credits:**	3
Teaching Hours/Week (L:T:P:S)			3:0:0:1	**Total Hours:**	40
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.

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: Communication Applications, Web-Based Applications, File Sharing and Storage Applications,Remote Access Applications , Network Management and Monitoring Applications ,Security Applications ,Internet of Things (IoT) Applications, Requirements, Network Architecture: OSI Model , Internet Architecture , Multiplexing and Demultiplexing, Implementing Network Software, Performance 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	8 Hrs
Textbook: Chapter 1	
RBT Levels: 2,3	
Module-2: Perspectives on Connecting, Encoding (NRZ, NRZI, Manchester, 4B/5B), Framing, Error Detection: 2-D Parity, Internet Checksum Algorithm, CRC, Reliable Transmission, Ethernet and Multiple Access Networks (802.3), Wireless. Program for Hamming code generation for error detection and correction.	8 Hrs
Textbook1: Chapter 2	
RBT Levels: 2,3,4	
Module-3: Internetworking and Advanced Internetworking Switching and Bridging, Basic Internetworking (IP), Routing, The Global Internet, Routing among Mobile Devices. Write a program for distance vector algorithm to find suitable path for transmission.	8 Hrs
Textbook1: Chapter 3,4	
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. Program for congestion control using leaky bucket algorithm.	8 Hrs
Textbook1: Chapter 5,6	
RBT Levels:2,3,4	
Module-5: Network Security and Applications Cryptographic Building Blocks, Key Pre-distribution, Firewalls, Traditional Applications, Infrastructure Services	8 Hrs
Textbook1 : Chapter 8,9	
RBT Levels:2,3,4	

IV. COURSE OUTCOMES	
CO1	Apply the basic concepts of networking and to analyse 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	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:

Assessment Details (both CIE and SEE) :
Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure -CIE & SEE Guidelines.

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

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	6th edition 2019	Morgan Kaufmann Publishers

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

1	Data Communication and Networking	Behrouz A. Forouzan	6th edition 2019	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

Department of Master of Computer Applications

Semester:	**I**	**Course Type:**	**PCC**		
Course Title: Database Management Systems					
Course Code:	**25MCAT104**			**Credits:**	3
Teaching Hours/Week (L:T:P:S)			3:0:0:1	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives:

- Analyze the basic concepts and the applications of database systems.
- Evaluate the different issues involved in the design and implementation of Database System.
- Explain the basic concepts of relational data model, entity relationship model, relational database design and database language SQL
- Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS

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, Purpose of Database System, Views of data, data models, types of data base, characteristics of data approach, three schema architecture of DBMS, components of DBMS.	8 Hrs
Textbook1&2: Chapter 1-2	
RBT Levels: 2	
Module-72: Introduction to the Relational Model, Structure Database Schema, Keys Schema Diagrams. Overview of the SQL Query Language, Basic Structure of SQL Queries, Data types, creating a database, integrity constraints, triggers.	8 Hrs
Textbook1: Chapter 3-5	
RBT Levels: 2,3	
Module3: Overview of the Design Process , The Entity-Relationship Model, Entities, Attributes and Entity sets Relationships and Relationship sets, roles and structural constraints, Reducing E-R Diagrams to Relational Schemas, specialization and generalization.	8 Hrs
Textbook2: Chapter 7- 8	
RBT Levels:2,3,4	
Module-47: Introduction, functional dependencies, First, Second, and third normal forms, Boyce/Codd normal form. Introduction, Multivalued dependencies and fourth normal form, Join dependencies and fifth normal form.	8 Hrs
Textbook2: Chapter 15	
RBT Levels:2,3,4	
Module-5: Transaction State- Implementation of Atomicity and Durability Concurrent Executions Serializability- Recoverability Implementation of Isolation Testing for serializability- Lock Based Protocols Timestamp Based Protocols- Validation- Based Protocols. Buffer Management, Failure with Loss of Non-Volatile Storage.	8 Hrs
Textbook 1: Chapter 17 - 19	
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	S1	S2	S3	S4	
CO1	2	72							1				
CO2	2	2								2			
CO3	2	2								2			
CO4	2	2	2									1	

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

General Rules:

Assessment Details (both CIE and SEE) :
Refer to Annexure - CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure -CIE & SEE Guidelines.

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Database System Concepts	Silberschatz, Korth	7th edition,2019	Mc Graw hill
2	Fundamentals of Database Systems	Elmasri and Navathe	6th Edition, 2011,	Pearson

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

1	An Introduction to Database systems	C.J. Date, A.Kannan, Swami Nadhan	Eight Edition.	Pearson
2	Fundamentals of Database Management Systems	M. L. Gillenson	Student Edition	Wiley
3	Database Management Systems	Raghu Ramakrishnan, Johannes Gehrke,	3rd Edition,2002	McGrawHill

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

1. dev.mysql.com
2. www. Postgressql.org.
3. https://www.w3schools.com/mysql/mysql_rdbms.asp
4. https://www.w3schools.in/dbms/intro

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Quizzes • Assignments • Seminar

Department of Master of Computer Applications

Semester	**I**	**Course Type:**	**PCC**		
Course Title: Web Technologies					
Course Code:		**25MCAT105**	**Credits:**		3
Teaching Hours/Week (L:T:P:S)			3:0:0:1	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:		Theory		**Exam Hours:**	3 Hrs

I. Course Objectives:

- Creating the small webpage using xhtml5.
- Use different tags of html to create webpage.
- Use of CSS and JavaScript
- Developing the dynamic document using JavaScript.

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 XHTML and CSS: Basicsyntax,Standardstructure,Basictextmarkup,Images,HypertextLinks.Lists, Tables,Forms,Frames,Syntacticdifferences between HTML andXHTML.	8 Hrs
Textbook1: Chapter 1,2	
RBT Levels: 2	
Module-2: CascadingStyleSheets: Introduction,Levelsofstylesheets,Stylespecificationformats,Selectorforms,Propertyvalueforms,Fontproperties,Listproperties,Color,Alignmentoftext,The boxmodel,Backgroundimages,Theand tags,Conflictresolution.	8 Hrs
Textbook1: Chapter 3	
RBT Levels: 2	
Module-3:JavaScript: IntroductiontoJavascriptScreenoutputandkeyboardinput,controlsstatements,Arrays andfunctions, pattern matching The Document Object Model, DOM-methods, Elements Accessin JavaScript,ElementAccess,EventsandEventHandling-onclick(),onload(),JavaScript.validations	8 Hrs
Textbook1: Chapter 4,5,6	
RBT Levels: 2,3	
Module-4: IntroductiontoXML: XML- Introduction, syntax, Document structure, Document Type Definitions, Namespaces, XMLschema,displayingrawXMLdocumentsHandlingstructuredandunstructureddatastore:Introduction to JSON, Array literals, Object literals, mixing literals, JSON Syntax, JSON data types,JSONEncodingand Decoding,Introduction toWeb3.0.	8 Hrs
Textbook1: Chapter 7	
RBT Levels: 2,3	
Module-5: Your first React Web Application, Components, components & server	8 Hrs
Textbook 2 : Chapter 1,2	
RBT Levels:2,3,4	

IV. COURSE OUTCOMES

CO1	Describe the basic concepts of web applications
CO2	Apply the knowledge of designing web application that uses asynchronous communication.
CO3	Design single page web application using javascript framework
CO4	Design an interactive web page with serverside scripting language for real world problems

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

PO/PSO	1	2	3	4	5	6	7	8	S1	S2	S3	S4
CO1	2											
CO2	2	2										
CO3				2						1	1	
CO4					2		1	1	1		1	1

VI. Assessment Details (CIE & SEE)

General Rules:

Assessment Details (both CIE and SEE) :
Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure -CIE & SEE Guidelines.

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Programming the World Wide Web.	Robert W. Sebesta	7th Editon, 2012.	Pearson Education
2	Full Stack React	Anthony Accomazo	1st Edition 2017	FullStack.IO

VII(b): Reference Books:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	WebProgrammingBuildingInternetApplications	ChrisBates	3rdEdition	WileyIndia,2006
2	Internet& WorldWideWebHowtoProgram	Deitel,P.J. Deitel,A.B .Goldberg:	3rdEdition	Pearson ,2004

VII(c): Web links and Video Lectures (e-Resources):				
• https://www.w3schools.com • https://www.tutorialspoint.com				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Quizzes • Assignments • Seminar				

Department of Master of Computer Applications

Semester:	**I**	**Course Type:**	**PCC**		
Course Title: Software Engineering					
Course Code:	**25MCAT106**			**Credits:**	3
Teaching Hours/Week (L:T:P:S)			3:0:0:1	**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, methodologies, and tools used in software development. Learn the importance of software processes and lifecycle models (e.g., Waterfall, Agile, Spiral).
- Gain knowledge of the fundamental principles and best practices in software engineering.
- Build proficiency in managing all stages of the software development lifecycle.

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 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
Textbook1: Chapter 1-2, Textbook2: Chapter 1-5	
RBT Levels: 2,3	
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. System Modelling : Context Models, Interaction Models : Use case modelling, Sequence diagrams. Structural models: Class diagrams. Behavioural models: Data-driven modelling, event driven modelling.	8 Hrs
Textbook1: Chapter 4, 5 Textbook2: Chapter 6-10	
RBT Levels: 2,3	
Module-3: Software Testing : Development Testing : Unit Testing, Component Testing, System Testing. Test-driven development. Release Testing : Requirements based testing, Scenario Testing, Performance Testing. User Testing: Alpha Testing, Beta Testing , Acceptance Testing.	8 Hrs
Textbook: Chapter 8	
RBT Levels:2,3,4	
Module-4: Software Evolution : Evolution Process. Legacy Systems. Software Maintenance : Maintenance prediction, Software reengineering, Refactoring. Quality Management : Software Quality , Software Standards, Reviews and Inspections, Quality management and agile development, Software measurement.	8 Hrs
Textbook: Chapter 9,24	
RBT Levels:2,3,4	
Module-5: Agile Software Development : Agile Methods, Agile development techniques, Agile Project management, Scaling agile methods.	8 Hrs
Textbook1 : Chapter 3	

RBT Levels:2,3,4

IV. COURSE OUTCOMES

CO1	Describe and apply the key activities of the software development lifecycle, including specification, design, validation, and evolution.
CO2	Apply appropriate methods to gather and specify requirements for software projects.
CO3	Apply test-driven development methodologies for robust software development.
CO4	Apply Agile Methods to enhance software development processes.

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

PO/ PSO	1	2	3	4	5	6	7	8	S1	S2	S3	S4
CO1	2	2							2	2		
CO2		2								2		
CO3			2								2	
CO4		2								2		

V. Assessment Details (CIE & SEE)

General Rules:

Assessment Details (both CIE and SEE) :
Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure -CIE & SEE Guidelines.

VI. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Software Engineering	Ian Sommerville	2020	Pearson
2	Software Engineering: A Practitioner's Approach	Roger S. Pressman	2020	McGraw-Hill Education

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

1	Fundamentals of Software Engineering	Rajib Mall	Fifth Edition, Jan 2021	PHI

VII(c): Web links and Video Lectures (e-Resources):
Tutorials Point : Software Engineering : https://www.youtube.com/watch?v=4b1D1QFEel0&list=PLWPirh4EWFpG2b1L3CL-OAPYcM25jLjXH NPTEL Swayam Course : https://onlinecourses.nptel.ac.in/noc24_cs119/preview - Software Engineering by Prof. Rajib Mall, IIT Kharagpur
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Assignments • Seminar (Presentation)

Semester:	I	**Course Type:**	PCCL		
Course Title: DBMS & Web Technologies Laboratory					
Course Code:		**25MCAL107**		**Credits:**	1
Teaching Hours/Week (L:T:P:S)			0:0:2:1	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Laboratory			**Exam Hours:**	3

I. Course Objectives:

- Create SQL queries for the small projects.
- Create database objects that include tables, constraints, indexes, and sequences.
- Creating and building dynamic web pages
- Understanding client and server-side scripting

II. Practical Component - Experiments

1	Set up a sample employee database and execute basic SQL queries
2	Create the following tables with properly specifying Primary keys, Foreign keys and solve the following queries. BRANCH (Branch_id, Branch_name, HOD) STUDENT (USN, Name, Address, Branch_id, Sem) BOOK (Bookid, Book_name, Author_id, Publisher, Branch_id) AUTHOR (Author_id, Author_name, Country, age) BORROW (USN, Bookid, Borrowed__Date) Execute the following Queries: i.List the details of Students who are all studying in 2nd Sem MCA. ii. List the students who are not borrowed any books. iii. Display the USN, Student name, Branch_name, Book_name, Author_name, Books_Borrowed_Date of 2nd Sem MCA Students who borrowed books. iv. Display the number of books written by each Author. v. Display the student details who borrowed more than two books. vi. Display the student details who borrowed books of more than one Author. vii. Display the Book names in descending order of their names. viii. List the details of students who borrowed the books which are all published by the same publisher.
3	Consider the following schema: STUDENT (USN, name, date_of_birth, branch, mark1,

	mark2, mark3, total, GPA) Execute the following queries: I. Update the column total by adding the columns mark1, mark2, mark3. ii. Find the GPA score of all the students. iii. Find the students who born on a particular year of birth from the date_of_birth column. iv. List the students who are studying in a particular branch of study. v. Find the maximum GPA score of the student branch-wise. vi. Find the students whose name starts with the alphabet vii. Find the students whose name ends with the alphabets viii. Delete the student details whose USN is given as 1001
4	Design an ER-diagram for the following scenario, Convert the same into a relational model and then solve the there are many teams are contesting each having a Teamid,Team_Name, City, a coach. Each team is uniquely identified by using Teamid. A team can have many Players and a captain. Each player is uniquely identified by Playerid, having a Name, and multiple phone numbers,age. A player represents only one team. There are many Stadiums to conduct matches. Each stadium is identified using Stadiumid, having a stadium_name,Address (involves city,area_name,pincode). A team can play many matches. Each match played between the two teams in the scheduled date and time in the predefined Stadium. Each match is identified uniquely by using Matchid. Each match won by any of the one team that also wants to record in the database. For each match man_of_the match award given to a player. Execute the following Queries: I. Display the youngest player (in terms of age) Name, Team name, age in which he belongs of the tournament. ii. List the details of the stadium where the maximum number of matches were played. iii. List the details of the player who is not a captain but got the man_of _match award at least in two matches. iv. Display the Team details who won the maximum matches. v. Display the team name where all its won matches played in the same stadium.
5	Perform normalization(1NF,2NF,3NF) on a given set of tables Create initial tables CREATE TABLE authors (author_id NUMBER PRIMARY KEY, author_name VARCHAR2(100), birth_date DATE); CREATE TABLE books (book_id NUMBER PRIMARY KEY, title VARCHAR2(200), publication_date DATE, genre VARCHAR2(50), author_id NUMBER, FOREIGN KEY (author_id) REFERENCES authors(author_id)); CREATE TABLE customers (customer_id NUMBER PRIMARY KEY, customer_name VARCHAR2(100),

	email VARCHAR2(100)); CREATE TABLE orders (order_id NUMBER PRIMARY KEY, order_date DATE, customer_id NUMBER, Total Amount Decimal (10,2));
6	Consider the schema for Movie Database: ACTOR (*Act_id, Act_Name, Act_Gender*) DIRECTOR(*Dir_id,Dir_Name,Dir_Phone*) MOVIES(*Mov_id,Mov_Title,Mov_Year,Mov_Lang,Dir_id*) MOVIE_CAST (*Act_id, Mov_id, Role*) RATING(*Mov_id,Rev_Stars*) Write SQL queries to **1.** List the titles of all movies directed by 'Hitchcock'. **2.** Find the movie names where one or more actors acted in two or more movies. **3.** Listallactorswhoactedinamoviebefore2000andalsoinamovieafter 2015 (use JOIN operation). **4.** Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title. **5.** Update ratingofall movies directed by'StevenSpielberg'to5.
7	Create an XHTML page that provides information about your department. Your XHTML page must use the following tags: a) Text Formatting tags b) Horizontal rule c) Meta element d) Links e) Images f) Tables (Use of additional tags encouraged).
8	Creating simple application to access data base using JDBC Formatting HTML with CSS
9	Write a javascript program for validating REGISTRATION FORM
10	Write a program for implementing XML document for CUSTOMER DETAILS.
11	Write a program to create a simple calculator Application using React JS
12	Create a Simple Login form using React JS

III. 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.

IV. COURSE OUTCOMES

CO1	Design entity-relationship diagrams to solve given database applications
CO2	Apply normalization techniques to improve the database design for the given problem. Build database and verify for its appropriate normalization for any given problem
CO3	Explain the fundamental concepts of web technologies
CO4	Implement user interactive web pages

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

PO/PSO	1	2	3	4	5	6	7	8	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:

Assessment Details (both CIE and SEE):
Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure -CIE & SEE Guidelines.

Department of Master of Computer Applications

Semester:	**I**	**Course Type:**	**PCC**		
Course Title: Research Methodology & IPR					
Course Code:	**25MCAT108**		**Credits:**		3
Teaching Hours/Week (L:T:P:S)			3:0:0:1	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	03

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, and Problems Encountered by Researchers in India.	8 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.	8 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.	8 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.	8 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.	8 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	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:

Assessment Details (both CIE and SEE):
Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure -CIE & SEE Guidelines.

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

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	New Age International
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: (Insert or delete rows as per requirement)				
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				

II Semester MCA

Semester:	**II**	**Course Type:**	**IPCC**		
Course Title: Machine Learning					
Course Code:	**25MCAI201**			**Credits:**	**4**
Teaching Hours/Week (L:T:P:S)			**3:0:2:1**	**Total Hours:**	**40**
CIE Marks:	**50**	**SEE Marks:**	**50**	**Total Marks:**	**100**
SEE Type:	**Theory**			**Exam Hours:**	**3 Hrs.**

I. Course Objectives:

- Introduce fundamental machine learning concepts and techniques.
- Develop practical skills in implementing machine learning models.
- Cultivate analytical thinking in solving complex computational 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	
III(a). Theory PART	
Module-1: Foundations of Machine Learning Introduction to Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning, Basic Mathematical Foundations, Data Preprocessing Techniques, Model Evaluation Metrics	8 Hrs.
Textbook1: Chapters 1-3	
RBT Levels: 2, 3	
Module-2: Supervised Learning Algorithms Linear Regression, Logistic Regression, Decision Trees, Random Forests, Support Vector Machines, Practical Implementation using Python and Scikit-learn	8 Hrs.
Textbook3: - Chapters 4-6	
RBT Levels: 3, 4	
Module-3:Unsupervised Learning and Dimensionality Reduction Clustering Algorithms (K-Means, DBSCAN), Principal Component Analysis (PCA), Dimensionality Reduction Techniques, Anomaly Detection, Practical Implementations	8 Hrs.
Textbook2: Chapters 7-8	
RBT Levels: 3,4	
Module-4:Advanced Machine Learning Techniques Ensemble Learning Methods, Gradient Boosting, Neural Network Basics, Introduction to Deep Learning, Overfitting and Regularization Techniques	8 Hrs.
Textbook3: Chapters 9-10	
RBT Levels: 3,4	
Module-5:Practical Machine Learning and Real-world Applications Machine Learning Project Lifecycle, Feature Engineering, Model Deployment Strategies, Case Studies, Ethics in Machine Learning.	8 Hrs.
Textbook1: - Chapters 11-12	
RBT Levels: 3,4	

III(b). PRACTICAL PART

Sl. No.	**Experiments / Programs / Problems** (insert rows as many required)
	PART – A
1	Load the Iris dataset from scikit-learn, perform basic statistical analysis, and create a visualization of feature distributions using seaborn. Train a K-Nearest Neighbors classifier and report its accuracy.

2	Implement a linear regression model to predict house prices using the Boston Housing dataset. Calculate mean squared error and R-squared value to evaluate model performance.
3	Develop a binary classification model using logistic regression to predict customer churn. Use a telecommunications customer dataset, split data into training and testing sets, and compute precision, recall, and F1-score.
4	Create a random forest classifier for credit card fraud detection. Implement feature scaling, handle class imbalance using techniques like SMOTE, and generate a confusion matrix.
5	Build a sentiment analysis model using naive Bayes classifier on a movie review dataset. Perform text preprocessing, vectorization, and evaluate model performance using cross-validation.
6	Develop a clustering algorithm using K-means to segment customer data based on purchasing behavior. Apply dimensionality reduction techniques like PCA and visualize cluster distributions.
7	Implement gradient boosting regression to predict bike-sharing demand. Use feature engineering techniques, handle categorical variables, and compare performance with other regression models.
8	Create an ensemble learning model combining multiple classifiers (random forest, gradient boosting, SVM) for a multi-class classification problem. Use voting and stacking techniques.
	PART - B
9	Develop a comprehensive machine learning pipeline for predicting employee attrition. Tasks include: • Data preprocessing • Feature selection • Model training using multiple algorithms • Hyperparameter tuning • Model interpretation and feature importance analysis
10	Design a recommendation system using collaborative filtering techniques. Use a movie rating dataset to: • Implement user-based and item-based recommendation approaches • Evaluate recommendation quality using metrics like precision and recall • Create a modular recommendation engine with different algorithm options
IV. COURSE OUTCOMES	
CO1	Explain basic machine learning principles and algorithmic approaches.
CO2	Apply machine learning algorithms to solve real-world data challenges.
CO3	Develop predictive models using appropriate machine learning techniques.

CO4	Evaluate machine learning model performance and ethical considerations.

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

PO/PSO	1	2	3	4	5	6	7	8	S1	S2	S3	S4
CO1	2			2					2			
CO2		2	2							2		
CO3	2			2							2	
CO4		2					1	1				1

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

General Rules:

Assessment Details (both CIE and SEE):
Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure -CIE & SEE Guidelines.

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Introduction to Machine Learning with Python	Thomas M. Mitchell	1e, 1997	McGraw-Hill Education
2	Introduction to Machine Learning with Python	Andreas C. Müller and Sarah Guido	1e, 2016	O'Reilly Media
3	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	Aurélien Géron	2e, 2019	O'Reilly Media

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

Department of Master of Computer Applications

Semester:	**II**	**Course Type:**	IPCC		
Course Title: Internet of Things					
Course Code:	**25MCAI202**			**Credits:**	4
Teaching Hours/Week (L:T:P:S)			3:0:2:1	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives:

- Define the IoT architecture and design along with functional/compute stack and data management.
- Explain IOT architecture for a given problem
- Understand the fundamental principles and components of Raspberry Pi and its role in IoT systems.
- Analyse the application protocol, transport layer methods for the given business case

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: What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack	8 Hrs
Textbook1: Chapter 1,2	
RBT Levels: 2,3	
Module-2: Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies	8 Hrs
Textbook1 : Chapter 3,4	
RBT Levels: 2,3	
Module-3: IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.	8 Hrs
Textbook 1: 5,6	
RBT Levels: 2,3	
Module-4: Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures:OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.	8 Hrs.
Texbook1: Chapter 7,8	
RBT Levels:2,3	
Module-5: IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino,– Raspberry Pi: Introduction to Raspberry Pi,, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City, Smart City Use-Case Examples.	8 Hrs.
Textbook 1: Chapter 12	
RBT Levels:3,4	

III(b). PRACTICAL PART

Sl. No.	**Experiments / Programs / Problems** (insert rows as many required)
1	Run some python programs on Pi like: Read your name and print Hello message with name Read two numbers and print their sum, difference, product and division. Word and character count of a given string Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input Print a name „n‟ times, where name and n are read from standard input, using for and while loops. Handle Divided by Zero Exception. Print current time for 10 times with an interval of 10 seconds. Read a file line by line and print the word count of each line
2	Get input from two switches and switch on corresponding LEDs
3	Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
4	Switch on a relay at a given time using cron, where the relay's contact terminals are Connected to a load.
5	Access an image through a Pi webcam.
6	Control a light source using webpage.
7	Implement an intruder system that sends an alert to the given email
8	Get the status of a bulb at a remote place (on the LAN) through web.
9	Get an alarm from a remote area (through LAN) if smoke is detected.
10	A team of two students must develop the mini project. However during the examination, each student must demonstrate the project individually The team must submit a brief project report that must include the following a. Introduction b. Requirement Analysis c Software Requirement Specification d. Analysis and Design, e. Implementation f. Testing. Brief synopsis not more than two pages to be submitted by the team as per the format given.

IV. COURSE OUTCOMES

CO1	Analyse the IoT architecture and design along with functional/compute stack and Data management.
CO2	Apply IOT architecture for a given problem.
CO3	Introduce machine learning and its applications in IoT data analytics**.**
CO4	Define the concept of IoT and its significance in the context of digitization

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

PO/PSO	1	2	3	4	5	6	7	8	S1	S2	S3	S4
CO1	2											
CO2	2	2										
CO3			2					1	1		1	
CO4				2				1	1			1

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

General Rules:

Assessment Details (both CIE and SEE):
Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure -CIE & SEE Guidelines.

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	IOT Fundamentals	David Hanes, Gonzalo Salgueiro	1st Edition	Pearson

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

1	"Internet of Things (A Hands-on-Approach)",	Vijay Madisetti & Arshdeep Bahga	1st Edition, 2014. (ISBN: 978-8173719547)	VPT

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

- https://youtu.be/WUYAjxnwjU4

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 Using Java					
Course Code:	**25MCAT203**			**Credits:**	3
Teaching Hours/Week (L:T:P:S)			3:0:0:1	**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 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 and Handling the Exception.

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: The History and Evolution of Java: Features of Java An overview of Java: Object Oriented Programming, Evolution of Programming Paradigms, 3 java Principles Data Types and Variables, Type conversion and casting, Arrays, Classes, Objects, Methods, and Attributes , this Keyword, Benefits of Object-Oriented Programming.	8 Hrs
Textbook 1: Chapter 1,2,3	
RBT Levels: 2,3	
Module-2:. Basics of Procedural Programming vs Object-Oriented , Constructors and Destructors, Overloading of Constructors, Class Methods and Instance Methods, Access Modifiers: Public, Private, Protected, Class Relationships: Association, Aggregation, Composition.	8 Hrs
Textbook1: Chapter 1, 6, 7 **Textbook2: Chapter 2,7**	
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 1,8,9	
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
Textbook1: Chapter 1, Textbook2: Chapter 1	
RBT Levels:2,3,4	
Module-5: Generics: Generic Classes and Methods, Exception Handling: Try,Catch Throw, Throws, User-defined exceptions. Custom Exceptions, Reflection and Metadata, Advanced Topics in OOP: Reflection and Metadata.	8 Hrs
Textbook1 : Chapter 10,14	
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	S1	S2	S3	S4	
CO1	2	2	1						2	1	2		
CO2	2	2							2		2		
CO3	2	2	1						2	2	1		
CO4	2	2	1						2	2	1		

VI. Assessment Details (CIE & SEE)

General Rules:

Assessment Details (both CIE and SEE) :
Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure-CIE & SEE Guidelines.

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Java: The Complete Reference	Herbert Schildt	2018	McGraw-Hill Education
2	Head First Java	Kathy Sierra and Bert Bates	2020	O'Reilly Media
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. https://m.youtube.com/watch?v=SiBw7os_zI
2. https://ocw.mit.edu/courses/6-01sc-introduction-to-electrical-engineeringand-computer-science-i-spring-2011/pages/unit-1-software-engineering/object-orientedprogramming/
3. https://m.youtube.com/watch?v=CoHCUimLmdM
4. https://www.freecodecamp.org/news/object-oriented-programming-crashcourse

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

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

- Quizzes
- Assignments
- Seminar

Department of Master of Computer Applications

Semester:	**II**	**Course Type:**	**PCC**		
Course Title: Data Structures & Algorithms					
Course Code:	**25MCAT204**			**Credits:**	3
Teaching Hours/Week (L:T:P:S)			3:0:0:1	**Total Hours:**	40 Hrs.
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives:

- To introduce fundamental concepts of data structures and algorithms and their importance in solving computational problems.
- To develop the ability to analyze and implement data structures like arrays, linked lists, stacks, queues, trees, and graphs.
- To enable understanding and application of basic algorithmic techniques for sorting, searching, and graph traversal.

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: Definition and Importance of Data Structures, Algorithm Design Process, Concept of Recursion and its Applications, Basics of Algorithm Analysis, Asymptotic Notations: Big O, Omega, Theta.	8 Hrs
Textbook1: Chapter 1, 3 Reference Book1: Chapter 1	
RBT Levels: 2	
Module-2: Arrays: Declaration, Initialization, Operations, Linked Lists: Singly, Linked Lists, Doubly Linked Lists, Operations on Linked Lists, Comparison of Arrays and Linked Lists, Problem-solving techniques using linear data structures.	8 Hrs
Textbook1: Chapter 4, Reference Book1: Chapter 10	
RBT Levels: 2, 3	
Module-3: Stack: Definition, Operations, Applications (e.g., Balanced Parentheses, Backtracking), Queue: Definition, Operations, Applications (e.g., Task Scheduling), Implementing Stacks and Queues using Arrays and Linked Lists, Solving Problems using Stacks and Queues, Hash Tables.	8 Hrs
Textbook1: Chapter 5, 6 Reference book1: Chapter 11	
RBT Levels: 2,3,4	
Module-4: Trees: Binary Trees, Binary Search Trees (BST), Traversal Algorithms: Inorder, Preorder, Postorder, Graphs: Representations (Adjacency Matrix and List), Graph Traversal Algorithms (BFS, DFS), Applications: Shortest Path and Minimum Spanning Tree.	8 Hrs
Textbook1: Chapter 7, 8 Reference Book1: Chapter 22	
RBT Levels:2,3,4	
Module-5: Sorting Algorithms: Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Searching Algorithms: Linear Search, Binary Search, Analysis and Comparison of Sorting and Searching Algorithms.	8 Hrs
Textbook1: Chapter 9 Reference Book1: Chapter 7, 8	
RBT Levels:2,3,4	

IV. COURSE OUTCOMES	
CO1	Understand the core principles of data structures and algorithm design.
CO2	Apply data structures such as arrays, linked lists, stacks, and queues to solve computational problems
CO3	Analyze the efficiency of sorting, searching, and traversal algorithms with respect time and space complexity
CO4	Design and implement solutions using tree and graph data structures for real-world problems.

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

PO/PSO	1	2	3	4	5	6	7	8	S1	S2	S3	S4
CO1	2	1		2				2	2	1		2
CO2	1	2	2	2					2	2	1	
CO3	2	2		1						2	2	2
CO4		2	2	2				2	1		2	2

VI. Assessment Details (CIE & SEE)

General Rules:

Assessment Details (both CIE and SEE):
Refer to Annexure F-CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure F-CIE & SEE Guidelines.

VII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Data Structures and Algorithms in Python	Michael T. Goodrich	3e, 2022	Wiley

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

1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein	4e, 2022	MIT Press

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:
•Quizzes • Assignments• Seminar

Department of Master of Computer Applications

Semester:	**II**	**Course Type:**	PCC		
Course Title: Operating Systems - Linux					
Course Code:	**25MCAT205**		**Credits:**		3
Teaching Hours/Week (L:T:P:S)			3:0:01	**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 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. 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, Texbook2: Chapter 15-19	
RBT Levels:2,3,4	

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)

VI.

PO/PSO	1	2	3	4	5	6	7	8	S1	S2	S3	S4
CO1	2	1	1						1			
CO2	2	2	1							1		
CO3	2	1	1							2		
CO4	2	1	1								1	

VII. Assessment Details (CIE & SEE)

General Rules:

Assessment Details (both CIE and SEE):
Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure -CIE & SEE Guidelines.

VIII. Learning Resources

VII(a): Textbooks: (Insert or delete rows as per requirement)

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(c): 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. 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

Department of Master of Computer Applications

Semester:	**II**	**Course Type:**	PCCL		
Course Title: DSA Laboratory					
Course Code:	**25MCAL206**			**Credits:**	1
Teaching Hours/Week (L:T:P:S)			0:0:2:1	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Laboratory			**Exam Hours:**	3 Hrs

I. Course Objectives:

- Develop a comprehensive understanding of fundamental data structures and their implementation strategies.
- Enhance problem-solving skills through algorithmic thinking and computational reasoning.
- Cultivate the ability to analyze and design efficient algorithms for various computational challenges.

II. Practical Component - Experiments

1	Array Manipulation: Write a program to find the second largest element in an unsorted integer array.
2	Linked List Operation: Implement a function to detect and remove a cycle in a singly linked list.
3	Stack Application: Design a stack-based program to check if a given string has balanced parentheses.
4	Queue Implementation: Create a circular queue with fixed size that supports enqueue and dequeue operations.
5	Hash Table Basics: Develop a simple hash table to store and retrieve student records using student ID as the key.
6	Binary Search Tree: Write a program to find the height of a binary search tree.
7	Graph Traversal: Implement depth-first search (DFS) algorithm to traverse a given graph.
8	Sorting Algorithm: Write a program to implement the bubble sort algorithm and count

	the number of swaps performed.
9	Binary Search: Develop a program to perform binary search on a sorted array and return the index of a target element.
10	Recursion: Create a recursive function to calculate the factorial of a given number.
11	String Manipulation: Write a program to reverse a string using stack data structure.
12	Memory Management: Implement a program to merge two sorted arrays into a single sorted array with minimal extra space.

III. 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.

IV. COURSE OUTCOMES

CO1	Recognize and describe the core principles of basic data structures and algorithmic concepts.
CO2	Apply appropriate data structure techniques to solve programming problems efficiently.
CO3	Analyze the computational complexity and performance characteristics of different algorithmic approaches.
CO4	Compare and select optimal data structure implementations for specific computational scenarios.

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

PO/PSO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**S1**	**S2**	**S3**	**S4**
CO1	2			1					2			
CO2		2	1							2		
CO3	2			2							2	

CO4		2		2								1

VI. Assessment Details (CIE & SEE)

General Rules:
Assessment Details (both CIE and SEE): **Refer to Annexure -CIE & SEE Guidelines.**
Semester End Examination (SEE): **Refer to Annexure -CIE & SEE Guidelines.**

Department of Master of Computer Applications

Semester:	**II**	**Course Type:**	PCCL		
Course Title: Object Oriented Programming Laboratory					
Course Code:	**25MCAL207**			**Credits:**	1
Teaching Hours/Week (L:T:P:S)			0:0:2:1	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Laboratory			**Exam Hours:**	3 Hrs

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) and design Patterns to create modular and maintainable code
-

II. 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	Construct a Java program to demonstrate class relationships: association, aggregation, and composition.
5	Implement a Java program showcasing inheritance and method overriding
6	Design a Java program demonstrating polymorphism at runtime
7	Construct a Java program using abstract classes and interfaces.
8	Develop a Java program applying SOLID principles for better design
9	Design a Java program implementing the Singleton design pattern
10	Construct a Java program using the Factory design pattern
11	Implement a Java program illustrating the Observer design pattern
12	Develop a Java program applying generics for a generic class and method.

III. 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.

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	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:

Assessment Details (both CIE and SEE):
Refer to Annexure -CIE & SEE Guidelines.

Semester End Examination (SEE):
Refer to Annexure -CIE & SEE Guidelines.

Semester:	II	Course Type:	AEC		
Course Title: Data Visualization and Analysis with Power BI					
Course Code:	**25MCAAE21**			**Credits:**	1
Teaching Hours/Week (L:T:P:S)			0:1:1:1	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory Exam			**Exam Hours:**	---

I. Course Objectives:

- To gain a foundational understanding of Power BI, including Power BI Desktop and the Power BI website.
- To create various data visualizations, including stacked and clustered bar charts, waterfall charts, scatter plots, filled maps, and 3D maps.
- To prepare and transform data using Power Query for acquisition, grouping, binning, merging, joining, and transformation.
- To design and build interactive reports and dashboards, utilizing bookmarks, buttons, and KPIs for enhanced user interactivity.
- To perform advanced data analysis with DAX, creating measures, calculated columns, and using functions like SUMX, IF, FILTER, Dates In Period, Dates Between, and Week To Date.

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 : Power BI Essentials	8 Hrs

Pre-requisites (Self Learning) Basic understanding of data analysis concepts and familiarity with spreadsheet software like Excel. Additionally, knowledge of SQL for data querying and manipulation would be beneficial for advanced data analysis tasks in POWER BI.

Module 1 : Utilize POWER BI Desktop and its web counterpart, acquiring data from various sources including CSV files and folders. Master data transformation with Power Query, create visualizations, and distinguish between dashboards and reports for effective data presentation.

Textbook1: Chapter 1,2

RBT Levels: L1, L2, L3, L4

Module 2 :Visualization in POWERBI	8 Hrs

Advanced visualization techniques in POWER BI, including various chart types, map visualizations, and interactive features like slicers, bookmarks, and buttons. Additionally, explore data grouping, binning, and Key Performance Indicators (KPIs) for effective data analysis and presentation.

Textbook1: : Chapter 3,4

RBT Levels: L1, L2, L3, L4

Module-3:Basic Data Transformation in Power BI	8 Hrs

Power Query basics, data preparation, and importing data from Excel and Azure SQL Database. Understand the difference between reference vs duplicate and append vs merge in POWER BI for effective data transformation.

Textbook1: : Chapter 4,5

RBT Levels: L1, L2, L3, L4

Module-4:Advanced Data Transformation in Power BI	8 Hrs

Advanced data manipulation techniques in POWER BI, including merge join types, pivot operations, grouping, exception reporting, flawless date conversion, and numeric division. These skills enhance ability to handle diverse data scenarios efficiently.

Textbook1: : Chapter 5,6

RBT Levels: L1, L2, L3, L4

Module-5: Power BI Modeling And DAX	8 Hrs

Advanced data modelling and calculation techniques in POWER BI, including sorting, data preparation, relationship management, and using measures versus calculated columns. Explore functions like SUM vs SUMX, IF and FILTER, and address DAX time zone issues, enhancing data analysis skills.

Textbook 1: : Chapter 6,7,8

RBT Levels: L2 & L3

IV. COURSE OUTCOMES

CO1	Apply Power BI Desktop and its web counterpart to acquire, prepare, and transform data from various sources, including CSV files and Azure SQL Database, using Power Query.
CO2	Apply advanced visualization techniques, including various chart types, map visualizations, and interactive features like slicers, bookmarks, and buttons, for effective data presentation.

CO3	Implement data modeling techniques, including designing star schemas, managing relationships, and differentiating between measures and calculated columns.
CO4	Perform advanced data analysis and calculations with DAX, using functions like SUM vs SUMX, IF, FILTER, and handling DAX time zone issues.
CO5	Develop an interactive reports and dashboards, publish reports, and pin them to dashboards in the PowerBI.com service, utilizing KPIs for performance tracking.

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

PO/PSO	1	2	3	4	5	6	7	8	S1	S2	S3	S4
CO1	2	2	1						1			
CO2	2	1								2		
CO3	2	1								2		
CO4	2	2									2	
CO5		1	1								1	

VI. Assessment Details (CIE & SEE)

General Rules:

Continuous Internal Evaluation (CIE):

Refer to Annexure-CIE & SEE Guidelines.

Semester End Examination (SEE):

Refer to Annexure-CIE & SEE Guidelines.

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1.	Power BI Cookbook: Creating Business Intelligence Solutions of Analytical Data Models, Reports, and Dashboards	Brett Powell	Second edition 2018	Packt Publishing
2.	Mastering Microsoft Power BI: Expert techniques for effective data analytics and business intelligence	Brett Powell	Third Edition 2020	Packt Publishing
3.	Power BI 10-Day Pass: A Practical Guide to Building Enterprise Data Models	Paul Turley	First Edition 2019	Independently published

VII(b): Reference Books:

1	M is for (Data) Monkey: A Guide to the M Language in Excel Power Query	Ken Puls and Miguel Escobar	First Edition 2015	Holy Macro! Books
2	Analyzing Data with Power BI and Power Pivot for Excel	Alberto Ferrari and Marco Russo	Second Edition 2017	Microsoft Press

VII(c): Web links and Video Lectures (e-Resources):
• [Microsoft Power BI Official Website](https://powerbi.microsoft.com/) • [Power BI Tips](https://powerbi.tips/) • [Guy in a Cube](https://guyinacube.com/) • [Power BI Blog](https://powerbi.microsoft.com/en-us/blog/) [Enterprise DNA](https://www.youtube.com/channel/UCiNm8KMJWggC4iRrxtnkovA)
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:
Assignments, Quizzes and Seminar, Mini projects