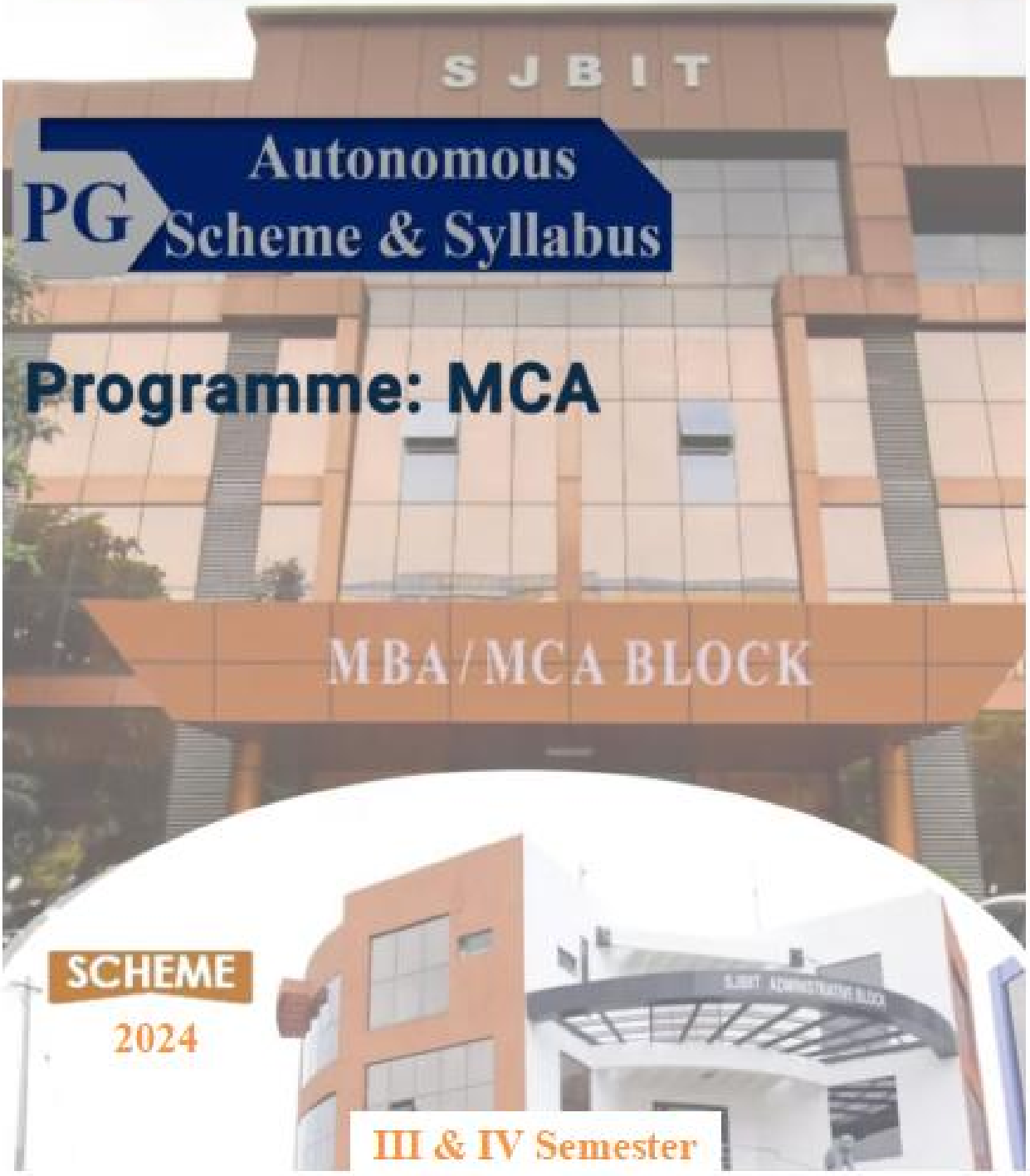
|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust (R)

SJB Institute of Technology

An AUTONOMOUS INSTITUTION UNDER VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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



PG Autonomous Scheme & Syllabus

Programme: MCA

SCHEME

2024

III & IV Semester

SERVICE TO MANKIND IS SERVICE TO GOD

His Divine Soul Padmabhushana

SriSriSri Dr.BalagangadharanathMahaSwamiji

FounderPresident,SriAdichunchanagiriShikshanaTrust®

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

HisHoliness ParamaPujya

SriSriSriDr.NirmalanandanathaMahaSwamiji

President, Sri AdichunchanagiriShikshanaTrust®

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

ReveredSri SriDr.Prakashanatha Swamiji

ManagingDirector,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.

Syllabus for 3rd & 4th Semester	
The syllabus, scheme and guidelines are provided in detail. The syllabus, scheme and guidelines are subjected to changes if any needed. The updates will be done and intimated timely.	
The Syllabus book is available on	www.sjbit.edu.in
For any queries, please write to	academicdean@sjbit.edu.in

UPDATES

Release/ Revision	Date	Remarks
Version 1	02/09/2025	First uploading,Version1

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Sri Adichunchanagiri Shikshana Trust (R)

SJB Institute of Technology

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

AUTONOMOUS SCHEME OF TEACHING & EXAMINATIONS (STE)

PG - MCA IInd year

SCHEME: 2024 **Sem: III** **Date: 07.07.2025**

SL No	Course Type	Course type Count	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week: L	T	P	O	Examinations: CIE Marks	SEE: Dur.	SEE: Th. Mrks	SEE: Lab. Mrks	Tot. Marks
								Lecture	Tutorial	Practical/ SL/others						
1	IPCC	4	MCA24I301	Cloud Essentials	MCA	MCA	4	3	–	2		50	3	50	-	100
2	PEC	1	MCA24E3XY	Specializnions			3	2	2	–		50	3	50	-	100
3	PEC	2	MCA24E3XY	Specializnions			3	2	2	–		50	3	50	-	100
4	PEC	3	MCA24E3XY	Specializnions			3	2	2	–		50	3	50	-	100
5	INT	1	MCA24IN31	Internship			8	–	–	–	@	100	3	–	100	200
6	AEC	3	MCA24AE31	Data Visualization & Analysis with Power BI	IE	IE	PP/NP	–	2	2	–	50	–	–	–	50
Total							21	9	8	4	0	350		200	100	650

Note: PCC: Professional core Courses, PEC: Professional Elective Courses. PROJ-Project Work, IPCC- Integrated Professional Core Courses, SP- Societal Project, AEC - Ability Enhancement course. SLC : 10 Courses shall be defined at the beginning of the course. Gthe student should select any one course of their interest and mentors will be alloted to them to guide through the course. Weekly assignment reviews shall be done by mentors. The student should complete the course by end of 3rd semester. Rubrics and methodology will be defined separately. SLC will be creadited in 4th semester.

Specializations

Aritificial Intelligence [MCA24E31Y]		Security [MCA24E32Y]	
Course Code	Course title	Course Code	Course title
MCA24E311	Data Mining & Warehousing	MCA24E321	Network Security
MCA24E312	Exploratory Data Analytics	MCA24E322	Cyber Security
MCA24E313	Introduction to GenAI	MCA24E323	Block Chain Technology

Web Application Development [MCA24E33Y]		Software Development [MCA24E34Y]	
Course Code	Course title	Course Code	Course title
MCA24E331	Full Stack Web Development	MCA24E341	DevOps
MCA24E332	UI & UX Design	MCA24E342	Software Testing
MCA24E333	Advanced Databases	MCA24E343	Software Project Management

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AUTONOMOUS SCHEME OF TEACHING & EXAMINATIONS (STE)

PG - MCA IInd year

SCHEME: 2024 **SEM: IV** **Date: 07.07.2025**

SL No	Course Type	Course type Count	Course Code	Course Title	Teaching Dept.	QP setting dept	Credits	Teaching Hrs/Week				Examinations				
								L	T	P	O		SEE			
								Lecture	Tutorial	Practical	PBL/ABL/ SL/othrs.	CIE Marks	Dur.	Th. Mrks	Lab. Mrks.	Tot. Marks
1	PRJ1	1	MCA24PR41	Major Project work	MCA	MCA	12	--	--	--	@	100	3	--	100	200
2	TS	1	MCA24TS42	Technical Seminar			2	--	--	--	--	100	3	--	--	100
3	SLC	1	MCA24SL43	BOS recommended ONLINE MOOC courses			3	--	--	--	--	50	--	50	--	100
Total							17	0	0	0	0	250	6	50	100	400

Note: PRJ-Project Work, SLC- Self Learning Course, TS - Technical Seminar

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Department of Master of Computer Applications

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Semester:	**III**	Course Type:	**IPCC**		
Course Title: Cloud Essentials					
Course Code:	**MCA24I301**			**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:**	**3Hrs.**

I. Course Objectives:

- To familiarize students with the core principles of cloud computing and highlight its importance in contemporary software development, including its historical evolution.
- To provide hands-on experience with AWS cloud services, focusing on key areas such as compute, storage, networking, and database solutions, along with an analysis of various cloud service and deployment models.
- To build competencies in deploying, configuring, and managing secure, scalable applications in the cloud using AWS, while gaining a thorough understanding of virtualization technologies and their relevance to cloud environments.
- To incorporate cloud computing concepts into software architecture and system design, with an emphasis on understanding and utilizing fundamental AWS services.
- To prepare students for careers in cloud computing by equipping them with the practical skills necessary for deploying and maintaining applications in AWS-based environments.

II. Teaching-Learning Process(General Instructions):

- While lectures remain an essential mode of instruction, consider using alternative, student-centric methods to enhance engagement and understanding
- Incorporate multimedia resources such as videos and animations to illustrate complex concepts and their real-world functions.
- Promote collaborative learning through group-based activities and discussions to encourage peer-to-peer interaction and deeper learning.
- Pose a minimum of three Higher Order Thinking(HOT) questions during each session to stimulate critical thinking and deeper inquiry.
- Implement Problem-Based Learning (PBL) to enhance analytical reasoning and foster design thinking skills like evaluating, designing, and synthesizing ideas rather than focusing on rote memorization.
- Present topics through multiple representations (visual, textual, symbolic) to cater to diverse

learning styles.

- Demonstratemultiplesolutionapproachesforthesameproblemandmotivatestudentsto explore and share their own innovative methods.
- Connect theoretical concepts to practical, real-world applications wherever possible to enhance relevance and student engagement.

III.COURSECONTENT

III(a).Theory PART

MODULE 1 **Introduction to Cloud Computing and Virtualization -** Defining Cloud Computing; Cloud Deployment Models; Cloud Service Models;Key Cloud Concepts.The Benefits of CloudComputing.TheDifferentCloudProviders.WhoUtilizesCloudServices?Features, and Cloud Computing Architecture. levels of virtualization, Hypervisors and its types. **Cloud Service Providers (CSPs) -** Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform form(GCP),IBM Cloud, Oracle Cloud Infrastructure(OCI),and Alibaba Cloud.	8 Hrs.
Text book1: Chapter3,Text Book2: Chapter 1	
RBT Levels: 1,2,3	
MODULE 2 **Getting Started with AWS -** AWS Accounts, AWS Free Tier, Securing an AWS Account, Multi-Factor Authentication (MFA), AWS Budgets and Alerts, Interacting with AWS, The AWS Management Console, AWS CLI, The Software Development Kit(SDK), Using the AWS Console, Creating an Account Alias, AWS Region, Search AWS Services, Installing the AWS CLI, Using the AWS CLI, The AWS Global Infrastructure, AWS Regions and Availability Zones, What Are Availability Zones? AWS Edge Locations. **Core Cloud Services :** Storage Services, Compute Services, Database Services, and Security Services **Storage Services(Free Tier)** : Overview of Amazon S3, S3 Buckets, Folders, S3 Objects,S3 StorageClasses.AmazonS3Demo.AWSCustomerstoriesComparisonwithAzureBlobStorage, Google Cloud Storage, IBM Cloud Object Storage, OCI Object Storage, Alibaba OSS(Object Storage Service) customer stories.	8 Hrs.
Textbook1:Chapters6,8TextBook2:Chapters2,4	
RBT Levels: 1,2,3,4	
MODULE 3 **Compute Services (Free Tier):**Elastic Compute Cloud(EC2),Compute Services in AWS, Virtual Machines, Amazon EC2 Components, Instances, AMI (Amazon Machine Image), An AWS EC2 Instance Family, Instance Types, Amazon EC2 Purchase Types, Create an EC2 Instance. AWS Customer stories Comparison with Azure B1S VM, GCP f1-micro VM, IBM Cloud Foundry / Code Engine, OCI Arm Ampere A1 & VM.Standard.E2.1.Micro, Alibaba ECS (Elastic Compute Service). Database Services(Free Tier) - On-Premise vs Cloud Database Hosting, Amazon Relational Database Service, Create Your First Amazon RDS Database.AWS Customer stories Comparison with Azure SQL Database, GCP Cloud SQL(MySQL, PostgreSQL),IBMDb2 Lite Plan,OCI Autonomous DB(ATP/ADW),Alibaba Apsara DBRDS(MySQL, PostgreSQL).	8Hrs.
Textbook1:Chapter9Text Book2: Chapters6,8	
RBT Levels: 1,2,3,4	

MODULE4 **Virtual Private Cloud(VPC)-**WhatIsaVPC?Subnets,InternetGateways,RouteTables, and NAT Gateways, Create a VPC, Public, and Private Subnet. AWS Customer stories Comparison with Azure Virtual Network(VNet),GCP Virtual Private Cloud(VPC),IBM VirtualPrivateCloud(VPC),OCIVirtualCloudNetwork(VCN),AlibabaVirtualPrivate Cloud (VPC). **Billing and Pricing Services(Free Tier) -** AWS Cost Explorer, Billing and Cost Management Dashboard. AWS Customer stories comparison with Azure Cost Management + Billing, GCP Cloud Billing Reports, IBM Cloud Billing Dashboard, OCI Cost Analysis and Budgets, Alibaba Billing Management Console.	8Hrs.
TextBook1: Chapter10Text Book2: Chapters5,11	
RBT Levels: 1,2,3,4	
MODULE 5 **Security and Management Services(Free Tier)-**AWS Security Services Overview, The Shared Responsibility Model, Security Compliance, AWS IAM, Creating Users, Groups, roles.IAMpolicies,AddingUserstogroup.AWSCloudWatch.AWSSecurityCustomer stories Comparison with Azure Entra ID (formerly AAD), GCP IAM , IBM IAM and MFA, OCI IAM , Alibaba RAM(Resource Access Management). AWS Management Services Customer stories comparison with Azure Monitor, GCP Operations Suite (formerly Stack driver), IBM Activity Tracker Lite, OCI Logging, Alibaba Cloud Monitor.	8Hrs.
TextBook1:Chapters5, 12TextBook2:Chapters3,10	
RBT Levels: 1,2,3,4	

III(b).PRACTICAL PART	
Sl.No.	**Experiments/Programs/ Problems**
1	**AWS Free Tier Account Setup and I AM Configuration** ● **Objective**: Setup a secure AWS account using Free Tier. ● **Tasks**: ○ Register for AWS Free Tier ○ Enable Multi-Factor Authentication(MFA) ○ Create IAM users and assign roles

2	**Launching and Managing a FreeEC2 Instance** This hands-on exercise guides you through the process of setting up and managing an Amazon EC2 instance within the AWS Free Tier (specifically using t2.micro ort3.micro instances, which offer 750 hours per month). **Key Learning Objectives:** ● **LaunchaLinuxEC2Instance:** Learn the steps involved in provisioning your first virtual server in the cloud. ● **Connect via SSH:** Understand how to securely access your running EC2 instance using SSH (Secure Shell). ● **Manage Instance States:** Gain practical experience with controlling the lifecycle of your EC2 instance, including starting, stopping, and terminating it. ● **Implement Termination Protection:** Discover how to safeguard your instance from accidental termination. ● **Monitor Performance:** Learn to monitor the performance of your EC2 instanceto ensure optimal operation. ● **Modify Security Groups:** Understand how to adjust security group rules to control inbound and outbound traffic to your instance.
3	**Creating and Managing S3 Buckets** ● **Service Used**: AmazonS3 (5GBfree) ● **Tasks**: ○ Create a bucket ○ Upload, retrieve, and delete files ○ Set public/private access and test access via URL
4.	**Creating a Dynamo DB Table** ● **Service Used**: Amazon Dynamo DB(Always Free–25GB storage) ● **Tasks**: ○ Create a table with a primary key ○ Insert, update, and delete records ○ Query data via AWS Console
5	**Deploying a Lambda Function** ● **Service Used**: AWS Lambda(1Mrequests/month free) ● **Tasks**: ○ Write and deploy a Python/Node.jsfunction ○ Trigger via console and test with different inputs ○ View logs in Cloud Watch
6	**Cloud Watch Alarms and Metrics** ● **Service Used**: Amazon Cloud Watch (Always Free) ● **Tasks**: ○ Monitor EC2 CPU utilization ○ Create alarms for thresholds ○ Use Cloud Watch Logs for Lambda function

7	**Launching a Free Amazon RDS Instance** ● **Service Used**: Amazon RDS(750hrs/monthfordb.t2.micro+20GBstorage) ● **Tasks**: ○ Launch an RDS MySQL/ Postgre SQL instance ○ Connect via MySQL Workbench or DBeaver ○ Create and query a sample database
8	**Hosting a Static Website on S3** ● **Service Used**: AmazonS3 (5GB storage) ● **Tasks**: ○ Upload HTML/CSS files ○ Enable static website hosting ○ Access site via public S3URL
9	**Creating and Testing SNS Notifications** ● **Service Used**: Amazon SNS(AlwaysFree–1M publishes) ● **Tasks**: ○ Create an SNS topic ○ Subscribe via email ● Publish a message and verify email notification
10	**AWS Budgets and Cost Monitoring** ● **Service Used**: AWS Billing Dashboard, Budgets ● **Tasks**: ○ Set a monthly Free Tier budget(e.g.,$1) ○ Enable email alerts ○ Use Cost Explorer to review usage

IV. COURSE OUTCOMES	
CO1	*Define* key concepts of cloud computing, including service models(IaaS, PaaS, SaaS)and Deployment models (public, private, hybrid).Illustrate the basic concepts of Cloud Computing and its services.
CO2	*Explain* the core components and architecture of Amazon Web Services (AWS), including Global infrastructure, account setup, and IAM. Summarize the various computing services available in AWS.
CO3	*Demonstrate* the ability to provision and manage AWS services such as EC2, S3,RDS, and VPC using the AWS Management Console and CLI. Apply different storage services present in AWS Cloud domain. Develop the skills required to work in AWS Cloud domain.
CO4	*Implement* monitoring, cost optimization, and security configurations using AWS tools like Cloud Watch, Cloud Trail, and IAM policies. Identify the relevant AWS services According to the requirements.

V. CO-PO-PSOMAPPING (mark H=3;M=2;L=1)																
PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	3												2			
CO2		2			2									2		
CO3		2			2		2				2				2	
CO4		2		2		2	2			2	2					2

VI. Assessment Details (CIE &SEE)

General Rules:

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

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

VII. Learning Resources

VII(a):Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Cloud Computing and AWS Fundamentals	Mr.Agha Urfi Mirza Mr. Praveen Kumar Chandapeta Mr.Justin Rajasekaran	Edition1:January2024	San International Scientific Publications
2	Cloud Computing with AWS	Pravin Mishra	2023	A Press Media, LLC, part of Springer Nature.

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

AWS Official Resources

- **AWS Cloud Practitioner Essentials(Free)**
  - Link:https://www.aws.training/Details/Curriculum?id=20685
  - Coverscloudconcepts,AWScoreservices,security,architecture,pricing,and support.
- **AWS Skill Builder**
  - Link:https://skillbuilder.aws
  - Offershundredsoffreeandpaidcourses,learningplans,andpracticeexams.

Microsoft Learn –Cloud Concepts

- Link:https://learn.microsoft.com/en-us/training/modules/cloud-concepts/
- Though Microsoft-based, this is excellent for general cloud fundamentals.

AWS–Official YouTube Channel

- Link:https://www.youtube.com/user/AmazonWebServices
- Features product demos, re Invent sessions, workshops, and beginner guides.

AWS Tutorials by AWS Made Easy

- Link:https://www.youtube.com/c/AWSMadeEasy
- Detailed AWStutorialsincludingEC2,VPC, S3, Lambda, and IAM.

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

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

- Case studies on Cloud Services
- AWS Skill builder and Microsoft Learn

Semester:	**III**	**Course Type:**	**PEC**		
Course Title: Data Mining &Warehousing					
Course Code:	**MCA24E311**			**Credits:**	3
Teaching Hours/ Week(L:T:P:O)			2:2:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

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

II. Teaching-Learning Process(General Instructions):

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

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

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

IV.COURSE OUTCOMES	
CO1	Understand the fundamental concepts of data mining and data warehousing.
CO2	Develop skills in extracting valuable patterns and knowledge from large datasets.
CO3	Apply data mining techniques to support decision-making processes.
CO4	To design & implement data warehouses.

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

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

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

General Rules:

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

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

VII. Learning Resources

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

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

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

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

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

Activity Based Learning(Suggested Activities in Class)/Practical Based learning
- Quizzes
- Assignments
- Seminar

Department of Master of Computer Applications

Semester:	**III**	**Course Type:**	**PEC**		
Course Title: Exploratory Data Analytics					
Course Code:	**MCA24E312**			**Credits:**	3
Teaching Hours/Week (L:T: P: O)			2:2:0:0	**Total Hours:**	40 Hrs
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives:

- Introduce the concept and purpose of exploratory data analysis in the data science pipeline.
- Provide exposure to data cleaning, summarization, and visualization techniques.
- Familiarize students with tools and libraries used for EDA in Python and R.
- Prepare students for applying EDA techniques in real-world data modeling and reporting.

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	
Theory Part	
Module-1: Understanding the importance and objectives of EDA, setting up the analysis environment (Python/R), Data types and structures, Data import/export techniques, Handling missing and duplicate data, Data cleaning and transformation basics	8 Hrs
Textbook1:Chapter1,2Textbook2:Chapter1,2	
RBTLevels:2, 3,4	
Module-2: Measures of central tendency and dispersion, understanding distributions and data shapes, identifying outliers and anomalies, Correlation and covariance analysis, Summarizing categorical and numerical data	8 Hrs
Textbook1:Chapter3, Textbook2:Chapter3,4	
RBTLevels:2,3,4	
Module-3: Principles of effective data visualization, Univariate and bivariate plots (histograms, box plots, scatter plots), Multivariate visualization (heatmaps, pair plots), Timeseries visualization,Using libraries: Matplotlib, Seaborn(Python); ggplot2(R)	8 Hrs
Textbook1:4,Textbook2:Chapter 5,6	
RBTLevels:2,3,4	
Module-4: Exploring relationships among multiple variables, Principal Component Analysis (PCA), Feature selection and extraction, Clustering basics (e.g., k-means), Handling high-dimensional data	8 Hrs
Textbook1:Chapter5, Textbook2:Chapter7,8	
RBTLevels:2,3,4	
Module-5: Preparing data for modeling, Feature engineering and selection, evaluating model assumptions through EDA, Creating reproducible analysis reports (Jupyter Notebooks, R Markdown), Best practices in presenting EDA findings	8 Hrs
Textbook1:Chapter6,7,Textbook2:Chapter9,10	
RBTLevels:2,3,4	

IV. COURSE OUTCOMES	
CO1	Explain the fundamentals and significance of exploratory data analysis in understanding datasets.
CO2	Apply data preprocessing and visualization techniques using appropriate tools and libraries.
CO3	Analyze multivariate data relationships and perform dimensionality reduction to uncover data patterns
CO4	Examine EDA outputs to support features election and model building decisions.

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

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

VI. Assessment Details(CIE&SEE)

General Rules:

Assessment Details(both CIE and SEE): Refer Annexure

Semester End Examination(SEE): Refer Annexure

VII. Learning Resources

VII(a).Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Hands-On EDA with Python	Suresh Kumar Mukhiya and Usman Ahmed	1e,2020 **ISBN-13**:978-1789537253	Packt Publishing
2	Hands-On EDA with R	Radhika Datar and Harish Garg	1e, 2019, **ISBN-13**:978-1789804379	Packt Publishing

VII(b).Reference Books:

1	Exploratory Data Analysis by John W. Tukey	JohnW. Tukey	1e,1977 ISBN-13:978-0201076165	Addison-Wesley Publishing Company

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

1. https://www.coursera.org/learn/exploratory-data-analysis
2. https://www.mygreatlearning.com/academy/learn-for-free/courses/basics-of-exploratory-data-analysis
3. https://www.codecademy.com/learn/eda-exploratory-data-analysis-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(MCA)

Semester:	**III**	**Course Type:**	**PEC**		
Course Title: Introduction to GenAI					
Course Code:	**MCA24E313**			**Credits:**	3
Teaching Hours/Week (L:T:P: O)			2:2:0:0	**Total Hours:**	40 Hrs
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives:

- Describe the core principles, taxonomy, and mathematical foundations of generative AI models.
- Implement foundational generative techniques including GANs, VAEs, and diffusion models—using Python and Tensor Flow.
- Design effective prompt pipelines and fine-tuning strategies for transformer-based large language models.
- Analyze and critically evaluate model performance, deployment considerations, and ethical implications in real-world generative AI applications.

II. Teaching-Learning Process(General Instructions):

These are sample Strategies, which teacher scan 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	
Theory Part	
Module-1: Foundations of Generative AI What is Generative AI & its applications, Generative vs. discriminative models, Mathematical foundations: probability, divergence measures, Data preprocessing for generative tasks.	8 Hrs
Textbook1:Chapter1, 2, 3, 4	
RBT Levels:2,3,4	
Module-2: Core Generative Modeling Techniques Generative Adversarial Networks (GANs): theory & training, Variational Auto encoders (VAEs): latent spaces & KL-loss, Diffusion models: forward/reverse processes.	8 Hrs
Textbook2:Chapter2, 3, 4	
RBT Levels:2,3,4	
Module-3: Transformer Architectures & Large-Scale LLMs Self-attention and Transformer block mechanics, Pretrained LLMs: GPT, BERT overview, Fine-tuning strategies (FT, PEFT, LoRA)	8 Hrs
Textbook1:5, Textbook2:5, 6 Referencebook:1	
RBT Levels:2,3,4	
Module-4: Prompt Engineering for Generative AI Principles of prompt design & evaluation, Prompt patterns (Persona, Recipe, Chain-of-Thought), Retrieval-Augmented Generation (RAG) & tool use.	8 Hrs
Textbook3:Chapter1, 2, 3, 4, 5	
RBT Levels:2,3,4	
Module-5: Deployment, Evaluation & Ethics Model evaluation metrics for generative outputs, Deployment strategies: APIs, containerization, scaling, Ethical considerations: bias, privacy, copyright.	8 Hrs
Textbook1:6, 7 Textbook2:Chapter7, 8	
RBT Levels:2,3,4	

IV. COURSE OUTCOMES	
CO1	Explain the differences between generative and discriminative models, and articulate the roles of probability and divergence measures in generative modeling
CO2	Build and train Generative Adversarial Networks, Variational Auto encoders, and diffusion models on sample datasets, and interpret their loss functions and outputs.
CO3	Develop and fine-tune transformer-based architectures, crafting prompts and employing Retrieval-Augmented Generation to solve downstream tasks
CO4	Evaluate generative AI systems using appropriate quantitative metrics, deploy models at scale, and assess ethical risks such as bias, privacy, and copyright

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

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

VI. Assessment Details(CIE&SEE)

General Rules: ReferAnnexuresection1

Assessment Details(both CIE and SEE): Refer Annexure

Semester End Examination(SEE): Refer Annexure

VII. Learning Resources

VII(a).Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Introduction to Generative AI	Numa Dhamani	2024 ISBN:9781638354345	Apress
2	Generative AI with PythonandTensorFlow2	Joseph Babcock and Raghav Bali	2023 ISBN:9781119732920	John Wiley &Sons
3	Prompt Engineering for Generative AI: Future-Proof Inputs for Reliable AI Outputs	James Phoenix & Mike Taylor	2024 ISBN: 9789355424655	Shroff/O'Reilly Media

VII(b).Reference Books:

1	Python Crash Course: A Hands-On, Project-Based Introduction to Programming	Eric Matthes	2e,2019	No Starch Press

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

1. https://www.coursera.org/learn/build-basic-generative-adversarial-networks-gans
2. https://www.deeplearning.ai/courses/generative-ai-for-everyone/
3. https://www.cloudskillsboost.google/course_templates/536

VIII.ActivityBasedLearning/PracticalBasedLearning/Experientiallearning:

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

Department of Master of Computer Applications

Semester:	**III**	**Course Type:**	**PEC**		
Course Title: Network Security					
Course Code:	**MCA24E321**			**Credits:**	3
Teaching Hours/Week (L: T: P: O)			2:2:0:0	**Total Hours:**	40 Hrs
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives:

- Understand Network Security Fundamentals
- Explore Cryptography Principles and Algorithms
- Analyze Security Attacks and Vulnerabilities
- Understand Cryptographic Protocols and Secure Communication
- Implement Network Security Architectures and Technologies
- Apply Operational Security and Best Practices
- Engage with Real-World Security Case Studies

II. Teaching-Learning Process (General Instructions):

Sample strategies that instructors can adopt to enhance the achievement of course outcomes to promote active, engaged learning.

Diversify Lecture Methods: The lecture method (L) need not be limited to traditional delivery. Alternativeandinnovativeteachingstrategiescanbeimplementedtoeffectivelymeetlearningobjectives.

Incorporate Multimedia Tools: Use videos, animations, or visual simulations to illustrate the functioning of complex concepts, making them easier to understand.

Foster Collaborative Learning: Encourage group-based activities and discussion to promote teamwork and peer learning within the classroom.

Ask Higher-Order Thinking Questions (HOTs): Pose at least three thought-provoking questions in each session to stimulate critical thinking and deeper understanding.

Implement Problem-Based Learning (PBL): Engage students with real-world problems that require analytical reasoning and design thinking. This approach builds their ability to evaluate, synthesize, and apply knowledge, rather than merely recall facts.

Present Concepts in Multiple Representations: Introduce topics using varied forms—visual, textual, symbolic, or physical— to cater to different learning styles and reinforce understanding.

EncourageDiverseProblem-SolvingApproaches:Demonstratemultiplemethodsforsolvingthesame problem and motivate students to explore and propose their own creative solutions.

Relate Theory to Real-World Applications: Emphasize how each concept can be practically applied, helping students grasp its relevance and utility in real-life contexts.

III. Course Content	
Theory Part	
MODULE1-Introduction to Network Security & Cryptography-What is Network Security? Goals: Confidentiality, Integrity, Availability (CIA Triad). Types of Threats and Attacks (e.g., DDoS, Malware, Social Engineering). Introduction to Cryptography: Symmetric vs Asymmetric Encryption, Hashing and Digital Signatures. Common cryptographic algorithms: DES, AES, RSA, ECC. Basic Authentication & Authorization concepts. Practical: Identify security components in real-world scenarios. Case studies on Types of Threats and Attacks – DDoS (Distributed Denial of Service), Malware; Symmetric Cryptography.	8 Hrs
Textbook1: Chapters1,2,3 Textbook2:Chapters1,3,5 Textbook3: Module1	
RBT Levels: 1,2,3,4	
Module2: Security Attacks, Vulnerabilities & Risk Management Categories of Attacks: Passive vs Active, Malware types: Viruses, Worms, Trojans, Ransomware, Application-level attacks: XSS, SQLi, Buffer Overflow. Insider Threats and Social Engineering. Risk, Vulnerability & Threat assessments, Practical: Analyze case studies of major cyber attacks. Case Studies : Vulnerability Exploitation, Risk Management, Application-level Attack – SQLi, BufferOverflow,InsiderThreat,Ransomware,RiskManagement,Worm,Zero-DayExploits,InsiderKnowledge,PassiveAttack,MobileMalware,SocialEngineering.	8 Hrs
Textbook1:Chapters 9,10,13 Textbook2:Chapter1; Textbook3 : Chapters Module1-3	
RBT Levels: 1,2,3,4	

Module3:Cryptographic Protocols &Secure Communication Public Key Infrastructure (PKI) and Certificates, SSL/TLS and HTTPS, IP sec and VPNs: Concepts & Configuration, Wi-Fi Security: WPA, WPA2, WPA3 & 802.1X, Secure Email Protocols: PGP, S/MIME. Case Studies: Public Key Infrastructure (PKI)and Certificates, SSL/TLS Protocol, VPN and IP sec Concepts, Wi-Fi Security Protocols – WPA2 Vulnerability. e-mail Security Protocols–Lack of PGP/S/MIME, End-to-End Encryption using SSL/TLS over Mobile.	8 Hrs
Textbook1::Chapters4,5,7,8 Textbook2:Chapters6-8	
RBT Levels:1,2,3,4	
Module 4:Network Security Technologies and Architectures Firewalls: Types and Configuration,IDS/IPS(IntrusionDetection/PreventionSystems),Network Segmentation and VLANs, Secure Network Design (DMZ, Bastion Hosts), Honey pots and Deception Technologies, Secure Cloud and Virtualization Basics. Case Studies : Firewalls, Network Segmentation, IDS/IPS, Secure Network Design, Bastion Hosts, Zero Trust. Honeypots and Deception Technologies, Secure Cloud and Virtualization Basics. Intrusion Detection Systems (IDS).	8 Hrs
Textbook1:Chapters 6,9,11; Textbook3:Chapters Module 8 and 9	
RBT Levels: 1,23,4	
Module 5:Operational Security, Policies & Best Practices Security Policies and Access Controls (ACLs, RBAC), Security Best Practices: Patch Management, Backups, Logging, Identity and Access Management (IAM) and Single Sign-On (SSO) ,Incident Response and Disaster Recovery Planning, Legal, Ethical, and Regulatory Issues in Security. Case Studies : Access Controls, IAM, SSO Misuse, Patch Management, Incident Response, Logging &Access Monitoring. Backups, Disaster Recovery Planning, Legal, Ethical, Regulatory Issues.IAM, SSO Token Theft.	8 Hrs
Textbook1:Chapters1,4,13; Textbook3: Chapters 12,13,15.	
RBT Levels: 1,2,3,4	

IV.COURSE OUTCOMES

CO1	Recall and define foundational concepts of network security, including the CIA triad, types Of threats and attacks, and cryptographic principles.
CO2	Explain different categories of security attacks, malware types, and secure communication Protocols in the context of real-world domains such as healthcare and e-commerce.
CO3	Apply cryptographic algorithms and network security technologies to identify and secure Components in application domains like educational systems and cab booking platforms.
CO4	Analyze vulnerabilities and incidents using real-world case studies to assess risks and Recommend appropriate operational security policies and controls.

V.CO-PO-PSOMAPPING(markH=3;M=2;L=1)

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

VI.Assessment Details(CIE&SEE)

General Rules:: ReferAnnexuresection1

Assessment Details(both CIE and SEE):: Refer Annexure

Semester End Examination(SEE):: Refer Annexure

VII. Learning Resources

VII(a).Textbooks:

Sl No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Network Security Essentials: Applications and Standards	William Stallings	Fourth Edition	Pearson
2	Introduction to Cryptography And Network Security	Behrouz A. Forouzan	First Edition	McGraw-Hill
3	Guide to Network Security Fundamentals	MARKCIAMPA	Seventh Edition	Cengage

VII(c):Web links and Video Lectures(e-Resources):
Simpli learn-Network Security Full Course-https://www.youtube.com/watch?v=6q4dLZSZ4ZQ **NPTEL (National Programme on Technology Enhanced Learning) - Network Security** - Course Name: Network Security. Instructor: Prof. D. Mukhopadhyay (IIT Kharagpur). Link: https://nptel.ac.in/courses/106105031. **Telusko-CybersecurityBasics-**Link:https://www.youtube.com/watch?v=InH4Khxjlbw
ActivityBasedLearning/PracticalBasedLearning/Experientiallearning: • **Case studies on Cloud Services** • **AWS Skill builder Courses** • **Courses on Microsoft Learn**

Department of Master of Computer Applications

Semester:	**III**	**Course Type:**	**PEC**		
Course Title: Cyber Security					
Course Code:	**MCA24E322**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:2:0:0	**Total Hours:**	40 Hrs
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives:

- **Understand** the fundamentals of cybercrime, including types, techniques, motives, tools used by cybercriminals, and the legal framework governing cyber offenses, especially the Indian IT Act 2000 and its amendments.
- **Analyze** various forms of phishing, identity theft, and the digital forensics lifecycle to identify cyber threats and understand their implications on data privacy and digital evidence.
- **Apply** Zero Trust principles and cloud security concepts to assess and design secure infrastructure for multi-cloud and hybrid environments, addressing modern organizational security needs.
- **Evaluate and design** Develop Secure Operations practices and behavioral security frameworks to embed security in development pipelines and influence secure user behavior through awareness programs and compliance strategies.

II. Teaching –Learning Process(General Instructions):

Sample strategies that instructors can adopt to enhance the achievement of course outcomes to romote active, engaged learning.

Diversify Lecture Methods: The lecture method(L) need not be limited to traditional delivery. Alternative and innovative teaching strategies can be implemented to effectively meet learning Objectives.

Incorporate Multimedia Tools: Use videos, animations, or visual simulations to illustrate the functioning of complex concepts, making them easier to understand.

Foster Collaborative Learning: Encourage group-based activities and discussions to promote teamwork and peer learning within the classroom.

Ask Higher-Order Thinking Questions(HOTs):Pose atleast three thought-provoking questions in each session to stimulate critical thinking and deeper understanding.

Implement Problem-Based Learning (PBL): Engage students with real-world problems that require analytical reasoning and design thinking. This approach builds their ability to evaluate, synthesize, and apply knowledge, rather than merely recall facts.

Present Concepts in Multiple Representations: Introduce topics using varied forms—visual, textual, symbolic, or physical— to cater to different learning styles and reinforce understanding.

Encourage Diverse Problem-Solving Approaches: Demonstrate multiple methods for solving the same problem and motivate students to explore and propose their own creative solutions.

Relate Theory to Real-World Applications: Emphasize how each concept can be practically applied, helping students grasp its relevance and utility in real-life contexts.	
III. Course Content	
Theory Part	
MODULE 1 -Introduction to Cybercrime and Laws: Definition and Origins of Cybercrime, Information Security, Who are Cybercriminals? Classifications of Cybercrimes. How Criminals Plan them – Introduction, How Criminals Plan the Attacks, Cyber cafe and Cyber crimes, Botnets, Attack Vector, The Indian IT ACT 2000andamendments.ToolsandMethodsusedinCybercrime Introduction, Proxy Server and Anonymizers, Password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow.	8 Hrs
Textbook1: Chapters 1,2,4,5 Textbook2: Chapters 1,2,3	
RBT Levels: 1,2,3,4	
Module 2: Phishing and Identity Theft: Introduction, Phishing – Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft. Digital Forensics Science, Need for Computer Cyber forensics and Digital Evidence, Digital Forensics Life Cycle.	8 Hrs
Textbook1: Chapters 6,8 Textbook 2: 5,6;	
RBT Levels: 1,2,3,4	
Module 3: Zero Trust Networks: Building Secure Systems in Untrusted Networks Introduction to Zero Trust, Core Concepts of Zero Trust, Authentication and Authorization, Zero Trust Architecture Overview: Definition and Principles, Key Components. Monitoring and Visibility, Threats Associated with ZTA: Potential Vulnerabilities, Mitigation Strategies. Challenges and Considerations, Future of Zero Trust.	8 Hrs
Textbook3:Chapters1-7	
RBT Levels:1,2,3,4	
Module 4: Multi-Cloud &Hybrid Security What is Multi-Cloud? What is Hybrid Cloud? Why organizations adopt them (vendor diversity, failover, compliance). Deployment - Multi and hybrid cloud. Key challenges in multi-cloud (inconsistencies, shadow IT, data control), Shared Responsibility Model comparison across AWS, Azure, GCP. Cross-cloud IAM governance challenges, Reference architecture for hybrid cloud (e.g., on-prem + AWS + Azure).	8 Hrs
Textbook3: Chapter 8	
RBT Levels: 1,2,3,4	
Module 5:DevSecOps, Automation &Compliance What is DevSecOps? Evolution from DevOps to DevSecOps, Culture, collaboration, and shared responsibility (Dev+ Sec + Ops), Pipeline security: Build, test, deploy with security gates, Why compliance matters in DevSecOps: PCI DSS, HIPAA, GDPR, SOC 2.	8 Hrs

Security Awareness and Behavioral Engineering **Importance of user behavior in Cyber Security -** Common attack vectors targeting human behavior: Phishing, smishing, vishing; Business Email Compromise (BEC); Social engineering tactics. What is Behavioral Engineering in Security? Principles from behavioral psychology: Nudges, habits, incentives. Embedding secure behavior into daily tasks (e.g., password hygiene, MFA). Key components of a mature security awareness program: Audience targeting (general users, IT staff, C-suite), Channels: Email, posters, LMS, videos; Metrics for success: Reporting rate, phishing susceptibility, engagement.	
Textbook1:Chapter10; Textbook 2: Chapter10.	
RBT Levels: 1,2,3,4	

IV.COURSE OUTCOMES	
CO1	Recall fundamental concepts of cybercrime, types of attacks, and key terminologies related to Cyber security laws, including provisions of the Indian IT Act 2000.
CO2	Explain different cybercrime planning methods ,classifications, phishing techniques, identity Theft types, and the digital forensics lifecycle.
CO3	Apply Zero Trust principles, authentication and authorization models, and cloud security Practices in multi-cloud and hybrid environments.
CO4	Analyze DevSecOps strategies and behavioral engineering techniques to identify vulnerabilities, Improve security posture, and ensure compliance.

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

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

VI. Assessment Details(CIE &SEE)

General Rules:

Assessment Details(both CIE and SEE):: Refer Annexure

Semester End Examination(SEE):: Refer Annexure

VII. Learning Resources

VII(a).Textbooks:

Sl No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Cyber security for Beginners	Raef Meeuwisse	2nd Edition,2017	Cyber Simplicity
2	Computer Forensics and Cyber Crime: An Introduction	Marjie T.Britz	4th Edition,2018	Pearson Education
3	ZeroTrust Networks: Building Secure System sin Untrusted Networks	Evan Gilman& Doug Barth	1st Edition,2017	O'Reilly Media

VII(c):Web links and Video Lectures(e-Resources):
Cybrary–CybersecurityTraining-https://www.cybrary.it/course/intro-to-cyber-security/ **NIST Cyber security Framework-**https://www.nist.gov/cyberframework **Introduction to Cyber Security by Cisco (Coursera)** https://www.coursera.org/learn/intro-cyber-security **Cyber Security Full Course for Beginners by Edureka (YouTube)** https://www.youtube.com/watch?v=1gVWIsgTrXc
Activity Based Learning/ Practical Based Learning/Experiential learning: • **Case Studies on Cyber Attacks.**

Semester:	**III**	**Course Type:**	**PEC**		
Course Title: Block Chain Technology					
Course Code:	**MCA24E323**			**Credits:**	3
Teaching Hours/Week (L:T: P:O)			2:2:0:0	**Total Hours:**	40 Hrs
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives:

- **Understand the foundational principles and architecture of block chain technology** including Distributed Ledger Technology (DLT), consensus mechanisms, and the comparison between block chain and traditional databases.
- **Explore real-world applications and industry use cases** of block chain across domains such as finance, healthcare, supply chain, and identity management, including the development and deployment of smart contracts and decentralized applications (DApps).
- Analyze block chain security frameworks and legal implications encompassing common attack vectors, cryptographic techniques, privacy- preserving technologies, and regulatory compliance requirements like GDPR and crypto governance.
- **Evaluate enterprise-level adoption, integration challenges, and future innovations**, including Layer2 scaling solutions, interoperability, decentralized identity systems(DID),Central Bank Digital Currencies(CBDCs), and the convergence of block chain with IoT, AI, and sustainable technologies.

II. Teaching-Learning Process (General Instructions):

Sample strategies that instructors can adopt to enhance the achievement of course outcomes to promote active, engaged learning.

- **Diversify Lecture Methods** : The lecture method(L) need not be limited to traditional delivery. Alternative and innovative teaching strategies can be implemented to effectively meet learning objectives.
- **Incorporate Multimedia Tools**: Use videos, animations, or visual simulations to illustrate the functioning of complex concepts, making them easier to understand.
- **Foster Collaborative Learning**: Encourage group based activities and discussions to promote teamwork and peer learning within the classroom.
- **Ask Higher-Order Thinking Questions(HOTs)**:Pose atleast three thought provoking questions in each session to stimulate critical thinking and deeper understanding
- **Implement Problem-Based Learning (PBL)**:Engage students with real-world problems that require analytical reasoning and design thinking. This approach builds the ability to evaluate, synthesize, and apply knowledge, rather than merely recall facts.
- **Present Concepts in Multiple Representations**: Introduce topics using varied forms—visual, textual, symbolic, or physical to cater to different learning styles and reinforce understanding.
- **Encourage Diverse Problem-Solving Approaches**: Demonstrate multiple methods for solving the same problem and motivate students to explore and propose their own creative solutions.

- **Relate Theory to Real world Applications**: Emphasize how each concept can be practically applied, helping students grasp its relevance and utility in real-life contexts.

III. Course Content	
Theory Part	
MODULE1-Block chain Fundamentals and Architecture Introduction to Blockchain and DLT, Types of Blockchain: Public, Private, Consortium, Blockchain Components: Blocks, Hashing, Digital Signatures, Merkle Tree. Consensus Mechanisms: PoW, PoS, PoA, DPoS. Comparison with Traditional Databases. **Case Studies :** Land Records on Blockchain (Public Blockchain, DLT, Components), Supply Chain Tracking in Food Industry (Consortium Blockchain, Components). Healthcare Data Management (Private Blockchain vs Traditional Database).	8 Hrs
Textbook1:Chapters 1,2,3	
RBT Levels: 1,2,3,4	
Module2:Blockchain Applications & Industry Use Cases Block chain in Finance (DeFi, Payments, Remittances), Supply Chain, Healthcare, Identity Management, Smart Contracts: Basics and Deployment, DApps and Use Cases (Ethereum, Hyperledger Fabric), Block chain-as-a-Service (BaaS). **CaseStudies:**Decentralized Finance(DeFi) Lending Platform,Transparent Food Supply Chain (Blockchain+IoT),Patient Data Sharing in Healthcare.	8 Hrs
Textbook1:Chapter15Textbook2:Chapters 11,13	
RBT Levels: 1,2,3,4	
Module3:BlockchainSecurity,Privacy,andLegalAspects Block chain Security Architecture, Common Attacks: 51% Attack, Sybil Attack, Replay Attack, Cryptographic Tools: Digital Signatures, Hashing, Merkle Trees, Privacy Enhancements: Zero-Knowledge Proofs, Ring Signatures, Mixers. Legal &Regulatory Landscape : GDPR, Crypto Compliance. **CaseStudies:**BlockchainVotingUsingMerkleTreesforIntegrity,LegalComplianceAuditfor A Blockchain-Based Health App. Health care Records Using Zero-Knowledge Proofs(ZKPs).	8 Hrs
Textbook1:Chapter4,5,13	
RBT Levels:1,2,3,4	
Module4:BlockchainIntegration&Enterprise Adoption Block chain with IoT, AI, and Big Data, Interoperability: Sidechains, Cross-chain Communication. Hyper ledger Fabric, Corda, Quorum. Real-World Case Studies (IBM, Maersk, Trade Lens, Ever ledger). Challenges in Scalability and Integration. **Case Studies** :Scalability Bottlenecks in a Public-Facing Block chain Voting Platform, Supply Chain Risk Monitoring Using Block chain &AI, Block chain + IoT for Predictive Maintenance.	8 Hrs
Textbook1:Chapter14,Textbook3:Chapter 6,7,8	
RBT Levels: 1,2,3,4	

MODULE 5 : Future Trends and Innovations in Block chain -Layer 2 Solutions: Lightning Network, Rollups, State Channels, Web3 and Decentralized Identity (DID), SSI. DAOs, NFTs, Metaverse & Block chain Convergence. Central Bank Digital Currencies(CBDCs). Sustainable Blockchain: Green PoS and ESG. Case Studies : Lightning Network for Micro-Payments in a Rural Mobile App, Decentralized Identity (DID) for University Degree Verification, DAOs in Crowd funded Urban Farming Project.	8 Hrs
Textbook1:Chapter17; Textbook 3:Chapter10-12.	
RBTLevels: 1,2,3,4	

IV.COURSE OUTCOMES

CO**1**	Define and recall the fundamental concepts of Blockchain technology, including Distributed Ledger Technology(DLT),types of blockchains, and key components like blocks, hashing, and digital signatures.
CO2	Explain the architecture, working principles, and consensus mechanisms of block chain and differentiate between public, private, and consortium block chains with relevant real-world use cases.
CO3	Develop and deploy basic smart contracts and DApps using block chain platforms like Ethereumor Hyperledger,and demonstrate the application of block chain in finance, healthcare, and supply chain scenarios.
CO4	Analyze block chain security threats, privacy-enhancing technologies, and regulatory implications, and evaluate integration strategies with AI, IoT, and Big Data for enterprise adoption.

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

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

VI. Assessment Details(CIE&SEE)

General Rules:: Refer Annexure

Assessment Details(both CIE and SEE):: Refer Annexure

Semester End Examination(SEE):: Refer Annexure

VII. Learning Resources

VII(a).Textbooks:

Sl No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	Mastering Blockchain	Imran Bashir	Third, 2020	Packt
2	Blockchain Basics	Daniel Drescher	First,2017	Apress

3	Blockchain Applications	Arshdeep Bahga, VijayMadisetti	First,2017	VPT
4	Blockchain Revolution	Don&Alex Tapscott	First,2016	Penguin

VII(c):Weblinks and Video Lectures(e-Resources):
Government-Backed Resources-https://nptel.ac.in/courses/106105184 CodeAcademy Blockchain Tutorial : https://www.youtube.com/watch?v=SSo_EIwHSd4GreatLearning– BlockchainforBeginnershttps://www.youtube.com/watch?v=hYip_Vuv8J0
ActivityBasedLearning/PracticalBasedLearning/Experientiallearning:
• Case studies on Block chain implementation,

Department of Master of Computer Applications

Semester:	III	**Course Type:**	PEC		
Course Title: Full Stack Web Development					
Course Code:	**MCA24E331**			**Credits:**	3
Teaching Hours/Week			2:2:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives

- To understand the fundamentals of frontend, backend and full stack web development.
- To build interactive user interfaces using modern JavaScript and frontend frameworks.
- To develop backend APIs with Express and integrate with databases securely.
- To enable students to manage version control, deploy applications, and present end-to-end solutions.

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.COURSECONTENT

III(a). Theory PART

Module-1:Foundations of Web Development Overview of web development (frontend, backend, full stack), Web architecture: Client-server model, HTTP,browsers,Toolssetup:VSCode,terminal,Git,GitHub,HTML5:Tags,forms,semanticHTML, CSS3: Selectors, Flexbox, Grid, responsive design, JavaScript fundamentals (variables, functions, events, DOM)	8 Hrs
Textbook:Book1,Chapters1 and 2 Textbook:Book2, Chapters1	

RBTLevels:2,3	
Module-2: Front end Development using Modern JavaScript JavaScript ES6+ features: arrow functions, let/const, spread/rest, DOM manipulation ande vent handling, Overview of React.jsframework likeVue.js), JSX, components, props, state, Basic routing and hooks, Form handling and validation	8Hrs
Textbook:Book1Chapters3and4	
RBT Levels:3,4	
Module-3: Backend Development with Node.js & Express : Introduction to Node.js, Using Express.js for routing and middleware, RESTful API development, connecting frontend with backend using HTTP/Fetch/Axios, File upload and error handling	8Hrs
Textbook:Book2,Chapters 2 and 5;	
RBTLevels:3,4	
Module-4:WorkingwithDatabasesandAuthentication: MongoDB basics (NoSQL) OR MySQL (Relational), CRUD operations from backend, Schema design andvalidation, Introduction to Mongoose(for MongoDB) or Sequelize (for MySQL), User authentication: JWT, sessions, password hashing, Role-based access control.	8Hrs
Textbook:Book1,Chapter5to7 **Textbook:Book1,Chapter6**	
RBTLevels:3,4	
Module-5: Version Control, Deployment & Capstone Project : Git basics: init, add, commit, branch, merge, Using Git Hub: repositories, pull requests Deployment platforms : Netlify(frontend),Render/Heroku(backend),CI/CD basics (overview),case study: Build a full stack web application(e.g.,Task Manager, Blog, E-commerce Lite), Final demo and presentation.	8Hrs
Textbook: Book1, Chapters 8 and 9 **Textbook:Book2,Deployment Appendix**	
RBTLevels:3,4,5	

IV. COURSE OUTCOMES

CO1	Explain the foundational concepts of full stack web development including web architecture, HTML,CSS, and JavaScript.
CO2	Demonstrate the use of modern JavaScript and React.js to design dynamic and responsive Frontend components.
CO3	Build RESTfull backend services using Node.js and Express, and integrate them with Databases and authentication mechanisms.
CO4	Develop and deploy a complete fullstack application using Git, GitHub, and cloud platforms.

V.CO-PO-PSOMAPPING(markH=3;M=2;L=1)

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

VI. Assessment Details(CIE&SEE)

General Rules:

Assessment Details(both CIE and SEE): Refer Annexure

Semester End Examination (SEE): Refer Annexure

VII. Learning Resources

VII(a):Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the Publisher
1	Shama Hoque	Full-Stack Development with MERN	Packt,	2022
2	Ethan Brown	Web Development with Node and Express	O'Reilly,	2020

VII(b):Reference Books:

VII(c): Weblinks and Video Lectures(e-Resources):

1. freeCodeCamp'sNode.jsandExpress.jsFullCourse
https://www.youtube.com/watch?v=Oe421EPjeBE

2. Net Ninja's MongoDB Tutorial Series
https://www.youtube.com/playlist?list=PL4cUxeGkcC9jpvoYriLI0bY8DOgWZfi6u

3. Mosh Hamedani's React Tutorial for Beginners
https://www.youtube.com/watch?v=Ke90Tje7VS0

4. Traversy Media's Web Security Crash Course
https://www.youtube.com/watch?v=6MXUOXZrM8s

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:	III	**Course Type:**	PEC		
Course Title : UI & UX Design					
Course Code:	**MCA24E332**			**Credits:**	3
Teaching Hours/Week			2:2:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives

- Describe foundational principles of user interface and user experience design.
- Explain how human perception and cognition inform design decisions.
- Apply industry-recognized guidelines to craft intuitive interfaces.
- Evaluate UI designs against usability and aesthetic criteria.

II. Teaching-Learning Process(General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.
1. Lecturer method (L)need not to be only a traditional lecture method but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning)Learning in the class.
4. Ask at least three HOT(Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters 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.COURSECONTENT

III(a). Theory PART

Module-1:Foundations of UI & UX Definitions and distinctions: UI versus UX, Overview of the UX lifecycle, The role and responsibilities of a UX designer, Typical industry workflows and deliverables.	8Hrs

Textbook2: Chapter 1, Textbook2: Chapters 1–2

RBT Levels :2

Module-2: Perception & Attention Establishing visual hierarchy, Gestalt principles in interface design (proximity, similarity, closure), Basics of color theory and typography, Strategies for managing user attention.	8Hrs
Textbook2: Chapter 2, **Textbook1**: Chapter 3	
RBT Levels :2	
Module-3: Interaction & Ergonomics Fitts' Law and designing effective touch targets, Affordances and signifiers: making interactive elements obvious, Providing feedback: micro-interactions and response patterns.	8Hrs
Textbook2: Chapter 3, **Textbook1**: Chapter 8	
RBTLevels:2,3	
Module-4: Patterns & Aesthetics Common UI component libraries and pattern catalogs, the aesthetic-usability effect and its implications, maintaining consistency and reinforcing branding, Designing and animating micro-interactions.	8Hrs
Textbook2: Chapter 4, **Textbook1**: Chapter 15	
RBT Levels: 2,3	
Module-5: Usability Evaluation & Best Practices Conducting heuristic evaluations, Planning and running usability tests (moderated, unmoderated), Metrics for measuring UX success, Iterating designs: balancing trade-offs and prioritizing changes.	8Hrs
Textbook2: Chapter 6, **Textbook1**: Chapter 27	
RBT Levels: 2,3,4	

IV. COURSE OUTCOMES

CO1	Describe key UI and UX concepts and terminology
CO2	Analyze design challenges using human-centered principles.
CO3	Design wireframes and prototypes that adhere to cognitive and perceptual guidelines.
CO4	Evaluate and iterate on UI designs based on heuristic and usability testing.

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

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

VI. Assessment Details(CIE&SEE)

General Rules:

Assessment Details(both CIE and SEE): Refer Annexure

Semester End Examination(SEE):: Refer Annexure

VII. Learning Resources

VII(a):Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	JavaScript and jQuery: The Missing Manual	David Sawyer McFarland	2014	O'Reily Media
2	Learning PHP, MySQL & JavaScript:With jQuery, CSS &HTML5	Robin Nixon	5e,2018	O'Reilly Media
3	Web Security for Developers: Real Threats, Practical Defense	Malcolm McDonald	1e,2020	O'Reilly Media

VII(b):Reference Books:

VII(c): Weblinks and Video Lectures(e-Resources):

1. Bootstrap Documentation Official Website
2. JavaScript Official Website
3. Web Technologies (CSE206C)by IIT Bombay: https://onlinecourses.nptel.ac.in/
4. IntroductiontoHTML5||Web Technologies Tutorial: https://www.youtube.com/watch?v=DgRngrWG59o
5. FreeCode Camp Web Development playlist: https://www.freecodecamp.org/news/tag/webdevelopment/
6. Crash Course Web Technologies: https://www.youtube.com/watch?v=RkAXDGnz0FQ
7. The Complete Web Developer Bootcamp 2023: https://www.udemy.com/course/webdevelopment-complete-bootcamp-2023/
8. **MDNWeb Docs (https://developer.mozilla.org)**
9. **GoogleDevelopersWebFundamentals (https://developers.google.com/web)**
10. **freeCodeCamp(https://www.freecodecamp.org)**

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

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

Department of Master of Computer Applications

Semester:	III	**Course Type:**	PEC		
Course Title: Advanced Databases					
Course Code:	**MCA24E333**			**Credits:**	3
Teaching Hours/Week			2:2:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I.Course Objectives

- Understand advanced relational concepts, SQL features, and query optimization strategies.
- Explore the architecture and mechanisms of distributed and NoSQL databases.
- Study object-oriented and temporal databases and their applications.
- Learn dataware housing, OLAP, and foundational datamining techniques for business intelligence.

II.Teaching-Learning Process(General Instructions)

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

1.Lecturer method (L)need not to be only a traditional lecture method but alternative effective teaching methods could be adopted to attain the outcomes.
2.Use of Video/Animation to explain functioning of various concepts.
3.Encourage collaborative (Group Learning)Learning in the class.
4.Ask at least three HOT(Higher order Thinking) questions in the class, which promotes critical thinking.
5.Adopt Problem Based Learning (PBL), which fosters 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: Advanced Relational Concepts & Query Optimization Review of relational algebra and calculus, Advanced SQL features: window functions, CTEs, and recursive queries, Query optimization techniques: cost-based optimization, indexing strategies, Execution plans and performance tuning.	8Hrs

Textbook: Book 1,Chapters6 and 9 **Textbook: Book2, Unit 2**	
RBTLevels:2, 3	
Module-2:Distributed Databases Architecture and design of distributed databases, Data fragmentation, replication, and allocation strategies, Distributed query processing and optimization, Concurrency control and recovery in distributed systems.	8Hrs
Textbook: Book1,Chapters11 **Textbook: Book2, Unit 1**	
RBTLevels:3,4	
Module-3:NoSQL Databases and BigData Introduction to NoSQL: key-value, document, column-family, and graph databases, CAPtheoremandBASEproperties,workingwithMongoDB:datamodeling,CRUD operations, indexing, Use cases and limitations of NoSQL databases.	8Hrs
Textbook:Book1,Chapters16 **Textbook: Book2, Unit 4**	
RBTLevels:3,4	
Module-4:Object-Oriented and Temporal Databases Object-oriented database concepts:OODBMS,object identity,encapsulation, Query languages for OODBMS, Temporal databases: time stamping, temporal query languages, Applications of object-oriented and temporal databases	8Hrs
Textbook: Book1, Chapter12and14 **Textbook: Book2, Unit 5**	
RBT Levels:3,4	
Module-5:DataWarehousing and Mining Data warehousing architecture: ETL processes, star and snowflake schemas, OLAP operations and data cube computation, Introduction to data mining : association rules, clustering, classification, Applications in business intelligence and decision support systems.	8Hrs
Textbook:Book1,Chapters15and16 **Textbook: Book2, Unit 5**	
RBTLevels:3, 4,5	

IV.COURSE OUTCOMES

CO1	Explain advanced SQL features and relational query optimization techniques for enhancing database performance.
CO2	Describe the concepts and architecture of distributed and NoSQL databases and demonstrate basic operations.
CO3	Illustrate the working of object-oriented and temporal databases and their specialized query capabilities
CO4	Analyze dataware housing components and implement basic datamining techniques for decision support systems.

V.CO-PO-PSOMAPPING(markH=3;M=2;L=1)

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

VI.Assessment Details(CIE&SEE)

General Rules:

Assessment Details(both CIE and SEE):: Refer Annexure

Semester End Examination(SEE):: Refer Annexure

VII. Learning Resources

VII(a):Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
1	**Advanced Database System**	Chhanda Ray	(1e,2020)	**ISBN-13**: 979-8691380891.
2	**Advanced Database Management System**	Mahesh Mali	(2e, 2023)	**ISBN-13**:978-93-5563-218-0,TechKnowledge Publications.

VII(b):Reference Books:

VII(c): Weblinks andVideo Lectures(e-Resources):

1. Advanced DatabaseSystems Edited by CarloZaniolo
2. Fundamentals of Database Systems by Ramez Elmasriand Shamkant B. Navathe Widely used in academia,
3. Database System Concepts by Abraham Silberschatz, HenryF. Korth, and S. Sudarshan
4. Advanced Database Management System by Rini Chakrabarti and Shilbhadra Dasgupta
5. Advanced Database Management Systems by Dr. Saranya.

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

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

Semester:	III	**Course Type:**	PEC		
Course Title: DevOps					
Course Code:	**MCA24E341**			**Credits:**	3
Teaching Hours/Week (L:T:P:O)			2:2:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3

I. Course Objectives:

- Understand the core principles and benefits of DevOps practices.
- Implement a CI/CD pipeline for automated software delivery.
- Automate infrastructure provisioning and configuration management.
- Integrate security practices throughout the DevOps lifecycle.

II. Teaching-Learning Process(General Instructions):

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

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

2. Show Video/animation films 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 thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.

6. Topics will be introduced in a multiple representation.

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

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

III. COURSE CONTENT	
Module-1: Introduction to DevOps, DevOps Fundamentals: Core concepts, principles, benefits & challenges, DevOps Lifecycle: Understanding the flow of activities in DevOps, Cultural Shift and Team Collaboration: Breaking down silos and fostering collaboration, DevOps Metrics and Measurement: Key Performance Indicators (KPIs) for measuring success	8Hrs
Textbook1: Chapter 1, 3, 4	
RBT Levels: 2,3,4	
Module-2: CI/CD Pipeline, Continuous Integration (CI): Benefits, practices, tools like Jenkins, Version Control Systems (VCS): Git fundamentals, branching strategies, Build Automation: Build servers, build pipelines using tools , Continuous Testing: Unit testing, integration testing frameworks, Deployment Strategies: Blue/green deployments, rollback procedures.	8Hrs
Textbook2: Chapter 5, 6, 7, 8, Textbook3: 2	
RBT Levels: 2,3	
Module-3: Infrastructure Automation and Configuration Management, Infrastructure as Code (IaC): Benefits, Infrastructure Definition Language (IDL) concepts, Configuration Management Tools: Chef, Puppet, Ansible - an overview, Infrastructure Provisioning with IaC: Creating infrastructure templates, (Cloud Infrastructure with IaC: Introduction to IaaS and provisioning using IaC	8Hrs
Textbook3: Chapter 8, 9, 10	
RBT Levels:2,3,4	
Module-4: Monitoring vs Observability: Understanding system behavior through data, Metrics, Logs, and Traces (ELT): Data collection and analysis for system health, Monitoring Tools: Selecting tools for infrastructure and application monitoring, Alerting and Notification: Setting up alerts for anomalies.	8Hrs
Textbook1: Chapter 11, 12, 13	
RBTLevels:2,3	
Module-5: Security in DevOps, DevSecOps: Integrating security practices into the DevOps lifecycle, Shifting Left Security: Implementing security early in the development process, Security Automation and Testing: Static code analysis, vulnerability scanning, Compliance and Governance: Security policies and access control.	8Hrs
Textbook1: Chapter 15, 16, 17, 18	
RBTLevels:3,4	

IV.COURSE OUTCOMES	
CO1	Understand the impact of DevOps on software development and delivery.
CO2	Apply and implement automated build, test, and deployment pipelines.
CO3	Utilize Infrastructure as Code (IaC) tools for infrastructure management.
CO4	Apply security best practices within the DevOps workflow.

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

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

VI. Assessment Details (CIE & SEE)

General Rules:

Assessment Details (both CIE and SEE) : : Refer Annexure

Semester End Examination (SEE): : Refer Annexure

VII. Learning Resources

VII(a): Textbooks:

Sl. No.	Title of the Book	Name of the author	Edition and Year	Name of the publisher
[1]	The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations	Gene Kim, Jez Humble, Patrick Debois	3e, 2019	IT Revolution Press
[2]	Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation	Jez Humble & Dave Farley	1e, 2010	Addison-Wesley Professional
[3]	DevOps for Dummies	Emily Freeman & Erik Morgan Dietrich2e	1e, 2019	John Wiley & Sons

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

- https://www.bmc.com/blogs/software-quality-metrics/
- https://www.youtube.com/watch?v=KqDlDubS-OU
- https://www.youtube.com/watch?v=Jj7dLM8cLuE

VIII:ActivityBasedLearning/PracticalBasedLearning/Experientiallearning:

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

- Quizzes,
- Assignments
- Seminar

Semester:	III	Course Type:	PEC		
Course Title: Software Testing					
Course Code:	MCA24E242			Credits:	3
Teaching Hours/Week (L:T:P:O)			2:2:0:0	Total Hours:	40
CIE Marks:	50	SEE Marks:	50	Total Marks:	100
SEE Type:	Theory			Exam Hours:	3 Hrs

I. Course Objectives:

- Understand the principles and lifecycle of modern software testing practices.
- Explore automation frameworks and test execution tools used in the industry.
- Familiarize with DevOps-based testing approaches and continuous testing workflows.
- Learn advanced testing techniques involving performance, mobile, and AI-assisted testing.

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)neednottobeonlytraditionallecturemethod,butalternativeeffective 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(HigherorderThinking)questionsintheclass,whichpromotescritical 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.COURSECONTENT	
III(a).Theory PART	
Module 1:Introduction to Software Testing in the Modern Era Shift from manual testing to automated & intelligent testing, Software testing lifecycle(STLC) in Agile and DevOps, Role of CI/CD pipelines in testing, Types of Testing: Unit, Integration, System, Regression, Smoke, Sanity, Static vs Dynamic Testing.	8Hrs
Textbook1:Chapter 1,2 Textbook2:Chapter 1,3	
RBT Levels: 2,3	
Module 2:TestAutomation and Frameworks Principles of Test Automation, Test automation tools overview: Selenium, JUnit, TestNG, Design of Automation Frameworks(Keyword, Data-driven, Hybrid),Page Object Model and its use in test maintainability	8Hrs
Textbook2:Chapter 12,14	
RBT Levels: 2,3	
Module 3:Testing in DevOps and CI/CD Environments Introduction to DevOps testing culture, Integration of testing tools with Jenkins, GitHub Actions, Shift-left testing TDD, and BDD, Docker and container-based testing.	8Hrs
Textbook1: Chapter:5 Textbook2:Chapter15	
RBTLevels:2,3,4	
Module 4: Advanced Topics–AI & ML in Testing Overview of AI/ML applications in software testing, Smart test generation,t est case, prioritization, Predictive analytics for defect detection, Tools likeTest.ai, Appli tools, Mabl	8Hrs
Textbook1: Chapter 8:(Conceptual Foundation)	
RBTLevels:2,3,4	
Module5: Performance, Security, and Mobile Testing Performance Testing: Load, Stress, Scalability(using JMeter basics),Security Testing basics: Vulnerability scanning, OWASP Top 10, Mobile Testing: Emulators Vs Real Devices, Testing Tools (e.g., Appium), Test reporting and dashboards	8Hrs
Textbook2:Chapter10,13	
RBTLevels:2,3,4	

IV.COURSE OUTCOMES

CO1	Explain various types of software testing and their role in modern software delivery
CO2	Demonstrate the use of test automation frameworks in functional testing
CO3	Apply DevOps testing practices and integrate testing into CI/CD pipelines
CO4	Analyze performance, security, and AI-driven testing techniques across platforms.

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		
CO1	2	2							2				
CO2	2	2							2				
CO3	2	1								1			
CO4	2	1									1		

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

General Rules:

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

Semester End Examination(SEE):
Refer to Annexure

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	Foundations of Software Testing	Rex Black, Erik van Veenendaal, Dorothy Graham	2022	Pearson Education
2	Software Testing: Principles and Practices	Srinivasan Desikan, Gopalaswamy Ramesh	2021	Pearson Education

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

1	Foundations of Software Testing	RexBlack Graham	4thEdition	Cengage

VII(c):Weblinks and Video Lectures(e-Resources):

- https://www.youtube.com/watch?v=T3q6QcCQZQg
- https://www.youtube.com/watch?v=E2t5XbWwj7I&list=PLL34mf651faM_nn8uKlnwbQPw5zSh_F84

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

ActivityBasedLearning(SuggestedActivitiesinClass)/PracticalBasedlearning
- Quizzes
- Assignments
- Seminar

Semester:	**III**	**Course Type:**	**PEC**		
Course Title: Software Project Management					
Course Code:	**MCA24E343**			**Credits:**	3
Teaching Hours/Week(L:T:P:O)			2:2:0:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks :**	50	**Total Marks:**	100
SEE Type:	Theory			**Exam Hours:**	3 Hrs

I. Course Objectives:

- Apply the practices and methods for successful software project management
- Identify techniques for requirements, policies and decision making for effective resource management
- Illustrate the evaluation techniques for estimating cost, benefits, schedule and risk
- Devise a framework for software project management plan for activities, risk, monitoring and control
- Design a framework to manage people.

II. Teaching-Learning Process(General Instructions):

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

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

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

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

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

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

6. Introduce Topics in manifold representations.

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

8.Discuss how every concept can be applied to the real world and when that's possible, it helps to improve the student's understanding.	
III. COURSE CONTENT	
III(a).Theory PART	
Module-1: Introduction To Software Project Management Introduction, Why is Software Project Management important? What is a Project?, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing software projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, What is Management? Management Control, Traditional versus Modern Project Management Practices.	8Hrs
Textbook1: Chapter 1	
RBT Levels: 2,3, 4	
Module-2 Project Evaluation & Finance Evaluation of Individual Projects, Cost Benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing allocation of Resources within Programmes, Financial Accounting –An overview– Accounting concepts, Principles & Standards, Ledger posting, Trial balance, Profit and Loss account Balance sheet.	8Hrs
Textbook 1:Chapter 3 ; Textbook 2:Chapter 1,4,5,6	
RBTLevels: 2,3, 4	
Module-3:Activity Planning Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass, Identifying critical path,Activity Float, Shortening Project Duration, Activity on Arrow Networks Risk Management, Nature of Risk, Categories of Risk, A framework for dealing with Risk, Risk Identification, Risk analysis and prioritization, risk planning and risk monitoring.	8Hrs
Textbook1 :Chapter 4 &5	
RBTLevels:2,3,4	
Module-4: Monitoring And Control Creating the Framework, Collecting the Data, Review, Project Termination Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting Project Back To Target, Change Control, Software Configuration Management.	8Hrs
Textbook1: Chapter 9	
RBTLevels:2,3,4	
Module-5: Managing People And Working In Teams Introduction, Understanding Behavior, Organizational Behavior: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress– Health and Safety Working In Teams, Becoming a Team, Decision Making, Leadership.	8Hrs
Textbook1:Chapter 11	
RBTLevels:2,3,4	

IV.COURSE OUTCOMES

CO1	Apply theoretical concepts for Project management.
CO2	Planning for resource allocation with Case Studies.
CO3	Solving problems related to risk identification, cost based analysis etc.,
CO4	Managing & Working in team.

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

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

VI.Assessment Details(CIE&SEE)

General Rules:

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

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

VII. Learning Resources

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

Sl. No.	Title of the Book	Name of the author	Editionand Year	Nameofthe publisher
1	Software Project Management	Bob Hughes, Mike Cotterell, Rajib Mal	5th Edition,2011	Tata McGrawHill.
2	Accounting for Management	JawaharLal	5th Edition	Wheeler Publications, Delhi.

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

1	Information Technology-Project Management	Jack Marchewka	4th Edition, 2013.	Wiley Student Version.
2	Project Planning, Scheduling & Control	James PLewis	5th Edition, 2011.	McGraw Hill
3	Software Project Management in Practice	Pankaj Jalote	2002	Pearson Education

VII(c):Weblinks and Video Lectures(e-Resources):

- https://www.coursera.org/in/articles/software-project-management
- https://www.tutorialspoint.com/software_engineering/software_project_management.htm
- https://onlinecourses.nptel.ac.in/noc19_cs70/preview

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:	**III**	**Course Type:**	**INT**		
Course Title: INTERNSHIP					
Course Code:	**MCA24IN31**			**Credits:**	8
Teaching Hours/Week (L:T:P:O)			0:0:0:@	**Total Hours:**	6 weeks
CIE Marks:	100	**SEE Marks:**	100	**Total Marks:**	200
SEE Type:	**Laboratory**			**Exam Hours:**	3 Hrs

I. Course Objectives:

Internship/Professional practice provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc.

The objective are further,
To put theory into practice.
To expand thinking and broaden the knowledge and skills acquired through course work in the field. To relate to, interact with, and learn from current professionals in the field.
To gain a greater understanding of the duties and responsibilities of a professional.
To understand and adhere to professional standards in the field. To gain insight to professional communication including meetings, memos, reading, writing, public speaking, research, client interaction, input of ideas, and confidentiality.
To identify personal strengths and weaknesses.
To develop the initiative and motivation to be a self-starter and work independently.

II. Internship/Professional practice

Students under the guidance of internal guide/s and external guide shall take part in all the activities regularly to acquire as much knowledge as possible without causing any inconvenience at the place of internship.

III. Seminar

Each student, is required to Present the seminar on the internship orally and/or through power point slides.

- Answer the queries and involve in debate/discussion.
- Submit the report duly certified by the external guide.
- The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

IV. Course outcomes	
At the end of the course the student will be able to:	
CO1	Gain practical experience within industry in which the internship is done.
CO2	Acquire knowledge of the industry in which the internship is done.
CO3	Apply knowledge and skills learned to classroom work.
CO4	Develop a greater understanding about career options while more clearly defining personal career goals.
CO5	Experience the activities and functions of professionals.
CO6	Develop and refine oral and written communication skills.
CO7	Identify areas for future knowledge and skill development.
CO8	Expand intellectual capacity, credibility, judgment, intuition.
CO9	Acquire the knowledge of administration, marketing, finance and economics.

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

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

VI. Assessment Details (CIE & SEE)
General Rules:
Assessment Details (both CIE and SEE) : Refer Annexure
Semester End Examination (SEE): Refer Annexure

Department of Master of Computer Applications

Semester:	III	**Course Type:**	AEC		
Course Title: Data Visualization and Analysis With Power BI					
Course Code:	**MCA24AE31**			**Credits:**	PP/NP
Teaching Hours/Week (L: T: P: O) {O – Other pedagogies, mention @}			0:2:2:0	**Total Hours:**	40
CIE Marks:	50	**SEE Marks:**	--	**Total Marks:**	50
SEE Type:	**----**			**Exam Hours:**	---

Pre prerequisite: Basic understanding of data analysis concepts and familiarity with spreadsheet software like Excel. Additionally, knowledge of SQL for data querying and manipulation would be beneficial for advanced data analysis tasks in POWER BI.

I. Course Objectives:

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

II. Teaching-Learning Process (General Instructions):

The following are some of the strategies that teachers can employ to facilitate the achievement of various course outcomes:

1. **Diverse Teaching Methods**: Instead of relying solely on traditional lecture methods, can explore alternative and effective teaching approaches. These might include interactive discussions, hands-on activities, or multimedia presentations.
2. **Visual Aids**: Utilize videos and animations to elucidate complex concepts. Visual representations enhance understanding and engagement among students.
3. **Collaborative Learning**: Encourage group learning within the classroom. Collaborative activities foster teamwork, communication, and a deeper grasp of subject matter.
4. **Higher Order Thinking (HOT) Questions**: Pose at least three thought-provoking questions during class. These questions stimulate critical thinking and encourage students to analyze and evaluate information.
5. **Problem-Based Learning (PBL):** Implement PBL, which nurtures analytical skills. PBL goes beyond rote memorization by challenging students to design solutions, evaluate evidence, and think critically.
6. **Multiple Representations**: Introduce topics using various representations. Visuals, diagrams, and real-world examples cater to diverse learning styles.
7. **Creative Problem Solving**: Present different approaches to solving the same problem. Encourage students to think outside the box and devise their own innovative solutions.
8. **Real-World Application**: Discuss how each concept relates to practical scenarios. Connecting theoretical knowledge to real-world contexts enhances students' comprehension and retention.

III. COURSE CONTENT

Module-1:Power BI Essentials	8 Hrs

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

Textbook1: Chapter 1,2

RBT Levels: L1, L2, L3, L4

Module-2:Visualization in POWERBI	8 Hrs

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

Textbook1: : Chapter 3,4

RBT Levels: L1,L2,L3, L4

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

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

Textbook1: : Chapter 4,5

RBT Levels: L1,L2,L3,L4

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

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

Textbook1: : Chapter 5,6

RBT Levels: L1, L2, L3,L4

Module-5: Power BI Modeling And DAX	8 Hrs

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

Textbook 1: : Chapter 6,7,8

RBT Levels:L1, L2, L3,L4

IV. COURSE OUTCOMES:

At the end of this course, students will be able to

CO1	Apply Power BI Desktop and its web counterpart to acquire, prepare, and transform data from various sources, including CSV files and Azure SQL Database, using Power Query.
CO2	Apply advanced visualization techniques, including various chart types, map visualizations, and interactive features like slicers, bookmarks, and buttons, for effective data presentation.
CO3	Implement data modeling techniques, including designing star schemas, managing relationships, and differentiating between measures and calculated columns.
CO4	Perform advanced data analysis and calculations with DAX, using functions like SUM vs SUMX, IF, FILTER, and handling DAX time zone issues.
CO5	Develop an interactive reports and dashboards, publish reports, and pin them to dashboards in the PowerBI.com service, utilizing KPIs for performance tracking.

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

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

CO2			3	3										2		
CO3		2	2												1	1
CO4	3				3											
CO5			2		2				2					1		

VI. Assessment Details (CIE & SEE)

General Rules:

Continuous Internal Evaluation (CIE): Refer Annexure

Semester End Examination (SEE): Refer Annexure

VII. Learning Resources

VII(a): Textbooks:

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

VII(b): Reference Books:

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

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

- [Microsoft Power BI Official Website](https://powerbi.microsoft.com/)
- [Power BI Tips](https://powerbi.tips/)
- [Guy in a Cube](https://guyinacube.com/)
- [Power BI Blog](https://powerbi.microsoft.com/en-us/blog/)
- [Enterprise DNA](https://www.youtube.com/channel/UCiNm8KMJWggC4iRrxtnkovA)

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

Assignments, Quizzes and Seminar, Mini projects

Department of Master of Computer Applications

Semester:	**IV**	**Course Type:**	**PRJ**		
Course Title: Major Project work					
Course Code:	**MCA24PR41**			**Credits:**	12
Teaching Hours/Week (L:T:P:O)			0:0:0:@	**Total Hours:**	**Lab sessions**
CIE Marks:	100	**SEE Marks:**	100	**Total Marks:**	200
SEE Type:	**Laboratory**			**Exam Hours:**	3Hrs

I. Course Objectives:

- Support independent learning.
- Guide to select and utilize adequate information from varied resources for maintaining ethics.
- Guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- Develop interactive, communication, organization, time management, and presentation skills. Impart flexibility and adaptability.
- Inspire independent and team working
- Expand intellectual capacity, credibility, judgment, intuition.
- Adhere to punctuality, setting and meeting deadlines.
- Instil responsibilities to oneself and others.
- Train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas

II. Project Work

Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.
Follow the Software Development life cycle
Data Collection ,Planning, Design the Test cases
Validation and verification of attained results
Significance of parameters w.r.t scientific quantified data.
Publish the project work in reputed Journal.

III. Course outcomes:

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

CO1	Present the project and be able to defend it.
CO2	Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
CO3	Habituated to critical thinking and use problem solving skills.
CO4	Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
CO5	Work in a team to achieve common goal.

CO6	Work on their own, reflect on their learning and take appropriate actions to improve it.

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

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

V. Assessment Details (CIE & SEE)

General Rules:

Assessment Details (both CIE and SEE) : Refer Annexure

Semester End Examination (SEE): Refer Annexure

Department of Master of Computer Applications (MCA)

Semester:	**IV**	**Course Type:**	**SE**		
Course Title :	Technical Seminar				
Course Code:	**MCA24TS42**			**Credits:**	02
Teaching Hours/Week (L:T:P:O)			0:0:0:@	**Total Hours:**	**Lab sessions**
CIE Marks:	100	**SEE Marks:**	--	**Total Marks:**	100
SEE Type:	**---**			**Exam Hours:**	---

I. Course Objectives:

- Support independent learning.
- To understand the technical paper writing.
- Guide to select and utilize adequate information from varied Literatures & resources.
- To formulate the problem to be solved in effective way.
- To understand the different research methodologies and its usage in solving the problem at hand.
- Train students to present the technical paper topic in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas

II. Technical Paper writing & Seminar

Each student of the project batch shall write the research paper in the selected domain jointly in constant consultation with guide and prepare the technical paper as per the norms avoiding plagiarism.
Each Student should periodically present their findings and progress of the work in seminar.

III. Course outcomes:

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

CO1	Present the seminar on the technical paper domain/topic.
CO2	Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the technical paper writing.
CO3	To formulate and write the technical paper in IEEE, APA format.

IV.CO-PO-PSO MAPPING (mark H=3; M=2; L=1)																
PO/PSO	1	2	3	4	5	6	7	8	9	10	11	12	S1	S2	S3	S4
CO1	2	2												2		
CO2	2	2											2			
CO3		2												2		

V. Assessment Details (CIE & SEE)
General Rules:
Assessment Details (both CIE and SEE) : Refer Annexure
Semester End Examination (SEE): Refer Annexure

Department of Master of Computer Applications

Semester:	**IV**	**Course Type:**	**SLC**		
Course Title: BOS recommended Online MOOC Courses					
Course Code:	**MCA24SL43**			**Credits:**	03
Teaching Hours/Week (L:T:P:O)			0:0:0:0	**Total Hours:**	**Lab sessions**
CIE Marks:	50	**SEE Marks:**	50	**Total Marks:**	100
SEE Type:	**Theory**			**Exam Hours:**	2Hrs

I. Course Objectives:

- To provide high quality education to students.
- The courses offered through this platform reduce the gap among students by including everyone in the digitalization of education.

II. Teaching learning process

NPTEL Online BOS recommended Certification Courses , through an online portal, 8weeks online **courses**, typically on topics relevant to students in their domains or in interdisciplinary domains. Students can select from any of the 10 courses approved in the BOS meeting.

III. Course Content

As defined by Swayam NPTEL for the respective courses.

IV. Course outcomes:

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

CO1	Will understand and acquire knowledge in new domain of IT or in similar interdisciplinary domain.
CO2	Will be able to apply the knowledge in problem solving.
CO3	Will be able to do self learning of new domain specific topic.

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

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

V. Assessment Details (CIE & SEE)

General Rules:

Assessment Details (both CIE and SEE) : Refer Annexure

Semester End Examination (SEE): Refer Annexure