

Dr. Ambedkar Institute of Technology, Bengaluru-56
(An Autonomous Institution, Affiliated to VTU, Approved by AICTE, Accredited by NAAC with A+ grade)

Master of Computer Applications Program
(Accredited by National Board of Accreditation)



Scheme 2024 – 2026
Revision of MCA III – IV Semester
For the Academic Year 2026-27



Dr. Ambedkar Institute of Technology, Bengaluru-56

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Master of Computer Applications Programme

INSTITUTE - VISION AND MISSION

Vision

To create Dynamic, Resourceful, Adept and Innovative Technical professionals to meet global challenges.

Mission

- To offer state-of-the-art under graduate, post graduate and doctoral programs in the fields of Engineering, Technology and Management
- To generate new knowledge by engaging faculty and students in research, development and innovation.
- To provide strong theoretical foundation to the students, supported by extensive practical training to meet the industrial requirements.
- To instil moral and ethical values with social and professional commitment.

MCA - VISION AND MISSION

VISION

To create a quality human resource with good technical competence to face the global challenges.

MISSION

- To create a Centre of Excellence through industry institute interaction.
- To prepare students for utilizing more creativity, innovativeness and leadership Qualities.
- To inculcate a sense of commitment to the students towards socio-economic development of the nation

Program Educational Objectives

PEO 1: Apply the principles of software engineering and application development in verticals related to Information Technology and Information Technology Enabled services (ITES).

PEO 2: Inculcate creative and innovative ideas with latest developments in the industry to be displayed as an entrepreneur, or a researcher or academician.

PEO 3: To incorporate the lifelong learning process with leadership skills and corporate social responsibilities.

Program Outcomes:

PO1 (Foundation Knowledge): Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.

PO2 (Problem Analysis): Identify, review, formulate and analyse problems for primarily focusing on customer requirements using critical thinking frameworks.

PO3 (Development of Solutions): Design, develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.

PO4 (Modern Tool Usage): Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.

PO5 (Individual and Teamwork): Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.

PO6 (Project Management and Finance): Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management.

PO7 (Ethics): Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware.

PO8 (Life-long learning): Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.

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Department of Master of Computer Applications

SCHEME OF TEACHING AND EXAMINATION OF MCA FIRST SEMESTER 2024-2026

Sl. No.	Course Type	Course Code	Course Title	Teaching hours per week			Examination				Credits
				L	T	P	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	PCC	MCAT11	Object Oriented Programming using Java	3	-	-	3	50	50	100	3
2	PCC	MCAT12	Web Technologies	3	-	-	3	50	50	100	3
3	PCC	MCAT13	Computer Networks	3	-	-	3	50	50	100	3
4	BSC	MCAT14	Mathematical Foundations for Computer Applications	3	-	-	3	50	50	100	3
5.	IPCC	MCAU15	Data Structures and Algorithms	3	-	2	3	50	50	100	4
6	IPCC	MCAU16	Fundamentals of C Programming	3	-	2	3	50	50	100	4
7	PCCL	MCAL17	Object Oriented Programming using Java Lab	-	-	2	3	50	50	100	1
8	PCCL	MCAL18	Web Technologies Lab	-	-	2	3	50	50	100	1
9	NCMC	MCAT19	Mathematics Bridge Course For MCA	3	-	-	3	-	100	100	PP
10	NCMC	MCACDN 110	Placement Training	4	-	-	-	-	50	50	PP
Total				18	-	08	27	400	550	950	22

Note:

PCC : Professional Core Course

BSC : Basic Science Course

AEC : Ability Enhancement Course

T : Tutorial

L : Lecture

CDN : Career Development Non-Credit Course

PCCL : Professional Core Course Lab

NCMC: Non-Credit Mandatory Course

IPCC : Integrated Professional Core Course

U : Integrated

M : Mini project

P : Practical

Bridge Course: Non-Credit Mandatory Course MMAT108-Mathematics for MCA Students: Students who have not taken Mathematics at the 10+2 or degree level are required to study and pass this course in the 1st semester. However, this course/subject will not be considered for vertical progression.

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Department of Master of Computer Applications

SCHEME OF TEACHING AND EXAMINATION OF MCA SECOND SEMESTER 2024-2026

Sl. No.	Course Type	Course Code	Course Title	Teaching hours per week			Examination				Credits
				L	T	P	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	PCC	MCAT21	Python Programming	3	-	-	3	50	50	100	3
2	PCC	MCAT22	Software Engineering	3	-	-	3	50	50	100	3
3	PCC	MCAT23	Data Science	3	-	-	3	50	50	100	3
4	IPCC	MCAU24	Database Management System	2	-	2	3	50	50	100	3
5	IPEC	MCAU25x	Elective –1	2	-	2	3	50	50	100	3
6	PEC	MCAT26x	Elective - 2	3	-	-	3	50	50	100	3
7	PCCL	MCAL27	Python Programming Lab	-	-	2	3	50	50	100	1
8	PCCL	MCAL28	Data Science Lab	-	-	2	3	50	50	100	1
9	PBLC	MCAM29	Mini Project-1	-	2	2	3	50	50	100	2
10	NCMC	MCACDN 210	Placement Training	4	-	-	-	-	50	50	PP
11	NCMC	MRMI211	Research Methodology and IPR (online)	Classes and evaluation procedures are as per the policy of the online course providers.							PP
Total				20	02	10	27	450	500	950	22

Note:

PCC : Professional Core Course

PCCL : Professional Core Course Lab

IPEC : Integrated Professional Elective Course

T : Tutorial

L : Lecture

NCMC: Non-Credit Mandatory Course

MRMI: Research Methodology & IPR

PEC : Professional Elective Course

IPCC : Integrated Professional Core Course

PBCL : Project Based Learning Course

U : Integrated

M : Mini project

CDN : Career Development Non-Credit Course

P : Practical

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MCA SECOND SEMESTER ELECTIVE COURSES

Integrated Professional Elective-1

S.No	Course Type	Course Code	Course Title
1.	IPEC	MCAU251	Cloud Essentials
2.	IPEC	MCAU252	Big Data Analytics
3.	IPEC	MCAU253	Go Programming

Professional Elective-2

S.No	Course Type	Course Code	Course Title
1.	PEC	MCAT261	Software Architecture
2.	PEC	MCAT262	Soft Computing
3.	PEC	MCAT263	Software Testing and Automation

Scheme 2024 – 2026

Revision of MCA III – IV Semesters

For the Academic Year 2026-27

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SCHEME OF TEACHING AND EXAMINATION OF MCA THIRD SEMESTER 2024-2026

Sl. No.	Course Type	Course Code	Course Title	Teaching hours per week			Examination				Credits
				L	T	P	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1	IPEC	MCAU31x	Professional Elective-3	2	-	2	3	50	50	100	3
2	IPEC	MCAU32x	Professional Elective-4	2	-	2	3	50	50	100	3
3	IPEC	MCAU33x	Professional Elective- 5	2	-	2	3	50	50	100	3
4	PROJ	MCAP34	Project Work	25-30 hours per week				100	50	150	13
Total				6	-	6	9	250	200	450	22

Note:

PBLC : Project Based Learning Course

INT : Internship

L : Lecture

T : Tutorial

IPEC : Integrated Professional Elective Course

SDC : Skill Development Course

P: Practical

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Department of Master of Computer Applications

MCA THIRD SEMESTER PROFESSIONAL ELECTIVE COURSES

Professional Elective-3

S.No	Course Type	Course Code	Course Title
1.	IPEC	MCAU311	Machine Learning and Deep Learning
2.	IPEC	MCAU312	Introduction to Generative AI
4.	IPEC	MCAU313	Exploratory Data Analysis

Professional Elective-4

S.No	Course Type	Course Code	Course Title
1.	IPEC	MCAU321	Full Stack Web Development
2.	IPEC	MCAU322	Social Media Analytics
3.	IPEC	MCAU323	Enterprise Application Programming

Professional Elective-5

S.No	Course Type	Course Code	Course Title
1.	IPEC	MCAU331	Operating Systems and Linux System Programming
2.	IPEC	MCAU332	Project Management with Scrum and git
4.	IPEC	MCAU333	Cyber Security

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SCHEME OF TEACHING AND EXAMINATION OF MCA FOURTH SEMESTER 2024-2026

Sl. No.	Course Type	Course Code	Course Title	Teaching hours per week			Examination				Credits
				L	T	P	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1.	PEC	MMC41	MOOC	-	-	-	-	50	50	100	02
2.	SEC	MCAS42	Technical Seminar	-	2	-	3	-	50	50	02
3.	INT	MCAI43	Industry Internship	15 weeks duration			3	100	100	200	10
Total				-	-	-	6	150	200	350	14
Grand Total											
Total Marks: 2700				Total Credits: 80							
Note:											
SEC : Skill Enhancement Course						NCMC: Non-credit Mandatory Course					
INT : Internship						PP : Passing is Mandatory					
MRMI: Research Methodology & IPR						MOOC: Massive Open Online Course					
L : Lecture						P: Practical					
T : Tutorial											

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Curriculum Distribution for MCA 2024 Scheme

Course Type	Semester-1 Credits	Semester-2 Credits	Semester-3 Credits	Semester-4 Credits	Total Credits
Basic Science Course (BSC)	3	-	-	-	3
Professional Core Course (PCC)	9	9	-	-	18
Professional Elective Course (PEC)	-	3	-	-	3
Integrated Professional Core Course (IPCC)	8	3	-	-	11
Integrated Professional Elective Course (IPEC)	-	3	9	-	12
Labs (PCCL)	2	2	-	-	4
Seminar (SEC)	-	-	-	2	2
Mini Project (PBL)		2			2
Project Work (PROJ)	-	-	13	-	13
Internship (INT)	-	-	-	10	10
MOOC (PEC)	-	-	-	2	2
Total Credits	22	22	22	14	80

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Master of Computer Applications
Scheme and Syllabus - CBCS – 2026 -2027

Semester	III						
Course Title	MACHINE LEARNING AND DEEP LEARNING						
Course Code	MCAU311						
Category	Integrated Professional Elective Course (IPEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	00	02	00	04	26+26	03
CIE Marks: 30+20=50	SEE Marks: 50		Total Max. marks=100		Duration of SEE: 03 Hours		

COURSE OBJECTIVES:

- To distinguish between, supervised & unsupervised and gain knowledge about basic concepts of Machine Learning.
- To understand concept learning and apply machine learning techniques and analyse text using NLP.
- To apply the appropriate machine learning strategy for any given problem.
- To develop skills of using recent machine learning software for solving practical problems.

UNIT I: Concept Learning and Supervised Learning Concept Learning-Find S algorithm Supervised Learning: Decision Tree- ID3 classifier, Overfitting and Under fitting Ensemble Methods-Bagging & Boosting, Random Forest Model	5 hours
UNIT II: Unsupervised Learning & Reinforcement Learning Introduction to Unsupervised Learning, Clustering- different types of clustering techniques-Partitioning methods, Hierarchical clustering Reinforcement Learning-Introduction, Markov's Decision Process	5 hours
UNIT III: Deep Neural Network Foundations of Neural Networks and Deep Learning: Neural Networks- Biological neuron, Perceptron, Multilayer feed forward networks, Training neural networks, Activation functions Convolution neural networks-CNN architecture, layers, pooling layers, fully connected layers, applications of CNN	5 hours
UNIT IV: Introduction to Natural Language Processing Introduction to NLP, History of NLP, Text Analytics and NLP, various steps of NLP, Types of data Preprocessing in NLP-Removing punctuation, removing stop words, Tokenization, Stemming, Lemmatization, creating a word cloud Feature extraction from texts- Feature extraction methods -Bag of Words (BOG)	5 Hours
UNIT V: Generative AI Definition and key concepts , Types of Generative Models: Autoregressive Models (e.g., GPT), Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs), Applications of Gen AI – Text, Image, Code Generation, Audio/Video synthesis. Prompt Engineering – Definition and Importance, Role of prompts in guiding AI behaviour. Types of Prompts – Zero- shot, few-shot and chain of thought programming	6 Hours

PRACTICAL COMPONENT	
List of Laboratory programs (2 hours/week per batch) 10 lab sessions+ 1 repetition class+ 1 Lab Assessment.	
	Knowledge of Data preprocessing and applying graphs using python to the datasets is a prerequisite to implement Machine Learning and Deep Learning algorithms.
Demonstrate different ways of preprocess the data. Apply data cleaning techniques and treat them on sample dataset.	
1.	Implement FIND S Algorithm using python to get Maximally Specific Hypothesis.
2.	Demonstrate the working of the decision tree using Sklearn package. or Demonstrate the working of Random Forest for a given dataset.
3.	Implement K-Means clustering technique for a given data set in python. Implement hierarchical clustering and visualize dendrograms.
4.	Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5.	Implement Perceptron using sklearn package.
6.	Implement Convolutional Neural Network to predict hand written digits.
7.	Implement text pre-processing techniques using python's natural language processing toolkit.
8.	Develop a python script to implement TF-IDF on a given paragraph.
9.	Construct Word Cloud for bag of words in python.
10.	Python program to simulate a resume screening system using basic Natural Language Processing (NLP) techniques such as keyword matching, scoring, and ranking.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animation videos

COURSE OUTCOMES:

- CO1: Explain the fundamentals of concept learning and supervised learning and apply basic classification algorithms.**
- CO2: Apply and analyze unsupervised learning and reinforcement learning techniques for decision making.**
- CO3: Analyze and evaluate deep neural network models such as CNNs and RNNs for different data representations.**
- CO4: Design and implement NLP and Generative AI applications using appropriate models and techniques to solve real-world problems.**

TEXT BOOKS

1. Machine Learning, Tom M Mitchel, McGraw Hill publications, ISBN-0070428077
2. Principles of Soft Computing, Dr. S. N. Sivanandam, Dr. S. N Deepa, Weilly India, 2 nd Edition, 2011.
3. Natural Language Processing Fundamentals, By Sohom Ghosh, Dwight Gunning, PACKT publisher, 2019
4. Josh Patterson and Adam Gibson, Deep Learning, A practitioner's approach, First edition, Shroff Publishers and Distributors Pvt. Ltd., 2017

REFERENCE BOOKS

1. Jake Vander plas, “Python Data Science Handbook: Essential tools for working with data”, O’Reilly Publishers, I Edition.
2. Ethem Alpaydin "Introduction to Machine Learning" 2nd Edition PHI Learning Pvt. Ltd- New Delhi.

EBOOKS/ONLINE RESOURCES

1. https://onlinecourses.nptel.ac.in/noc23_cs18/preview
2. https://onlinecourses.nptel.ac.in/noc23_ee87/preview

SCHEME FOR EXAMINATIONS

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

MAPPING of COs with POs

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Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Master of Computer Applications
Scheme and Syllabus - CBCS – 2024 -2026

Semester	III						
Course Title	INTRODUCTION TO GENERATIVE AI						
Course Code	MCAU312						
Category	Integrated Professional Elective Course (IPEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	00	02	00	04	26+26	03
CIE Marks: 30+20=50	SEE Marks: 50		Total Max. marks=100		Duration of SEE: 03 Hours		

COURSE OBJECTIVES:

- To learn the fundamentals of Neural Networks and their various types.
- To understand concept learning, apply and analyse text using NLP.
- To explore Generative AI models like GANs, VAEs, and Transformers.
- To discuss current trends and future directions in Generative AI research.

UNIT I: Foundations of Neural Network	5 hours
Foundations of Neural Networks and Deep Learning: Deep learning revolution, Biological neuron, Perceptron, Structure of Artificial Neural Networks, Steps in Training an Artificial Neural Network, Activation functions	
UNIT II: Advanced Neural Network	5 hours
Introduction to Generative AI, Types of Generative Models: Autoregressive Models (e.g., GPT) Variational Autoencoders (VAEs), Transformers, Attention Mechanism in detail Long Short-Term Memory Networks (LSTMs).	
UNIT III: Introduction to GenAI	5 Hours
Generative Adversarial Networks (GANs), Applications of Generative AI in: Art, Design, Music Composition, Text, Image, and Video Generation, Generative AI vs Discriminative AI Introduction to Generative AI Models: Transformers, Attention Mechanism in detail Long Short-Term Memory Networks (LSTMs).	
UNIT IV: Overview of LLMs and GANs	6 Hours
Architecture of Large Language Models (LLMs) Transformer Architecture, Encoder, Decoder, and Self-Attention Mechanism, Benefits, Challenges, and Limitations of LLMs, Best LLMs and Frameworks: GPT-4, Gemini, Claude, LLaMA, LangChain	
UNIT V: Introduction to Prompt Engineering	5 Hours
Principles of Effective Prompt Design-Persona Pattern, Root Prompts, Prompting Techniques-Zero-shot, One-shot, Few-shot Learning, Controlling Output Style, Tone, and Format, Incorporating Context and External Knowledge	

PRACTICAL COMPONENT	
	List of Laboratory programs (2 hours/week per batch) 10 lab sessions+ 1 repetition class+ 1 Lab Assessment.
	Knowledge of Data preprocessing and applying graphs using python to the datasets is a prerequisite to implement Machine Learning and Deep Learning algorithms.
Demonstrate different ways of preprocess the data. Apply data cleaning techniques and treat them on sample dataset.	
1.	Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
2.	Implement Perceptron using sklearn package.
3.	Generate hand written digits using GANs.
4.	Implement Text Generation using LSTM.
5.	Implement text pre-processing techniques using python's natural language processing toolkit.
6.	Develop a python script to implement TF-IDF on a given paragraph.
7.	Construct Word Cloud for bag of words in python.
8.	Python program to simulate a resume screening system using basic Natural Language Processing (NLP) techniques such as keyword matching, scoring, and ranking.
9.	Implement Basic Autoencoder for Noise Removal in images.
10.	Classify text as positive/negative for Sentiment Analysis with simple LSTM.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animation videos
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COURSE OUTCOMES:

- CO1: Remember the evolution of AI and the significance of Deep Learning with NLP and GenAI.**
- CO2: Understand appropriate techniques to process the data and analyse text extraction using NLP.**
- CO3: Apply various advanced Neural Network architectures for diverse applications like image recognition and sequence modeling.**
- CO4: Analyzing the performance and limitations of large language models.**

TEXT BOOKS

1. Generative AI for Everyone: Understanding the Essentials and Applications of This Breakthrough Technology". Altaf Rehmani.
2. "Introduction to Generative AI" , Numa Dhamani, Kindle Edition, 2024.
3. Natural Language Processing Fundamentals, By Sohom Ghosh, Dwight Gunning, PACKT publisher, 2019
4. Neural Networks and Deep Learning: A Textbook" by Charu C. Aggarwal.

REFERENCE BOOKS

- 1. "Generative Adversarial Networks Cookbook: Over 100 recipes to build generative models using Python, TensorFlow, and Keras" by Josh Kalin.
- 2. Generative AI with Python and TensorFlow 2: Create images, text, and music with VAEs, GANs, LSTMs, Transformer models” , Joseph Babcock and Raghav Bali , 2024

EBOOKS/ONLINE RESOURCES

1. <https://elearn.nptel.ac.in/shop/iit-workshops/completed/leveraging-generative-ai-for-teaching-programming-courses/?v=c86ee0d9d7ed>
2. <https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-language-models/?v=c86ee0d9d7ed>

SCHEME FOR EXAMINATIONS

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

MAPPING of COs with POs

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Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Master of Computer Applications
Scheme and Syllabus - CBCS – 2024 -2026

Semester	III						
Course Title	EXPLORATORY DATA ANALYSIS						
Course Code	MCAU313						
Category	Integrated Professional Core Course (IPCC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	00	02	00	04	26+26	03
CIE Marks: 30+20=50	SEE Marks: 50		Total Max. marks=100		Duration of SEE: 03 Hours		

COURSE OBJECTIVES:

- To introduce the fundamental concepts and principles of exploratory data analysis.
- To equip students with skills to summarize and visualize both univariate and multivariate data effectively.
- To develop the ability to clean, pre-process, and transform raw data for analysis.
- To expose learners to current trends and tools used in the field of EDA.

UNIT I: Introduction to Exploratory Data Analysis	5 hours
Historical background and role of EDA in data science, Philosophy and goals of EDA, Comparison with classical statistical methods, Types of data and scales of measurement, Importance of visual summaries before formal modelling.	
UNIT II: Univariate Data Exploration	5 hours
Distribution shape: symmetry, skewness, kurtosis Summary statistics: mean, median, mode, variance, standard deviation, range, IQR Graphical techniques: histograms, dot plots, stem-and-leaf plots, boxplots, Identifying outliers and anomalies.	
UNIT III: Bivariate and Multivariate Data Exploration:	5 hours
Scatter plots, trend analysis, Correlation vs. causation, Crosstabs and pivot tables, Pair plots and heatmaps, Data smoothing (moving averages, LOESS)	
UNIT IV: Data Transformation and Cleaning	5 Hours
Motivation for data transformation (e.g., to achieve normality or reduce skew) Log, square root, and other transformations, Handling missing values and duplicates, Introduction to resistant statistics (median, trimmed mean)	
UNIT V: Emerging Trends and case studies	6 Hours
EDA as a storytelling tool, AI-powered visualizations, integration with big data platforms. Case studies: EDA on real-world datasets (Titanic, Iris, planet), pitfalls in EDA.	

PRACTICAL COMPONENT	
List of Laboratory programs (2 hours/week per batch) 10 lab sessions+ 1 repetition class+ 1 Lab Assessment.	
	The lab progress from basic summaries → visualization → cleaning → storytelling → automated tools
1.	Perform data type identification and visual summaries using Pandas and Matplotlib.
2.	Compute univariate summary statistics and visualize distributions with histograms and boxplots.
3.	Detect and visualize outliers using IQR and Z-score methods.
4.	Explore bivariate relationships with scatter plots, crosstabs, and correlation heatmaps.
5.	Create multivariate visualizations using pair plots and trend analysis with moving averages.
6.	Clean datasets by handling missing values, removing duplicates, and applying transformations.
7.	Compare resistant statistics like median and trimmed mean against mean in presence of outliers.
8.	Build an EDA storytelling notebook using Titanic dataset with narrative plots.
9.	Conduct a complete case study EDA workflow on the Iris dataset.
10.	Generate automated EDA reports using AI-powered libraries like Sweetviz or Pandas-Profiling.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animation videos
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COURSE OUTCOMES:

- CO1: Understand the role and importance of Exploratory Data Analysis in the data science pipeline.**
- CO2: Analyze univariate, bivariate, and multivariate datasets using summary statistics and visualization techniques.**
- CO3: Apply data cleaning, transformation, and analysis methods to prepare raw datasets and derive meaningful insights.**
- CO4: Interpret and communicate findings from real-world datasets through visual storytelling, reporting, and modern EDA tools.**

TEXT BOOKS

1. Exploratory Data Analysis by John W. Tukey.
2. An Introduction to Statistical Learning by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani
3. Think Stats: Exploratory Data Analysis in Python by Allen B. Downey

REFERENCE BOOKS

1. Practical Statistics for Data Scientists by Peter Bruce, Andrew Bruce, and Peter Gedeck

EBOOKS/ONLINE RESOURCES

- https://www.coursera.org/specializations/exploratory-data-analysis-and-visualization?utm_source=copilot.com

- https://www.mygreatlearning.com/exploratory-data-analysis/free-courses?utm_source=copilot.com

SCHEME FOR EXAMINATIONS

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

MAPPING of COs with POs

[illegible]

Dr Ambedkar Institute of Technology, Bengaluru-56
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Scheme and Syllabus - 2024 -2026

Semester	III						
Course Title	FULL STACK WEB DEVELOPMENT						
Course Code	MCAU321						
Category	Integrated Professional Elective Course (IPEC)						
Scheme and Credits	No. of Hours/Week					Total	Credits
	L	T	P	SS	Total	teaching hours	
	02	00	02	00	4	26+26	
CIE Marks: 30+20:50	SEE Marks: 50		Total Max. marks=100		Duration of SEE: 03 Hours		

COURSE LEARNING OBJECTIVES:

- Discuss the components and architecture of the MERN stack for full-stack web development.
- Develop server-side applications and RESTful APIs using Node.js and Express.js.
- Build dynamic and responsive front-end applications using React.js.
- Integrate MongoDB with front-end and back-end components to create a complete MERN stack web application.

Unit 1: React Fundamentals	5 Hours
Introduction to React.js, Features and advantages of React, Single Page Applications (SPA), React architecture and virtual DOM, JSX syntax and rendering elements, Components: , Functional components, Props and component reusability, State management using useState, Event handling in React.	
Unit 2: React Hooks & Application Development	5 Hours
React Hooks: useEffect, Component lifecycle using hooks, Handling forms and controlled components, Conditional rendering, Lists and keys, Routing using React Router, Basic error handling.	
Unit 3: Node.js Fundamentals	5 Hours
Introduction to Node.js, Features of Node.js and Advantages over Traditional Server-Side Technologies, Node.js architecture: Event-driven, non-blocking I/O, V8 JavaScript engine, Installing Node.js and npm, Node modules and module system, Core modules: url, fs, http, path, creating a simple web server using Node.js, npm and package management.	
Unit 4: Express.js and REST APIs	5 Hours
Introduction to Express.js, handling HTTP requests and responses. Introduction to RESTful APIs, handling HTTP methods: GET, POST, PUT, DELETE, Middleware and its types, handling request and response objects, Basic error handling.	
Unit 5: MongoDB Fundamentals	6 Hours
Introduction to MongoDB and NoSQL databases, Differences between SQL and NoSQL databases, MongoDB architecture and document-oriented model, Collections and documents, Data types in MongoDB, installing MongoDB, CRUD operations: Insert, read, Update, Delete, querying documents using find() and other operators, Introduction to Mongoose, Connecting MongoDB with Node.js.	
PRACTICAL COMPONENT	
List of Laboratory programs (2 hours/week per batch)	
10 lab sessions+ 1 repetition class+ 1 Lab Assessment.	

Practical Programs on ReactJS, NodeJS and MongoDB, Database Connectivity	
1.	Design a Single Page Application (SPA) using React . The application contains multiple pages, such as Home , About , and Contact , and requires smooth navigation between these pages without reloading the browser [use React Router for client-side routing.]
2.	Create a React application that displays product details using props and allows the user to increase or decrease the product quantity using buttons. The total price should update automatically along with the Order date and expected delivery Date, which must be calculated and displayed upon updating the item's quantity.
3.	Develop an online registration system using React and Node.js. with Express for the backend. The registration form should collect user details such as name, email, and password. After submission, the system must validate each input field. If any validation fails, an appropriate error message should be displayed for the corresponding field; otherwise, a success message confirming successful registration should be shown. [Demonstrate the registration form by applying React concepts such as state management and event handling, and implement backend processing using Node.js to handle form submission and validation.]
4.	Design a web server to serve static content to users. The server must handle client requests through routers and return the contents of a requested file. If the requested file does not exist or an error occurs while reading the file, the server should respond with a 404 – File Not Found error message.
5.	a) Create a Node.js file that reads the requested file and returns the content to the client using routers. If anything goes wrong, throw a 404 error b) Implement file operations using NodeJS file system Module.
6.	Develop a ride-hailing application for a cab booking company. When a user books a cab, the system performs multiple asynchronous operations : 1. Check driver availability 2. Confirm the booking Implement these operations using JavaScript Promises and async/await to handle asynchronous behaviour efficiently. If all steps succeed, the system should display “Booking Successful” . If any step fails, it should display an appropriate error message .
	Develop a RESTful web application to manage library books using Node.js and Express.js , allowing operations such as viewing books, adding new books, updating book details, and deleting books .
8.	Design a user login system that verifies credentials against a MongoDB database. The system should display “Login Success” for valid credentials and “Login Failed” for invalid credentials, using ReactJS for the frontend and NodeJS + ExpressJS for the backend
9.	Develop a simple database application for the Employee Management System to manage employee records. The system should allow administrators to create, read, update, and delete (CRUD) employee details using a Node.js backend connected to a MongoDB database . The operations can be tested using tools like Postman . The database should store employee details, including Employee ID, Name, Department, Salary, and Email. The system should display meaningful messages when the administrator is trying to update or delete non-existent employee information.
10.	Design a web-based Student Management System using the MERN stack (MongoDB, Express, React, Node.js) . The application should efficiently handle the student records by adding, viewing, updating, and deleting student details.

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Master of Computer Applications
Scheme and Syllabus - CBCS – 2024 -2026

Semester	III						
Course Title	SOCIAL MEDIA ANALYTICS						
Course Code	MCAU322						
Category	Integrated Professional Elective Course (IPEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	00	02	00	04	26+26	03
CIE Marks: 30+20=50	SEE Marks: 50		Total Max. marks=100		Duration of SEE: 03 Hours		

COURSE OBJECTIVES:

- To introduce the fundamental concepts, characteristics, types and challenges of social media analytics and familiarize students with the social media analytics cycle.
- To develop an understanding of data visualization techniques and their role in representing and interpreting structured and unstructured social media data.
- To familiarize students with social media text, network and action analytics and their applications in extracting meaningful insights from social media data.
- To develop knowledge and practical skills in mobile, hyperlink, location and search-engine
- To develop the ability to align social media analytics with business objectives, formulate social media strategies, analyse data, manage risks and interpret analytical results for decision-making.

UNIT I: Concept Learning and Supervised Learning	5 hours
Social Media Analytics and Visualization: An Overview	
Seven Layers of Social Media Analytics – Types – Analytics Cycle – Challenges – Core Characteristics of social media – types of social media	
Visualization as an aid to analytics - Common visualizations – common pitfalls – visually representing unstructured data	
UNIT II: Social Media Text, Network and Actions Analytics	5 hours
Types of Social Media Text - Purpose of Text Analytics - Steps in Text Analytics - Working with Social Media Text Analysis Tools - Common network terms – common social media network types – types of networks - Analyzing Social Media Networks - What Is Actions Analytics? - Common Social Media Actions - Working with Actions Analytics Tools	
UNIT III: Mobile and hyperlink Analytics	5 hours
What Is Mobile Analytics? - Types of Apps - Characteristics of Mobile Apps - Working with Mobile Analytics Tools - Apps Analytics - Types of Hyperlinks - Hyperlink Analytics - Working with Hyperlinks Analytics	
UNIT IV: Location and search engine Analytics	6 hours
Sources of Location Data - Categories of Location Analytics - Working with Location Analytics Tools	
Search engine Analytics: Types - Search Engine Analytics - Working with Search Engine Analytics	
UNIT V: Analytics–Business Alignment, Data Analysis and Information Interpretation	5 hours

Understanding Social Media and Business Alignment·- Formulating a Social Media Strategy - Managing Social Media Risks – Data Analysis – four dimensions - Information Interpretation

PRACTICAL COMPONENT	
List of Laboratory programs (2 hours/week per batch) 10 lab sessions+ 1 repetition class+ 1 Lab Assessment.	
Develop the programs on social media analytics	
1.	Working with Social Media Text Analysis Tools.
2.	Case Study: Implementing Text Analysis to review customer opinion
3.	Working with Actions Analytics Tools
4.	Implementing Actions Analytics Tools to visualize ROI of social groups
5.	Working with Mobile Analytics Tools
6.	Working with Hyperlinks Analytics
7.	Implementing Hyperlinks Analytics to analyze social media videos
8.	Working with Location Analytics Tools
9.	Working with Search Engine Analytics
10.	Implementing Search Engine Analytics with google trends.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animation videos

COURSE OUTCOMES:

CO1: Understand the fundamental concepts, characteristics, types, analytics cycle and challenges of social media analytics, and illustrate the role of visualization in analytics.

CO2: Apply text, network and action analytics techniques to analyse social media data and derive meaningful insights.

CO3: Apply mobile and hyperlink analytics techniques to evaluate mobile applications, user activities and hyperlink structures.

CO4: Analyse location-based and search-engine data using appropriate analytics techniques and tools to identify useful patterns and insights.

CO5: Evaluate social media analytics in relation to business objectives, formulate suitable social media strategies, analyse data and interpret results for informed decision-making.

TEXT BOOKS

1.	Seven Layers of Social Media Analytics: Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data, Gohar F. Khan
2.	Social Media Analytics [2015], Techniques and Insights for Extracting Business Value Out of Social Media, Matthew Ganis, AvinashKohirkar, IBM Press

REFERENCE BOOKS

1. Mining the Social Web, Matthew A. Russell, SECOND EDITION Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.

EBOOKS/ONLINE RESOURCES

- <https://2012books.lardbucket.org/books/online-marketing-essentials/s04-introduction-to-emarketing.html>
- <https://2012books.lardbucket.org/books/online-marketing-essentials/s06-online-advertising.html>
- https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_cs117

SCHEME FOR EXAMINATIONS

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

MAPPING of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	1	2	2	1	1	1
CO2	2	3	2	3	3	1	1	1
CO3	2	3	2	3	3	1	1	1
CO4	2	3	2	3	3	1	1	1
CO5	1	3	2	3	3	2	3	3

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Master of Computer Applications
Scheme and Syllabus - 2024 -2026

Semester	III						
Course Title	ENTERPRISE APPLICATION PROGRAMMING						
Course Code	MCAU323						
Category	IPEC						
Scheme and Credits	No. of Hours/Week					Total	Credits
	L	T	P	SS	Total	teaching hours	
	02	00	02	00	4	28+28	
CIE Marks: 30+20	SEE Marks: 50		Total Max. marks=100		Duration of SEE: 03 Hours		

COURSE LEARNING OBJECTIVES:

- Understand the architecture of enterprise applications.
- Develop server-side applications using Java EE/Spring.
- Work with databases and persistence layers using ORM tools.
- Design and implement secure, scalable, and distributed applications.
- Explore deployment strategies and enterprise application testing.

Unit 1: Introduction to Enterprise Applications:	6 Hours
Introduction to Enterprise Applications: Definition, Characteristics, types (ERP, CRM, SCM, etc.), and challenges; Enterprise application architecture and layers; Overview of Java EE; Spring Boot introduction; Comparison of monolithic vs. microservices architecture.	
Unit 2: Web Development with Spring:	5 Hours
Spring MVC and Controller, Dispatcher Servlet, Handler Mapping, Controller classes, Request Mapping, View Resolvers, Model and View, RESTful Web Services, REST API design, JSON processing, creating REST controllers with Spring Boot.	
Unit 3: Business Logic and Dependency Injection:	5 Hours
Spring Core & Bean Life Cycle, Inversion of Control (IoC), Bean scopes, Configuration (XML/Java-based), Application Context, Service Layer and Transactions, Creating service classes, transaction management, AOP for business concerns (logging, security).	
Unit 4: Database Access and Persistence:	6 Hours
JDBC and Spring JDBC Template, Data Source, connection pooling, querying with templates, Exception handling in JDBC, JPA and Hibernate with Spring, Entity classes, annotations, persistence context, Repositories and query methods.	
Unit 5: Security, Testing, and Deployment:	6 Hours
Spring Security Fundamentals, Authentication, authorization, custom login forms, Securing REST APIs, Testing and Deployment: Unit testing (JUnit, Mockito), integration testing, WAR/JAR packaging, deploying on Tomcat, Docker basics.	
PRACTICAL COMPONENT	
List of Laboratory programs (2 hours/week per batch)	

10 lab sessions+ 1 repetition class+ 1 Lab Assessment.	
Practical Programs on	
1	Create a Simple Spring Boot Application – Create a Spring Boot project and display “Welcome to Spring Boot” using a basic controller.
2	Spring MVC Application – Create a simple controller to accept a student name and display a welcome message using @Controller and @RequestMapping
3	Simple REST API using Spring Boot – Create REST endpoints to display student details using @RestController and @GetMapping.
4	REST API with GET and POST – Create a simple Student REST API to add and retrieve student information using JSON.
5	Dependency Injection using Spring – Create StudentService and StudentController classes and demonstrate Dependency Injection using @Service and constructor injection.
6	Database Connectivity using Spring JDBC – Connect Spring Boot with MySQL and perform simple Insert and Display operations on a Student table.
7	CRUD Application using Spring Data JPA – Create a Student entity and perform Insert, View, Update and Delete operations using JPA Repository.
8	Student Management REST API – Develop a simple REST API for student records using Spring Boot, JPA and MySQL.
9	Basic Spring Security – Create a simple login application and protect selected web pages using Spring Security.
10	Testing and Packaging a Spring Boot Application – Write a simple JUnit test, build the application as a JAR file and run it using the command line.

TEACHING LEARNING PROCESS: Chalk and Talk, PowerPoint presentation, animations, videos

TEXTBOOKS:

1. Spring in Action Author: Craig Walls Edition: 6th Edition (or latest available) Publisher: Manning Publications
2. Enterprise Java Microservices: Building Scalable and Resilient Distributed Systems Author: Ken Finnigan Publisher: O'Reilly Media

E-RESOURCES:

1. https://youtu.be/If1Lw4pLLEo?si=B3F-MHZ8q4N9vh_b
2. https://youtu.be/UgX5lgv4uVM?si=GJLcXH9jior1_4pp

COURSE OUTCOMES:

CO1: Understand architecture and layers of enterprise applications.
CO2: Build web applications using Spring MVC and REST.
CO3: Implement service layers and apply dependency injection.
CO4: Integrate database operations using JDBC, JPA, and Hibernate.

SCHEME FOR EXAMINATIONS

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

MAPPING of COs with Pos

LEVEL OF CO-PO MAPPING TABLE								
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2						
CO2	3	3	2					
CO3	3	3	2					
CO4	3	3	2					
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1								

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Master of Computer Applications
Scheme and Syllabus – 2024 -2026

Semester	III						
Course Title	OPERATING SYSTEMS AND LINUX SYSTEM PROGRAMMING						
Course Code	MCAU331						
Category	Integrated Professional Elective Course (IPEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	00	02	00	04	26+26	3
CIE Marks: 50	SEE Marks:50		Total Max. Marks=100		Duration of SEE: 03 Hours		

Course Learning Objectives:

- Understand the concept of OS and different types of OS.
- Understand the techniques for management of different resources.
- Understand the UNIX Architecture, File systems and use of basic Commands.
- Understand and analyze UNIX System calls.

UNIT I: Introduction	5 Hours
Defining operating system, History and Evolution of operating system, Basic Concepts: batch processing, spooling, multiprogramming, multiprocessor system, time-sharing	
UNIT II: Process Management	5 Hours
Process concept, Process Control Block, Process State: State Transition Diagram, Scheduling Queues: Queuing Diagram, Types of schedulers-contexts switching and dispatcher,	
UNIT III: Introduction to UNIX:	6 Hours
Unix Architecture, Features of UNIX, General purpose utility commands, Basic and advanced file attributes, File system. Introduction to version control system: Introduction to Shell Script: Shell scripts, read, command line arguments, exit, wildcards, escape characters, logical operators and conditional operators	
UNIT IV: Programming through Shell Script:	5 Hours
if conditional, case conditional, expr computations and string handling, while looping, for looping, set and shift, trap interrupting a program, function: introduction, scope of variable Scripting Standards: Scripts and naming convention, Script File Permission,	
UNIT V: Introduction to filters:	5 Hours
pr: paginating files, head: Displaying the beginning of a file, tail: displaying the end of the file, cut: slitting a file vertically, paste: pasting files, sort: ordering a file, uniq, tr: translating characters. Filters and regular expression: grep: Searching for a pattern, Basic Regular Expression, Extended Regular Expression and egrep, sed: stream editor, Line addressing, Context addressing,	

PRACTICAL COMPONENT
List of Laboratory programs (2 hours/week per batch)

1. Write a shell script that takes a valid directory name as an argument and recursively descend all subdirectories, finds the maximum length of any file in that hierarchy and writes this maximum value to standard output
2. Write a shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions and otherwise output each file name followed by its permissions
3. Create a script file called file-properties that reads a file name entered and outputs its properties
4. Write a shell script which accepts valid log-in names as arguments and prints their corresponding home directories, if no arguments are specified, print a suitable error message.
5. Write a shell script that accepts a path name and creates all the components in that path name as directories. For example, if the script is named mpc, then the command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d.
6. Write a shell script that accepts one or more filenames as argument and convert all of them to uppercase provided they exist in current directory
7. Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which directory the search is to begin. If this second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at all levels must be searched. The script need not include any error checking.
8. Write a shell script to display the calendar for current month with current date replaced by * or depending on whether the date has one digit or two digits.
9. Write a shell script that accepts filenames as arguments and displays its creation time if the file exists and if the file does not exist, send output error message.
10. Write a shell script that accepts the file name, starting and ending line number as an argument and display all the lines between the given line number.

TEXT BOOKS

1.	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th edition, Wiley-India, 2006
2.	Sumitabha Das, Unix Concepts and Applications, McGraw Hill, 4th Edition, 2012, ISBN:978-0-07-063546-3
3.	Ganesh Naik, Learning Linux Shell Scripting, Packt Publishing, 2nd Edition, May 2018, ISBN:978-1788993197

REFERENCE BOOKS

1.	Imran Afzal, A Complete Course on Linux bash shell scripting with real life examples, Packt Publishing, July 2019, ISBN:9781838984083
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e-LEARNING RESOURCES

<https://www.coursera.org/courses?query=operating%20system>

COURSE OUTCOMES:

CO1	Demonstrate the need for OS and different types of OS
CO2	Apply suitable techniques for management of different resources
CO3	Understand the file system and demonstrate commands to extract and interpret data for further processing.
CO4	Analyze the usage of different shell commands and implement shell script commands

MAPPING of COs with POs

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Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Master of Computer Applications
Scheme and Syllabus - 2024 -2026

Semester	III						
Course Title	PROJECT MANAGEMENT WITH SCRUM AND GIT						
Course Code	MCAU332						
Category	Integrated Elective Course (IPEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	00	02	00	04	26+26	03
CIE Marks: 30+20=50	SEE Marks: 50		Total Max. marks=100		Duration of SEE: 03 Hours		

COURSE LEARNING OBJECTIVE:

- Understand the principles of Agile and Scrum methodology.
- Apply Scrum roles, artifacts, and events in software projects.
- Use version control systems effectively, especially Git.
- Collaborate using tools like GitHub, Git Lab, or Bitbucket.
- Integrate Scrum and version control in real-life project scenarios.

UNIT I: Introduction to Agile and Scrum		5 hours
Software Development Methods: Waterfall and Agile; Agile Manifesto and Principles; Introduction to Scrum; Scrum Roles: Product Owner, Scrum Master, and Development Team; Scrum Events: Sprint, Daily Scrum, Sprint Planning, Review, and Retrospective; Scrum Artifacts: Product Backlog, Sprint Backlog, and Increment.		
UNIT II: Scrum Project Management		5 hours
Project Planning using Scrum, User Stories and Acceptance Criteria, Product Backlog Creation and Prioritization, Sprint Planning, Story Points and Planning Poker, Sprint Execution and Monitoring, Scrum Board and Burndown Chart, Case Study: Managing a Software Project using Scrum.		
UNIT III: Introduction to Git and Version Control		6 hours
Need for Version Control, Benefits of Version Control in Software Projects, Centralized and Distributed Version Control, Introduction to Git and GitHub, Git Installation and Configuration, Basic Git Commands: init, clone, add, commit, status, log, Working with a Git Repository.		
UNIT IV: Git Branching and Team Collaboration		5 hours
Introduction to Branches, Creating and Switching Branches, Feature Branches, Merging Branches, Basic Conflict Resolution, Remote Repositories, GitHub Collaboration, Pull Requests, Issues and Project Boards, Good Commit Practices and Team Collaboration.		
UNIT V: Scrum and Git for Software Projects		5 hours
Connecting Scrum with Git, Managing Project Tasks using GitHub, Mapping Sprints with Development Tasks, Feature Branches for Sprint Work, Introduction to Continuous Integration, GitHub Actions basics, Mini Project: End-to-End Software Project using Scrum and Git.		
PRACTICAL COMPONENT Laboratory program (2 hours/week per batch)		
1	Create a Software Project using Scrum – Select a simple project such as a Library Management System and identify its objective, stakeholders, Scrum roles, and project requirements.	
2	Create a Product Backlog – Prepare a list of requirements for a Student Attendance System in the form of user stories and assign priorities.	
3	Sprint Planning and Estimation – Select user stories from the product backlog, assign story points using Planning Poker, and prepare a Sprint Backlog.	

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Scheme and Syllabus - CBCS – 2024 -2026

Semester	III						
Course Title	CYBER SECURITY						
Course Code	MCAU333						
Category	Integrated Professional Elective Course (IPEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	00	02	00	04		
CIE Marks: 50	SEE Marks: 50		Total Max. marks=100		Duration of SEE: 03 Hours		

COURSE OBJECTIVES:

- Understand the fundamental concepts of cybercrime, cybercriminals, cyber-attacks, attack vectors, and relevant cyber laws.
- Explain various cybercrime techniques and tools and buffer overflow attacks.
- Analyze phishing, identity theft, digital evidence, and the digital forensics life cycle to understand how cyber incidents are investigated.
- Apply appropriate security mechanisms and tools and network firewalls to demonstrate basic cyber defense practices.
- Demonstrate practical awareness of common network, web, wireless, and mobile security vulnerabilities through practical exercises.

UNIT I : Introduction, Cybercrime	5 hours
Definition and Origins of the word, Cybercrime and information Security, Who are Cybercriminals? Classifications of Cybercrimes. How Criminals Plan Them – Introduction, How Criminals Plan the Attacks, Cyber cafe and Cybercrimes, Botnets, Attack Vector, The Indian IT ACT 2000.	
UNIT II: Tools and Methods used in Cybercrime	5 hours
Introduction, Proxy Server and Anonymizers, Password Cracking, Key loggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow	
UNIT III: Phishing and Identity Theft	6 hours
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.	
UNIT IV: Cybercrime: Mobile and Wireless devices	5 hours
Introduction, proliferation of mobile and wireless devices, Trends in Mobility, credit card frauds in Mobile and wireless computing, Attacks on Mobile/cell phones.	

UNIT V: Network Defense tools**5 hours**

Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System.

PRACTICAL COMPONENT**List of Laboratory experiments (2 hours/week per batch)****10 lab sessions+ 1 repetition class+ 1 Lab Assessment.**

1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:

- a) Caesar Cipher
- b) Playfair Cipher
- c) Hill Cipher
- d) Vigenere Cipher
- e) Rail fence – row & Column Transformation

2. Implement the following algorithms

- a) DES
- b) RSA Algorithm
- c) Diffie-Hellman
- d) MD5
- e) SHA-1

3. Implement the Signature Scheme - Digital Signature Standard

4. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG)

5. Setup a honey pot and monitor the honeypot on network (KF Sensor)

6. Installation of rootkits and study about the variety of options

7. Perform wireless audit on an access point or a router and decrypt WEP and WPA. (Net Stumbler)

8. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)

9. Demonstrate how bots connect to a command-and-control (C2) server.

10..Build a vulnerable web application (simple login form) and Perform SQL injection attacks to bypass authentication.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES:

CO1: To Create Solutions in Incident Handling and Implement Cyber security Best Practices and management

CO2: Communicate in a Written and Professional Manner to Stratazize Identify and Implem Legal Ramifications.

CO4: Analyze the threats of cybercrime and the significance of detecting them.

1. Sunit Belapure and Nina Godbole, “Cyber Security: Understanding cyber crimes, computer forensics and legal perspectives”, Wiley India Pvt. Ltd, 2013
2. James Graham, Ryan Olson, Rick Howard, “Cyber SecurityEssentials”, CRC Press 2010

1. Bill Nelson, Amelia Philips and Christopher Steuart, “Guide to Computer Forensics and Investigations”, 4th Edition, 2015
2. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
3. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.

- Each full question consists of 20 marks.
- Questions are set covering all the topics under each module

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Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Master of Computer Applications
Scheme and Syllabus - CBCS – 2024-2026

Semester	III						
Course Title	PROJECT WORK						
Course Code	MCAP34						
Category	Ability Enhancement Project (AEP)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	00	00	04	00	04	56	03
CIE Marks: 50	SEE Marks: 50		Total marks=100		Max.	Duration of SEE: 03 Hours	

COURSE LEARNING OBJECTIVES:

- Apply classroom knowledge to real-world problems through research, design, and implementation.
- Develop innovative thinking by creating original solutions, systems, or applications.
- Gain project management experience using structured methodologies like Scrum and Git.
- Improve communication skills through professional documentation and effective presentations.

As part of the MCA programme, students will undergo a 4-week industry internship to gain practical exposure and professional experience. The internship will serve as the foundation for their major project work, which will be extended and carried forward throughout the entire 3rd semester. This integrated approach ensures that students apply classroom learning to real-world scenarios, develop industry-relevant skills, and produce a comprehensive project that reflects both academic rigor and practical application.

Project work is aimed at fostering research, practical application of knowledge, and innovation. The evaluation process follows these steps:

1. Selection and Approval of Project Work:

- Topic Selection: Students propose project topics, often in consultation with their faculty advisor.
- Approval Process: The proposed topic is submitted for approval by a project committee or department, ensuring alignment with academic standards and relevance.

2. Project Execution:

- Research and Development: Students carry out research, experiments, or development work as per the project plan.

3. Submission of the Project Report:

- Format and Guidelines: The report must follow the prescribed format by the university/department.

- **Plagiarism Check:** The report is often checked for plagiarism to ensure originality.

4. Evaluation Process:

- **Internal Evaluation:** Faculty members from the department review the project report and presentation for content quality, innovation, and depth of research.
- **External Evaluation:** An external examiner, often an industry expert or academician from another institution, reviews the project.
- **Viva Voce Examination:** The student defends their project work before a panel comprising internal and external examiners. This assesses their understanding, analytical ability, and application of the project work.

5. Grading Criteria (Guidelines only)

- **Report Quality:** Depth of research, organization, and clarity of the document.
- **Presentation Skills:** Effectiveness in communicating key aspects of the project.
- **Technical Merit:** Innovation, accuracy, and the applicability of the research.
- **Viva Performance:** Understanding of the subject, responses to questions, and ability to discuss the work effectively.

6. Final Outcome:

- **Marks Allocation:** Typically, evaluation is a blend of internal (guided by the department) and external (examiner's input) assessments, distributed over the report, presentation, and viva.
- **Pass Requirement:** Students must meet a minimum threshold to pass, as per university policies.

This structured evaluation ensures a comprehensive assessment of the student's practical and research capabilities, preparing them for further research or professional practice.

- **Periodic Reviews:** Regular progress reviews are conducted by faculty to monitor the project's progress and provide feedback.
- **Documentation:** Students maintain a detailed record of their methodology, data, results, and analysis.

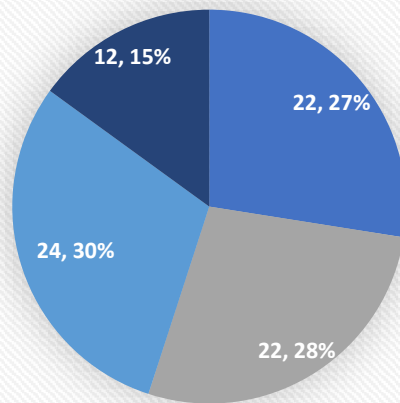
COURSE OUTCOME:

- CO1** Analyze and formulate a real-world computing problem through requirement analysis and literature survey.
- CO2** Design and develop an appropriate computing solution by applying relevant concepts, technologies, and methodologies.
- CO3** Evaluate and validate the developed solution using appropriate testing, analysis, and performance measures.
- CO4** Demonstrate professional competence through project documentation, presentation, teamwork, ethical practices, and viva voce.

MAPPING of COs with Pos:

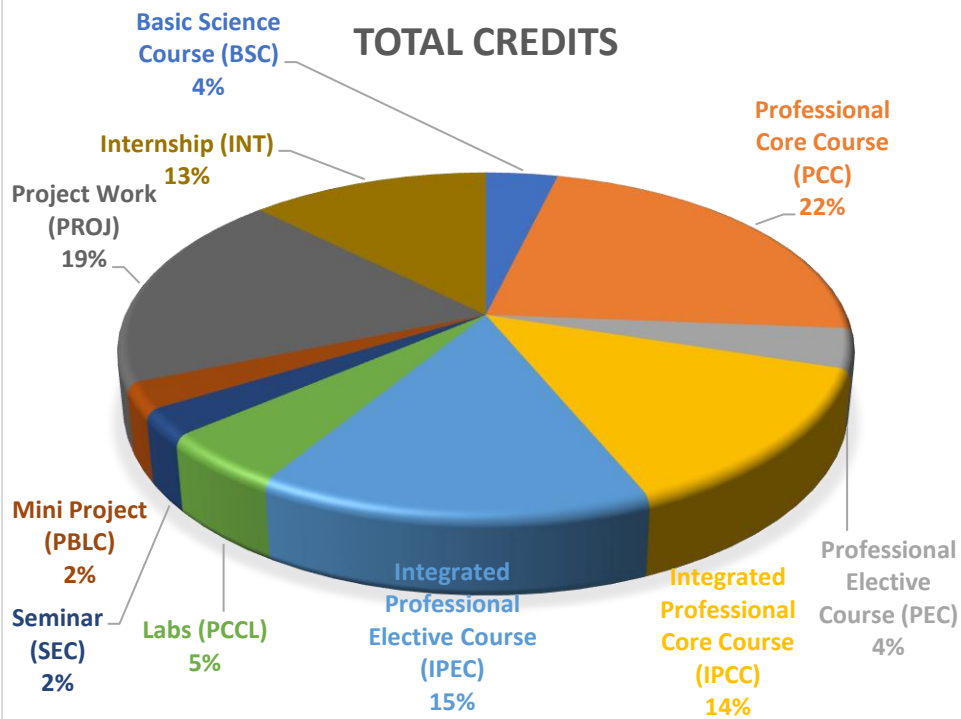
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Semester-wise Credits



■ Semester-1 ■ Semester-2 ■ Semester-3 ■ Semester-4

TOTAL CREDITS



ASSESSMENT DETAILS (BOTH CIE AND SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

- Three Tests conducted (Average of best two of three CIE tests conducted) for each of 30 Marks (duration 01 hour 30 minutes)
- Assignments covering all COs assessed of 10 Marks:
- Course Seminar suitably planned to attain the COs and POs assessed for 5 Marks.
- Group Activity assigned covering all Cos and mapping POs as assessed for 5 Marks.

CIE Evaluation components

Assessment	Max. Marks	Min. Passing marks
Average of two CIE tests conducted	30	15
Assignment	10	5
Seminar	5	2.5
Group Activity	5	2.5
Total	50	25

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- The 15 marks are for conducting the experiment and preparation of the laboratory record, the other 05 marks shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report.
- Each experiment report can be evaluated for 10 are added and scaled down to 15 marks. The laboratory test at the end /after completion of all the experiments shall be conducted for 50 marks and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 20 marks.

SEMESTER END EXAMINATION (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks. There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have a sub-question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module

SEE for IPCC

Theory SEE will be conducted by college as per the scheduled timetable, with common question papers for the course (duration 03 hours)

1. The question paper will be set for 100 marks and marks scored will be scaled down proportionately to 50 marks.
2. The question paper will have ten questions. Each question is set for 20 marks.
3. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
4. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

The minimum marks to be secured in CIE to appear for SEE shall be the 15 (50% of maximum marks-30) in the theory component and 10 (50% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only.

However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.

SEE will be conducted for 100 marks and students shall secure 40% of the maximum marks to qualify in the SEE. Marks secured will be scaled down to 50. (Student has to secure an aggregate of 50% of maximum marks of the course (CIE+SEE)).

Dr. Ambedkar Institute of Technology, Bengaluru-56

(An Autonomous Institution, Affiliated to VTU, Approved by AICTE, Accredited by NAAC with A+ grade)

Department of Master of Computer Applications

SCHEME OF TEACHING AND EXAMINATION OF MCA FOURTH SEMESTER 2024-2026

Sl. No.	Course Type	Course Code	Course Title	Teaching hours per week			Examination				Credits
				L	T	P	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1.	PEC	MMC41	MOOC	-	-	-	-	50	50	100	02
2.	SEC	MCAS42	Technical Seminar	-	2	-	3	-	50	50	02
3.	INT	MCAI43	Industry Internship	15 weeks duration			3	100	100	200	10
Total				-	-	-	6	150	200	350	14
Grand Total											
Total Marks: 2700				Total Credits: 80							
Note:											
SEC : Skill Enhancement Course						NCMC: Non-credit Mandatory Course					
INT : Internship						PP : Passing is Mandatory					
MRMI: Research Methodology & IPR						MOOC: Massive Open Online Course					
L : Lecture						P: Practical					
T : Tutorial											

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Master of Computer Applications
Scheme and Syllabus - CBCS – 2024-2026

Course Title	MOOC (Massive Open Online Course)						
Course Code	MMC41						
Category	Non-Credit Mandatory Course(NCMC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
		-	-	-	-	-	2
CIE Marks: 50	SEE Marks: 50		Total Max. marks: 100		Duration of SEE: 3 hours		

COURSE OBJECTIVES:

To develop self-directed learning skills through online courses, digital learning resources, and interactive learning platforms.

To develop technical and professional competencies by completing relevant online courses, assignments, quizzes, and projects.

To improve digital literacy and learning skills through effective use of online educational tools, multimedia content, and virtual learning environments.

To develop problem-solving and critical-thinking abilities by applying concepts learned through MOOCs to practical and real-world situations.

1. A student has to register and complete the online course individually.
2. Students shall take up any online courses of their interest like online.vtu.ac.in/ NPTEL. The courses can be chosen in the areas of any latest technology / programming skill / technical writing / aptitude skills/ personality development etc.
3. The course duration must span for 4-12 weeks duration.
4. This course does not have CIE, but online exam marks is considered for SEE. Student must produce the completion certificate before the last working day of 4th semester.
5. Students must obtain prior approval from the department's NPTEL course Coordinator, and the Head of the Department. (But different from the previously registered NPTEL course)

*** Strict monitoring of the student progress in the registered NPTEL course will be done by the**

Student's proctor, department's NPTEL course Coordinator and the Head of the Department.

Evaluation Criteria

- If a student scores below 40%, the course shall be marked as F (Fail), and no credits will be Transferred.

- The student must then take the NPTEL course in the next academic term as per institute Academic policies.
- At the end of 4th semester, if a student fails to clear the NPTEL course, special provision may be provided as the NPTEL supplementary exam guideline, which states that CIE of NPTEL to be considered and SEE to be conducted by the institution based on the NPTEL curriculum and assignments of the respective course.
- The course duration must span 4-12 weeks.
- This course does not have any CIE or SEE however, student must produce completion certificate for the course taken up during their MCA Course. The result is decided either pass or fail based on the course in the stipulated time.
- Passing NPTEL is mandatory.

COURSE OUTCOMES

By the end of the internship, students will be able to:

CO1: Understand fundamental concepts and principles related to the selected MOOC.

CO2: Apply knowledge gained from the MOOC to practical and real-world problems.

Mapping COs with POs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	1	2	0	0	0
CO2	3	3	3	2	3	1	1	1

Dr Ambedkar Institute of Technology, Bengaluru-56
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Semester	IV						
Course Title	TECHNICAL SEMINAR						
Course Code	MCAS42						
Category	Skill Enhancement Course (SEC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	00	02	00	00	02	56	02
CIE Marks: 50	SEE Marks: 50		Total marks=100			Max.	

COURSE OBJECTIVES:

To develop research skills by exploring recent advancements in chosen technical domains.

To enhance analytical ability through systematic review and comparison of scholarly papers.

To improve communication skills by presenting technical content clearly and effectively.

To strengthen documentation practices with structured reports adhering to academic standards.

Topic Selection

- Choose a broad research or technical domain
- Narrow down to a specific area of inquiry

Literature Review

- Collect 10-12 recent research papers (preferably from the last 2–3 years) from reputed sources such as IEEE Xplore, ScienceDirect, or ACM Digital Library.
- Select the best 5–8 papers, prioritizing journal publications or high-quality conference papers.

Paper Analysis

- Study the selected papers systematically.
- Summarize each paper based on contributions, improvements claimed, parameters used, experiments conducted, and tools applied.

Report Preparation

- Compile a structured report highlighting contributions, differences among approaches, possible improvements, and critical analysis.
- Ensure adherence to prescribed format and originality through plagiarism checks.

Evaluation Process

- Internal evaluation by faculty guides based on report quality, innovation, and depth of research.
- External evaluation by industry experts or academicians from other institutions.
- Viva voce examination to assess understanding, analytical ability, and application of the seminar topic.

Grading Criteria

- Report quality (clarity, depth, organization).
- Presentation skills (effective communication of key aspects).
- Technical merit (innovation, accuracy, applicability).
- Viva performance (subject knowledge, analytical responses, discussion ability).

Final Outcome

- Marks are awarded based on a blend of internal and external evaluations covering report, presentation, and viva.
- Students must meet the minimum threshold set by university policies.
- Periodic reviews and documentation of methodology, data, results, and analysis are mandatory.

Continuous Internal Evaluation (CIE) – 50 Marks

Evaluation will be conducted in **two phases**, based on the following rubrics:

- **Phase 1 (25 Marks):**
 - Selection of topic and its technical relevance
 - Review of literature
 - Consideration of sustainability and societal concerns
 - Presentation of the selected study
- **Phase 2 (25 Marks):**
 - Review of technological developments and analysis
 - Presentation skills
 - Report writing quality

Evaluation will be carried out by a **senior faculty/internal guide** along with **one external member** from academia, industry, or a research organization.

Semester End Evaluation (SEE) – 50 Marks

Assessment will be based on the following rubrics:

- Topic selection – **5 Marks**
- Literature review – **10 Marks**
- Technical relevance, sustainability, and societal concerns – **15 Marks**
- Presentation skills – **10 Marks**
- Viva voce – **10 Marks**

COURSE OUTCOMES

By the end of the seminar, students will be able to:								
CO1-Identify and analyze recent research trends in chosen technical domains.								
CO2-Evaluate and compare scholarly contributions, methodologies, and tools from selected research papers.								
CO3-Present technical content effectively through structured seminars and professional communication.								
CO4-Prepare well-documented reports that highlight analysis, interpretations, and scope for further improvement.								
Mapping COs with POs								
CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	2	–	–	1	3
CO2	3	3	2	2	1	1	2	3
CO3	2	2	1	2	3	1	1	2
CO4	2	2	1	2	2	1	3	3

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Master of Computer Applications
Scheme and Syllabus - CBCS – 2024 -2026

Semester	IV						
Course Title	INDUSTRY INTERNSHIP						
Course Code	MCAI43						
Category	INTERNSHIP (INT)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	15 WEEKS DURATION						10
CIE Marks: 100	SEE Marks: 100	Total marks=200		Max.	Duration of SEE: 03 Hours		

COURSE OBJECTIVES:

CLO1: To gain industry exposure by applying classroom knowledge in real organizational settings.

CLO2: To develop professional skills through hands-on experience with tools, technologies, and workflows.

CLO3: To enhance teamwork and communication by collaborating with industry professionals and peers.

CLO4: To build career readiness by understanding workplace practices, ethics, and problem-solving approaches.

The internship is intended to provide students with practical exposure to real-world professional environments and enable them to apply the knowledge and skills acquired during the programme to industry, research, or application-oriented problems.

The internship may be undertaken in an industry, R&D organization, business organization, research institute, academic/research institution, or other recognized organization, subject to the applicable VTU and institutional guidelines.

INT: Industry/ Research Internship leading to the project work /startup

Industry Internship: The main objective of the industry internship is to ensure that the intern is exposed to a real-world environment and gain practical experience. Often, it may be a practical exposure to the theory that has been learned during the academic period. The industry internship helps students understand of analytical concepts and tools, hone their skills in real-life situations, and build confidence in applying the skills learned.

Research Internship: A research internship is an opportunity for students or early career professionals to gain hands-on experience in conducting research under the guidance of a mentor or within a research team. These internships can take place in academic institutions, research organizations, government agencies, or private companies

Research /Industry Internship: In the fifth-semester Students have to be in touch with a guide/mentor/coordinator and regularly submit the report referred to the progress internship. Based on the progress report the Guide/Mentor/coordinator has to enter the CIE marks. He/she has to attend the SEE at the parent Institute.

Internship: The student shall undergo an Internship for the specified period as per the Scheme of Teaching and Examination.

- 1) The department/college shall nominate a faculty member to facilitate, guide, and supervise students under internship.
- 2) The students shall report the progress of the internship to the internal guide at regular intervals and seek his/her advice.
- 3) The Internship shall be completed during the period specified in the Scheme of Teaching and Examination.
- 4) After completion of the Internship, students shall submit a report to the Head of the Department with the approval of both internal and external guides.
- 5) There shall be 100 marks for CIE (Presentation: 50 marks, Report: 50 marks) and shall be evaluated by the internal panel.
- 6) The students are permitted to carry out the internship only at the companies registered under VTU.

Continuous Internal Evaluation (CIE) – 50 Marks

Assessment will be conducted during the semester based on the following components:

- **Internship Report – 20 Marks**
- **Seminar Presentation – 20 Marks**
- **Question & Answer Session – 10 Marks**
- **Total-50 Marks**

Semester End Evaluation (SEE) – 50 Marks

Final evaluation at the end of the semester will follow the same criteria:

- **Internship Report – 20 Marks**
- **Seminar Presentation – 20 Marks**
- **Question & Answer Session – 10 Marks**
- **Total – 50 Marks**

COURSE OUTCOMES

By the end of the internship, students will be able to:

CO1-Apply academic knowledge to real-world industry problems and professional practices.

CO2-Gain hands-on experience with tools, technologies, and workflows used in organizations.

CO3-Collaborate effectively in teams, demonstrating communication and interpersonal skills in a workplace setting.

CO4- Understand professional ethics and practices by observing industry standards, sustainability concerns, and problem-solving approaches.

Mapping COs with POs								
CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	2	2	1	1	3
CO2	2	2	3	3	2	2	1	3
CO3	1	1	2	1	3	2	2	2
CO4	2	3	2	2	3	2	3	3