Thakur Institute of Management Studies, Career Development & Research, Mumbai

(Autonomous Institute Affiliated to University of Mumba, Approved by AICTE and Government. of Maharashtra)

ISO 20001:2018 Certified

Accredited by National Board of Accreditation

Accredited with A+ Grade by National Assessment and Accreditation Council,

Master of Computer Applications (MCA)

Choice Based Credit System with Multiple Entry and Multiple Exit Option

First Year with Effect from AY 2024-25 (Sem. I, II & Bridge Course)

Second Year with Effect from AY 2025-26 (Sem. III, IV)

SYLLABUS SEM II

Under

FACULTY OF SCIENCE & TECHNOLOGY

(As per AICTE, NEP 2020 & Government of Maharashtra Guidelines with effect from the Academic Year 2024-25)

Course Code	Course Name				
MM-MCA-21	Artificial Intelligence & Machine Learning				
Teaching Scheme: Contact Hours (Per Week)			Credits Assigned		
Theory	Tutorial	Total	Theory	Tutorial	Total
3	-	3	3	-	3
Examination Scheme (Marks)					
In Semester Assessment(ISA)			End Sem. Examination	Term Work	Total (Marks)
Continuous Assessment (CA)	MSE	Total (ISA) (CA + MSA)			
25	25	50	50	-	100

Prerequisite: Data Preprocessing and mining

Course Objectives: Course aim to:

Sr. No.	Course Objective
1	Understand the foundational concepts of AI, including intelligent agents, reasoning, and logic.
2	Analyze and compare different search techniques and their applications in AI problem-solving.
3	Evaluate machine learning methods, including supervised, unsupervised, and reinforcement learning, for various applications.
4	Apply advanced machine learning techniques such as ensemble learning and dimensionality reduction to complex data problems

Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Explain the basic concepts of AI and the structure of intelligent agents.	Understand
CO2	Analyze and implement appropriate search algorithms to solve AI problems.	Evaluate
CO3	Apply and evaluate different supervised and unsupervised machine learning models including dimensionality reduction	Evaluate

CO4	Apply and analyze techniques for ensemble learning and understand reinforcement learning.	Analyze

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Introduction to AI concept** - Definition of AI, History, and Future of AI, Problem-solving Approach to Typical AI Problem. Intelligent Agents and Environment the structure of an agent, Types of Agents, Environments and Its Properties, PEAS Representation for an Agent, Reasoning and Logic, Prepositional logic, First order logic, Using First-order logic, Inference in First-order logic. **Self-Learning -** Forward and Backward Chaining	6	1	1
2	**Search techniques -** Depth First Search, Breadth First Search, Uniform Cost Search, Depth Limited Search, Iterative Deepening, Bidirectional Search, Comparing Different Techniques Informed Search Methods: Heuristic functions, Best First Search, A*, AO*, Hill Climbing, Simulated Annealing, Min-max search procedure, Alpha-beta pruning **Self-Learning:** Constraint programming (CP)	6	2	2
3	**Basics of ML & Supervise Learning:** Need and Applications of Machine Learning, Process of Learning in ML, Comparison: Data Mining vs. Machine Learning, Types of Learning: Supervised, Unsupervised, and Reinforcement Learning, Training vs. Testing in Machine Learning, Challenges in Learning: Overfitting and Regularization Classification methods: Statistical-based algorithms-Regression, Naïve Bayesian classification, Distance-	6	3	3

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
	based algorithm- K Nearest Neighbor, Decision Tree-based algorithms – CART **Self-Learning –** Semi-supervised learning			
4	**Advanced Techniques in Supervised Learning:** Non-linear regression, Logistic Regression, -Random Forest, Bayesian Belief networks, Bias/variance tradeoff, Introduction, Optimal Separating Hyperplane, separating data with maximum margin, Support Vector Machine (SVM), Finding the maximum margin, The Non-Separable Case: Soft Margin Hyperplane, Kernel Trick, Defining Kernels **Self-Learning –** Bayesian Belief Network	6	3	3
5	**Unsupervised learning and Dimensionality Reduction**- Clustering Methods: Partitioning methods- K-Means, Hierarchical-Agglomerative and divisive methods Dimensionality reduction - Feature Engineering, Feature Selection methods, - Filters; Wrappers, Embedded, PCA, LDA, Case Study (Clustering/Anomaly/Fraud Detection) **Self-Learning –** SVD	7	3	3
6	**Ensemble learning Methods and Reinforcement** – Ensemble learning - Mixture Models, Classifier using multiple samples of the data set, improving classifier by focusing on error, weak learner with a decision stump, Bagging, Stacking, Boosting, Implementing the AdaBoost algorithm, Classifying with AdaBoostBootstrapping and cross validation Reinforcement Learning (RL), Elements of Reinforcement Learning, Reinforcement Learning vs Supervised Learning, Approaches of solving Reinforcement Learning: Value based, policy based, model based, MDP **Self-Learning –** Monte Carlo methods	9	4	3

Reference Books:

Reference No.	Reference Name
1	Stuart Russell, Peter Norvig ,Artificial Intelligence – A Modern Approach, , Pearson Education / Prentice Hall of India, 3rd Edition, 2009 .ISBN- 13: 978-013604259
2	Tom Mitchell, Machine Learning, Mcgraw-Hill, First Edition, ISBN No. 0-07-115467-1.
3	Peter Harrington, Machine Learning in Action . Manning Publications , April 2012 ,ISBN 9781617290183
4	George F Luger, Artificial Intelligence, Fifth Edition-2009, Pearson Education Publications ,ISBN-978-81-317-2327-2
5	Christopher M. Bishop, Pattern Recognition and Machine Learning, McgrawHill, ISBN No. 978-81-322-0906
6	Kumar Satish ,Neural Networks, Second edition Tata McGraw Hill-,2013, ISBN1259006166, 9781259006166
7	Anandita Das ,Artificial Intelligence and Soft Computing for Beginners-,2nd Edition, ShroffPublication, ISBN- 9789351106159
8	Elaine Rich, Kevin Knight, S.B. Nair, Artificial Intelligence, 3rd Edition, Tata McGraw Hill-2008., ISBN 10: 0070087709 / ISBN 13: 9780070087705

Web References:

Reference No.	Reference Name
1	nptel.ac.in-A first course in Artificial Intelligence-Deepak Khemani,
2	nptel.ac.in -Introduction to machine learning – BalaramanRavindran, IIT Madras
3	Tutorial point.com/machine_learning_with_python/index.htm

Assessment:

Continuous Assessment (CA): 25 marks

Following measures can be used for the continuous assessment as:

- Assignments /Quiz /Case studies /Presentations /Projects /Any other measure with the permission of the Director and HOD-Academics.
- The continuous evaluation has to be done throughout the Semester.
- The faculty can use the flexibility of the mode as per the requirement of the course.
- The CA will be the average of 2 assessments of amounting to total 20 marks
- Continuous Assessment marks will be the total of the CA (20 marks) and attendance (5 marks)
- The students can accrue 10 marks at most by attempting any of the following **assessment tools** for improving their termwork marks of CA. The term work will be capped at 20 marks in any case.
- The List of **assessment tools need to be validated by the** subject-faculty **and** approved by the HOD-Academics/ Director**.**

Sr. No.	Assessment Tools	Marks
1.	Subject relevant certificate course for 4 weeks or more from MOOCS platforms / Swayam / NPTEL (assignment submission with qualifying marks) or competitions of Smart India Hackathon.	10 marks
2.	Participation/ Win in subject relevant event/ competition/ hackathon	05/10 marks
3.	Content beyond syllabus/Self-learning presentation	05 marks
4.	Creating subject relevant Proof of concept(patent/copyright)	10 marks
5.	Participation in subject relevant event/workshop/Conference/ competition (in other Institutes)	05 marks

Relevant certificates will have to be submitted to concerned faculty.

Mid Semester Examination(MSE): 25 marks

- Assessment consists of one class test of 20 marks.
- The class test is to be conducted when approx. 40 -50% of the syllabus is completed.
- Duration of the class test shall be 1 hour 15 minutes.

In Semester Assessment (ISA): 50 marks

- The In Semester Assessment marks will be the total of the MSE (25 marks) and CA (25 marks).

End Semester Theory Examination: 50 marks

- Weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.
- Duration of the class test shall be 2 hours.

Course Code	Course Name				
RM- MCA-21	Research Methodology				
Teaching Scheme: Contact Hours (Per Week)			Credits Assigned		
Theory	Tutorial	Total	Theory	Tutorial	Total
3	1	4	3	1	4
Examination Scheme (Marks)					
In Semester Assessment (ISA)			End Sem. Examination	Term Work	Total (Marks)
Continuous Assessment (CA)	MSE	Total (ISA) (CA + MSE)			
25	25	50	50	25	125

Prerequisite: NIL

Course Objectives: The course aims to

Sr. No.	Course Objective
1	To Impart knowledge on the identification of research problem
2	To discuss aspects such as creating good research design
3	To practice formulation of hypothesis and objectives of research study
4	To apply statistical methods and ICT tools for analysis of data
5	To elaborate process of writing a good research report and understanding about ethics in research

Course Outcomes (CO): On successful completion of the course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	To formulate correct research problem	Understand and Apply

CO2	To successfully construct testable hypothesis	Create
CO3	To be able construct accurate research design in terms of questionnaire, surveys etc for collecting and analyzing data	Apply and Create
CO4	To write a comprehensive and accurate research report following the ethics code	Create

CO PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-
CO3	-	3	-	2	-	-	-	-
CO4	-	-	3	2	2	2	2	3

Course Contents:

Module No.	**Detailed Contents**	**Hrs.**	**CO No.**	**Ref No.**
1	**Introduction to RM:** The concept of research, Need for understanding of research, characteristics of good research, Research Approaches, Significance of Research, Research Methods versus Methodology, Application of Research, Problems Encountered by Researchers in India **Self Learning:- Research and Scientific Method**	**4**	**1**	**1**
2	**Problem Identification and Formulation in Research:** Literature Review Process, Identifying gap areas from literature and research database, Formulation of Research Questions, Hypothesis- Characteristics and Types Hypothesis Testing – Logic and Importance **Self Learning:- Importance of literature review in defining a problem**	**6**	**2**	**1,2**
3	**Types of Research and research design:** Types of research, pure (basic, fundamental) and applied research, qualitative and quantitative. Research Design: Meaning, need, types of research design – Exploratory, Descriptive, Causal research Design, Components	**8**	**3**	**1**

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
	of research design, and Features of good Research design. Experiments, surveys and case study Research design **Self Learning: - Concept of Independent & Dependent variables.**			
4	**Sampling, Data Collection and analysis:** Types and sources of data – Primary and secondary, Methods of collecting data, Concept of sampling and sampling methods – sampling frame, sample, characteristics of good sample, simple random sampling, purposive sampling, convenience sampling, designing and Validation, verification of data collection tools, snowball sampling, classification and tabulation of data, coding the data, graphical representation of data, graphs and charts – Histograms, frequency polygon and frequency curves, bell shaped curve, and its properties. Statistical Methods for Data Analysis **Self Learning:-Applications of Statistics in Research**	**8**	**3**	**1,3**
5	**Reporting the research outcomes:** Reporting research outcomes using research paper–Identifying title for research paper, layout of a research paper, process of publishing a paper in a good journal. Research report and its structure, journal articles – Components of journal articles. Explanation of various components. Structure of an abstract and keywords. Thesis and dissertations. Components of thesis and dissertations. Referencing styles and bibliography. **Self Learning:- Technique of Interpretation**	**8**	**4**	**4,5**
6	**Ethics in Research and use of ICT tools:** Plagiarism - Definition, different forms, consequences, unintentional plagiarism, copyright infringement, collaborative work. Qualities of good Researcher ICT Tools for Research: Role of computers in research, maintenance of data using software such as Mendeley, Endnote, Tabulation and graphical presentation of research data and software tools. (Suggested use of SPSS/ PSPP or MATLAB or any other equivalent open-source tools) **Self Learning:- Impact Factor – Citation index of Journals**	**6**	**4**	**1,6**

Reference Books:

Reference No	Reference Name
1	Kothari CR. Research Methodology, Methods and Techniques. New Age International (P) Ltd., Publishers. 2004.
2	Ridley D. The literature review: A step-by-step guide for students.
3	Newbold P, Carlson WL, Thorne BM. Statistics for business and economics. Pearson; 2013.
4	Lester JD, Lester Jr JD. Writing research papers: A complete guide. Pearson; 2018.
5	Booth WC, Colomb GG, Williams JM. The craft of research. University of Chicago press; 2009 May 15.
6	Kumar R. Research methodology: A step-by-step guide for beginners.

Web References:

Reference No	Reference Name
1	https://gradcoach.com/what-is-research-methodology/
2	https://www.indeed.com/career-advice/career-development/research-methodology
3	https://paperpal.com/blog/academic-writing-guides/what-is-research-methodology
4	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5037944/

Tutorials:

Sr.No	Experiments
1	Case study discussion on different research approaches.
2	Workshop on formulating research questions and hypotheses
3	Group discussion on designing research for specific case studies.
4	Comparative analysis of qualitative and quantitative research methods.
5	Practical exercise on creating a sampling plan for a research project
6	Fieldwork simulation for data collection.
7	Hands-on session using statistical software (SPSS/PSPP/MATLAB)
8	Write a mock research paper abstract and outline.
9	Case studies on ethical dilemmas in research.
10	Tutorial on using Mendeley/Endnote/Overleaf for reference management.
11	Simulation of the journal submission process.
12	Discussion on the future of research methodologies.

Assessment:

Continuous Assessment (CA): 25 marks

Following measures can be used for the continuous assessment as:

- Assignments /Quiz /Case studies /Presentations /Projects /Any other measure with the permission of the Director and HOD-Academics.
- The continuous evaluation has to be done throughout the Semester.
- The faculty can use the flexibility of the mode as per the requirement of the course.
- The CA will be the average of 2 assessments of amounting to total 20 marks
- Continuous Assessment marks will be the total of the CA (20 marks) and attendance (5 marks)
- The students can accrue 10 marks at most by attempting any of the following **assessment tools** for improving their termwork marks of CA. The term work will be capped at 20 marks in any case.
- The List of **assessment tools need to be validated by the** subject-faculty **and** approved by the HOD-Academics/ Director**.**

Sr. No.	Assessment Tools	Marks
1.	Subject relevant certificate course for 4 weeks or more from MOOCS platforms / Swayam / NPTEL (assignment submission with qualifying marks) or competitions of Smart India Hackathon.	10 marks
2.	Participation/ Win in subject relevant event/ competition/ hackathon	05/10 marks
3.	Content beyond syllabus/Self-learning presentation	05 marks
4.	Creating subject relevant Proof of concept(patent/copyright)	10 marks
5.	Participation in subject relevant event/workshop/Conference/ competition (in other Institutes)	05 marks

Relevant certificates will have to be submitted to concerned faculty.

Mid Semester Examination(MSE): 25 marks

- Assessment consists of one class test of 20 marks.
- The class test is to be conducted when approx. 40 -50% of the syllabus is completed.
- Duration of the class test shall be 1 hour 15 minutes.

In Semester Assessment (ISA): 50 marks

- The In Semester Assessment marks will be the total of the MSE (25 marks) and CA (25 marks).

Term Work : 25 marks

- The term work will be based on the tutorial performance of the student**.**

End Semester Theory Examination: 50 marks

- Weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.
- Duration of the class test shall be 2 hours.

Course Code	Course Name				
ME-MCA-211	Software Testing and Quality Assurance				
Teaching Scheme: Contact Hours (Per Week)			Credits Assigned		
Theory	Tutorial	Total	Theory	Tutorial	Total
3	-	3	3	-	3
Examination Scheme (Marks)					
In Semester Assessment(ISA)			End Sem. Examination	Term Work	Total (Marks)
Continuous Assessment (CA)	MSE	Total (ISA) (CA + MSA)			
25	25	50	50	-	100

Prerequisite: Basic Programming knowledge

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	Develop a deep understanding of the fundamental principles and methodologies of software testing, including various testing types, levels, and the overall testing lifecycle.
2	Gain proficiency in designing and executing test cases and scenarios that ensure comprehensive coverage of software requirements, and learn to document and report defects effectively.
3	Acquire understanding with manual and automated testing tools, and learn to apply different testing techniques such as black-box and white-box testing to evaluate software quality.
4	Understand the role of software testing within the broader software development process.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Understand fundamental concepts and terminology in software testing, including test levels, test types and defect life cycle.	Understand

CO2	Explain the role and significance of different software testing techniques and how they contribute to software quality.	Understand
CO3	Design test cases using appropriate test design techniques, such as boundary value analysis and equivalence partitioning.	Apply
CO4	Demonstrate and interpret automated testing tools and effectively collaborate in Agile teams, applying Agile testing principles	Apply

COPO Mapping:

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

Course Contents:

Module No.	Detailed Contents	Hrs	CO No	Ref No
1	**Module:** Fundamentals of Testing-What is testing, Testing principles, Fundamental test process. Test levels, Test types: the targets of testing, Maintenance testing. **Self-learning:** Different Types of Functional and Non-Functional Testing	5	1	1
2	**Testing processes** Introduction, Test Process Models, Test Planning and Control, Test Analysis and Design, Test Implementation and Execution, Evaluating Exit Criteria and Reporting, Test Closure activities. **Self-learning:** Necessity of Test Case Documentation	7	1,2	1

Module No.	Detailed Contents	Hrs	CO No	Ref No
3	**Test Design Techniques** Identifying test conditions and designing test cases, Categories of test design techniques, Specification-based or Black box techniques, White box techniques, Experience-based techniques, and Choosing test techniques. **Self-learning:** Functional Specification-Based Test Case Design	8	2,3	2
4	**Reviews** Introduction, The principles of reviews, Type of reviews, Introducing Reviews-Defect Removal Effectiveness of Reviews, Success Factors for Reviews. Incident Management- Introduction, Defect Life Cycle, Defect Fields. **Self-learning:** Review Case study	6	3	2
5	**Test Tools and Automation** Introduction, Test Tool Concepts Automation Costs, Risks, and Strategies, Test tool Classification, Test Tool Categories- Test Management Tools, Test Execution tools, Keyword-Driven Automated Test Execution. **Self-learning:** A case study of Integrated Test tools.	7	4	3
6	**Agile Testing** Agile Testing Life Cycle, Agile Testing Quadrants, Agile Testing Techniques: Behavior Driven Development, Session Based testing, Acceptance Driven testing, Exploratory Testing. **Self-learning:** Role of Tester in Risk-based Testing	7	4	3

Topics of Content Beyond Syllabus: QuickTestPro, Checkpoints (Standard Checkpoint/Bitmap Checkpoint)

Reference Books:

Reference No	Reference Name
1	Foundations of Software Testing-2nd Edition, by Dorothy Graham,Erik Van Veenendaal,Cengage Learning
2	Advanced Software Testing-Volume 2,by Rex Black,Shroff Publishers
3	Software Testing Concepts and Tools,by Nageswara Rao Pusuluri,Dreamtech

Web References:

Reference No	Reference Name
1	https://www.guru99.com/
2	https://www.softwaretestinghelp.com/
3	https://www.geeksforgeeks.org/top-10-resources-to-learn-software-testing-in-2023/
4	https://onlinecourses.nptel.ac.in/noc22_cs61/preview
5	https://www.istqb.org/

Assessment:

Continuous Assessment (CA): 25 marks

Following measures can be used for the continuous assessment as:

- Assignments /Quiz /Case studies /Presentations /Projects /Any other measure with the permission of the Director and HOD-Academics.
- The continuous evaluation has to be done throughout the Semester.
- The faculty can use the flexibility of the mode as per the requirement of the course.
- The CA will be the average of 2 assessments of amounting to total 20 marks
- Continuous Assessment marks will be the total of the CA (20 marks) and attendance (5 marks)
- The students can accrue 10 marks at most by attempting any of the following **assessment tools** for improving their termwork marks of CA. The term work will be capped at 20 marks in any case.
- The List of **assessment tools need to be validated by the** subject-faculty **and** approved by the HOD-Academics/ Director**.**

Sr. No.	Assessment Tools	Marks
1.	Subject relevant certificate course for 4 weeks or more from MOOCS platforms / Swayam / NPTEL (assignment submission with qualifying marks) or competitions of Smart India Hackathon.	10 marks
2.	Participation/ Win in subject relevant event/ competition/ hackathon	05/10 marks
3.	Content beyond syllabus/Self-learning presentation	05 marks
4.	Creating subject relevant Proof of concept(patent/copyright)	10 marks
5.	Participation in subject relevant event/workshop/Conference/ competition (in other Institutes)	05 marks

Relevant certificates will have to be submitted to concerned faculty.

Mid Semester Examination(MSE): 25 marks

- Assessment consists of one class test of 20 marks.
- The class test is to be conducted when approx. 40 -50% of the syllabus is completed.
- Duration of the class test shall be 1 hour 15 minutes.

In Semester Assessment (ISA): 50 marks

- The In Semester Assessment marks will be the total of the MSE (25 marks) and CA (25 marks).

End Semester Theory Examination: 50 marks

- Weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.
- Duration of the class test shall be 2 hours.

Course Code	Course Name				
ME-MCA-212	Digital Marketing Essentials				
Teaching Scheme: Contact Hours (Per Week)			Credits Assigned		
Theory	Tutorial	Total	Theory	Tutorial	Total
3	-	3	3	-	3
Examination Scheme (Marks)					
In Semester Assessment(ISA)			End Sem. Examination	Term Work	Total (Marks)
Continuous Assessment (CA)	MSE	Total (ISA) (CA + MSA)			
25	25	50	50	-	100

Prerequisite: Nil

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	Develop a deep understanding of the fundamental principles and methodologies of key digital marketing concepts, including SEO, SEM, content marketing, social media marketing, email marketing, and affiliate marketing.
2	Learn how to create and implement effective digital marketing strategies that align with business goals and target audience needs.
3	Create comprehensive digital marketing plans and campaigns using real-world case studies and practical applications.
4	Learn to design, implement, and optimize email marketing campaigns and understand the role of marketing automation tools in nurturing leads and enhancing customer relationships.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Create and implement effective digital marketing strategies tailored to specific business objectives and target audiences.	Create

CO2	Learn to plan, execute, and manage social media campaigns on platforms such as Facebook, Instagram, Twitter, LinkedIn, and YouTube to drive brand awareness and engagement.	Apply
CO3	Learn to develop and manage engaging content across digital platforms, optimizing it for both search engines and user engagement.	Apply
CO4	Understand use digital marketing analytics tools (e.g., Google Analytics) to measure campaign performance, analyze user behavior, and make data-driven decisions to optimize marketing efforts.	Analyze

COPO Mapping:

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

Course Contents:

Module No.	Detailed Contents	Hrs	CO No	Ref No
1	**Fundamentals of Digital Marketing :** Introduction to Digital Marketing - Importance and Scope, Traditional Marketing vs. Digital Marketing, Key Concepts and Terminology **Self-learning –** Growth Hacking Strategies	5	1	1
2	**Content Marketing :** Introduction to Content Marketing, Types of Content, Content Creation Strategies, Content Distribution Channels,Measuring Content Effectiveness **Self-learning -** Dynamic Content Creation	6	2	2

Module No.	Detailed Contents	Hrs	CO No	Ref No
3	**Website Planning and Development :** Understanding Websites and Domains, Introduction to Content Management Systems (CMS), Basics of HTML, CSS, and JavaScript, Designing User-Friendly Websites, Introduction to WordPress **Self-learning -** Growth-Driven Design	7	3	1
4	**Digital Marketing Channels :** Overview of Digital Marketing Channels,Search Engine Marketing (Advertising), Social Media Marketing (SMM), Email Marketing, Content Marketing, Affiliate Marketing **Self-learning -** Local SEO and Hyperlocal Targeting	7	3	1, 3
5	**Search Engine Optimization (SEO) :** Introduction to SEO, On-Page SEO, Off-Page SEO, Technical SEO, Keyword Research and Analysis, SEO Tools and Techniques **Self-learning -** Automated Technical SEO Audits	8	4	1
6	**Social Media Marketing (SMM) :** Introduction to Social Media Marketing, Platforms:(Facebook, Instagram, Twitter, LinkedIn, Pinterest, YouTube), Social Media Strategy and Planning, Social Media Advertising, Analytics and Reporting **Self-learning -** Social Media Crisis Management and Reputation Management	7	2	1

Topics of Content Beyond Syllabus: Customer Relationship Management (CRM)

Reference Books:

Reference No	Reference Name
1	Seema Gupta, Digital Marketing , Second Edition, The McGraw Hill Company
2	Ryan Deiss, Digital Marketing for Dummies , Part 2 , A wiley brand
3	Jan, Deborah ,Social Media Marketing, Book III, A wiley brand
4	Michael T. Clark, The Affiliate Marketing Bible: 5 in 1, A wiley brand

Web References:

Reference No	Reference Name
1	"Digital Marketing for Dummies" by Ryan Deiss and Russ Henneberryhttp://repo.darmajaya.ac.id/4150/1/Digital%20Marketing%20For%20Dummies%20%28%20PDFDrive%20%29.pdf
2	Introduction-to-seo-ebook.pdf https://cdn2.hubspot.net/hub/53/file-13204607-pdf/docs/introduction-to-seo-ebook.pdf
3	Website Planning and Development https://www.eway-crm.com/eWay-Book/eWay-Book%20-%20Online%20Marketing%20EN.pdf
4	Content Marketing https://mailchimp.com/marketing-glossary/content-marketing/
5	Social Media Marketing (SMM) https://library.uniteddiversity.coop/Media_and_Free_Culture/The_Social_Media_Marketing_Book.pdf

Assessment:

Continuous Assessment (CA): 25 marks

Following measures can be used for the continuous assessment as:

- Assignments /Quiz /Case studies /Presentations /Projects /Any other measure with the permission of the Director and HOD-Academics.
- The continuous evaluation has to be done throughout the Semester.
- The faculty can use the flexibility of the mode as per the requirement of the course.
- The CA will be the average of 2 assessments of amounting to total 20 marks
- Continuous Assessment marks will be the total of the CA (20 marks) and attendance (5 marks)
- The students can accrue 10 marks at most by attempting any of the following **assessment tools** for improving their termwork marks of CA. The term work will be capped at 20 marks in any case.
- The List of **assessment tools need to be validated by the** subject-faculty **and** approved by the HOD-Academics/ Director**.**

Sr. No.	Assessment Tools	Marks
1.	Subject relevant certificate course for 4 weeks or more from MOOCS platforms / Swayam / NPTEL (assignment submission with qualifying marks) or competitions of Smart India Hackathon.	10 marks
2.	Participation/ Win in subject relevant event/ competition/ hackathon	05/10 marks
3.	Content beyond syllabus/Self-learning presentation	05 marks
4.	Creating subject relevant Proof of concept(patent/copyright)	10 marks

5.	Participation in subject relevant event/workshop/Conference/ competition (in other Institutes)	05 marks

Relevant certificates will have to be submitted to concerned faculty.

Mid Semester Examination(MSE): 25 marks

- Assessment consists of one class test of 20 marks.
- The class test is to be conducted when approx. 40 -50% of the syllabus is completed.
- Duration of the class test shall be 1 hour 15 minutes.

In Semester Assessment (ISA): 50 marks

- The In Semester Assessment marks will be the total of the MSE (25 marks) and CA (25 marks).

End Semester Theory Examination: 50 marks

- Weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.
- Duration of the class test shall be 2 hours.

Course Code	Course Name				
ME-MCA-213	Ethical Hacking				
Teaching Scheme: Contact Hours (Per Week)			Credits Assigned		
Theory	Tutorial	Total	Theory	Tutorial	Total
3	-	3	3	-	3
Examination Scheme (Marks)					
In Semester Assessment (ISA)			End Sem. Examination	Term Work	Total (Marks)
Continuous Assessment (CA)	MSE	Total (ISA) (CA + MSE)			
25	25	50	50	-	100

Prerequisite: Understanding of networking concepts and protocols (e.g., TCP/IP, DNS).
Familiarity with fundamental security principles and common threats.

Course Objectives: Course aim to

Sr. No.	Course Objective
1	Understand the fundamental concepts of ethical hacking and cybersecurity.
2	Identify and assess vulnerabilities in networks, systems, and applications.
3	Perform ethical hacking techniques and penetration testing.
4	Analyze and interpret security test results.
5	Develop and implement security countermeasures.

Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Demonstrate Comprehensive Knowledge of Ethical Hacking Techniques and Tools**:**	Understand
CO2	Analyze and Mitigate Security Vulnerabilities in Networks and Systems	Analyze
CO3	Implement Ethical Hacking Methodologies in Real-World Scenarios	Create
CO4	Evaluate the Impact of Ethical Hacking on Cybersecurity within organizations, contributing to enhanced security postures**.**	Evaluate

CO PO Mapping:

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

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Module 1 :** Overview of Ethical Hacking, Ethical Hacking vs. Malicious Hacking, Types of Hackers (White Hat, Black Hat, Grey Hat), Legal and Ethical Issues in Hacking, Overview of Hacking Tools and Techniques **Self-Learning Topics :-**Case Studies and Real-World Examples	6	1	1

2	**Module 2 :** Introduction to Footprinting and Reconnaissance, Techniques for Information Gathering, Network, Scanning, DNS Queries, WHOIS Lookup, Tools for Footprinting (e.g., Nmap, Maltego), Identifying Target System Information, Analyzing and Interpreting Data **Self-Learning Topics :-** footprinting tools	6	1,2	3
3	**Module 3:** Introduction to Scanning and Enumeration, Network Scanning Techniques, Port Scanning, Vulnerability Scanning, Tools for Scanning and Enumeration (e.g., Nmap, Nessus), Techniques for Service Enumeration, Identifying and Analyzing Open Ports and Services **Self-Learning Topics :-** Scanning, enumeration and sniffing tools	8	2,3	3,2
4	**Module 4 :** Introduction to Web Application Security, Common Web Vulnerabilities, SQL Injection, Cross-Site Scripting (XSS), Cross-Site Request Forgery (CSRF), Tools for Web Application Security Testing (e.g., Burp Suite, OWASP ZAP) **Self-Learning Topics:-** Techniques for Securing Web Applications and OWASP Top 10 of Web-application security	8	3,4	4,5
5	**Module 5:** Introduction to Wireless Network Security, Common Wireless Attacks, Packet Sniffing, Man-in-the-Middle Attacks, Wireless Security Protocols (WEP, WPA, WPA2), Tools for Wireless Network Security Testing (e.g., Air cracking, Wireshark) **Self Learning Topics:-** Basics of Cryptography, Encryption Techniques, Public Key Infrastructure (PKI), Tools of WEP/WPA, cloud computing, cryptography, Pen testing.	6	4,5	6
6	**Module 6 :** Introduction to System Hacking, Types of System Attacks, Password Cracking, Privilege Escalation, Exploitation Techniques, Tools for System Hacking (e.g., Metasploit, Hydra),	6	5,6	8,9

	Self-Learning Topics:- Prevention and Mitigation Strategies**,** Tools of session hijacking			

Reference Books:

Reference No	Reference Name
1	Ethical Hacking: A Comprehensive Guide to Ethical Hacking - by R. Schou and R. J. Kinsner
2	The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws - by Dafydd Stuttard and Marcus Pinto
3	Nmap Network Scanning: The Official Nmap Project Guide to Network Discovery and Security Scanning - by Gordon Lyon
4	Metasploit: The Penetration Tester's Guide - by David Kennedy, Jim O'Gorman, Devon Kearns, and Mati Aharoni
5	Hacking: The Art of Exploitation - by Jon Erickson
6	The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws - by Dafydd Stuttard and Marcus Pinto
7	OWASP Testing Guide (available online at the OWASP website)
8	Wireless Network Security: A Beginner's Guide - by Lawrence C. Miller and Jim H. Smith
9	Cryptography and Network Security: Principles and Practice - by William Stallings

Web References:

Reference No	Reference Name
1	https://www.knowledgehut.com/blog/security/ethical-hacking-vs-hacking
2	https://www.eccouncil.org/cybersecurity-exchange/ethical-hacking/basics-footprinting-reconnaissance/
3	https://www.infosecinstitute.com/resources/penetration-testing/process-scanning-and-enumeration/

4	https://www.eccouncil.org/cybersecurity-exchange/ethical-hacking/system-hacking-definition-types-processes/
5	https://www.esecurityplanet.com/trends/the-best-security-for-wireless-networks/
6	https://www.udemy.com/topic/ethical-hacking/
7	https://www.eccouncil.org/train-certify/certified-ethical-hacker-ceh/

Assessment:

Continuous Assessment (CA): 25 marks

Following measures can be used for the continuous assessment as:

- Assignments /Quiz /Case studies /Presentations /Projects /Any other measure with the permission of the Director and HOD-Academics.
- The continuous evaluation has to be done throughout the Semester.
- The faculty can use the flexibility of the mode as per the requirement of the course.
- The CA will be the average of 2 assessments of amounting to total 20 marks
- Continuous Assessment marks will be the total of the CA (20 marks) and attendance (5 marks)
- The students can accrue 10 marks at most by attempting any of the following **assessment tools** for improving their termwork marks of CA. The term work will be capped at 20 marks in any case.
- The List of **assessment tools need to be validated by the** subject-faculty **and** approved by the HOD-Academics/ Director**.**

Sr. No.	Assessment Tools	Marks
1.	Subject relevant certificate course for 4 weeks or more from MOOCS platforms / Swayam / NPTEL (assignment submission with qualifying marks) or competitions of Smart India Hackathon.	10 marks
2.	Participation/ Win in subject relevant event/ competition/ hackathon	05/10 marks
3.	Content beyond syllabus/Self-learning presentation	05 marks
4.	Creating subject relevant Proof of concept(patent/copyright)	10 marks
5.	Participation in subject relevant event/workshop/Conference/ competition (in other Institutes)	05 marks

Relevant certificates will have to be submitted to concerned faculty.

Mid Semester Examination(MSE): 25 marks

- Assessment consists of one class test of 20 marks.

- The class test is to be conducted when approx. 40 -50% of the syllabus is completed.
- Duration of the class test shall be 1 hour 15 minutes.

In Semester Assessment (ISA): 50 marks

- The In Semester Assessment marks will be the total of the MSE (25 marks) and CA (25 marks).

End Semester Theory Examination: 50 marks

- Weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.
- Duration of the class test shall be 2 hours.

Course Code	Course Name				
ME-MCA-221	Quality Metric and Performance Measurement				
Teaching Scheme: Contact Hours (Per Week)			Credits Assigned		
Theory	Tutorial	Total	Theory	Tutorial	Total
3	-	3	3	-	3
Examination Scheme (Marks)					
In Semester Assessment (ISA)			End Sem. Examination	Term Work	Total (Marks)
Continuous Assessment (CA)	MSE	Total (ISA) (CA + MSE)			
25	25	50	50	-	100

Prerequisite:

1. Software Testing Fundamentals:
   - Basic understanding of software testing principles and techniques.
   - Awareness of different types of testing (unit testing, integration testing, system testing, etc.).
2. Software Development Life Cycle (SDLC):
   - Knowledge of the stages in the software development lifecycle.
   - Familiarity with concepts like requirements gathering, design, development, testing, deployment, and maintenance.

Course Objectives: Course aim to

Sr. No.	Course Objective
1	Explore Software Quality Assurance core concepts, methodologies, and operational practices
2	Evaluate different techniques of Software Quality Management to determine their effectiveness and applicability.
3	Utilize various techniques to identify and manage defects to enhance the quality of the given software.
4	Apply various measurements and metrics for assessing Software Project Quality.

Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Understand the fundamentals of Software Quality Assurance and its operations.	Understand
CO2	Understand effectiveness, applicability, and impact of Software Quality Assurance to ensure software quality.	Understand
CO3	Implement effective defect management strategies, analyzing defect patterns, and applying corrective measures to improve software performance and reliability.	Analyze
CO4	Develop and implement solutions to address challenges in software project quality management	Apply

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	-	-	-	-	-	-	-
CO2	3	3	-	3	-	-	-	-
CO3	3	3	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Module: Software Quality Assurance** Software Quality,Factors affecting quality,Quality Models,Software Quality Estimation,Quality Metrics,Quality Assurance,Software Reviews,Formal Technical Reviews. **Self Learning Topics:** Relationship between Quality Factors and Criteria	5	1	1

2	**Module: SQA operations** Quality Assurance Metrics in the SDLC Phases Components of a Software Quality Assurance Plan Organizational Efforts in Software Quality Assurance Importance and Advantages of a Dedicated SQA Function. **Self Learning Topics:** Five views Software Quality	6	1, 2	1,2
3	**Module:Software Quality Management** Comprehensive Quality Management Quality Planning, Enhancement, and Monitoring Cause-and-Effect Diagrams, Pareto Analysis, and Process Flowcharts, Quality Planning and Documentation, Quality Benchmarks and Performance Metrics, Auditing Processes and Various Audit Types **Self Learning Topics:** Testing Maturity Model	6	1, 2	1,2
4	**Module: Metrics and Measurement** Understanding Measurement and Metrics-Comprehending Measurement and Metrics Metrics for Tracking System Test-System Test Tracking Metrics Metrics for Defect Management- Defect Management Metrics Metrics for Software Maintenance-Software Maintenance Metrics Metrics for Requirement- Requirement Metrics Defect Causal Analysis-Root Cause Analysis of Defects Metrics for SDLC Phases-SDLC Phase Metrics **Self Learning Topics:** Measuring Test Effectiveness	8	1 , 3	1,2
5	**Module :Quality Assurance in Agile Methodology** **Quality Assurance in Requirement Analysis**-Identify missing user stories,Determine scope,Recognize dependencies between user stories,Edge cases,Develop acceptance criteria,Identify gaps in the details within story documents. **Estimations and Planning**-Identify functionalities,System knowledge, inter-	8	1, 3 , 4	1,3

	dependencies,Estimate story points, Edge cases,Documentation. **Self Learning Topics:** CMM Architecture			
6	**Module :Defect Management for Quality and Improvement** Defect Life Cycle, Defect Classification with Bug Tracking Process, Importance of Defect Leakage Prevention, Residual Defect Density, Detecting and Analyzing Software Defects - Techniques for Root Cause Analysis, Orthogonal Defect Classification. **Self Learning Topics:** ISO 9126 Quality Characteristics	7	3, 4	1,3

Reference Books:

Reference No	Reference Name
1	Sofware Testing and Quality Assurance Theory and practice -Kshirasagar naik, Priyadarshini Tripathy- Wiley
2	Software Quality Assurance - 2 nd Edition,June 2017 - by Nina S. Godbole - Alpha Science International Ltd.
3	Quality Assurance: Software Quality Assurance Made Easy - by Solis Tech - Createspace Independent Publishing Platform

Web References:

Reference No	Reference Name
1	https://www.geeksforgeeks.org/software-engineering-software-quality-assurance/
2	https://www.softwaretestinghelp.com/software-quality-assurance/
3	https://www.guru99.com/software-quality-assurance-test-audit-review-makes-your-life-easy.html

Assessment:

Continuous Assessment (CA): 25 marks

Following measures can be used for the continuous assessment as:

- Assignments /Quiz /Case studies /Presentations /Projects /Any other measure with the permission of the Director and HOD-Academics.
- The continuous evaluation has to be done throughout the Semester.
- The faculty can use the flexibility of the mode as per the requirement of the course.
- The CA will be the average of 2 assessments of amounting to total 20 marks
- Continuous Assessment marks will be the total of the CA (20 marks) and attendance (5 marks)
- The students can accrue 10 marks at most by attempting any of the following **assessment tools** for improving their termwork marks of CA. The term work will be capped at 20 marks in any case.
- The List of **assessment tools need to be validated by the** subject-faculty **and** approved by the HOD-Academics/ Director**.**

Sr. No.	Assessment Tools	Marks
1.	Subject relevant certificate course for 4 weeks or more from MOOCS platforms / Swayam / NPTEL (assignment submission with qualifying marks) or competitions of Smart India Hackathon.	10 marks
2.	Participation/ Win in subject relevant event/ competition/ hackathon	05/10 marks
3.	Content beyond syllabus/Self-learning presentation	05 marks
4.	Creating subject relevant Proof of concept(patent/copyright)	10 marks
5.	Participation in subject relevant event/workshop/Conference/ competition (in other Institutes)	05 marks

Relevant certificates will have to be submitted to concerned faculty.

Mid Semester Examination(MSE): 25 marks

- Assessment consists of one class test of 20 marks.
- The class test is to be conducted when approx. 40 -50% of the syllabus is completed.
- Duration of the class test shall be 1 hour 15 minutes.

In Semester Assessment (ISA): 50 marks

- The In Semester Assessment marks will be the total of the MSE (25 marks) and CA (25 marks).

End Semester Theory Examination: 50 marks

- Weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.
- Duration of the class test shall be 2 hours.

Course Code	Course Name				
ME-MCA-222	Advanced Digital Marketing				
Teaching Scheme: Contact Hours (Per Week)			Credits Assigned		
Theory	Tutorial	Total	Theory	Tutorial	Total
3	-	3	3	-	3
Examination Scheme (Marks)					
In Semester Assessment (ISA)			End Sem. Examination	Term Work	Total (Marks)
Continuous Assessment (CA)	MSE	Total (ISA) (CA + MSE)			
25	25	50	50	-	100

Prerequisite: Basics of Digital Marketing

Course Objectives: Course aim to

Sr. No.	Course Objective
1	Gain proficiency in conducting keyword research, optimizing website content, and running successful pay-per-click (PPC) campaigns using tools like Google Ads.
2	Create comprehensive digital marketing plans and campaigns using real-world case studies and practical applications.
3	Learn about ethical considerations, privacy laws, and regulations that impact digital marketing practices.
4	Create and manage compelling and engaging content that drives traffic, generates leads, and fosters customer engagement across digital platforms.

Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Understand and integrate the fundamental concepts of digital marketing with business analytics, including customer segmentation, targeting, and data-driven decision-making.	Analyze
CO2	Learn to design, launch, and manage effective social media marketing campaigns across multiple platforms (e.g., Facebook, Instagram, Twitter, LinkedIn) to build brand awareness and engagement.	Create

CO3	Equipped to create, segment, and automate email marketing campaigns that enhance customer relationships and improve conversion rates.	Apply
CO4	Apply business analytics techniques to perform customer segmentation, targeting, and positioning, enabling them to develop more personalized and effective digital marketing campaigns.	Apply

CO PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	3	3	-	-	-	-
CO2	2	3	3	3	-	-	-	-
CO3	3	3	3	3	-	-	-	-
CO4	3	3	3	3	-	-	-	-

Course Contents:

Module No.	**Detailed Contents**	**Hrs.**	**CO No.**	**Ref No.**
1	**Pay-Per-Click Advertising (PPC) :** Introduction to PPC, Setting Up and Managing Campaigns, Keyword Selection and Bidding, Ad Creation and Optimization, Analytics and Reporting **Self learning topic :** Stay Updated Industry Blogs & Forums	5	1	4
2	**Introduction to Email Marketing :** Email Marketing Tools and Platforms, Creating Effective Email Campaigns, List Building Strategies, Automation and Segmentation, Measuring Email Campaign Performance **Self learning topic :** Email List Segmentation	6	3	2
3	**Analytics and Data-Driven Marketing :** Introduction to Digital Marketing Analytics, Google Analytics: Setup and Basics, Tracking and Measuring Performance, Key Metrics and KPIs, Data-Driven Decision Making	7	4	3

	Self learning topic : Learn the basics of predictive modeling techniques			
4	**Mobile Marketing :** Introduction to Mobile Marketing, Mobile Advertising, Mobile App Marketing, SMS and Push Notifications, Mobile Marketing Strategies **Self learning topic :** In-App Advertising	7	2	1
5	**Video Marketing :** Introduction to Video Marketing, Platforms: YouTube, Vimeo, Instagram Reels, Creating Engaging Video Content, Video SEO, Video Advertising **Self learning topic :** Storytelling in Video	8	2	1
6	**Emerging Technologies in Digital Marketing :** Artificial Intelligence in Marketing, Machine Learning and Predictive Analytics, Chatbots and Conversational Marketing, Augmented Reality (AR) and Virtual Reality (VR), Blockchain and Its Impact on Digital Marketing **Self learning topic :** Impact of 5G on Marketing	7	4	1

Topics of content beyond Syllabus: Case Study: Market Basket Analysis

Reference Books:

Reference No	Reference Name
1	Seema Gupta, Digital Marketing , Second Edition, The McGraw Hill Company
2	Ryan Deiss, Digital Marketing for Dummies , Part 2 , A wiley brand
3	Jan, Deborah ,Social Media Marketing, Book III, A wiley brand
4	Bruce Clay, Search Engine optimization All-in-one for Dummies, A wiley brand

Web References:

Reference No	Reference Name
1	"Digital Marketing for Dummies" by Ryan Deiss and Russ Henneberryhttp://repo.darmajaya.ac.id/4150/1/Digital%20Marketing%20For%20Dummies%20%28%20PDFDrive%20%29.pdf
2	Introduction-to-seo-ebook.pdf https://cdn2.hubspot.net/hub/53/file-13204607-pdf/docs/introduction-to-seo-ebook.pdf
3	Website Planning and Development

	https://www.eway-crm.com/eWay-Book/eWay-Book%20-%20Online%20Marketing%20EN.pdf
4	Content Marketing https://mailchimp.com/marketing-glossary/content-marketing/
5	Social Media Marketing (SMM) https://library.uniteddiversity.coop/Media_and_Free_Culture/The_Social_Media_Marketing_Book.pdf

Assessment:

Continuous Assessment (CA): 25 marks

Following measures can be used for the continuous assessment as:

- Assignments /Quiz /Case studies /Presentations /Projects /Any other measure with the permission of the Director and HOD-Academics.
- The continuous evaluation has to be done throughout the Semester.
- The faculty can use the flexibility of the mode as per the requirement of the course.
- The CA will be the average of 2 assessments of amounting to total 20 marks
- Continuous Assessment marks will be the total of the CA (20 marks) and attendance (5 marks)
- The students can accrue 10 marks at most by attempting any of the following **assessment tools** for improving their termwork marks of CA. The term work will be capped at 20 marks in any case.
- The List of **assessment tools need to be validated by the** subject-faculty **and** approved by the HOD-Academics/ Director**.**

Sr. No.	Assessment Tools	Marks
1.	Subject relevant certificate course for 4 weeks or more from MOOCS platforms / Swayam / NPTEL (assignment submission with qualifying marks) or competitions of Smart India Hackathon.	10 marks
2.	Participation/ Win in subject relevant event/ competition/ hackathon	05/10 marks
3.	Content beyond syllabus/Self-learning presentation	05 marks
4.	Creating subject relevant Proof of concept(patent/copyright)	10 marks
5.	Participation in subject relevant event/workshop/Conference/ competition (in other Institutes)	05 marks

Relevant certificates will have to be submitted to concerned faculty.

Mid Semester Examination(MSE): 25 marks

- Assessment consists of one class test of 20 marks.
- The class test is to be conducted when approx. 40 -50% of the syllabus is completed.
- Duration of the class test shall be 1 hour 15 minutes.

In Semester Assessment (ISA): 50 marks

- The In Semester Assessment marks will be the total of the MSE (25 marks) and CA (25 marks).

End Semester Theory Examination: 50 marks

- Weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.
- Duration of the class test shall be 2 hours.

Course Code	Course Name				
ME-MCA-223	Digital Forensic				
Teaching Scheme: Contact Hours (Per Week)			Credits Assigned		
Theory	Tutorial	Total	Theory	Tutorial	Total
3	-	3	3	-	3
Examination Scheme (Marks)					
In Semester Assessment (ISA)			End Sem. Examination	Term Work	Total (Marks)
Continuous Assessment (CA)	MSE	Total (ISA) (CA + MSE)			
25	25	50	50	-	100

Prerequisite: Basics of Digital Marketing

Course Objectives: Course aim to

Sr. No.	Course Objective
1	Understand the fundamental concepts, scope, and evolution of digital forensics, including its role in legal investigations and ethical considerations.
2	Classify and analyze digital evidence from file systems, operating systems, and memory, identifying key OS artifacts and registry data from Windows, Linux, and macOS.
3	Evaluate the strengths and limitations of open-source and commercial digital forensic tools, including network forensic and mobile forensics.
4	Apply legal frameworks, ethical principles, and regulations in cloud forensic investigations, particularly regarding data privacy, evidence handling, and reporting.

Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Understanding the basic concepts of digital forensics alongwith its application in the management of digital evidence.	Understand and Apply
CO2	Analyze the File Systems and OS Artifacts considering the legal and ethical framework.	Analyze
CO3	Apply digital forensics tools for the network as well as evaluate its effectiveness on mobile forensics.	Apply and Evaluate
CO4	Explore the forensic challenges and methodologies in cloud environments.	Evaluate

CO PO Mapping:

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

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Overview of Digital Forensics -** Definition, scope, and importance, history and evolution of digital forensics. Digital Evidence: Types of digital evidence, Principles of evidence collection and preservation, chain of custody. Legal and Ethical Issues: laws and regulations governing digital forensics. **Self-Learning** – Ethical considerations in digital investigations.	6	1	1,2
2	**Digital Evidence -** What is Digital Evidence?, Characteristics Of Digital Evidence, Type of Evidence, Challenges in Evidence Handling, Evidence Handling Procedure. Legal Principles of Digital Evidence, Digital Evidence and Metadata. **Self-Learning** – Volatile Evidence	8	2	1,2
3	**File Systems and OS Artifacts -** FAT, NTFS, and EXT file systems, Windows, Linux, and macOS artifacts, registry analysis. Memory Forensics: Volatile memory acquisition, analysis of RAM dumps, memory forensic tools (Volatility, Rekall). Application Forensics: Email, web browser, and document forensics, malware analysis basics. **Self-Learning** – Comparative study between different operating systems	7	2	2
4	**Network Forensic -** Introduction to Network Forensics	7	2	2

	Network logs: firewall, IDS/IPS, and server logs. Traffic Analysis, capturing and analyzing network traffic, packet analysis with Wireshark, flow analysis. Intrusion Detection and Incident Response: Techniques for detecting and responding to network-based attacks. **Self-Learning** – Case studies of real-world incidents.			
5	**Mobile Forensics Overview -** Understanding Mobile forensics, challenges in mobile forensics. Data Acquisition from Mobile: Devices(iOS/Android/Windows), physical, logical, and cloud acquisition methods, tools and techniques for data extraction. Analysis of Mobile Data, analyzing SMS, call logs, GPS, and app data **Self-Learning** – Mobile OS forensics (iOS, Android), cloud data forensics.	6	3	3
6	**Cloud Forensics -** Cloud service models (IaaS, PaaS, SaaS) and forensic challenges, data acquisition in cloud environments, Legal and jurisdictional issues in cloud forensics. **Self-Learning** – Future Trends in Digital Forensics AI and machine learning in forensics.	6	4	4

Topics of content beyond Syllabus: Dark Web and Deep Web Forensics

Reference Books:

Reference No	Reference Name
1	Jain, N. (2016). Digital Forensic: The Fascinating World of Digital Evidences with CD. India: Wiley.
2	Jain, N., Kalbande, D. R. (2019). Digital Forensic. India: Wiley.
3	Tamma, R., Skulkin, O., Mahalik, H., Bommisetty, S. (2020). Practical Mobile Forensics: Forensically Investigate and Analyze IOS, Android, and Windows 10 Devices, 4th Edition. United Kingdom: Packt Publishing.
4	Ramakrishnan, G., Haqanee, M. (2024). Cloud Forensics Demystified: Decoding Cloud Investigation Complexities for Digital Forensic Professionals. United Kingdom: Packt Publishing.

Web References:

Reference No	Reference Name
1	Dr. Nimmi Singh, Digital Forensics,NPTEL
2	Dr. Harising Gour, Mobile Forensics, NPTEL
3	Prof. Saji K Mathew, CyberSecurity, NPTEL

Assessment:

Continuous Assessment (CA): 25 marks

Following measures can be used for the continuous assessment as:

- Assignments /Quiz /Case studies /Presentations /Projects /Any other measure with the permission of the Director and HOD-Academics.
- The continuous evaluation has to be done throughout the Semester.
- The faculty can use the flexibility of the mode as per the requirement of the course.
- The CA will be the average of 2 assessments of amounting to total 20 marks
- Continuous Assessment marks will be the total of the CA (20 marks) and attendance (5 marks)
- The students can accrue 10 marks at most by attempting any of the following **assessment tools** for improving their termwork marks of CA. The term work will be capped at 20 marks in any case.
- The List of **assessment tools need to be validated by the** subject-faculty **and** approved by the HOD-Academics/ Director**.**

Sr. No.	Assessment Tools	Marks
1.	Subject relevant certificate course for 4 weeks or more from MOOCS platforms / Swayam / NPTEL (assignment submission with qualifying marks) or competitions of Smart India Hackathon.	10 marks
2.	Participation/ Win in subject relevant event/ competition/ hackathon	05/10 marks
3.	Content beyond syllabus/Self-learning presentation	05 marks
4.	Creating subject relevant Proof of concept(patent/copyright)	10 marks
5.	Participation in subject relevant event/workshop/Conference/ competition (in other Institutes)	05 marks

Relevant certificates will have to be submitted to concerned faculty.

Mid Semester Examination(MSE): 25 marks

- Assessment consists of one class test of 20 marks.
- The class test is to be conducted when approx. 40 -50% of the syllabus is completed.
- Duration of the class test shall be 1 hour 15 minutes.

In Semester Assessment (ISA): 50 marks

- The In Semester Assessment marks will be the total of the MSE (25 marks) and CA (25 marks).

End Semester Theory Examination: 50 marks

- Weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.
- Duration of the class test shall be 2 hours.

Course Code	Course Name				
MM-MCA-L21	Artificial Intelligence & Machine Learning Lab using Python				
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)			
		Term Work	End Sem Examination		Total
			Practical	Oral	
2	1	50	30	20	100

Prerequisite: Python programming

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	Evaluate logic programming concepts using Python programming for problem-solving.
2	Analyze supervised and unsupervised learning algorithms for data prediction and classification tasks.
3	Apply dimensionality reduction techniques to simplify complex datasets.
4	Implement ensemble learning methods and deploy machine learning models using web APIs.

Lab Course Outcomes (CO): On successful completion of course learner / student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Evaluate relationships among objects using Python programming for logic programming tasks.	Analyze
CO2	Implement classification and clustering algorithms on real life data	Evaluate
CO3	Perform feature extraction and selection using dimensionality reduction techniques	Evaluate

CO4	Develop models using appropriate machine learning algorithms for real world problems	Create

COPO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	-	-	-	-
CO2	3	3	3	3	-	-	-	-
CO3	3	3	3	3	-	-	-	-
CO4	3	3	3	3	-	-	-	-

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	Logic programming with Python: To specify relationships among objects and properties of objects, problem-solving. **Self Learning Topic: -** Define rules defining implicit relationships between objects.	4	1	1
2	Supervised Learning: Linear Regression predicts a real-valued output based on an input value, Logistic regression-the notion of classification, the cost function for logistic regression, and the application of logistic regression, KNN classification. Unsupervised Learning: K-Means clustering algorithm, K-medoid clustering algorithm. **Self Learning Topic: -** Evaluation metrics like MSE, Accuracy, Confusion Matrix, Precision, Recall, ROC curve.	10	2	1
3	Dimensionality Reduction: Features Extraction, Feature selection, Normalization, Transformation, Principal Components Analysis-visualizations of complex datasets. **Self Learning Topic: -** LDA (Linear Discriminant Analysis).	2	3	1

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
4	Classifying data using Support Vector Machines (SVMs): SVM-RBF kernels. **Self Learning Topic:** -SVM-Kernels-Polynomial kernel.	2	2	1
5	Bagging Algorithm:Decision Tree,different ensemble techniques like bagging, boosting, stacking and voting, Random Forest- bagging, Attribute bagging and voting for class selection. Boosting Algorithms: AdaBoost, Stochastic Gradient Boosting, Voting Ensemble **Self Learning Topic: -** Extra Trees. AdaBoost as a Forward Stage wise Additive Model.	6	2	1
6	Deployment of Machine Learning Models: simple Web API. **Self Learning Topic:**- Python Flask library	2	4	1

Reference Books:

Reference No	Reference Name
1	Aurelian Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition.
2	Paul J. Deitel, Python Fundamentals.
3	Introduction to Computer Programming using Python, John V Guttag
4	EthemAlpaydın, Introduction to Machine Learning, PHI, Third Edition, ISBN No. 978-81-203- 5078-6.
5	Peter Harrington, Machine Learning in Action. Manning Publications, April 2012ISBN 9781617290183.

Web References:

Reference No	Reference Name
1	https://learning.oreilly.com/library/view/learning-robotics using/9781783287536/cover.html
2	http://www.qboticslabs.com
3	https://subscription.packtpub.com/book/big_data_and_business_intelligence
4	https://scikit-learn.org/0.16/modules/generated/sklearn.lda.LDA.html
5	https://machinelearningmastery.com/ensemble-machine-learning-algorithmspython-scikit-learn/
6	https://www.coursera.org/learn/machine-learning#syllabus

7	https://data-flair.training/blogs/python-ml-data-preprocessing/

Suggested list of experiments:

Practical No	Problem Statement
1	Understanding and installation of Python libraries: e.g. NumPy, Pandas, SciPy, Matplotlib, and Scikit-Learn (All libraries related to AIML)
2	Implementation of Logic programming using Python for water jug problem/BFS and for tic-tac-toe problem. **Water Jug Problem using BFS:** Implement the BFS algorithm to explore all possible states and find a solution to measure the exact amount of water. **Tic-Tac-Toe Game:** Implement a simple text-based Tic-Tac-Toe game that supports two players, checks for wins, and handles game logic.
3	Implementation of Linear Regression, Logistic regression **Objective:** Predict a continuous target variable. **Tasks:** 1. Load a dataset 2. Split the data into training and testing sets. 3. Implement the model. Evaluate the model's performance using metrics like Mean Absolute Error (MAE) , R-squared, Confusion Matrix
4	Implementation of KNN- classification. **Objective:** Predict a continuous target variable. **Tasks:** 1. Load a dataset 2. Split the data into training and testing sets. 3. Implement the model. Evaluate the model's performance using metrics like Mean Absolute Error (MAE) , R-squared, Confusion Matrix
5	Implementation of K-Means and K-medoid clustering algorithm. **Objective:** Group data into clusters using K-Means clustering. **Tasks:** 1. Load a dataset 2. Implement clustering. 3. Determine the optimal number of clusters using the Elbow method. Visualize the clusters and analyze the results.
6	Implementation of dimensionality reduction techniques: Features Extraction and Selection, Normalization, Transformation, Principal Components Analysis **Objective:** Reduce the dimensionality of the data using Principal Component Analysis (PCA). **Tasks:** 1. Load a dataset. 2. Apply PCA to reduce the number of features.

	3. Visualize the data in 2D or 3D after dimensionality reduction. Analyze the variance explained by each principal component
7	Implementation of Classifying data using Support Vector Machines (SVMs) **Objective:** Classify data into categories using Support Vector Machines. **Tasks:** 1. Load a dataset 2. Split the data into training and testing sets. 3. Implement an SVM classifier. Evaluate the model using the accuracy and confusion matrix.
8	Implementation of Bagging Algorithm: Decision Tree **Objective:** Classify data into categories **Tasks:** 1. Load a dataset 2. Split the data into training and testing sets. 3. Implement a classifier. Evaluate the model using accuracy, precision, recall, and F1-score.
9	Implementation of Bagging Algorithm: Random Forest. **Objective:** Classify data into categories **Tasks:** 1. Load a dataset 2. Split the data into training and testing sets. 3. Implement a classifier. Evaluate the model using accuracy, precision, recall, and F1-score.
10	Implementation of Boosting Algorithms: AdaBoost **Objective:** Implement model to handle large datasets and improve model efficiency. **Tasks:** 1. Load a dataset 2. Split the data into training and testing sets. 3. Implement a model Evaluate the model using accuracy using MSE
	Implementation of Boosting Algorithms: Stochastic Gradient Boosting, Voting Ensemble. **Objective:** Implement model to handle large datasets and improve model efficiency. **Tasks:** 5. Load a dataset 6. Split the data into training and testing sets. 7. Implement a model Evaluate the model using accuracy using MSE
11	Deployment of Machine Learning Models.
12	Understanding and installation of Python libraries: e.g. NumPy, Pandas, SciPy, Matplotlib, and Scikit-Learn (All libraries related to AIML)

Assessment:

Lab Termwork marks : 50 marks

- 2-hour Laboratory work will be based on the syllabus with minimum 10 experiments.
    1. Experiments: 25 marks
    2. Attendance : 5 marks
    3. MSE : 20 marks
- Practical will be evaluated by the subject teacher and documented according to a rubric.

End Semester Examination : 50 marks

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Course Code	Course Name				
ME-MCA-L211	Software Testing and Quality Assurance Lab				
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)			
		Term Work	End Sem Examination		Total
			Practical	Oral	
2	1	50	30	20	100

Pre-requisite: Database management system

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	Understand fundamental principles of software testing.
2	understand the essential characteristics, requirements, and usage of automation tools like Selenium WebDriver.
3	Understand TestNg and automation framework basics.
4	Understand the structure and principles of the data-driven framework.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Apply software testing techniques to test a software application	Applying
CO2	Implement the Selenium tool to perform automation testing.	Applying
CO3	Implement TestNg frameworks to test the application.	Applying
CO4	Apply the data-driven framework to real-world problems by integrating and analyzing data effectively	Applying

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	-	-	3	-	-	-	-
CO2	3	-	-	3	-	-	-	-
CO3	3	-	3	3	-	-	-	-

CO4	3	3	3	3	-	-	-	-

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Introduction of Testing** Study of Review, Construction of Control Flow Graph & Writing Test Cases with Case Studies. **Self-learning:Self:** Requirement analysis and derive test scenarios , Review of Project Document, Case Study.	2	1	1
2	**Introduction to Selenium:** Introduction to automation Testing, Selenium latest version, Installation, Selenium WebDriver First Script. **Self-learning:**Record and run a test case in Selenium IDE	2	2	1,2
3	**Selenium Web Driver Commands:** Implementing Web Drivers on Multiple Browser (chrome, Firefox), handling multiple frames using Browser commands, navigation Commands, and find element command **Self-learning:** Implementation of web driver on safari	5	2	1,2
4	**Selenium Action Class** Locator (id, CSS selector, Xpath), Handling Alerts using selenium web driver, types of alerts. Action Classes in selenium, Handling Drop Down, List Boxes, Command Button, radio buttons & text boxes. **Self-learning:** Custom Gesture Simulation,Handling JavaScript-Triggered Events	6	2	1,2
5	**TestNg Framework** Installing Testng, TestNg Test, writing test cases using TestNG, testNg annotation, Testing .xml **Self-learning:** Parameters and dependencies from xml	6	3	3
6	**Automation Framework Basics:** Introduction to basic types, linear scripting, library architecture framework, data-driven Framework. **Self-learning:** Keyword Driven Framework	5	4	3

Reference Books:

Reference No	Reference Name
1	Selenium WebDriver, Pearson, Rajeev Gupta, ISBN 9789332526297
2	Selenium WebDriver Practical Guide - Automated Testing for Web Applications Kindle Edition, SatyaAvasarala
3	Testing Beginner's Guide, Packt Publishing Ltd.Varun Menon,

Web References:

Reference No	Reference Name
1	https://www.techlistic.com/p/selenium-tutorials.html
2	https://www.guru99.com/selenium-tutorial.html
3	https://www.toolsqa.com/selenium-tutorial/

Suggested list of experiments:

Practical No	Problem Statement
1	Prepare a test case for any known application.
2	Implement Web Drivers on Chrome & Firefox Browsers
3	Demonstrate the Locator(id,css selector, path)
4	Demonstrate handling multiple frames in selenium
5	Demonstrate different types of alerts
6	Demonstrate: Handling Drop Down, List Boxes
7	Demonstrate Command Buttons, Radio buttons & text boxes. Waits command
8	Demonstrate action classes in Selenium
9	Installation of TestNg, running testNg and TestNg annotations
10	Demonstrate data-driven Framework.

Assessment:

Lab Termwork marks : 50 marks

- 2-hour Laboratory work will be based on the syllabus with minimum 10 experiments.
    1. Experiments: 25 marks
    2. Attendance : 5 marks
    3. MSE : 20 marks
- Practical will be evaluated by the subject teacher and documented according to a rubric.

End Semester Examination: 50 marks

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Course Code	Course Name				
ME-MCA-L212	Digital Marketing Essentials Lab				
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)			
		Term Work	End Sem Examination		Total
			Practical	Oral	
2	1	50	30	20	100

Pre-requisite: Basic knowledge of Computer and Internet

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	To enable students to understand and apply key digital marketing analytics tools and techniques in real-world scenarios.
2	To analyze marketing performance through various digital channels and platforms using data-driven approaches.
3	To provide hands-on experience with tools for content marketing, social media, SEO, and SEM analytics.
4	To empower students to interpret digital marketing data and optimize strategies for customer engagement and conversion.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Analyze digital marketing analytics tools for performance tracking and reporting.	Analyze
CO2	Evaluate the expertise in analyzing data from various digital platforms to enhance marketing strategies.	Evaluate
CO3	Develop skills to optimize content, social media, and search engine campaigns based on analytical insights.	Evaluate
CO4	Measure the impact of digital marketing efforts on business objectives and make data-driven decisions.	Create

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	-	-	-	-
CO2	3	3	3	3	-	-	-	-
CO3	3	3	3	3	-	-	-	-
CO4	3	3	3	3	-	-	-	-

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Fundamentals of Digital Marketing:** Introduction to Digital Marketing - Importance and Scope, Campaign Analysis using Google Ads **Self Learning Topic: -** Define the rules of Google Ads	5	1	1
2	**Content Marketing and Distribution:** Introduction to Content Marketing - Types of Content, Content Creation Strategies,Content Performance Analysis using BuzzSumo **Self Learning Topic: -** Content Distribution Channels	4	2	1
3	**Website Planning, Development, and SEO:** Understanding Websites and Domains, On-Page SEO Techniques, Create and Optimize a Digital Marketing Webpage **Self Learning Topic: -**Basics of HTML, CSS, and JavaScript.	5	3	1
4	**Social Media Marketing:** Introduction to Social Media Marketing, Social Media Platforms (Facebook, Instagram, Twitter, LinkedIn, YouTube), Social Media Advertising and Analytics, Social Media Post Creation and Analysis **Self Learning Topic:**Social Media Strategy and Planning	5	2	2
5	**Advanced Digital Marketing Techniques:**	3	2	2

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
	Keyword Research and Analysis using SEMrush, Sentiment Analysis using Social Media Data, A/B Testing for Landing Pages **Self Learning Topic: -** Technical SEO			
6	**Email Marketing and Affiliate Marketing:** Creating and Managing an Email Marketing Campaign, Facebook Ad Campaign Creation and Management **Self Learning Topic:**- Affiliate Marketing Strategies	4	4	3

Reference Books:

Reference No	Reference Name
1	Seema Gupta, 'Digital Marketing', McGraw Hill Education.
2	Ryan Deiss, Digital Marketing for Dummies , Part 2 , A wiley brand
3	Jan, Deborah ,Social Media Marketing, Book III, A wiley brand
4	Deepak Bansal, 'The Complete Guide to Digital Marketing', BPH Publications.

Web References:

Reference No	Reference Name
1	https://skillshop.exceedlms.com/student/collection/654330-digital-marketing?locale=en-GB
2	https://digilib.stiestekom.ac.id/assets/dokumen/ebook/feb_27aff686c21a3ec16bdc9e2e8d785bf6b8d8e4e8_1655821975.pdf
3	http://repo.darmajaya.ac.id/4150/1/Digital%20Marketing%20For%20Dummies%20%28%20PDFDrive%20%29.pdf
4	https://authorsonly.blvnp.com/wp-content/uploads/2016/09/Jab-Jab-Jab-Right-Hook.pdf
5	https://neilpatel.com/wp-content/uploads/2018/10/Neil-Patels-Advanced-Cheatsheet-to-SEO.pdf

Suggested list of experiments:

Practical No	Problem Statement
1	Implementation of Setting Up and Analyzing a Digital Marketing Campaign **Objective:**

	To set up a basic digital marketing campaign using Google Ads and analyze its performance. **Task:** Set up a Google Ads campaign by choosing a product or service. Use appropriate keywords and ad groups. Monitor metrics like impressions, clicks, CTR (Click-through Rate), and conversions over a week.
2	Implementation of Content Creation and Distribution **Objective:** To create a blog post and distribute it via various content distribution channels. **Task:** Write a 500-word blog post on a relevant topic. Share it on Facebook, Twitter, and LinkedIn. Use tools like Buffer or Hootsuite to schedule and analyze distribution effectiveness.
3	Implementation of Content Performance Analysis using BuzzSumo **Objective:** To analyze the performance of content pieces based on social shares and engagement. **Task:** Learn to optimize content strategy for maximum reach and impact
4	Implementation of Create the Digital Marketing Webpage **Objective:** a Website is the virtual store from where the commercial transaction of buying and selling takes place **Task:** 1. 1. Go to GoDaddy and analyze the different kind of domain names offered there. 2. Go to GoDaddy and analyze the different kind of hosting options offered there. 3. Go to Wix.com and create a promotional web page in a shared hosting service 4. Customize the Website using various options given by Wix 5. Publish the website online 6. Find the ranking of your website using Alexa.com
5	Implementation of Campaign Analysis using Google Ads **Objective:** To create and analyze the performance of a Google Ads campaign. **Task:** ● Set up a Google Ads account, create an ad, select targeting options, and launch the campaign.
6	Implementation of A/B Testing for Landing Pages **Objective:** To conduct A/B testing on a website landing page for conversion optimization.

	Task: Understand the impact of design and content changes on user behavior. 1.
7	Implementation of On-Page SEO for a Website **Objective**: To perform on-page SEO for a given website. **Task**: 1. Optimize meta titles, descriptions, header tags (H1, H2), alt texts for images, and internal linking for a sample webpage. Use tools like Yoast SEO to check optimization.
8	Implementation of Social Media Post Creation and Analytics **Objective**: To create and analyze social media posts for a campaign. **Task**: Design a set of social media posts using Canva for a campaign (e.g., product launch). Post them on Facebook and Instagram, and track engagement (likes, shares, comments) using platform analytics.
9	Implementation of Sentiment Analysis using Social Media Data **Objective:** To analyze user sentiments on social media platforms using tools like Hootsuite or custom scripts **Task:** Track brand sentiment and its impact on marketing strategy.
10	Implementation of Keyword Research for SEO **Objective**: To conduct keyword research using SEMrush or Google Keyword Planner. **Task**: Use tools like SEMrush or Google Keyword Planner to identify 10 keywords related to a given topic. Analyze the search volume, competition, and relevance of each keyword.
11	Implementation of : Email Marketing Campaign Setup **Objective**: To create and launch an email marketing campaign using Mailchimp. **Task**: Design an email template for a product promotion campaign. Import a list of contacts, segment them based on behavior, and schedule the email. Analyze open rates and CTR from the campaign report
12	Implementation of Facebook Ad Campaign Creation **Objective:** To create and manage a Facebook Ad campaign. **Task:** Set up a Facebook Ads Manager account. Create a campaign with a target audience, budget, and ad creatives. Monitor metrics such as impressions, reach, and conversions.

Assessment:

Lab Termwork marks : 50 marks

- 2-hour Laboratory work will be based on the syllabus with minimum 10 experiments.
    1. Experiments: 25 marks
    2. Attendance : 5 marks
    3. MSE : 20 marks
- Practical will be evaluated by the subject teacher and documented according to a rubric.

End Semester Examination: 50 marks

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Course Code	Course Name				
ME-MCA-L213	Ethical Hacking Lab				
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)			
		Term Work	End Sem Examination		Total
			Practical	Oral	
2	1	50	30	20	100

Pre-requisite: Networking concepts, Structured Query Language, encryption algorithms

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	To provide an in-depth understanding of ethical hacking methodologies.
2	To develop practical skills in identifying and exploiting vulnerabilities.
3	To teach students how to think like a hacker to better secure systems.
4	To familiarize students with the latest tools and techniques used in ethical hacking.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Students will be able to understand and explain the ethical implications of hacking.	Understanding
CO2	Students will gain hands-on experience with various ethical hacking tools and techniques.	Applying
CO3	Students will be capable of conducting penetration testing and vulnerability assessments.	Analyzing
CO4	Students will develop strategies to defend against potential security threats.	Creating

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	-	-	-	-	-	3
CO2	3	3	2	3	-	-	-	3

CO3	3	3	2	3	-	-	-	3
CO4	3	3	-	3	-	-	-	3

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Module 1:** Installing and configuring the tools, and basic network scanning using Nmap. Packet analysis using Wireshark, Introduction to Metasploit for penetration testing, Utilizing tools like Shodan, Maltego, and Recon-ng and analyzing gathered data to identify potential targets **Self-Learning Topics**: Understanding the significance of passive vs. active reconnaissance.	4	1	1,2,3
2	**Module 2:** Deep dive into Nmap scanning techniques (SYN, ACK, XMAS scans), Banner grabbing and service enumeration, identifying open ports and potential vulnerabilities, Using tools like OpenVAS, Nessus, and Nikto. **Self-Learning Topics**:Workflow for integrating OpenVAS, Nessus, and Nikto into vulnerability assessment pipelines.	4	1,2	1,2
3	**Module 3:** Using Metasploit Framework for exploitation, Exploiting common vulnerabilities (SQL injection), Post-exploitation techniques and maintaining access, and Understanding the OWASP Top Ten vulnerabilities. **Self-Learning Topics**: Exploiting common web vulnerabilities (e.g., XSS, CSRF, SQLi)	4	2,3	3
4	**Module 4 :** Burpsuite: Dashboard, proxy, repeater, sitemap **Self-Learning Topics**: Defense strategies against social engineering attacks.	4	3,4	4
5	**Module 5:** Brute force, dictionary and rainbow table attacks, Tools like John the Ripper, Hydra, and Hashcat. Techniques for cracking Windows and Linux passwords, Tools for launching DoS attacks (LOIC, HOIC), Techniques to mitigate DoS attacks (password cracking and DoS attack methodologies, as well as mitigation strategies)	5	2,3	4

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
	Self-Learning Topics: Case studies of famous DDoS attacks.			
6	**Module 6:** Using tools like GPG, and OpenSSL, cracking weak encryption, Understanding and practicing encryption/decryption, Overview of penetration testing methodologies (PTES, OWASP), Conducting a full penetration test on a simulated network/ web application(owasp juice shop) **Self-Learning Topics**: Report writing and documentation of findings.	5	4	3,5

Reference Books:

Reference No	Reference Name
1	The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws - by Dafydd Stuttard and Marcus Pinto
2	Hacking: The Art of Exploitation - by Jon Erickson
3	Metasploit: The Penetration Tester's Guide - by David Kennedy et al.
4	Kali Linux Revealed: Mastering the Penetration Testing Distribution - by Raphaël Hertzog and Jim O'Gorman
5	Penetration Testing: A Hands-On Introduction to Hacking - by Georgia Weidman

Web References:

Reference No	Reference Name
1	https://www.udemy.com/topic/ethical-hacking/
2	https://www.eccouncil.org/train-certify/certified-ethical-hacker-ceh/

Suggested list of experiments:

Practical No	Problem Statement
1	Installing and configuring the tool
2	Packet Analysis Using Wireshark
3	Basic terminologies of Nmap, Shodan and Maltego
4	Using Recon-ng for collecting information about the target
5	Use Nmap for Port and Network Scan

6	Use Nmap for OS and service detection
7	Practical demonstration of Nikto
8	Installation on metasploit in Linux System
9	Create Basic Payload by using Metasploit
10	Use Metasploit to find common exploits
11	Installation of burp suite in windows
12	By using Burp suite Scan Network and perform Basic web application penetration testing
13	Use Hydra for brute-forcing username and password by using wordlist
14	Use Hydra to perform directory brute-forcing
15	Understanding of encryption, vulnerability testing, and the ethical aspects of penetration testing

Assessment:

Lab Term work marks : 50 marks

- 2-hour Laboratory work will be based on the syllabus with minimum 10 experiments.
    1. Experiments: 25 marks
    2. Attendance : 5 marks
    3. MSE : 20 marks
- Practical will be evaluated by the subject teacher and documented according to a rubric.

End Semester Examination: 50 marks

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Course Code	Course Name				
ME-MCA-L221	Quality Metric and Performance Measurement Lab				
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)			
		Term Work	End Sem Examination		Total
			Practical	Oral	
2	1	50	30	20	100

Pre-requisite: Nil

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	Learn QA, Testing, SDLC/STLC, and create effective test plans and cases.
2	Use manual testing techniques and manage bugs with Bugzilla and MantisBT
3	Automate UI tests, validate APIs, and perform load tests using tools like K6.
4	Integrate tests into CI/CD pipelines and generate reports with Playwright Runner.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Demonstrate knowledge of QA, Software Testing, SDLC/STLC, and create effective test plans and cases.	Analyze
CO2	Apply manual testing techniques and manage the bug life cycle using Bugzilla and MantisBT effectively.	Apply
CO3	Automate UI tests with Playwright, validate APIs using Postman/REST Assured, and perform load tests with K6.	Apply
CO4	Integrate automated tests into CI/CD pipelines and generate detailed test reports using Playwright Test Runner.	Apply

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	-	-	3	-	-	-	-
CO2	3	-	-	3	-	-	-	-

CO3	3	-	3	3	-	-	-	-
CO4	3	3	3	3	-	-	-	-

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Introduction to Quality Assurance** Basics of Quality Assurance & Software Testing,SDLC and STLC,Types of Testing: Functional, Non-functional, Manual, Automation,Introduction to Test Plans and Test Cases. Tool: Google Sheets or Markdown Editors	4	1	1,2
2	**Manual Testing Techniques** Exploratory Testing. Boundary Value Analysis and Equivalence Partitioning. Bug Life Cycle. Tool : Bug Tracking: Bugzilla, MantisBT.	4	2	1,2
3	**Automated UI Testing with Playwright** Introduction to Playwright for Web Automation. Writing and executing Playwright scripts. Handling dynamic content and assertions. Tool : Playwright.	5	3	1,2
4	**API Testing** Basics of REST APIs. Using tools to test APIs. Validating response codes, headers, and payloads. Tool : Postman. REST Assured (Java-based API testing library).	4	3	2,3
5	**Performance Testing** Introduction to Performance Testing. Key Metrics: Response Time, Throughput, Latency. Load Testing with Open-Source Tools. Tool : K6 (JavaScript-based performance testing tool).	4	3	2,3
6	**Continuous Testing with CI/CD** Basics of CI/CD and Continuous Testing. Integrating Automated Tests into a CI/CD pipeline. Test Reporting and Metrics. Tool: Playwright Test Runner for integration.	4	4	3

Reference Books:

Reference No	Reference Name
1	"Software Testing: Principles and Practices" by Srinivasan Desikan and Gopalaswamy Ramesh
2	"Lessons Learned in Software Testing" by Cem Kaner, James Bach, and Bret Pettichord
3	"Foundations of Software Testing" by Dorothy Graham, Rex Black, and Erik Van Veenendaal

Web References:

Reference No	Reference Name
1	https://medium.com/%40divyarajsinhdev/mastering-api-performance-testing-with-k6-grafana-and-wiremock-86daa07561d9
2	https://learning.postman.com/docs/tests-and-scripts/run-tests/run-tests-with-ci-cd/?utm_source=chatgpt.com
3	https://k6.io/blog/getting-started-with-performance-testing-in-ci-cd-using-k6/

Suggested list of experiments:

Practical No	Problem Statement
1	Create a test plan for a "User Registration" feature of a web app.
2	Write test cases for a "Search" feature in a blogging platform
3	Perform exploratory testing on a sample site (https://opensource-demo.orangehrmlive.com/).Log 3 bugs in Bugzilla with clear steps to reproduce.
4	Automate the login process of a sample application using Playwright.
5	Write a script to verify the correct navigation of menu items on a sample site.
6	Test GET and POST requests for a public API (e.g., https://reqres.in/).
7	Automate API tests using REST Assured to validate response structure and status codes.
8	Use K6 to test the performance of an API endpoint and analyze the results.
9	Generate test reports using Playwright's built-in reporting tools and integrate them into the CI/CD workflow.

Assessment:

Lab Termwork marks : 50 marks

- 2-hour Laboratory work will be based on the syllabus with minimum 10 experiments.
    1. Experiments: 25 marks
    2. Attendance : 5 marks
    3. MSE : 20 marks

- Practical will be evaluated by the subject teacher and documented according to a rubric.

End Semester Examination: 50 marks

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Course Code	Course Name				
ME-MCA-L222	Advanced Digital Marketing Lab				
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)			
		Term Work	End Sem Examination		Total
			Practical	Oral	
2	1	50	30	20	100

Pre-requisite: Database management system

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	Equip with hands-on experience in setting up, managing, and optimizing Pay-Per-Click (PPC) advertising campaigns using platforms like Google Ads.
2	Enable to design effective email marketing campaigns and focus on list segmentation, automation, content creation, and performance measurement.
3	Utilize digital marketing analytics tools, such as Google Analytics, to track and measure key performance indicators (KPIs),
4	Knowledge in mobile marketing, including in-app advertising, mobile app marketing, and SMS/push notifications.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Gain proficiency in keyword selection, bidding strategies, ad copy creation, and performance analysis to achieve specific marketing objectives.	Analyze
CO2	Developing and executing video marketing strategies on platforms like YouTube, focusing on video creation, SEO, and engagement techniques.	Evaluate
CO3	Develop skills to use digital analytics tools, such as Google Analytics, to track, measure, and analyze digital marketing performance	Evaluate
CO4	Measure the impact of mobile marketing strategies, including mobile app marketing, SMS campaigns, and in-app advertising.	Create

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	-	-	-	-
CO2	3	3	3	3	-	-	-	-
CO3	3	3	3	3	-	-	-	-
CO4	3	3	3	3	-	-	-	-

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Pay-Per-Click Advertising (PPC) :** Introduction to PPC, Setting Up and Managing Campaigns, Keyword Selection and Bidding, Analytics and Reporting **Self learning topic :** Stay Updated Industry Blogs & Forums	5	1	4
2	**Introduction to Email Marketing :** Email Marketing Tools and Platforms, Creating Effective Email Campaigns, List Building Strategies, Measuring Email Campaign Performance **Self learning topic :** Email List Segmentation	4	3	2
3	**Analytics and Data-Driven Marketing :** Introduction to Digital Marketing Analytics, Google Analytics: Setup and Basics, Tracking and Measuring Performance, Key Metrics and KPIs, Data-Driven Decision Making **Self learning topic :** Learn the basics of predictive modeling techniques	5	4	3
4	**Mobile Marketing :** Introduction to Mobile Marketing, Mobile Advertising, Mobile App Marketing, SMS and Push Notifications, Mobile Marketing Strategies **Self learning topic :** In-App Advertising	5	2	1
5	**Video Marketing :** Introduction to Video Marketing, Platforms: YouTube, Vimeo, Instagram Reels, Creating Engaging Video Content, Video SEO, Video Advertising **Self learning topic :** Storytelling in Video	3	2	1
6	**Emerging Technologies in Digital Marketing :** Artificial Intelligence in Marketing, Machine Learning and Predictive Analytics, Chatbots and Conversational Marketing,	4	4	1

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
	Augmented Reality (AR) and Virtual Reality (VR), Blockchain and Its Impact on Digital Marketing **Self learning topic :** Impact of 5G on Marketing			

Reference Books:

Reference No	Reference Name
1	Seema Gupta, Digital Marketing , Second Edition, The McGraw Hill Company
2	Ryan Deiss, Digital Marketing for Dummies , Part 2 , A wiley brand
3	Jan, Deborah ,Social Media Marketing, Book III, A wiley brand
4	Bruce Clay, Search Engine optimization All-in-one for Dummies, A wiley brand

Web References:

Reference No	Reference Name
1	https://skillshop.exceedlms.com/student/collection/654330-digital-marketing?locale=en-GB
2	https://blog.hubspot.com/marketing/video-marketing
3	https://digilib.stiestekom.ac.id/assets/dokumen/ebook/feb_27aff686c21a3ec16bdc9e2e8d785bf6b8d8e4e8_1655821975.pdf
4	http://repo.darmajaya.ac.id/4150/1/Digital%20Marketing%20For%20Dummies%20%28%20PDFDrive%20%29.pdf
5	https://authorsonly.blvnp.com/wp-content/uploads/2016/09/Jab-Jab-Jab-Right-Hook.pdf

Suggested list of experiments:

Practical No	Problem Statement
1	Setting Up a PPC Campaign on Google Ads Objective: Learn how to set up a Pay-Per-Click (PPC) campaign using Google Ads. **Task:** 1. Create a Google Ads account. 2. Choose campaign settings (type, location, budget). 3. Define ad groups and select relevant keywords. 4. Create ad copies. 5. Launch the campaign.
2	Conducting Keyword Research and Bid Strategy for PPC Objective: Understand keyword research and bidding strategies in PPC campaigns.

	Task: 1. Use tools like Google Keyword Planner or SEMrush to find keywords. 2. Analyze keyword relevance, competition, and cost-per-click (CPC). 3. Set bids based on budget and goals.
3	Creating and Optimizing Ad Copy for a PPC Campaign Objective: Learn how to create compelling ad copy for PPC. **Task:** 1. Write ad headlines and descriptions. 2. Include relevant keywords and a clear call-to-action. 3. Use A/B testing to compare different versions. 4. Analyze performance and optimize ad copy.
4	Analyzing PPC Campaign Performance Using Google Analytics Objective: Use Google Analytics to analyze PPC performance. **Task:** 1. Connect Google Ads with Google Analytics. 2. Track key metrics such as CTR, CPC, and Conversion Rate. 3. Generate reports and visualize data. 4. Identify areas for improvement.
5	Creating an Effective Email Marketing Campaign with Mailchimp Objective: Learn to create email campaigns using Mailchimp. **Task:** 1. Create a Mailchimp account. 2. Build an email list. 3. Design an email template. 4. Write engaging email content with a clear call-to-action. 5. Schedule and send the email.
6	Designing Email List Segmentation Strategies and Automation Workflows Objective: Segment an email list and create automation workflows. **Task:** 1. Define segmentation criteria (e.g., demographics, behavior). 2. Create segments in Mailchimp. 3. Set up automation workflows for different segments. 2. 4. Analyze the performance.
7	Tracking and Measuring Digital Marketing Performance with Google Analytics Objective: Set up Google Analytics to track digital marketing KPIs. **Task:** 1. Install Google Analytics on a website. 2. Define goals and events to track. 3. Create custom reports to measure specific KPIs. 2. 4. Analyze data to make data-driven decisions.
8	Developing a Mobile Marketing Strategy for a Fictional Brand Objective: Create a comprehensive mobile marketing strategy. **Task:**

	1. Define the target audience and objectives. 2. Choose mobile marketing channels (e.g., SMS, in-app ads). 3. Create content tailored to mobile users. 4. Launch and monitor the campaign.
9	Creating and Managing an In-App Advertising Campaign Objective: Learn how to set up and manage an in-app advertising campaign. **Task:** 1. Choose an in-app ad network (e.g., AdMob, Unity Ads). 2. Set up targeting and ad creatives. 3. Monitor performance and optimize the campaign. 4. Generate a performance report.
10	Creating an Engaging Video Marketing Strategy on YouTube Objective: Develop a video marketing strategy for YouTube. **Task:** 1. Define goals and target audience. 2. Plan video content (format, script, visuals). 3. Upload videos and optimize titles, descriptions, and tags for SEO. 4. Monitor performance and adjust strategy.
11	Using AI Tools to Improve Digital Marketing Campaigns Objective: Utilize AI tools for enhancing digital marketing strategies. **Task:** 1. Identify AI tools (e.g., ChatGPT, HubSpot AI, Smartly.io). 2. Integrate AI tools with existing platforms. 3. Analyze campaign performance using AI insights. 4. Make data-driven improvements.
12	Analyzing the Impact of 5G on Digital Marketing Strategies Objective: Understand the implications of 5G for digital marketing. **Task:** 1. Research the capabilities of 5G technology. 2. Identify areas of digital marketing impacted by 5G. 3. Develop a strategy that leverages 5G for faster content delivery and enhanced user experiences. 4. Present findings.

Assessment:

Lab Termwork marks : 50 marks

- 2-hour Laboratory work will be based on the syllabus with minimum 10 experiments.
    1. Experiments: 25 marks
    2. Attendance : 5 marks
    3. MSE : 20 marks
- Practical will be evaluated by the subject teacher and documented according to a rubric.

End Semester Examination: 50 marks

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Course Code	Course Name				
ME-MCA-L223	Digital Forensic Lab				
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)			
		Term Work	End Sem Examination		Total
			Practical	Oral	
2	1	50	30	20	100

Pre-requisite: Nil

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	To provide a comprehensive understanding of digital forensics methodologies and processes.
2	To develop practical skills in acquiring, analyzing, and preserving digital evidence.
3	To familiarize students with the tools and techniques used in digital forensic investigations.
4	To prepare students to conduct forensic investigations and present findings in a legal context.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Understand and explain the principles and practices of digital forensics.	Understand
CO2	Gain hands-on experience with various digital forensics tools and software.	Apply
CO3	Capable of acquiring, preserving, and analyzing digital evidence.	Analyze
CO4	Develop the ability to create detailed forensic reports suitable for legal proceedings.	Create

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	-	-	-	-	-	3
CO2	3	3	2	3	-	-	-	3

CO3	3	3	2	3	-	-	-	3
CO4	3	3	-	3	-	-	-	3

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Introduction to Digital Forensics Tools,** Installing and configuring the tools, Overview of digital forensics investigation process, Introduction to forensic imaging and hashing. **Evidence Acquisition and Imaging,** Disk imaging techniques using FTK Imager, creating a bit-by-bit copy of a storage device **Self-Learning topic-** Verifying the integrity of acquired evidence using hashing.	4	1	1
2	**File System Forensics, a**nalyzing file systems (NTFS, FAT32, EXT4), recovering deleted files using Autopsy, understanding file slack and unallocated space. **Windows Registry Analysis, e**xtracting and analyzing registry hives, identifying key artifacts (MRU, USB history, user activity) **Self-Learning topic-** Tools for registry analysis (Registry Explorer, RegRipper).	4	1,2	1,2
3	**Memory Forensics:** Capture and analyze volatile memory, acquiring RAM using tools like DumpIt or Belkasoft RAM Capturer, analyzing memory dumps with Volatility, identifying running processes, open connections, and malicious activities. **Network Forensics:** Capture and analyze network traffic for forensic evidence, using Wireshark for packet capture and analysis, identifying suspicious traffic and reconstructing sessions **Self-Learning topics -** Extracting files and artifacts from captured traffic.	4	2,3	2,3
4	**Email and Browser Forensic:** Analyzing email headers and attachments for signs of phishing or tampering, investigating browser history, cookies, and cached files, tools like MailXaminer, BrowsingHistoryView. **Mobile Device Forensics:** Using tools like Cellebrite UFED, Oxygen Forensic Suite, Extracting contacts, messages, call logs, and app data,	4	2,3	3,4

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
	Self-Learning topics - Analyzing mobile operating systems (Android, iOS).			
5	**Malware Forensics:** Identifying and extracting malware samples, analyzing malware behavior using sandboxing tools, Understanding the forensic implications of malware. **Cloud Forensics:** Acquiring data from cloud storage services (e.g., Google Drive, Dropbox), Challenges and strategies in cloud forensics. **Self-Learning topics-** analyzing cloud service logs and metadata	4	3,4	4,5
6	**Log Analysis and Event Reconstruction:** Analyze system logs to reconstruct events, tools for log analysis (Splunk, ELK stack). **Reporting and Legal Considerations in Digital Forensics, w**riting detailed forensic reports for legal proceedings, understanding chain of custody and evidence handling procedures, Case study analysis of real-world digital forensics cases. **Self-Learning topics** - parsing and analyzing logs from Windows Event Viewer, syslogs, correlating log entries to reconstruct timelines	4	4	6

Reference Books:

Reference No	Reference Name
1	"Computer Forensics: Principles and Practices" by Linda Volonino, Reynaldo Anzaldua, and Jana Godwin
2	"Guide to Computer Forensics and Investigations" by Bill Nelson, Amelia Phillips, and Christopher Steuart
3	"Practical Mobile Forensics" by Satish Bommisetty, Rohit Tamma, and Heather Mahalik
4	"Digital Evidence and Computer Crime: Forensic Science, Computers and the Internet" by Eoghan Casey
5	"The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory" by Michael Hale Ligh et al.

Web References:

Reference No	Reference Name
1	Dr. Nimmi Singh, Digital Forensics,NPTEL
2	Dr. Harising Gour, Mobile Forensics, NPTEL
3	Prof. Saji K Mathew, CyberSecurity, NPTEL

Suggested list of experiments:

Practical No	Problem Statement
1	**Introduction to Digital Forensics Tools:** Familiarize with basic digital forensics tools like FTK Imager, Autopsy, and EnCase.
2	**Evidence Acquisition and Imaging:** Learn the process of acquiring digital evidence.
3	**File System Forensics:** Explore file systems and recover deleted files.
4	**Windows Registry Analysis:** Investigate Windows Registry for forensic evidence
5	**Memory Forensics:** Capture and analyze volatile memory.
6	3. **Network Forensics:** Capture and analyze network traffic for forensic evidence.
7	3. **Email and Browser Forensics:** Investigate email and browser artifacts.
8	**Mobile Device Forensics:** Capture and analyze mobile data for forensic evidence
9	**Malware Forensics:** Analyze and investigate malware-infected systems.
10	**Cloud Forensics:** Investigate cloud-based environments for forensic evidence.
11	**Log Analysis and Event Reconstruction:** Analyze system logs to reconstruct events.
12	**Reporting and Legal Considerations in Digital Forensics:** Prepare forensic reports and understand legal implications

Assessment:

Lab Termwork marks : 50 marks

- 2-hour Laboratory work will be based on the syllabus with minimum 10 experiments.
    1. Experiments: 25 marks
    2. Attendance : 5 marks
    3. MSE : 20 marks
- Practical will be evaluated by the subject teacher and documented according to a rubric.

End Semester Examination: 50 marks

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Course Code	Course Name				
MM-MCA-L22	Full-stack Development Lab				
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)			
		Term Work	End Sem Examination		Total
			Practical	Oral	
4	2	50	30	20	100

Pre-requisite: Basic knowledge of HTML, CSS, JavaScript and understanding of web development concepts.

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	Create and manage React components, utilizing hooks for state management and implementing routing techniques.
2	Develop dynamic web applications using Node.js and Express.js to handle RESTful APIs.
3	Understand and create NoSQL databases using MongoDB.
4	Create and deploy a full-stack application by integrating React, Node.js, Express, and MongoDB.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Understand and Apply web application development using React Component-Based Architecture and Routing.	Understand & Apply
CO2	Build and manage web applications and RESTful APIs using Node.js and Express.js.	Create
CO3	Design and Implement Data Storage Solutions Using MongoDB.	Create
CO4	Build and Deploy a Full Stack Web Application.	Create

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	-	-	-	-
CO2	3	3	3	3	-	-	-	-
CO3	3	3	3	3	-	-	-	
CO4	3	3	3	3	3	-	-	3

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Module 1: Introduction to ES6+, React and JSX :** Introduction to essential ES6+ features like arrow functions, destructuring in function parameters, spread/rest operators, template literals, and promises. Understanding the role of React in web development, Understanding the Component based Architecture of ReactJS, Introduction to JSX and its benefits, Setting up a React development environment. **Creating React Components** Defining and using a component, Organizing Components, Import and Export Components, JSX: Converting HTML to JSX, Passing props to a component Rendering components within a React application, Event Handling **Self Learning :** Understanding the Component Life Cycle	8	1	1,2, 3
2	**Module 2: State Management in React :** Introduction to state and its importance in React, Managing state with hooks, React-Forms **React Routing** Understanding the ReactJS Routing, Configuring the Router. **Self Learning :** State Management with Redux	12	1	2,3

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
3	**Module 3: Node.js and its Modules :** Understanding Node.js Architecture, Setting up a Node.js development environment, Asynchronous programming, Introduction to Node modules, managing project & dev dependencies in package.json and package-lock.json. **Building Simple Web Servers with Node.js** Creating a basic web server with Node.js, Handling HTTP requests and responses. **Self Learning :** Creating Custom Node Modules	8	2	4,5
4	**Module 4: Introduction to MongoDB** Understanding NoSQL databases and the role of MongoDB, Setting up a MongoDB development environment, Connection with Javascript and Node.js, Data Modeling, Create database, Drop database **MongoDB Collection** Introduction to Collection, Collection Vs Tables, Create Collection, Drop Collection, Operation on MongoDB **Self Learning :** MongoDB Indexing and Aggregation	8	3	5,6
5	**Module 5: Building RESTful APIs with Express.js** Introduction to Express.js as a web application framework, Routing, middleware, and request handling in Express, Building RESTful endpoints for web services, CRUD operations with Express.js. **Self Study :** Basics of GraphQL.	10	2	4,5
6	**Module 6: Building and Deploying Project** Develop a significant web application, Project development, testing, and debugging **Self Learning :** Study various deployment strategies and tools	6	4	7,8

Reference Books:

Reference No	Reference Name
1	Haverbeke, M. (2018). Eloquent JavaScript: A Modern Introduction to Programming. United States: No Starch Press.
2	Horton, A., Vice, R. (2016). Mastering React: Master the Art of Building Modern Web Applications Using React. India: Packt Publishing.

3	Stefanov, S. (2016). React: Up & Running : Building Web Applications. United States: O'Reilly Media.
4	Brown, E. (2019). Web Development with Node and Express: Leveraging the JavaScript Stack. United States: O'Reilly Media.
5	Lim, G. (2019). Beginning Node.js, Express & MongoDB Development. United States: Independently Published.
6	Bradshaw, S., Brazil, E., Chodorow, K. (2019). MongoDB: The Definitive Guide: Powerful and Scalable Data Storage. United States: O'Reilly Media.
7	Biswas, N. (2023). Ultimate Full-Stack Web Development with MERN. India: Orange Education Pvt Limited.
8	Lim, G. (2021). Beginning MERN Stack: Build and Deploy a Full Stack MongoDB, Express, React, Node.js App. Singapore: Amazon Digital Services LLC - Kdp.

Web References:

Reference No	Reference Name
1	https://react.dev/
2	https://nodejs.org/en
3	https://www.mongodb.com/
4	https://expressjs.com/
5	https://www.mongodb.com/resources/languages/mern-stack-tutorial
6	https://www.freecodecamp.org/learn/front-end-development-libraries/#react
7	https://www.udemy.com/course/react-tutorial/
8	https://www.udemy.com/course/mern-stack-authentication-and-deployment/
9	https://learn.mongodb.com/

Suggested list of experiments:

Practical No	Problem Statement
1	Write a program to implement the arrow function in JavaScript.
2	Write a program to implement rest/spread operators.
3	Build a React application that includes a component with a button. Implement an event handler that changes the button's text when clicked.
4	Create a React component with an array of items and a button that, when clicked, adds a new item to the array and updates the displayed list.
5	Develop a form component in React that updates its state based on user input and displays the input value below the form.
6	Create a React component that uses the useState hook to toggle between "ON" and "OFF" states when a button is clicked.
7	Develop a form component in React that updates its state based on user input and displays the input value below the form.
8	Set up React Router in a React application and create two routes: /home and /about. Implement navigation between these routes using links.
9	Use Node.js to handle a POST request that logs the request body to the console.
10	Create a custom Node module that exports a function to calculate the factorial of a number. Import and use this module in another script.
11	Connect to a MongoDB database using Node.js and create a collection named users.
12	Write a MongoDB query to find all documents in the users collection where the age field is greater than 25.
13	Create an Express.js server with a route that responds with a JSON object { message: 'Hello, API!' } when accessed via a GET request.
14	Implement a RESTful endpoint in Express.js that performs a CRUD operation (e.g., create a new resource) and returns the created resource in the response.
15	Implement CRUD operation with Mongoose

Assessment:

Lab Termwork marks : 50 marks

- 4-hour Laboratory work will be based on the syllabus with minimum 15 experiments and a mini project to be done in group.
    1. Experiments : 20 marks
    2. Group Project (maximum 3 members) :5 marks
    3. Attendance:5 marks
    4. MSE : 20 marks
- Practical will be evaluated by the subject teacher and documented according to a rubric.

End Semester Examination: 50 marks

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Course Code	Course Name				
MM-MCA-L23	Skill based Lab Course-Devops Lab				
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)			
		Term Work	End Sem Examination		Total
			Practical	Oral	
2	1	50	30	20	100

Pre-requisite:

- Basic Understanding of Linux/Unix
- Basics of Programming Language
- Knowledge of Networking concepts
- Understanding the SDLC software development model , Agile development

Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	To Learn what DevOps is, including its principles and the benefits it offers to organizations.
2	To obtain knowledge of Version Control Systems to effectively track changes with Git, GitHub and understand their best practices in team environments
3	To learn what containers are, using Docker, and the benefits they offer in terms of consistency, scalability, and efficiency.
4	Understand the concept of CI and how Jenkins automates the process of integrating code changes from multiple contributors.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Recall and explain the key principles and benefits of DevOps	Understand
CO2	Demonstrate the use of Git and GitHub to manage version control in projects and compare different workflows.	Analyse
CO3	Implement and evaluate containerized applications using Docker	Apply
CO4	Configure Jenkins for automated build and deployment and assess its effectiveness in CI/CD workflows	Evaluate

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	-	-	-	-
CO2	3	3	3	3	-	-	-	-
CO3	3	3	3	3	-	-	-	-
CO4	3	3	3	3	-	-	-	-

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**DevOps Introduction** What is DevOps Key Principles and practices Benefits of Implementing DevOps Basic Git Setup **Self Learning** : SDLC, Agile Programming	2	1	1,2
2	**Development :** Exploring Git and GitHub Commands Familiarize students with essential Git concepts and commands Basic Git commands - init, clone, add, commit, push, pull GitHub operations using Git - forks, pull requests, merging Git for version control **Self Learning** : Use of Git in modern DevOps	4	2	3
3	**GitLab Essentials** Using GitLab web IDE Git commands to interact with GitHub Overview of CI/CD Workflow CI/CD capabilities of GitLab **Self Learning** : Security and Compliance issues in using GitLab	4	2	4
4	**Continuous Integration -** Jenkins Jenkins Installation – setup Setting up a CI/CD pipeline for a web development Build and deploy a web application to a local HTTP server Integrating Jenkins with GitHub	6	3	5,6

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
	Self Learning : Case studies of Jenkins in large-scale environments			
5	**Continuous Deployment :** Docker for Containerization Basics of Docker Architecture, components, What is Containerization, Understanding images and containers, Docker commands: build, run, images, containers Build ,deploy and manage web/software application on Docker Engine Docker Management **Self Learning** : Best practices for securing Docker images and containers	6	3	5
6	**Configuration Management**: Ansible Introduction to Software Configuration management , Ansible Playbooks using YAML , Push/Pull Models **Self Learning** : Best practices for writing maintainable and scalable playbooks	4	4	7

Reference Books:

Reference No	Reference Name
1	Sanjeev Sharma and Bernie Coyne,"DevOps for Dummies", Wiley Publication
2	DevOps Bootcamp, Sybgen Learning
3	Prem Kumar Ponuthorai, Jon Loeliger, Version Control with Git, 3rd Edition,O'Reilly Media.
4	Mastering Jenkins by Jonathan McAllister,Packt Publishing
5	Karl Matthias & Sean P. Kane, Docker: Up and Running, O'Reilly Publication.
6	John Ferguson Smart,"Jenkins, The Definitive Guide", O'Reilly Publication.
7	Sanjeev Sharma and Bernie Coyne," DevOps for Dummies", Wiley Publication
8	Httermann, Michael, "DevOps for Developers", Apress Publication.

Web References:

Reference No	Reference Name
1	https://www.javatpoint.com/devops
2	https://docs.gitbook.com/
3	https://git-scm.com/docs/gittutorial
4	https://www.jenkins.io/doc/book/installing/

5	https://saucelabs.com/resources/blog/a-getting-started-guide-to-setting-up-jenkins
6	https://faun.pub/jenkins-pipeline-script-to-build-deploy-application-on-web-server-af55daf70c5a
7	https://www.whizlabs.com/blog/integrate-jenkins-with-github
8	https://www.jenkins.io/solutions/github/
9	https://www.jenkins.io/doc/tutorials/
10	https://docs.docker.com/get-started/
11	https://docs.ansible.com/ansible/latest/getting_started/index.html

Suggested list of experiments:

Practical No	Basic Git commands
1	Create and fork repositories in GitHub. Apply branch, merge, rebase concepts.
2	Using Git for Collaboration
3	Collaborating and Cloning using GitHub
4	Using GitLab Web IDE
5	Performing merge requests using GitLab
6	Workflow management in GitLab
7	Demonstrate Continuous Integration and development using Jenkins
8	Explore docker commands for content management
9	Develop a simple containerized application using Docker
10	Ad-hoc Ansible commands
11	Using Ansible playbooks
12	Basic Git commands

Assessment:
Lab Termwork marks : 50 marks

- 2-hour Laboratory work will be based on the syllabus with minimum 10 experiments.
    1. Experiments: 25 marks
    2. Attendance : 5 marks
    3. MSE : 20 marks
- Practical will be evaluated by the subject teacher and documented according to a rubric.

End Semester Examination: 50 marks

Practical and oral examination will be based on the suggested practical list and entire syllabus.

Course Code	Course Name				
MM-MCA-L24	Communication & Soft Skill Development Lab				
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)			
		Term Work	Practical	Oral	Total
2	1	50	--	--	50

Prerequisite: An understanding of the English language, including grammar, is essential to effectively work in the Industry as English is a global language across all IT industries.

Course Objectives: Course aim to

Sr. No.	Course Objective
1	Develop essential soft skills to prepare students for employment and ensure they can work productively within an organization
2	Offer insight into corporate culture while enhancing etiquette, interpersonal skills, and professional image
3	Raising students' awareness of organizational behavior aspects to achieve professional success
4	Foster well-rounded leaders and technocrats who contribute to both individual and organizational growth

Course Outcomes (CO): On successful completion of the course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Effectively convey ideas with confidence and persuasion in both verbal and written communication	Evaluate
CO2	Prepare and deliver engaging presentations with confidence in any professional context	Evaluate
CO3	Participate effectively in recruitment processes and attain positive outcomes	Create
CO4	Understand different facets of organizational behaviour and effectively manage the transition from campus life to the corporate environment	Apply

CO PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	-	-	-	-	3	-	-	-
CO2	-	-	-	-	3	-	-	-
CO3	-	-	-	-	3	-	-	-
CO4	-	-	-	-	3	-	-	-

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Soft Skills Introduction:** Soft Skills Introduction: What are Soft Skills? Significance of Soft Skills, Soft Skills vs. Hard Skills, Components of Soft Skills, Identifying and Exhibiting Soft Skills **Self-Learning Topics:** Research the top 10 soft and hard skills required in IT Industry, Personal SWOT Analysis of soft skills	2	1	1,2
2	**Communication**: Oral Communication: Purpose of communication, process of communication, verbal and non-verbal communication, characteristics of effective communication, barriers to effective communication. Listening skills, differences between Listening and Hearing, Understanding Non-verbal Cues, Intercultural sensitivities, Business etiquette Practical (Role plays, case studies) Written Communication: Application letter, CV writing, Cover letter, LinkedIn Profile Creation, E- mail etiquette Practical (Practice on CV writing, create LinkedIn Profile) **Self-Learning Topics:** Explore AI tools such as Kickresume/ Resume worded/ Enhancv for creating a resume and LinkedIn profile	6	1, 2, 3	2,3,5

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
3	**Presentation Skills**: Presentation techniques, Planning the presentation, Structure of presentation, Preparation, Evidence and Research, Understanding the audience, Delivering the presentation, managing Q&A sessions, Time management. Visual aids, handling technical issues, overcoming nervousness. Practical (Presentation by students in a maximum group size of 4 on Organizational Behavior topics allocated by faculty.) **Self-Learning Topics:** Use AI tools such as Presentations.AI/ Canva / Mentimeter to prepare presentations and make them interactive	8	1,2, 4	1,2,5, 6, 7, 8
4	**Group Discussions**: Group discussions, key characteristics of a successful group discussion, preparation for group discussions, roles and responsibilities of participants, setting and maintaining ground rules, importance of active listening and respectful communication, conflict resolution, leadership and moderation, evaluation components Practical – Simulation and Role Plays **Self-Learning Topics:** Study strategies for contributing constructively to discussions, techniques for agreeing, disagreeing, and building on others' ideas	2	1,3	1,2,5
5	**Interview Techniques**: Interview techniques, pre-interview preparation, self-assessment and research, conduct during the interview, verbal and non-verbal communication, common questions and answers, stress and anxiety management, handling online interviews. Practical (Role plays, mock interviews, Telephonic Interviews) **Self–Learning Topics:** Explore AI tools for interview preparation such as NodeFlair/ Interviewing.io/ ChatGpt	6	1,3	1,2,4,5
6	**Campus to Corporate Transition:**	2	4	1,2

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
	Professional Attitude and Work Ethic, Alignment with Company Values, Adapting to Work Culture, Managing Expectations and Responsibilities, Working in Teams, Navigating Office Dynamics, Understanding Generational Differences Practical (Group discussions, Role Plays) **Self–Learning Topics:** Research about company culture and values, company's leadership and organizational structure and company's background for your dream company			

Reference Books:

Reference No	Reference Name
1	Soft Skills – Know Yourself and Know the World – Dr. K. Alex, S. Chand
2	Soft Skills for Everyone – Jeff Butterfield, Cenage Learning
3	Business Communication (Revised Edition),Rai & Rai, Himalaya Publishing House.
4	Winning at Interviews – Edgar & ShowickThorpe, Pearson Education
5	The Quick & Easy way to Effective Speaking – Dale Carnegie, Fingerpriniti Classics
6	Stephen Robbins & Judge Timothy: Organization Behavior, Pearson Education
7	K. Aswathappa – Organizational Behavior: Text, cases & games, Himalaya Publishing House.
8	Pareek, Udai, Understanding Organizational Behaviour, Oxford University Press, New Delhi.

Web References:

Reference No	Reference Name
1	https://www.geeksforgeeks.org/interview-preparation/
2	https://prepinsta.com/
3	https://www.hackerrank.com/
4	https://interviewing.io/
5	https://in.indeed.com/

Suggested list of experiments:

Practical No	Problem Statement
1	Create your CV in the Institute format.
2	Write a cover letter to be used with your CV.
3	Create your LinkedIn Profile. Ensure that it aligns with your CV.
4	Prepare a group presentation. Topics to be covered – 1. Personality: Meaning, Personality Determinants, Traits, Personality types and their impact on career growth, Gender Differences in Personality, Cultural Influences on Personality Traits 2. Attitude: Meaning, attitude and perception, components of attitude – cognitive, affective and behavioural components, changing attitude and its impact on career growth, Adaptability and flexibility 3. Motivation and Job Satisfaction, Intrinsic vs. Extrinsic Motivation, Factors Influencing Job Satisfaction, Strategies for Enhancing Motivation and Job Satisfaction 4. Generational Differences, Importance of understanding generational differences, Characteristics of different generations, Communication across generations, generational differences in the workplace - work values and motivations across generations 5. Leadership and Initiative, Decision-Making, Leader vs Managers, leadership at work, decision-making, ethical leadership 6. Goal setting: SMART Goals, short-term and long-term goals, personal and professional goals, Steps in Goal Setting 7. Time and Self-Management, Key Principles of Time Management, Deadline Management, Techniques and Tools for Effective Time Management 8. Learning in a group, Understanding Work Teams, Dynamics of Group Behavior, Techniques for effective participation, Networking, Relationship building

	9. Remote Work and Virtual Teams, communication and other challenges, Remote Collaboration Tools, Time Zone Management, Cultural Sensitivity, Technology Barriers 10. Emotional intelligence, components of emotional intelligence, importance of emotional intelligence, applying emotional intelligence, measuring emotional intelligence – Self SWOC analysis techniques 11. Emotional well-being, enhancing emotional well-being, Work-Life Balance, managing stress, what is stress, recognizing stress, acknowledging stress, common signs of stress, techniques for managing stress 12. Cultural Awareness and Sensitivity; Diversity, Equity, and Inclusion, Global Perspective, Adaptation, Overcoming Unconscious Bias 13. Design Thinking, Creativity and innovation, Problem-solving, Customer Service orientation, understanding needs 14. Conflict Resolution, Conflict Resolution Strategies and Techniques, Root Cause Analysis, Preventive Measures 15. Professionalism at work, Workplace Etiquette, Reliability and Accountability, Respect for Others, Communication, Appearance and Presentation, Ethical Behavior, Attitude and Mindset, Handling Conflicts 16. Company Research for Job Interview - Company Overview, Products and Services, Industry and Competitors, Company Culture, Recent News and Developments, Key People and Leadership, Company's Social Media and Online Presence, Preparing Questions for the Interviewer. Present for a specific company.
5	Mock Group Discussions
6	Prepare and deliver your answer to "Tell me something about yourself"
7	Mock Personal Interviews
8	Extempore Public Speaking

Course Code	Course Name			
OJT-MCA-21	In-Semester Capstone Project			
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)		
		Term Work	End Sem Examination	Total
			Practical & Oral	
2	1	25	25	50

Pre-requisite: Basic knowledge of Software Development
Lab Course Objectives: Course aim to

Sr. No.	Course Objective
1	Conceptualize knowledge with emphasis on team work, effective communication, critical thinking and problem solving skills.
2	Adapt to a rapidly changing environment by having learned and applied new skills and new technologies.
3	Acquaint with the process of applying basic computer applications and provide solutions to the problems in various application domains.

Lab Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Demonstrate the ability to produce a technical document.	Understand
CO2	Apply software project management skills during project work.	Apply
CO3	Build small groups to work effectively in team on medium scale computing projects.	Create
CO4	Design and evaluate solutions for complex problems.	Create

Guidelines for Mini Project:

1. Students shall form a group of 2 to 3 students.

2. Students should do survey and identify needs, which shall be converted into problems in consultation with the faculty Supervisor/Guide/HOD/Internal Committee of faculties. The project contact hours shall be allotted in the time table and 2 hours workload shall be considered for the guide/ supervisor.
3. Students shall submit an implementation plan in the form of Gantt/PERT/CPM chart, which will cover weekly activity of mini project.
4. A log book to be prepared by each group, wherein the group can record weekly work progress, Guide/Supervisor can verify and record notes/comments.

5. Faculty may give inputs during mini project activity; however, focus shall be on self-learning.
6. Students in a group shall understand the problem effectively, propose multiple solutions and select the best possible solution in consultation with Guide/ Supervisor.
7. Students shall convert the best solution into a working model using various components of their domain areas and demonstrate.
8. The solution to be validated with proper justification and project report to be compiled in standard format of University of Mumbai.

Assessment of Mini Project:

I) Term work (25 Marks):

The progress of the mini project to be evaluated on a continuous basis.
In continuous assessment focus shall also be on each individual student, assessment based on an individual's contribution in group activity, their understanding and response to questions.
Distribution of Term work marks shall be as below;

o Marks awarded by guide/supervisor based on log book : 10
o Self contribution and use of skill set in project : 10
o Quality of Project report : 05

II) Mini Project Internal Examination (25 Marks):

Report should be prepared as per the guidelines.
The students shall present a seminar on Mini project and demonstrate their understanding of need/problem.

- Mini Project shall be evaluated through a presentation and demonstration of working model by the student project group to a panel of examiner at Institute level.
- Mini Project shall be assessed based on following points:
- Quality of survey/ need identification.
- Clarity of Problem definition based on need.
- Innovativeness in solutions.
- Feasibility of proposed problem solutions and selection of best solution.
- Cost effectiveness.
- Societal impact.
- Full functioning of working model as per stated requirements.
- Effective use of skill sets.
- Contribution of an individual as a member or leader.
- Clarity in written and oral communication.

Course Code	Course Name			
AC-MCA-21	Competitive Programming and Aptitude Development			
Contact Hours (Per Week)	Credits Assigned	Examination Scheme (Marks)		
		Term Work	End Sem Examination	Total
1	Non Credit	25	-	25

Prerequisite:

1. Basic understanding of fundamentals of programming(C++/ Java)
2. Understanding of Data Structures and Algorithms
3. Basic Mathematical Skills
4. Time Management Skills

Course Objective: Course aims to

Sr. No.	Course Objective
1	Prepare students to perform in technical tests of Campus Recruitment processes in given time constraints
2	Build in students problem-solving skills using various algorithms
3	Accustom students with the competitive programming platforms
4	Prepare students to perform in aptitude tests of Campus Recruitment processes in given time constraints

Course Outcomes (CO): On successful completion of course learner/student will be able to

Sr. No.	Course Outcome	Bloom Level
CO1	Apply fundamental and algorithmic logic to write programs to solve problems on any competitive coding platform	Apply
CO2	Solve problems based on array and strings on any competitive coding platform	Apply
CO3	Solve mathematical problems commonly asked in campus recruitments	Apply
CO4	Solve logical reasoning problems commonly asked in campus recruitments	Apply

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-

Course Contents:

Module No.	Detailed Contents	Hrs.	CO No.	Ref No.
1	**Module 1: Basic Problem Solving** Fundamental logic, algorithmic thinking, and applying basic programming constructs like loops, conditionals, and functions to solve simple computational problems	2	1	1,2,3
2	**Module 2: Array and String** One-dimensional and multi-dimensional arrays, sorting and searching algorithms, string manipulation	3	1	1,2,3
3	**Module 3: Problem Solving approaches** Divide and Conquer - Recursion, Greedy algorithms, Dynamic Programming	3	1,2	1,2,3
4	**Module 4: Quantitative Ability** Numbers, Average, Percentage, Profit & Loss, Ratio & Proportion, Allegation & Mixture	2	1,2	1,2,3
5	**Module 5: Quantitative Ability** Time & Work, Time & Distance, Permutation & Combination, Probability	3	3	4,5,6
6	**Module 6: Logical Ability** Puzzles and Seating Arrangement, Blood relationship, Data Interpretation, Syllogisms	2	3,4	4,5,6

Reference Books:

Reference No	Reference Name
1	How to Design Programs, Second Edition by Matthias Felleisen, Robert Bruce Findler, Matthew Flatt, Shriram Krishnamurthi, 2014
2	Think Like A Programmer by V. Anton Spraul, 2012
3	The Art of Computer Programming, Third Edition by Donald Knuth, 1997
4	The Pragmatic Programmer, Andrew Hunt , David Thomas, 2010
5	Quantitative Aptitude for Competitive Examinations by RS Aggarwal, S Chand Publishing, 2017
6	A Modern Approach To Logical Reasoning by RS Aggarwal, S Chand Publishing, 2018

Web References:

Reference No	Reference Name
1	https://github.com/jwasham/coding-interview-university#interview-prep-books
2	https://people.scs.carleton.ca/~lanthier/teaching/ProcessingNotes/COMP1405_Ch1_IntroductionToComputerScience.pdf
3	https://github.com/hxu296/leetcode-company-wise-problems-2022
4	https://www.indiabix.com/aptitude/questions-and-answers/
5	https://www.indiabix.com/logical-reasoning/questions-and-answers/

Assessment

Competitive Programming is an audit course. Term work marks will be based on submission of all assignments and any test conducted.