

|| 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



S J B I T

Autonomous PG Scheme & Syllabus

Programme: MCA

MBA/MCA BLOCK

SCHEME

2024

I & II Semester

SJBIT ADMINISTRATIVE BLOCK



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 lead and take the right path.



AUTONOMOUS SCHEME (Tentative) PG - MCA 1st year

SCHEME: 2024

Date: 08.01.2025

SEM: I

SL No	Course Type	Course type Count	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O	CIEMarks	SEE			Tot. Marks
								Lecture	Tutorial	Practical	PBL/ABL/SL/others.		Dur.	Th. Mirks	Lab. Mirks.	
1	IPCC	1	MCA24II01	Programming in Python	MCA	MCA	4	3	0	2	-	50	3	50	-	100
2	BSC	1	MCA24TI02	Mathematical Foundations for Computer Applications			3	3	0	0	-	50	3	50	-	100
3	PCC	1	MCA24TI03	Computer Networks			3	3	0	0	-	50	3	50	-	100
4	PCC	2	MCA24TI04	Database Management Systems			3	3	0	0	-	50	3	50	-	100
5	PCC	3	MCA24TI05	Web Technologies			3	3	0	0	-	50	3	50	-	100
6	PCC	4	MCA24TI06	Software Engineering			3	3	0	0	-	50	3	50	-	100
7	PCCL	1	MCA24L107	Laboratory			2	-	2	2	-	50	3	-	50	100
8	MAC	1	MCA24MI08	Research Methodology & IPR			PP/NP	1	-	-	2	50	-	-	-	50
9	AEC	1	MCA24AE11	Cyber Security Essentials	IE	IE	PP/NP	-	2	2	-	50	-	-	-	50
Total							21	19	4	6	2	450	21	300	50	800

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

SLC : 10 to 15 courses shall be defined at the beginning of the course. The student should select any one course of their interest and mentors will be allotted 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.



AUTONOMOUS SCHEME (Tentative) PG - MCA 1st year

SCHEME: 2024
SEM: II

Date: 08.01.2025

SL No	Course Type	Course type Count	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O	CIE Marks	SEE			Tot. Marks
								Lecture	Tutorial	Practical	PBL/ABL/SL/abrs.		Dur.	Th. Mfirs.	Lab. Mfirs.	
1	IPCC	2	MCA24I201	Machine Learning	MCA	MCA	4	3	0	2	--	50	3	50	-	100
2	IPCC	3	MCA24I202	Internet of Things			4	3	0	2	--	50	3	50	-	100
3	PCC	5	MCA24T203	Object Oriented Programming using Java			3	3	0	0	--	50	3	50	-	100
4	PCC	6	MCA24T204	Data Structures & Algorithms			3	3	0	0	--	50	3	50	-	100
5	PCC	7	MCA24T205	Operating Systems-Linux			3	3	0	0	--	50	3	50	-	100
6	PCCL	2	MCA24L206	DSA Laboratory			2	--	2	2	--	50	3	-	50	100
7	PCCL	3	MCA24L207	Object Oriented Programming Laboratory			2	--	2	2	--	50	3	-	50	100
8	AEC	2	MCA24AE21	AWS Cloud Foundations	IE	IE	PP / NP	--	2	2	--	50	-	-	-	50
Total							21	15	6	10	0	400	21	250	100	750

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. The student should select any one course of their interest and mentors will be allotted 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 credited in 4th semester.



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Department of Master of Computer Applications

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8	MCA24M108	Research Methodology & IPR	28
9	MCA24AE11	Cyber Security Essentials	32
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Department of Master of Computer Applications

Semester:	I	Course Type:	IPCC		
Course Title: Programming in Python					
Course Code:	MCA24I101		Credits:	4	
Teaching Hours/Week (L:T:P:O)			3:0:2:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs.
I. Course Objectives:					
<ul style="list-style-type: none"> • 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):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Add new products with details (name, price, quantity)

	<ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 F-CIE & SEE Guidelines.												
Semester End Examination (SEE): Refer to Annexure F-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):												
<ol style="list-style-type: none"> FreeCodeCamp: Learn Python - Full Course for Beginners: https://www.youtube.com/watch?v=ROjZy1WbCIA: https://www.youtube.com/watch?v=ROjZy1WbCIA Crash Course Python by FreeCodeCamp: https://www.freecodecamp.org/news/tag/python/: https://www.freecodecamp.org/news/tag/python/ Python for Everybody Specialization by University of Michigan on Coursera: https://www.coursera.org/specializations/python: https://www.coursera.org/specializations/python 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												
<ul style="list-style-type: none"> • Quizzes • Assignments • Seminar 												



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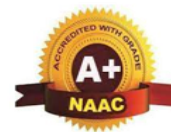
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Department of Master of Computer Applications

Semester:	I	Course Type:	BSC		
Course Title: Mathematical Foundations for Computer Applications					
Course Code:	MCA24T102		Credits:	3	
Teaching Hours/Week (L:T:P:O)			3:0:0:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs.
I. Course Objectives:					
<ul style="list-style-type: none"> 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):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes. Use of Video/Animation to explain functioning of various concepts. Encourage collaborative (Group Learning) Learning in the class. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking. 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. Introduce Topics in manifold representations. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them. 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	
Basic Structures: Sets, Principle of Inclusion, Exclusion and Pigeonhole principle Functions and Matrices: Eigen values and Eigenvectors. Text Book 1	
Module2	
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	
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	
Euclerian 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	
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 analyzingpropositions 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 graphsand 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 F-CIE & SEE Guidelines.

Semester End Examination (SEE):

Refer to Annexure F-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	7 th Edition	McGraw Hill
2.	Probability & Statistics for Engineers & Scientists	Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye	9 th Edition, 2023	Pearson Education

VII(b). Web links and Video Lectures (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\(MOOCs\)](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.



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Department of Master of Computer Applications

Semester:	I	Course Type:	PCC	
Course Title: Computer Networks				
Course Code:	MCA24T103		Credits:	3
Teaching Hours/Week (L:T:P:O)		3:0:0:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks: 100
SEE Type:	Theory		Exam Hours:	3 Hrs
I. Course Objectives:				
<ul style="list-style-type: none"> • 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):				
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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 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	Computer Networks A Systems Approach					Larry L Peterson and Bruce S Davie				6 th edition 2019		Morgan Kaufmann Publishers	
VII(b): Reference Books: (Insert or delete rows as per requirement)													
1	Data Communication and Networking			Behrouz A. Forouzan				6 th 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 <ul style="list-style-type: none"> • Quizzes • Assignments • Seminar 													



Department of Master of Computer Applications

Semester:	I	Course Type:	PCC		
Course Title: Database Management Systems					
Course Code:	MCA24T104		Credits:	3	
Teaching Hours/Week (L:T:P:O)			3:0:0:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs

I. Course Objectives:

- 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	7 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 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	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:
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Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminar



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SJB Institute of Technology

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Accredited by NAAC with 'A+' grade, Certified by ISO 9001 - 2015
Recognized by UGC, New Delhi with 2(F) & 12 (B)



Department of Master of Computer Applications

Semester	I	Course Type:	PCC		
Course Title: Web Technologies					
Course Code:		MCA24T105	Credits:		3
Teaching Hours/Week (L:T:P:O)			3:0:0:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs
I. Course Objectives:					
<ul style="list-style-type: none"> • Creating the small web page using xhtml5. • Use different tags of html to create web page. • Use of CSS and JavaScript • Developing the dynamic document using JavaScript. 					
II. Teaching-Learning Process (General Instructions):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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: Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links. Lists, Tables, Forms, Frames, Syntactic differences between HTML and XHTML.	8 Hrs
Textbook1: Chapter 1,2	
RBT Levels: 2	
Module-2: Cascading Style Sheets: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Fontproperties, List properties, Color, Alignment of text, The box model, Background images, The and <div> tags, Conflict resolution.	8 Hrs
Textbook1: Chapter 3	
RBT Levels: 2	
Module-3: Java Script: Introduction to Javascript Screen output and keyboard input, controls statements, Arrays and functions, pattern matching The Document Object Model, DOM-methods, Elements Access in Java Script, Element Access, Events and Event Handling-onclick(), onload(), Java Script.validations	8 Hrs
Textbook1: Chapter 4,5,6	
RBT Levels: 2,3	
Module-4: Introduction to XML: XML- Introduction, syntax, Document structure, Document Type Definitions, Namespaces, XML schema, displaying raw XML documents Handling structured and unstructured data store: Introduction to JSON, Array literals, Object literals, mixing literals, JSON Syntax, JSON data types, JSON Encoding and Decoding, Introduction to Web3.0.	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 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	Programming the World Wide Web.	Robert W. Sebesta	7th Editon, 2012.	Pearson Education
2	Full Stack React	Anthony Accomazo	1 st 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	Web Programming Building Internet Applications	Chris Bates	3rd Edition	Wiley India, 2006
2	Internet& World Wide Web How to Program	Deitel, P.J.Deitel, A.B.Goldb erg:	3rd Edition	Pearson ,2004

VII(c): Web links and Video Lectures (e-Resources):
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- | |
|---|
| <ul style="list-style-type: none">• https://www.w3schools.com• https://www.tutorialspoint.com |
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VIII: Activity Based Learning / Practical Based Learning/Experiential learning:
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Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- | |
|---|
| <ul style="list-style-type: none">• Quizzes• Assignments• Seminar |
|---|



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

Department of Master of Computer Applications

Semester:	I	Course Type:	PCC		
Course Title: Software Engineering					
Course Code:	MCA24T106		Credits:	3	
Teaching Hours/Week (L:T:P:O)			3:0:0:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs
I. Course Objectives:					
<ul style="list-style-type: none"> • 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):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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 F-CIE & SEE Guidelines.												
Semester End Examination (SEE): Refer to Annexure F-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)



Department of Master of Computer Applications

Semester:	I	Course Type:	PCCL		
Course Title: DBMS & Web Technologies Laboratory					
Course Code:	MCA24L107		Credits:	2	
Teaching Hours/Week (L:T:P:O)			0:2:2:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Laboratory			Exam Hours:	3
I. Course Objectives:					
<ul style="list-style-type: none"> • 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.				

	<p>iii. Find the students who born on a particular year of birth from the date_of_birth column.</p> <p>iv. List the students who are studying in a particular branch of study.</p> <p>v. Find the maximum GPA score of the student branch-wise.</p> <p>vi. Find the students whose name starts with the alphabet</p> <p>vii. Find the students whose name ends with the alphabets</p> <p>viii. Delete the student details whose USN is given as 1001</p>
4	<p>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:</p> <p>I. Display the youngest player (in terms of age) Name, Team name, age in which he belongs of the tournament.</p> <p>ii. List the details of the stadium where the maximum number of matches were played.</p> <p>iii. List the details of the player who is not a captain but got the man_of _match award at least in two matches.</p> <p>iv. Display the Team details who won the maximum matches.</p> <p>v. Display the team name where all its won matches played in the same stadium.</p>
5	<p>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 (</p>

	<p>order_id NUMBER PRIMARY KEY, order_date DATE, customer_id NUMBER, Total Amount Decimal (10,2));</p>
6	<p>Consider the schema for Movie Database: ACTOR (<u>Act_id</u>, Act_Name, Act_Gender) DIRECTOR(<u>Dir_id</u>, Dir_Name, Dir_Phone) MOVIES(<u>Mov_id</u>, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST (<u>Act_id</u>, <u>Mov_id</u>, Role) RATING(<u>Mov_id</u>, Rev_Stars) Write SQL queries to</p> <ol style="list-style-type: none"> 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. List all actors who acted in a movie before 2000 and also in a movie after 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 rating of all movies directed by 'Steven Spielberg' to 5.
7	<p>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).</p>
8	<p>Creating simple application to access data base using JDBC Formatting HTML with CSS</p>
9	<p>Write a javascript program for validating REGISTRATION FORM</p>
10	<p>Write a program for implementing XML document for CUSTOMER DETAILS.</p>
11	<p>Write a program to create a simple calculator Application using React JS</p>
12	<p>Create a Simple Login form using React JS</p>
<p>III. Teaching-Learning Process (General Instructions):</p>	
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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 F-CIE & SEE Guidelines.

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



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Approved by AICTE, New Delhi.

Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi

Accredited by NAAC with 'A+' grade, Certified by ISO 9001 - 2015

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



Department of Master of Computer Applications

Semester:	I	Course Type:	MAC		
Course Title: Research Methodology & IPR					
Course Code:	MCA24M108		Credits:		PP
Teaching Hours/Week (L:T:P:O)			1:0:0:2	Total Hours:	40
CIE Marks:	50	SEE Marks:	--	Total Marks:	50
SEE Type:	---			Exam Hours:	---
I. Course Objectives:					
<ul style="list-style-type: none"> 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):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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 a Research 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 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	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



Department of Master of Computer Applications

Semester:	I	Course Type:	AEC		
Course Title: Cyber Security Essentials					
Course Code:	MCA24AE11		Credits:		PP
Teaching Hours/Week (L:T:P:O) <small>{O – Other pedagogies, mention @}</small>			0:2:2:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	--	Total Marks:	50
SEE Type:	----			Exam Hours:	---
I. Course Objectives:					
<p>1. Introduction to Cybersecurity: Understand the importance of cybersecurity in today's digital landscape. Define key terms and concepts related to cybersecurity.</p> <p>2. Networking Fundamentals: Gain knowledge of basic networking protocols, devices, and services. Understand common network vulnerabilities and attacks.</p> <p>3. Legal and Ethical Considerations: Explore legal and ethical aspects of cybersecurity. Understand the importance of compliance with regulations and standards.</p> <p>4. Emerging Threats and Trends: Stay updated on the latest cybersecurity threats and trends. Discuss the evolving nature of cyber threats and the importance of continuous learning.</p> <p>5. Hands-on Labs and Practical Exercises: Provide hands-on experience through labs and practical exercises. Allow students to apply theoretical knowledge to real-world scenarios.</p>					
II. Teaching-Learning Process (General Instructions):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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. 					

<p>4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.</p> <p>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.</p> <p>6. Introduce Topics in manifold representations.</p> <p>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.</p> <p>8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.</p>	
III. COURSE CONTENT	
III(a). Theory PART	
Module-1	Hrs : 8
Heading: Essential Security Principles	
<ol style="list-style-type: none"> 1. Define essential security principles. 2. Explain common threats and vulnerabilities. 3. Explain access management principles. 4. Explain encryption methods and applications. 	
Textbook:Chapter:sections	
<ol style="list-style-type: none"> 1. Network Security Essentials, 6e - by William Stallings (Author) 	
Pre-requisites (Self Learning)	
RBT Levels: L2 & L3	
Module-2	Hrs 8
Heading: Basic Network Security Concepts	
<ol style="list-style-type: none"> 1. Describe TCP/IP protocol vulnerabilities. 2. Explain how network addresses impact network security. 3. Describe network infrastructure and technologies. 4. Set up a secure wireless SoHo network. 5. Implement secure access technologies. 	
Textbook:Chater:sections	
<ol style="list-style-type: none"> 1. Network Security Essentials, 6e - by William Stallings (Author) 	
Pre-requisites (Self Learning): Security Principals	
RBT Levels: L2 & L3	
Module-3	Hrs 8

Heading: Endpoint Security Concepts	
<ol style="list-style-type: none"> 1. Describe operating system security concepts. 2. Demonstrate familiarity with appropriate endpoint tools that gather security assessment information. 3. Verify that endpoint systems meet security policies and standards. 4. Implement software and hardware updates. 5. Interpret system logs. 6. Demonstrate familiarity with malware removal. 	
Textbook:Chapter:sections	
1. Endpoint Security - by Mark Kadrich (Author)	
Pre-requisites (Self Learning): Network Basics	
RBT Levels: L2 & L 3	
Module-4	Hrs 8
Heading: Vulnerability Assessment and Risk Management	
<ol style="list-style-type: none"> 1. Explain vulnerability management. 2. Use threat intelligence techniques to identify potential network vulnerabilities. 3. Explain the importance of disaster recovery and business continuity planning. 	
Textbook:Chapter:sections	
1. Security Risk Management Program from the Ground Up - by Evan Wheeler (Author)	
Pre-requisites (Self Learning): System Security	
RBT Levels: L3	
Module-5	Hrs 8
Heading: Incident Handling	
<ol style="list-style-type: none"> 1. Monitor security events and know when escalation is required. 2. Explain digital forensics and attack attribution processes. 3. Explain the impact of compliance frameworks on incident handling. 4. Describe the elements of cybersecurity incident response. 	
Textbook:Chapter:sections	
1. Incident Handling and Response: A Holistic Approach for an efficient Security Incident Management. - by Jithin Alex (Author)	
Pre-requisites (Self Learning): Vulnerability Management	
RBT Levels: L2 & L3	
III(b). PRACTICAL PART	
Sl.	Experiments / Programs / Problems (insert rows as many required)

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

IV. COURSE OUTCOMES

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

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							1		
CO3	1		2								2	
CO4	2		2									1
CO5		1	2									

VI. Assessment Details (CIE & SEE)

General Rules:

Continuous Internal Evaluation (CIE):

Refer to Annexure F-CIE & SEE Guidelines.

Semester End Examination (SEE):

Refer to Annexure F-CIE & SEE Guidelines.

VII. Learning Resources

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

1. Cyber Security Full Course

<https://www.youtube.com/watch?v=1pa8uy4DyMo&list=PL9ooVrP1hQOGPQVeapGsJCKtzIO4DtI4>

2. <https://www.youtube.com/watch?v=hXSFdwIOfnE>

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

Working with Kali Linux, Penetration Testing, SQL Injection, Cookie Injection etc

II Semester MCA



Department of Master of Computer Applications

Semester:	II	Course Type:	IPCC		
Course Title: Machine Learning					
Course Code:	MCA24I201		Credits:	4	
Teaching Hours/Week (L:T:P:O)			3:0:2:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs.
I. Course Objectives:					
<ul style="list-style-type: none"> • 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):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 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	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												
<ul style="list-style-type: none"> • Quizzes • Assignments • Seminar 												



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SJB Institute of Technology

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Approved by AICTE, New Delhi.

Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi
Accredited by NAAC with 'A+' grade, Certified by ISO 9001 - 2015
Recognized by UGC, New Delhi with 2(F) & 12 (B)



Department of Master of Computer Applications

Semester:	II	Course Type:	IPCC		
Course Title: Internet of Things					
Course Code:		MCA24I202	Credits:		4
Teaching Hours/Week (L:T:P:O)			3:0:2:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs
I. Course Objectives:					
<ul style="list-style-type: none"> • 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):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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 					

<p>than simply recall it.</p> <p>6. Introduce Topics in manifold representations.</p> <p>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.</p> <p>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.</p>	
III. COURSE CONTENT	
III(a). Theory PART	
<p>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</p>	8 Hrs
Textbook1: Chapter 1,2	
RBT Levels: 2,3	
<p>Module-2: Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies</p>	8 Hrs
Textbook1 : Chapter 3,4	
RBT Levels: 2,3	
<p>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.</p>	8 Hrs
Textbook 1: 5,6	
RBT Levels: 2,3	
<p>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.</p>	8 Hrs.
Texbook1: Chapter 7,8	
RBT Levels:2,3	
<p>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.</p>	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 web cam.											
6	Control a light source using web page.											
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	<p>A team of two students must develop the mini project. However during the examination, each student must demonstrate the project individually</p> <p>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.</p> <p>Brief synopsis not more than two pages to be submitted by the team as per the format given.</p>											
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 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	IOT Fundamentals		David Hanes, Gonzalo Salgueiro	1 st Edition				Pearson				
VII(b): Reference Books: (Insert or delete rows as per requirement)												
1	“Internet of Things (A Hands-on-Approach)”,		Vijay Madiseti & Arshdeep Bahga	1 st Edition, 2014. (ISBN: 978-8173719547)				VPT				
VII(c): Web links and Video Lectures (e-Resources):												
<ul style="list-style-type: none"> • https://youtu.be/WUYAjsxwU4 												
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:												
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • Quizzes • Assignments • Seminar												



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



Department of Master of Computer Applications

Semester:	II	Course Type:	PCC		
Course Title: Object Oriented Programming Using Java					
Course Code:	MCA24T203		Credits:	3	
Teaching Hours/Week (L:T:P:O)			3:0:0:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs
I. Course Objectives:					
<ul style="list-style-type: none"> • 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):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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 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	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													
<ul style="list-style-type: none"> • Quizzes • Assignments • Seminar 													



Department of Master of Computer Applications

Semester:	II	Course Type:	PCC		
Course Title: Data Structures & Algorithms					
Course Code:	MCA24T204		Credits:	3	
Teaching Hours/Week (L:T:P:O)			3:0:0:0	Total Hours:	40 Hrs.
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs
I. Course Objectives:					
<ul style="list-style-type: none"> • 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):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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:												
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning												
<ul style="list-style-type: none"> • Quizzes • Assignments • Seminar 												



Department of Master of Computer Applications

Semester:	II	Course Type:	PCC		
Course Title: Operating Systems - Linux					
Course Code:	MCA24T205		Credits:		3
Teaching Hours/Week (L:T:P:O)			3:0:0:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs
I. Course Objectives:					
<ul style="list-style-type: none"> • 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):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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)

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	
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	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:	MCA24L206		Credits:	2	
Teaching Hours/Week (L:T:P:O)			0:2:2:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Laboratory			Exam Hours:	3 Hrs
I. Course Objectives:					
<ul style="list-style-type: none"> 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 F-CIE & SEE Guidelines.												
Semester End Examination (SEE): Refer to Annexure F-CIE & SEE Guidelines.												



|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust (R)
SJB Institute of Technology



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Approved by AICTE, New Delhi.

Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi
Accredited by NAAC with 'A+' grade, Certified by ISO 9001 - 2015
Recognized by UGC, New Delhi with 2(f) & 12 (B)

Department of Master of Computer Applications

Semester:	II	Course Type:	PCCL		
Course Title: Object Oriented Programming Laboratory					
Course Code:	MCA24L207		Credits:	2	
Teaching Hours/Week (L:T:P:O)			0:2:2:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Laboratory			Exam Hours:	3 Hrs
I. Course Objectives:					
<ul style="list-style-type: none"> • 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 F-CIE & SEE Guidelines.

Semester End Examination (SEE):

Refer to Annexure F-CIE & SEE Guidelines.



Department of Master of Computer Applications (MCA)

Semester:	II	Course Type:	AEC		
Course Title: AWS Cloud Foundations					
Course Code:	MCA24AE21		Credits:		PP
Teaching Hours/Week (L:T:P:O) <small>{O – Other pedagogies, mention @ }</small>			0:2:2:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	--	Total Marks:	50
SEE Type:	-----			Exam Hours:	---
I. Course Objectives:					
<ol style="list-style-type: none"> 1. Develop a foundational understanding of AWS Cloud services and their basic architectural principles. 2. Gain proficiency in navigating the AWS Management Console and using key AWS services. 3. Learn about cloud security and compliance, including shared responsibility models and best practices. 4. Acquire knowledge of billing, account management, and pricing models for efficient resource utilization. 5. Prepare for the AWS Certified Cloud Practitioner exam, demonstrating essential cloud skills and knowledge. 					
II. Teaching-Learning Process (General Instructions):					
<p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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

8 Hrs

Heading:Cloud Concepts

1.1 Define the AWS Cloud and its value proposition.

- Define the benefits of the AWS cloud including:

- o Security
- o Reliability

- o High Availability

- o Elasticity

- o Agility

- o Pay-as-you go pricing
- o Scalability

- o Global Reach
- o Economy of scale

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

1.2 Identify aspects of AWS Cloud economics

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

- o Understand the role of operational expenses (OpEx)

- o Understand the role of capital expenses (CapEx)

- o Understand labor costs associated with on-premises operations

- o Understand the impact of software licensing costs when moving to the cloud

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

- o Right-sized infrastructure

- o Benefits of automation

- o Reduce compliance scope (for example, reporting)

- o Managed services (for example, RDS, ECS, EKS, DynamoDB)

1.3 Explain the different cloud architecture design principles

- Explain the design principles

- o Design for failure

- o Decouple components versus monolithic architecture

- o Implement elasticity in the cloud versus on-premises

- o Think parallel

Textbook:Chapter:sections

AWS Portal

Pre-requisites (Self Learning)	
RBT Levels: L2 & L3	
Module 2	8 Hrs
<p>Heading: Security and Compliance</p> <p>2.1 Define the AWS shared responsibility model</p> <ul style="list-style-type: none"> • Recognize the elements of the Shared Responsibility Model • Describe the customer’s responsibility on AWS o Describe how the customer’s responsibilities may shift depending on the service used (for example with RDS, Lambda, or EC2) • Describe AWS responsibilities <p>2.2 Define AWS Cloud security and compliance concepts</p> <ul style="list-style-type: none"> • Identify where to find AWS compliance information o Locations of lists of recognized available compliance controls (for example, HIPPA, SOCs) o Recognize that compliance requirements vary among AWS services • At a high level, describe how customers achieve compliance on AWS o Identify different encryption options on AWS (for example, In transit, At rest) • Describe who enables encryption on AWS for a given service • Recognize there are services that will aid in auditing and reporting o Recognize that logs exist for auditing and monitoring (do not have to understand the logs) o Define Amazon CloudWatch, AWS Config, and AWS CloudTrail • Explain the concept of least privileged access <p>2.3 Identify AWS access management capabilities</p> <ul style="list-style-type: none"> • Understand the purpose of User and Identity Management o Access keys and password policies (rotation, complexity) o Multi-Factor Authentication (MFA) o AWS Identity and Access Management (IAM) • Groups/users • Roles • Policies, managed policies compared to custom policies o Tasks that require use of root accounts Protection of root accounts <p>2.4 Identify resources for security support</p> <ul style="list-style-type: none"> • Recognize there are different network security capabilities o Native AWS services (for example, security groups, Network ACLs, AWS WAF) o 3 rd party security products from the AWS Marketplace • Recognize there is documentation and where to find it (for example, best practices, whitepapers, official documents) o AWS Knowledge Center, Security Center, security forum, and security blogs o Partner Systems Integrators • Know that security checks are a component of AWS Trusted Advisor <p>Textbook: Chapter: sections</p> <p>AWS Portal</p>	
Pre-requisites (Self Learning): Security and Compliance	
RBT Levels: L2 & L3	
Module-3	8 Hrs

Heading: Technology

- a. Define methods of deploying and operating in the AWS Cloud
 - Identify at a high level different ways of provisioning and operating in the AWS cloud
 - o Programmatic access, APIs, SDKs, AWS Management Console, CLI, Infrastructure as Code
 - Identify different types of cloud deployment models
 - o All in with cloud/cloud native
 - o Hybrid
 - o On-premises
 - Identify connectivity options
 - o VPN
 - o AWS Direct Connect
 - o Public internet
- b. Define the AWS global infrastructure
 - Describe the relationships among Regions, Availability Zones, and Edge Locations
 - Describe how to achieve high availability through the use of multiple Availability Zones
 - o Recall that high availability is achieved by using multiple Availability Zones
 - o Recognize that Availability Zones do not share single points of failure
 - Describe when to consider the use of multiple AWS Regions
 - o Disaster recovery/business continuity
 - o Low latency for end-users
 - o Data sovereignty
 - Describe at a high level the benefits of Edge Locations
 - o Amazon CloudFront
 - o AWS Global Accelerator
- 3.3 Identify the core AWS services
 - Describe the categories of services on AWS (compute, storage, network, database)
 - Identify AWS compute services
 - o Recognize there are different compute families
 - o Recognize the different services that provide compute (for example, AWS Lambda compared to Amazon Elastic Container Service (Amazon ECS), or Amazon EC2, etc.)
 - o Recognize that elasticity is achieved through Auto Scaling
 - o Identify the purpose of load balancers
 - Identify different AWS storage services
 - o Describe Amazon S3
 - o Describe Amazon Elastic Block Store (Amazon EBS)
 - o Describe Amazon S3 Glacier
 - o Describe AWS Snowball
 - o Describe Amazon Elastic File System (Amazon EFS)
 - o Describe AWS Storage Gateway
 - Identify AWS networking services
 - o Identify VPC
 - o Identify security groups
 - o Identify the purpose of Amazon Route 53
 - o Identify VPN, AWS Direct Connect
 - Identify different AWS database services
 - o Install databases on Amazon EC2 compared to AWS managed databases
 - o Version
 - o Identify Amazon RDS
 - o Identify Amazon DynamoDB
 - o Identify Amazon Redshift
- c. Identify resources for technology support

<ul style="list-style-type: none"> • Recognize there is documentation (best practices, whitepapers, AWS Knowledge Center, forums, blogs) • Identify the various levels and scope of AWS support <ul style="list-style-type: none"> o AWS Abuse o AWS support cases o Premium support o Technical Account Managers • Recognize there is a partner network (marketplace, third-party) including Independent Software Vendors and System Integrators • Identify sources of AWS technical assistance and knowledge including professional services, solution architects, training and certification, and the Amazon Partner Network • Identify the benefits of using AWS Trusted Advisor <p>Textbook:Chapter:sections AWS Portal</p>	
Pre-requisites (Self Learning): Security and Compliance	
RBT Levels: L2 & L4	
Module-4	8 Hrs
<p>Heading:Billing and Pricing</p> <p>4.1 Compare and contrast the various pricing models for AWS (for example, On-Demand Instances, Reserved Instances, and Spot Instance pricing)</p> <ul style="list-style-type: none"> • Identify scenarios/best fit for On-Demand Instance pricing • Identify scenarios/best fit for Reserved-Instance pricing <ul style="list-style-type: none"> o Describe Reserved-Instances flexibility o Describe Reserved-Instances behavior in AWS Organizations • Identify scenarios/best fit for Spot Instance pricing <p>4.2 Recognize the various account structures in relation to AWS billing and pricing</p> <ul style="list-style-type: none"> • Recognize that consolidated billing is a feature of AWS Organizations • Identify how multiple accounts aid in allocating costs across departments <p>Textbook:Chapter:sections AWS Portal</p>	
Pre-requisites (Self Learning): Technology	
RBT Levels: L2 & L3	
Module-5	8 Hrs
<p>Heading:Billing and Pricing</p> <p>5.1 Identify resources available for billing support</p> <ul style="list-style-type: none"> • Identify ways to get billing support and information <ul style="list-style-type: none"> o Cost Explorer, AWS Cost and Usage Report, Amazon QuickSight, third-party partners, and AWS Marketplace tools o Open a billing support case o The role of the Concierge for AWS Enterprise Support Plan customers • Identify where to find pricing information on AWS services <ul style="list-style-type: none"> o AWS Simple Monthly Calculator o AWS Services product pages o AWS Pricing API • Recognize that alarms/alerts exist 	

<ul style="list-style-type: none"> • Identify how tags are used in cost allocation Textbook:Chapter:sections AWS Portal												
Pre-requisites (Self Learning):Billing and Pricing												
RBT Levels: L2 & L3												
III(b). PRACTICAL PART												
Sl. No.	Experiments / Programs / Problems(insert rows as many required)											
1	Lab 1 - Introduction to AWS IAM											
2	Lab 2 - Build your VPC and Launch a Web Server											
3	Lab 3 - Introduction to Amazon EC2											
4	Lab 4 - Working with EBS											
5	Lab 5 - Build a Database Server											
Instructions for conduction of practical part: AWS Portal registration.												
IV. COURSE OUTCOMES												
CO1	Attain a comprehensive understanding of AWS Cloud concepts and foundational services.											
CO2	Demonstrate proficiency in navigating the AWS Management Console and utilizing key cloud services.											
CO3	Develop skills in managing AWS resources efficiently and cost-effectively.											
CO4	Acquire knowledge of cloud security best practices and compliance measures.											
CO5	Gain insights into billing, pricing models, and effective account management for optimal cost control.											
V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)												
PO/PSO	1	2	3	4	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.	AWS Certified Cloud Practitioner Study Guide	Ben Piper&David Clinton	1st edition (2 August 2019)	Sybex
VII(b): Reference Books:				
1	AWS Certified Cloud Practitioner (CLF-C01) Cert Guide	Anthony J. Sequeira	First Edition (15 August 2020)	Pearson Education
VII(c): Web links and Video Lectures (e-Resources):				
AWS PORTAL: https://awsacademy.instructure.com/courses/58071/				
VIII: Activity Based Learning / Practical Based Learning/Experiential learning:				
Refer AWS Portal for quiz and assessments.				