Institute of Engineering & Management, Kolkata

(A School of the University of Engineering and Management, Kolkata)

Detailed Syllabus

3rd Semester – MCA – 2025-2027 Batch

DEPARTMENT OF COMPUTER APPLICATIONS

MCA STRUCTURED SYLLABUS - SECOND YEAR AND FIRST SEMESTER OF MCA2025 ADMISSION BATCH

Course Code	Course Title	Total No. of Contact Hours				Total No. of Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
3rd Semester (Theory)						
MCA301	Operating Systems and Systems Software	4	1	0	5	4
MCA302	Software Engineering & TQM	4	1	0	5	4
MCA304	Statistics and Numerical Techniques	3	1	0	4	3
MCA305	Artificial Intelligence and Machine Learning	4	1	0	5	4
MCAGS301	General Studies & Current Affairs-III	2	0	0	2	0.5
Total of Theory					**21**	**15.5**
3rd Semester (Practical)						
MCA391	Operating Systems Laboratory (Unix)	0	0	2	2	3
MCA392	Software Project Management Laboratory	0	0	2	2	3
MCA395	Artificial Intelligence and Machine Learning Laboratory (PYTHON)	0	0	2	2	3
Total of Practical					**6**	**9**
3rd Semester (Sessional)						
MCA371	Sustainability, Climate Action and Environmental Sciences	2	1	0	3	2
MCA381	Industrial Training	0	0	0	0	2
MCA382	Minor Project	0	0	0	8	6
MCA373	Seminar	0	0	0	0	1
MCAGS381	Competitive Aptitude Training - III	2	0	0	2	0.5
IFC	Industry and Foreign Certification	0	0	0	0	0
MAR	Mandatory Additional Requirements	0	0	0	0	0
MOOCS	Massive Open Online Courses	0	0	0	0	0
Total of Sessional					**13**	**11.5**
Total of the Semester					**40**	**36**

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University of Engineering and Management
Institute of Engineering & Management, New Town Campus

Syllabus for MCA Admission Batch 2025, 3rd Semester

Subject Name: Operating System and System Software **Credit: 04**

Subject Code: MCA301 & MCA391 **Lecture Hours: 40 Hrs.**

Name of the Course: Operating System and System Software & Operating Systems Laboratory (Unix)	
Course Code: MCA301 & MCA391	**Semester: 3**
Duration: 40 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 100
Tutorial: 1	Continuous Assessment: 100
Practical: 2	Practical Sessional Internal continuous evaluation: 100
Credit: 4 +3	Practical Sessional external examination: 100

Aim:	
Sl. No.	
1	To understand the system architecture of an operating system
2	Ability to apply CPU scheduling algorithms to manage tasks.
3	Initiation into the process of applying memory management methods and allocation policies.
4	Knowledge of methods of prevention and recovery from a system deadlock.

Objective:	
Sl. No.	
1	To deliver a detailed knowledge of integral software in a computer system – Operating System.
2	To understand the workings of an operating system as a resource manager.
3	To familiarize the students with Process and Memory management.
4	To describe the problem of process synchronization and its solution.
Pre-Requisite:	
Sl. No.	
1.	You should know about Computer Architecture and Organization.
2	Proficiency in C or another programming language.
3	Familiarity with Assembly language.

Course Outcome:	
CO1	Understand Operating System Concepts: Gain knowledge about operating system functions, generations, processes, and threads.
CO2	Develop Process Scheduling Algorithms: Create algorithms for process scheduling, considering CPU utilization, throughput, turnaround time, waiting time, and response time.
CO3	Identify the deadlock situation and provide an appropriate solution so that the protection and security of the operating system are also maintained.
CO4	Learn File Handling and Process Control: Understand the basics of File, Device, and Disk Storage Management

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	2	1	0	0	1	1	0	3	2	0	1
CO2	3	3	3	2	2	1	0	0	1	1	0	2	3	1	1
CO3	3	3	2	2	2	2	1	2	1	1	0	2	3	1	1
CO4	3	2	3	1	2	1	0	0	1	1	0	3	3	0	1

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Introduction**	1. Introduction to Operating Systems 2. Hardware Support for Operating Systems 3. Resource Management 4. Operating System Architectures	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	• Basic Unix Commands
2	**Process Management**	5. Fundamentals of Process Management 6. Process Scheduling 7. Process Communication and Synchronization 8. Deadlocks 9. Multi-threading	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	8	• C Programs for Process Scheduling • Implementation of Banker's Algorithm
3	**Memory Management**	10. Basic Memory Management 11. Virtual Memory	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu)	8	• C programs to simulate contiguous memory allocation techniques • C programs to simulate the paging technique

			AICTE-prescribed syllabus: mcadegree.pdf (aicte-india.org) ***Industry Mapping:*** The concepts delivered are in sync with the industry standards		
4	**File Management**	12. File Systems 13. File System Implementation	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	7	• Unix commands on file operations • C program for file organization technique.
5	**Input –Output Management**	14. Basics of I/O Management 15. Disk Management	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	7	• C programs to simulate disk scheduling algorithms

6	**Security and Protection** **Advanced Operating System**	16. Security Issues 17. Protection Mechanisms 18. Distributed Operating Systems	***International Academia:*** CS 372 Operating Systems Syllabus (utexas.edu); CS 140: Operating Systems (stanford.edu) ***AICTE-prescribed syllabus:*** mcadegree.pdf (aicte-india.org) ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	6	• Advanced Unix commands

List of Books Text Books:			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Naresh Chauhan	Principles of Operating Systems (Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18)	1st Ed/ 9780198082873	Oxford University Press
Reference Books:			
Abraham Silberschatz, Peter B. Galvin	Operating System Concept	9th Ed/ 9788126554270	WILEY
Andrew S. Tanenbaum	Modern Operating Systems	4th Ed/ 9789332575776	Pearson Education India
William Stallings	Operating Systems	9th Ed/ 9789352866717	Pearson Education
Sumitabha Das	UNIX: Concepts and Applications (Lab Reference)	4th Ed/ 9780070635463	McGraw Hill Education

University of Engineering and Management
Institute of Engineering & Management, New Town Campus

Syllabus for MCA Admission Batch 2025, 3rd Semester

Subject Name: Software Engineering & TQM **Credit: 04**

Subject Code: MCA302 **Lecture Hours: 40 Hrs.**

Name of the Course: Software Engineering & TQM	
Course Code: MCA302 & MCA392	**Semester: 3rd**
Duration: 40 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam: 100
Tutorial: 1	Continuous Assessment: 100
Practical: 2	Practical Sessional internal continuous evaluation: 100
Credit: 4 + 3	Practical Sessional external examination: 100

Aim:	
Sl. No.	
1	To gain knowledge of various aspects of software engineering project management.
2	To enhance ability to identify qualities of a good solution
3	To implement learned algorithm/design techniques to solve problems

Objective:	
Sl. No.	
1	The fundamental knowledge of software engineering
2	The different basic models need to implement different project problems
3	The various design methods to develop the software system
4	The quality and other issues related to the software products and systems
Pre-Requisite:	
Sl. No.	
1.	Knowledge in fundamental theories of computer science and one programming language
Course Outcome:	
CO1	On completion of this course students are expected to learn fundamentals and different models of software engineering.
CO2	On completion of this course students are expected to learn different aspects of requirement analysis in software project management.
CO3	On completion of this course students are expected to learn various types of software design and concepts of coding.
CO4	On completion of this course students are expected to learn different types of testing and quality issues.

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	-	-	-	-	-	1	-	2	1	3	-	-
CO2	2	3	2	1	-	-	-	1	2	3	3	1	3	-	-
CO3	3	2	3	-	2	-	-	-	-	-	-	1	3	-	-
CO4	2	2	2	3	2	-	-	1	1	1	-	1	3	-	-

Module Number	Topic	Subtopics	Mapping withIndustry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Introduction and Software Process Models**	Software, Software Engineering, Myths, Software Process, Work Products, Importance of Software Engineering, Standard for Software Process, Waterfall Model, Prototyping Model, Iterative Enhancement Model, Spiral Model, RAD model.	***International Academia:*** (https://ocw.mit.edu/courses/16-355j-software- engineering-concepts- fall-2005/pages/lecture- notes/) ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20%28AI&ML%29.pdf) ***Industry Mapping:*** IEEE SRS standard, Rational Rose, Reqview, Jira software,Axosoft.	8	1. Make a comparative studies of different models of software development process.
2	**Requirement Engineering and SoftwareProject Management**	Software Requirements, Types of Requirements, Requirement Engineering Cycle, Requirements Specification document, Characteristics of Requirements, Requirement verification and validation, Role of Management in Software Development, Project Estimation Techniques, Staffing, Scheduling, Earned Value Analysis, Software Risks, Software Configuration Management, Software Process and Project metrics.	**International Standards** https://ocw.mit.edu/cour ses/16-355j-software- engineering-concepts- fall-2005/pages/lecture- notes/) ***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20%28AI&ML%29.pdf) ***Industry Mapping:*** MSproject, ProjectLibre, FunctionPointmodeler.	12	1. Write an SRS. 2. Compute function points using the method of FPA to determine the cost of s/w project 3. Implement COCOMO using the different formulas 4. Implement Gantt Chart and determine milestones 5. Implement PERT-CPM method

3	**Software Design andCoding**	Process, Data and Behavioural Modelling, Design Concepts, Modularity, Architectural design, Coupling and Cohesion, Top-down and bottom-up design, Object- oriented Analysis, Function- oriented and Object-Oriented Design approach, Software Design Document, Coding styles and documentation,	***International Standards*** : (https://ocw.mit.edu/course s/16-355j-software- engineering-concepts-fall-2005/pages/lecture-notes/) ***AICTE prescribed syllabus:*** *(*https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20%28AI&ML%29.pdf) ***Industry Mapping:*** IEEE SDD document. Smart draw, Visual Paradigm/Microsoft Visio/MS Project/Umbrello/R ational Rose.	8	1. Implement the Cyclomatic Complexity of coding 2. Implement and evaluate the Halstead's Metrics of Coding 3. 3. Implement Dharma's metrics 4. Implement polymorphism factor formula. 5. Implement inheritance formula
4	**Testing and SoftwareQuality**	Testing principles, testing strategies, Black-box and White- box Testing Techniques, Levels of testing -unit, integration, system, regression, Test Plan, Test Cases Specification, Software debugging, Software Maintenance, Software Quality Factors, ISO , SEI CMM, CMMI, Software Reliability. Software Availability.	***International Standards:*** (https://ocw.mit.edu/courses/6-170-laboratory-in- software-engineering-fall-2005/pages/assignments/) ***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/CS%20%28AI&ML%29.pdf) ***Industry Mapping:*** Eclipse, Bugzilla,MantisBT, Jira Software.	12	1. Implement H-K information factor. 2. Implement EMV method

List of Books Text Books:			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Rajib Mall	Fundamentals of Software Engineering(Chapter No. 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12)	4th edn	PHI
Reference Books:			
Roger S. Pressman	Software Engineering, A Practitioners Approach(Chapter No. 8, 10, 14, 16, 26, 28)	7th edn	MGH

Workshop/Seminar/Bootcamp/Hackathon based Learning

Module Number	Topic	Subtopics	Mapping withIndustry and International Academia	Lecture Hours	Corresponding Lab Assignment
5 ★ (AI Addition)	AI-Augmented SDLC (NEW — Open Source)	★ AI-assisted requirements elicitation: using local LLMs (Ollama + Llama 3) to draft SRS sections; NLP-based requirement extraction demo ★ AI code completion — open-source tools only: • Tabby (Apache 2.0): self-hosted on college server, students connect via VS Code • Continue (MIT): VS Code / JetBrains plugin, works with any Ollama model ★ Automated code review with open-source tools: • Semgrep OSS (LGPL 2.1): pattern-based static analysis • Bandit (MIT): Python security linting ★ AI-augmented testing: • LLM-based test case generation from SRS text (demo with Ollama) • Property-based testing concepts (Hypothesis library — MIT) ★ AI in DevOps / CI-CD: • Jenkins (MIT) + Tekton (Apache 2.0): pipeline as code • Prometheus + Grafana (Apache 2.0): intelligent alerting / AIOps concepts ★ Prompt engineering for software artefacts: generating user stories, API docs, release notes ★ Agentic coding assistants overview: LangChain (MIT), AutoGen (MIT) — multi-step task agents ★ Ethics & legal: IP ownership of AI-generated code; bias in automated code review; accountability	All tools 100% free & open source: • Tabby — Apache 2.0 (self-hosted AI code assistant) • Continue — MIT (VS Code / JetBrains plugin) • Semgrep OSS — LGPL 2.1 • Bandit — MIT • Jenkins — MIT • Tekton — Apache 2.0 • Prometheus — Apache 2.0 • Grafana — AGPL 3.0 • Ollama — MIT (local LLMs) • LangChain — MIT • AutoGen — MIT Reference: Pressman, 'Software Engineering' 9th ed. Tabby documentation (tabbyml.com) AICTE alignment: AI tools in SDLC — NEP 2020 / AICTE Model Curriculum CS (AI & ML)	4 (additional)	Lab 1 — AI Code Completion: Install Tabby on department server. Students connect via Continue plugin in VS Code. Write a function stub with docstring; let Tabby complete it. Evaluate quality. Lab 2 — Static Analysis: Run Semgrep OSS and Bandit on a provided vulnerable Python project. Identify issues; fix and re-scan. Lab 3 — AI Test Generation: Provide an SRS requirement to Ollama (Llama 3). Prompt: 'Generate 5 test cases in Python unittest format.' Evaluate coverage.

University of Engineering and Management
Institute of Engineering & Management, New Town Campus
Syllabus for MCA Admission Batch 2025, 3rd Semester

Subject Name: Statistics and Numerical Techniques **Credit: 04**

Subject Code: MCA304 **Lecture Hours: 48 Hrs.**

Name of the Course: Statistics and Numerical Techniques	
Course Code: MCA304	**Semester: 3rd**
Duration: One Semester	**Maximum Marks: 100**
Teaching Scheme: Lecture method	**Examination Scheme**
Theory: 4	End Semester Exam: 100
Tutorial: 1	Continuous Assessment: 100
Credit: 4	
Aim:	
Sl. No.	
1	Equip students with the skills to collect, organize, and summarize data effectively, enabling them to understand the fundamentals of descriptive and inferential statistics.
2	Provide students with the knowledge of numerical techniques for solving complex mathematical problems, fostering proficiency in methods such as root finding, interpolation, and numerical integration.
3	Enable students to apply statistical and numerical methods to real-world scenarios across various disciplines, promoting critical thinking, problem-solving, and ethical data practices.

Objective:	
Sl. No.	
1	Develop students' understanding of different data types and the ability to collect, organize, and summarize data effectively, using descriptive statistics techniques.
2	Enable students to grasp the principles of statistical inference, including hypothesis testing, confidence intervals, and regression analysis, to draw meaningful conclusions from sample data about populations.
3	Equip students with proficiency in numerical techniques such as root finding, interpolation, and numerical integration, enabling them to solve complex mathematical problems encountered in various disciplines.
4	Foster the application of statistical and numerical methods in practical scenarios across diverse fields, through case studies and hands-on exercises, promoting critical thinking, problem-solving, and ethical data practices.
Pre-Requisite:	
Sl. No.	
1.	Basic knowledge of senior secondary and under graduate levels mathematics.
Course Outcome:	
CO1	Upon completion of the course, students will demonstrate proficiency in collecting, analyzing, and interpreting data using appropriate statistical techniques, enhancing their ability to make informed decisions based on empirical evidence.
CO2	Students will be able to apply numerical techniques like interpolation and numerical integration to solve complex mathematical problems encountered in engineering, science, and other disciplines, effectively utilizing computational tools to address real-world challenges.
CO3	Students will be able to apply numerical techniques like solution of equation and system of linear equations to solve complex mathematical problems.
CO4	At the end of the course, students will be able to apply numerical methods like numerical solution of ODE to solve complex mathematical problems encountered in engineering, science, and other disciplines to address day-to-day life critical problems.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	3	2	-	-	-	-	-	-	-			
CO2	3	2	-	2	3	-	-	-	-	-	-	-			
CO3	3	3	-	2	3	-	-	-	-	-	-	-			
CO4	3	3	-	2	3	-	-	-	-	-	-	-			

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours
1	Statistics, Probability and Distribution	Statistics - measure of central tendency, dispersion (Moments, Skewness & Kurtosis). Least square curve fitting - linear & non-linear. Probability, introduction to mass function, density function, distribution function (Binomial, Poisson, Normal), estimation of parameters (unbiasedness-concept of noise/error, consistency).	**Industry Mapping:** https://www.sagemath.org/ , MATLAB **International Academia:** https://ocw.mit.edu/courses/18-440-probability-and-random-variables-spring-2014/pages/lecture-notes/ , https://ocw.mit.edu/courses/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/pages/lecture-notes/	16
2	Interpolation and Numerical Integration	Interpolation-Newton's Forward, Backward, Sterling & Bessel's Interpolation formulae, Lagrange's Interpolation. Inverse Interpolation. Integration - Trapezoidal, Simpson's 1/3rd, Weddle's Rule, Romberg Integration, Gauss- Legendre two & three points formula, Newton Cotes Formula.	**Industry Mapping:** https://www.sagemath.org/ , MATLAB **International Academia:** https://ocw.mit.edu/courses/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/pages/lecture-notes/	12

3		Solution of any equation - Method of Iteration, Method of Bisection, Newton-Raphson Method, Regula-Falsi method and Secant Method. Solution of system of linear equations - Gauss Elimination Method, Gauss-Jacobi, Gauss-Seidel, LU factorization and Tri-diagonalization.	**Industry Mapping:** https://www.sagemath.org/ , MATLAB **International Academia:** https://ocw.mit.edu/courses/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/pages/lecture-notes/	12
4		Solution of differential equations - Picard's method, Euler-modified method, Taylor's Series method, Runge-Kutta method, Milne's Predictor-Corrector method.	**Industry Mapping:** https://www.sagemath.org/ , MATLAB **International Academia:** https://ocw.mit.edu/courses/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/pages/lecture-notes/	8

List of Books Text Books:			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
B. S. Grewal	Higher Engineering Mathematics	44th Edition	Khanna Publishers
Reference Books:			
Dr. Hari Arora	PROBABILITY AND STATISTICS	3rd Edition	S.K. KATARIA & SONS
K. DAS	NUMERICAL METHODS	2nd Edition	U.N.DHUR & SONS PRIVATE LTD.
B.K. PAL & K. DAS	ENGINEERING MATHEMATICS Volume - IIA	1st Edition (2021)	U.N.DHUR & SONS PRIVATE LTD.
Madhumangal Pal	Numerical Analysis for Scientists and Engineers: Theory and C Programs	1st Edition (2007)	Alpha Science International Ltd

University of Engineering and Management

Institute of Engineering & Management, New Town Campus

Syllabus for MCA Admission Batch 2025, 3rd Semester

Subject Name: Artificial Intelligence and Machine Learning **Credit: 04**

Subject Code: MCA305 & MCA395 **Lecture Hours: 40 Hrs.**

Name of the Course: Artificial Intelligence and Machine Learning	
Course Code: MCA305 & MCA395	**Semester: 3rd**
Duration: 40 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 4	End Semester Exam:100
Tutorial: 1	Continuous Assessment:100
Practical: 2	Practical Sessional internal continuous evaluation:100
Credit:4+3	Practical Sessional external examination:100

Aim:	
Sl. No.	
1	To gain knowledge of various aspects of artificial intelligence
2	To enhance the ability to identify qualities of a good solution of AI, ML etc.
3	To implement learned analytical techniques and AI & ML to solve problems.
Objective:	
Sl. No.	
1	Provide you with the knowledge and expertise to become a machine learning expert.
2	Demonstrate an understanding of intelligence and machine learning concepts that are vital for real-life problems.
3	Produce Python code to analyze different problems.
4	Critically evaluate intelligent problems based on their design, development and use in real-time.
Pre-Requisite:	
Sl. No.	
1.	Proficiency in Mathematics, Algorithms and Programming related to AI, ML etc.

Course Outcome:	
CO1.	Explain how knowledge is collected, created and managed for intelligence.
CO2.	Understand the key concepts in AI including their real-world applications and the toolkit used by intelligent systems.
CO3.	Implement AI & ML techniques using knowledge and toolkits.
CO4.	To enable systems to solve complex problems and automate decision-making processes.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	-	-	-	-	-	1	1	3	1
CO2	3	2	1	1	3	2	-	1	-	-	-	2	1	2	2
CO3	3	2	3	2	3	1	-	1	1	-	-	2	2	3	2
CO4	3	3	3	3	2	2	-	1	1	-	-	2	2	2	3

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Module I: Introduction to AI(2L)**	Overview of Artificial Intelligence – Introduction–History of AI– Applications of Al– Objectives of Al- features of AI	***International Academia:*** https://ocw.mit.edu/courses/res-str-002-data-management-spring-2016/ ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in	4	1. Write a program for displaying reversal of a number. 2. Implement python script to read person's age from keyboard and display whether he is eligible for voting or not. 3. Implement python script to check the given year is leap year or not. 4. Implement Python Script to generate prime numbers series up to n. 5. To display elements of list in reverse order. 6. Implement python script to accept

			sync with the industry standards		line of text and find the number of characters, number of vowels and number of blank spaces in it. 7. Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between 1000 and 2000. 8. Implement a python script for factorial of number by using recursion.
2	**Module II: Symbolic Logic(6L)**	Normal Forms in Propositional Logic – Logical Consequences – Resolution Principal – Predicate Calculus – Well Formed Formulas – Clausal Form – Rules of Inference – Unification – Resolution	***International Academia:*** https://ocw.mit.edu/courses/15-062-data-mining-spring-2003/ ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	1. Write a program which accepts a sequence of comma-separated numbers from console and generate a list and a tuple which contains every number. Suppose the following input is supplied to the program: 34, 67, 55, 33, 12, 98. Then, the output should be: ['34', '67', '55', '33', '12', '98'] ('34',67', '55', '33', '12', '98'). 2. Write Python script to copy file contents from one file to another. 3. Implement a python script to check the element is in the list or not by using Linear search & Binary search. 4. Implement a python script to arrange the elements in sorted order using Bubble, Selection, Insertion and Merge sorting techniques. 5. Write a python program by using exception handling mechanism. 6. Write a python program to perform various database operations (create, insert, delete, update).

3	**Module III: Search Techniques (6L)**	Different types of search techniques and comparison among them	***International Academia:*** https://ocw.mit.edu/courses/15-071-the-analytics-edge-spring-2017/pages/visualization/ ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	6	1. Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance of the given different types of data. 2. Write a program to demonstrate Regression analysis with residual plots on a given data set.
4	**Module IV: Knowledge Representation (8L)**	Procedural verses declarative knowledge, forward verses backward reasoning, Structured Knowledge: Graphs, Frames, and Related Structures, Object-Oriented Representations, Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics	***International Academia:*** **https://prolearn.mit.edu/data-science-and-big-data-analytics-making-data-driven-decisions** ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	1. Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance of the given different types of data. 2. Write a program to demonstrate Regression analysis with residual plots on a given data set.
5	**Module V: Expert systems(2L)**	Characteristic features of expert systems Applications, importance of expert systems Rule based system architectures (the knowledge base, the inference process, explaining how or why, building a knowledge base, the I/O interface)	***International Academia:*** ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in	4	

			sync with the industry standards		
6	**Module VI: Machine Learning (10L)**	Computational learning tasks for predictions, learning as function approximation, generalization concept. - Linear models and Nearest-Neighbors (learning algorithms and properties, regularization). - Neural Networks (MLP and deep models, SOM). - Probabilistic graphical models. - Principles of learning processes: elements of statistical learning theory, model validation. - Support Vector Machines and kernel-based models. To implement linear regression, Data classification, Data clustering – To learn how to create segments based on similarities using K-Means and Hierarchical clustering	***International Academia:*** **https://professionalprograms.mit.edu/online-program-internet-of-things/** ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	1. Write a program to demonstrate the working of the decision tree-based ID3 algorithm. 2. Write a program to implement the Naïve Bayesian classifier for a sample training data set stored as a .CSV file. 3. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. 4. Write a program to implement k-Means clustering algorithm to cluster the set of data stored in .CSV file 5.
7.	**Module VII: Introduction to Robotics(4L)**	Definitions, illustration of application domains -Mechanics and kinematics of the robot-Sensors for robotics -Robot Control-Architectures for controlling behavior in robots-Robotic Navigation-Tactile Perception in humans and robots-Vision in humans and robots.	***International Academia:*** https://ocw.mit.edu/courses/6-034-artificial-intelligence-fall-2010/ ***AICTE-prescribed syllabus:*** https://makautexam.net/aicte_details/CourseStructure/MCA21.pdf ***Industry Mapping:*** The concepts delivered are in sync with the industry standards	4	Python lab for text analysis 1. Choose some book-length document and download it. 2. Count its characters, lines and words. 3. Count sentences, vocabulary, and the like. 4. Show collocations, common context, concordance, and similar relationships among the words. 5. Plot a lexical dispersion or two. 6. Plot a frequency distribution of the most common words.

List of Books Text Book			
Name of Author	**Title of the Book**	**Edition**	**Name of the Publisher**
Rich, Knight	Artificial Intelligence	3rd edn	PHI
Patterson	Introduction to Artificial Intelligence and Expert Systems	2nd edn	Pearson
Akerkar	Introduction to Artificial Intelligence	2nd edn	PHI
Alpaydin	Introduction to Machine Learning	3rd edn	PHI

Workshop/Seminar/Bootcamp/Hackathon based Learning

Module Number	Topic	Subtopics	Mapping withIndustry and International Academia	Lecture Hours	Corresponding Lab Assignment
10 ★ (AI Addition)	Generative AI (GenAI) (NEW — Open Source)	★ What is Generative AI? Discriminative vs. generative models — intuition first ★ Transformer architecture intuition: self-attention, multi-head attention, positional encoding (conceptual, no heavy maths) ★ Foundation models overview: • GPT family — autoregressive, text generation • BERT — masked language model, classification/NER • T5 — encoder-decoder, text-to-text tasks ★ Prompt engineering — hands-on with local Ollama models: • Zero-shot, few-shot, chain-of-thought prompting • System prompts; temperature and top-p controls ★ Retrieval Augmented Generation (RAG): • Why RAG? Solving hallucination & knowledge cutoff • Pipeline: chunk → embed → store → retrieve → generate • Vector databases: ChromaDB (Apache 2.0), FAISS (MIT) ★ Fine-tuning concepts: LoRA / QLoRA — theory only; no GPU needed ★ Evaluating GenAI: BLEU, ROUGE, hallucination metrics ★ Use cases: summarisation, code generation, Q&A over documents ★ Lab: Build a PDF Q&A chatbot using Hugging Face + Ollama + ChromaDB — runs fully on CPU	All tools 100% free & open source: • Ollama (MIT) Local LLM runner — no API key Models: Llama 3 8B (Meta Community Licence), Mistral 7B (Apache 2.0), Phi-3 Mini (MIT) • Hugging Face Transformers — Apache 2.0 • LangChain — MIT • ChromaDB — Apache 2.0 • FAISS — MIT (Meta) • sentence-transformers — Apache 2.0 Free Learning Resources: • Hugging Face NLP Course (free) • 'Build LLM Apps' — DeepLearning.AI (free audit) AICTE / NEP alignment: Generative AI listed as priority emerging area in AICTE Model Curriculum revision 2024	6 (additional)	Lab: PDF Q&A Chatbot (CPU-only) Step 1: pip install langchain chromadb sentence-transformers Step 2: Install Ollama; pull Llama 3 8B model Step 3: Load a PDF (any textbook chapter) Step 4: Chunk text → embed with sentence-transformers → store in ChromaDB Step 5: LangChain RetrievalQA chain with Ollama as LLM Step 6: Ask 5 questions; verify answers include source page citations Deliverable: Q&A transcript + ChromaDB collection stats

11 ★ (AI Addition)	Agentic AI Systems (NEW — Open Source)	★ What is Agentic AI? From chatbots → autonomous agents ★ The ReAct loop: Reason → Act → Observe → Reason (repeat) ★ Agent components: LLM brain, tools, memory, planning ★ LangChain Agents (MIT): • Tool definition; agent executor; ReAct agent • Built-in tools: web search, Python REPL, SQL ★ AutoGen (MIT — Microsoft Research): • Multi-agent conversations; AssistantAgent + UserProxyAgent • Code-writing + code-execution agent pairs ★ CrewAI (MIT): role-based multi-agent workflows ★ Flowise (Apache 2.0): visual no-code agent builder — drag-and-drop flows ★ Memory types in agents: • Short-term: conversation buffer / summary • Long-term: vector store (ChromaDB) • Episodic: past interaction recall ★ Agentic safety: guardrails, human-in-the-loop, output validation ★ Lab: Build a two-tool LangChain agent (Ollama backend) that can (1) query a local SQLite DB and (2) summarise a text file — fully offline	All tools 100% free & open source: • LangChain Agents — MIT • LlamaIndex — MIT • AutoGen — MIT (Microsoft) • CrewAI — MIT • Flowise — Apache 2.0 • Ollama — MIT • SQLite — Public Domain Free Learning Resources: • AutoGen documentation — Microsoft Research (free) • CrewAI documentation (free) • LangChain documentation (free) AICTE / NEP alignment: Agentic AI / AI Agents listed in emerging CS curriculum areas 2024–25	6 (additional)	Lab: Two-Tool SQLite Agent Setup: pip install langchain langchain-community ollama pull phi3 # lightweight, runs on 4GB RAM Tool 1: SQLite query tool — student marks database Tool 2: Text summariser — reads a file, returns summary Task: Ask agent in natural language: 'Who has the highest marks in Data Science?' 'Summarise the module 3 notes file' Observe: agent selects correct tool, constructs query, returns answer Deliverable: Agent trace log showing tool selection + answers

University of Engineering and Management
Institute of Engineering & Management, New Town Campus

Syllabus for MCA Admission Batch 2025, 3rd Semester

Subject Name: General Studies & Current Affairs - III **Credit: 0.5**

Subject Code: MCAGS301 **Lecture Hours: 48 Hrs.**

Module number	Topic	Sub-topics	Mapping with International/ National/ State Level Exams	Lecture Hours	Corresponding Assignment
1	**GK, Current Affairs and Economics**	**National income-** Concept of GDP, GNP, NNP bothin FC & MP, PCI Tax (**BECC-103, Unit-1,Unit- 2,Unit-3)** http://egyankosh.ac.in//handle/123456789/67653 **NCERT Textbook: (Chapter 2): https://ncert.nic.in/textbook.php?leec1=2-6** Frank, ISC Economics(Chapter-14, 15, 16) https://books.google.co.in/books?id=4lGQISi9G7wC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=fa lse 2. **Concept of tax,** objective of tax, Direct & Indirect Tax, Progressive, Regressive & Proportional tax**.** 3. **Textbook: Principles of Microeconomis: NGregory Mankiew, Chapter 12)** Textbook: FRANKChapter-19 (class - 12) https://books.google.c	***International Exams*** ***1.GRE (https://www.ets.org/pdfs/gre/gre-math-review.pdf)*** ***2.GMAT (https://downloads.mba.com/downloads/gmat- handbook.pdf)*** ***National Exams:*** ***1. UPSC Civil Services Exam*** (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26 ***UPSC Combined DefenceServices (https://upsc.gov.in/sites/default/files/Notif-CDS-I- Exam-2023-Engl-211222.pdf), pg 20-21*** ***3. RBI Grade B (https://rbidocs.rbi.org.in/rdocs/Content/PDFs/DADVTGRB09052023FA65E4FB1***	48	**1. National Income**: Write a report on the challenges and limitations in measuring national income, such as the informal sector, data collection issues, and non-market transactions. **2. Concept of Tax-** Write a report on the difference between tax evasion and tax avoidance. Discuss the measures taken by the Indian government to combat tax evasion and promote tax compliance. **3. Inflation & Deflation** Write a report on the causes of deflation and

		o.in/books?id=4lGQI Si9G7wC&printsec=f rontcover&source=gb s_ge_summary_r&ca d=0#v=onepage&q&f=false 4. **Inflation & Deflation -** Inflation & its impact, Deflation & its impact, WPI, CPI, GDP deflator.**(BECC-106, Block-2,Unit-6)** http://egyankosh.ac.in//han dle/123456789/75067 Textbook: M LJhingan 12th Edition. Macro-Economic Theory, Part-5,Chapter-37 **Market structure-**Perfect competition, monopoly, oligopoly, duopoly, monophony, duopoly, Oligopoly(BECC-101, Block-4, Unit-9,10,11,12) http://egyankosh.ac.in//han dle/123456789/67491 Textbook: FRANKChapter-19 (Class-12) https://books.google.c o.in/books?id=4lGQI Si9G7wC&printsec=f rontcover&source=gb s_ge_summary_r&ca d=0#v=onepage&q&f=false **GK and Current Affairs** –Based on MonthlyMagazines provided andrecent news of national and international importance. **Newspaper Reading:** TheEconomic Times. **Traditional GK and CA**:Capitals of countries, the currency of countries, important dates, Sports football, hockey, recent events & awards etc. Important books &authors, ImportantHydropower dams, atomicpower plants, important	***C2CF473396B4FD7E5F69 CDDE.PDF), pg 22-23*** ***4. IBPS Probationary officer(https://www.ibps.in/ wp-content/uploads/Detailed- Advt.-CRP-PO-XII.pdf) ,Pg 7.*** ***5. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileSe rver/PortalManagement/Upl oadedFiles/notice_CGLE_0 3042023.pdf) pg. 20-22*** ***6. Intelligence Bureau ACIO (https://www.pw.live/exams/ wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)*** ***7. XAT (https://xat.org.in/xat-syllabus/)*** ***8. GATE (https://gate2025.iisc.ac.in/p apers-and-syllabus/)*** ***9. CAT https://iimcat.ac.in/per/g01/ pub/756/ASM/WebPortal/1/i ndex.html?756@@1@@1 State Level Exams:*** ***1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Downl oad?param1=202302251424 30_Syllabus.pdf&param2=a***		its consequences for the economy. **4. Market Structure.** Analyze the impact of different market structures on consumers, focusing on factors like price, quality, and choice. Analyze their effectiveness and impact on the economy. ** All the assignments are in line with entrance exams for premier B-Schools and GS Paper-I of UPSC CSE.

		national parks, Minister &portfolio & constituencies,Population census, Persons in news -most famous,popular recent only, Important dances & festivals of Indian states,International Head Quarters & world organization, Importantpresident & pm electedfrom various countries, Important about banks likepayment banks, smallbanks & license system, Awards, Sports, Books & author, National & International affairs	***dvertisement, pg 1*** ***2.*** **Miscellaneous Services Recruitment Examination** (***file:///C:/Users/UEMK/Downloads/2707970_2019.pdf),pg 1***		

References

1. Indian Economy-Ramesh Singh

University of Engineering and Management
Institute of Engineering & Management, New Town Campus

Syllabus for MCA Admission Batch 2025, 3rd Semester

Subject Name: Sustainability, Climate Action and Environmental Sciences Credit: 03

Subject Code: MCA373 Lecture Hours: 36 Hrs.

Name of the Course: **ENVIRONMENT AND ECOLOGY**	
Course Code: MCA373	**Semester: 3rd**
Duration: 36	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 1	End Semester Exam: 100
Tutorial: 1	Continuous Assessment: 100
Credit: 2	
Aim:	
Sl. No.	
1	Imparting knowledge about the environment and ecosystem around us.
2	Imparting knowledge about the natural resources, biodiversity, and the importance of their conservation
3	**Environmental Management and Pollution Control**

Objective:	
Sl. No.	
1	Students will gain knowledge about the environment and ecosystem.
2	Students will learn about natural resources, biodiversity, and the importance of their conservation

3	**To make students aware of problems of environmental pollution, its impact on humans and the ecosystem, and control measures.**
4	**At the end of the course, students will learn about waste disposal measures and environmental management.**
Pre-Requisite: NA	
Course Outcome:	
1.	**Define Environmental factors and the basic components of the ecosystem.**
2.	**Understand and explain the importance of Plantation.**
3.	**List the pollutants and analyze the importance of reducing/ controlling environmental pollution.**
4.	**Analyze the importance of Biohazards, Environmental and Social fety**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	2	1	2	1	2	2	2	3	2	1	2	2
CO2	3	2	3	2	2	3	1	2	2	1	1	1	3	1	3
CO3	2	2	1	3	1	2	3	3	1	1	2	3	3	3	1
CO4	1	3	1	3	3	2	2	3	2	3	2	1	1	1	2

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours
1	**Overview**	Basic ideas of environment, basic concepts, man, society & environment, their interrelationship Mathematics of population growth and associated problems, Importance of population study in environmental engineering, the definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. Materials balance: Steady state conservation system, steady state system with non-conservative pollutants, step function. Importance, scope and principles of EIA.	***International Academia:*** https://online.stanford.edu/courses/xeiet100-clean-renewable-energy-storage-sustainable-future ***AICTE-prescribed syllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** https://cbs.umn.edu/populus/downloadplant(WWTP) .	6

2	**Ecology**	Elements of ecology: System, open system, closed system, the definition of ecology, species, population, community, definition of ecosystem- components types and function. (1L) Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web.(2L) Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. (1L) Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.(2L)	***International Academia:*** ***https://ocw.mit.edu/courses/1-020-ecology-ii-engineering-for-sustainability-spring-2008/*** ***AICTE-prescribed syllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** ***https://vsni.co.uk/solutions/ecology*** ***https://www.helsinki.fi/en/researchgroups/statistical-ecology/software***	6
3	**Air Pollution**	Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. (1L) Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.(1L) Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget.(1L) Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion).(2L) Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model.(2L) Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. (2L) Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green-house gases, effect of ozone modification. (1L) Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference). (1L)	***International Academia:*** https://ocw.mit.edu/courses/1-84j-atmospheric-chemistry-fall-2013/pages/lecture-notes/ ***AICTE-prescribed syllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** https://www.who.int/europe/tools-and-toolkits/airq---software-tool-for-health-risk-assessment-of-air-pollution	6
4	**Water Pollution**	Pollutants of water, their origin and effects: Oxygen demanding	***International Academia:***	6

		wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds.DO, 5-day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river [deoxygenating, reaeration], COD, Oil, Greases, pH. Lake: Eutrophication [Definition, source and effect]. Waste water standard [BOD, COD], Water Treatment system,primary and secondary treatments, tertiary treatment definition.Water pollution due to the toxic elements. USEPA and WHO guidelines for drinking water.	***https://online.stanford.edu/courses/cee270m-aquatic-and-organic-chemistry-environmental-engineering*** ***AICTE-prescribed syllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** *Activated Sludge Simulation (ASIM), Sewage Treatment Operation and Analysis Over Time (STOAT), and GPS-X are the common softwares used for waste water treatment plant(WWTP).*	
5	**Lithosphere**	Lithosphere; Internal structure of earth, rock and soil (1L). Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).(2L)	***International Academia:*** ***https://ocw.mit.edu/courses/1-34-waste-containment-and-remediation-technology-spring-2004/*** ***AICTE-prescribed syllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** ***https://www.wasteworksonline.com/***	6
6	**Noise pollution**	Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise] (1L) Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L10 (18hr Index) ,n Ld.Noise pollution control. (1L)	***International Academia:*** ***No link found*** ***AICTE-prescribed syllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** No software found	3
7	**Environmental Management**	Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol. (2L)	***International Academia:*** ***https://ocw.mit.edu/courses/11-601-introduction-to-environmental-policy-and-planning-fall-2016/*** ***AICTE-prescribed syllabus:*** ***https://old.aicte-india.org/downloads/Environmental_Studies_curriculum.pdf*** ***Industry Mapping:*** ***https://www.intelex.com/products/environment/***	3

List of Books Text Books:			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
MP Poonia, SC Sharma, S. Kumar	Environmental Studies (AICTE Textbook)	3rd- 2021/ 978-9390779024	Khanna Book Publishing Co.
Reference Books:			
NA			

University of Engineering and Management
Institute of Engineering & Management, New Town Campus
Syllabus for MCA Admission Batch 2025, 3rd Semester

Subject Name: Competitive Aptitude Training – III **Credit: 0.5**

Subject Code: MCAGS381 **Lecture Hours: 48 Hrs.**

Module number	Topic	Sub- topics	Mapping with International/National/ State Level Exams	Lecture Hours	Corresponding Assignment
1	**Quantitative Aptitude**	**Textbook:** Quantitative Aptitude for Competitive Examination **Author:** R.S Agarwal **Publishing House:** S. Chand 1. Simple & Compound Interest, 2. Number System, 3. Quadratic Equations	***National Exams:*** ***1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26*** ***2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21*** ***3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22*** ***4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)*** ***State Level Exams:***	12	**1. Simple & Compound Interest:** • **Simple Interest Applications:** o Calculate the total interest and amount payable on a loan with simple interest. o Determine the time required to double an investment with simple interest. o Compare the simple interest earned on different principal amounts or at different interest rates. • **Compound Interest Applications:** o Calculate the compound interest and final amount of an investment over multiple years. o Compare the growth of an investment with different compounding frequencies (annual, semi-annual, quarterly, monthly). o Determine the time required to double or triple an investment with compound interest.
					o Understand the concept of effective annual rate (EAR) and how it relates to nominal

			1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement), pg 1
			2.* Miscellaneous Services Recruitment Examination** (https://adda247jobs-wp-assets-prod.adda247.com/jobs/wp-content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf ***) pg 1
					interest rates and compounding frequencies.
					
					2. Number System:
					
					• **Divisibility Rules:**
					  ○ Test the divisibility of numbers by 2, 3, 4, 5, 6, 8, 9, 10, and 11.
					  ○ Apply divisibility rules to simplify calculations and solve problems.
					• **Prime and Composite Numbers:**
					  ○ Identify prime and composite numbers.
					  ○ Find the prime factorization of composite numbers.
					  ○ Use prime factorization to find the highest common factor (HCF) and least common multiple (LCM) of numbers.
					• **Number Properties:**
					  ○ Understand the concepts of even and odd numbers, natural numbers, whole numbers, integers, rational and irrational numbers.
					  ○ Solve problems involving the properties of these number types.
					
					3. Quadratic Equations:
					
					• **Solving Quadratic Equations:**
					  ○ Solve quadratic equations using factoring, completing the square, and the quadratic formula.
					  ○ Determine the nature of roots (real, equal, imaginary) of a quadratic equation.
					• **Word Problems:**
					  ○ Apply quadratic equations to solve real-world problems, such as finding the dimensions of a rectangle given its area and

					perimeter, or determining the trajectory of a projectile. **4. Quadratic Functions and Graphs:** • Graph quadratic functions andinterpret the graph to find the vertex, axis of symmetry, and intercepts. • Use the graph to solve quadratic equations and inequalities.
2	**Logical Reasoning**	**Textbook:** Verbal and Non-Verbal reasoning **Author:** R.S Agarwal **Publishing House:** S. Chand 1. Puzzle a) Classification Based Puzzle b) Sequential Based Puzzle c) Selection Based Puzzle d) Ranking Based Puzzle e) Blood Relation Based Puzzle Inequality	***National Exams:*** ***1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26*** ***2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21*** ***3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22*** ***4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)*** ***State Level Exams:*** ***1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement), pg 1***	12	**1. Classification Based Puzzles:** • **Grouping by Attributes:** Provide a list of items (e.g., animals, fruits, professions) and ask students to classify them into groups based on shared characteristics (e.g., habitat, color, skill set). • **Identifying the Odd One Out:** Present a group of items where one does not belong and have students explain why it is different from the others. • **Missing Item:** Give a set of items with a pattern and have students determine the missing item that fits the pattern. **2. Sequential Based Puzzles:** • **Logical Sequencing:** Present a series of events or actions and have students arrange them in a logical order. • **Number Series:** Give a series of numbers with a pattern and ask students to find the missing number or continue the series. • **Letter Series:** Provide a series of letters with a pattern and have students determine the missing letter or continue the series. **3. Selection Based Puzzles:** • **Team Selection:** Provide a set of candidates with different skills and have students select the best team for a specific task. • **Item Selection:** Give a list of items with

			2. **Miscellaneous Services Recruitment Examination** (***file:///C:/Users/UEMK/Downloads/2707970_2019.pdf***) ***pg1***		different attributes and ask students to choose the most suitable item for a given purpose. • **Eligibility Criteria:** Present a set of rules or conditions and have students determine which candidates are eligible or ineligible based on those criteria. **4. Ranking Based Puzzles:** • **Height/Weight Arrangement:** Arrange a group of people in ascending or descending order based on their height or weight. • **Marks/Scores:** Order students or players based on their marks, scores, or performance in a competition. • **Preferences:** Determine the order of preference for a group of people based on their likes and dislikes. **5. Blood Relation Based Puzzles:** • **Family Tree:** Present a family tree with missing information and have students deduce the relationships between different members. • **Coded Relationships:** Use codes or symbols to represent relationships and ask students to decode them. **6. Puzzles with Statements:** Give a set of statements about the relationships between people and have students draw afamily tree or answer questions based onthose statements **7. Inequality Puzzles:** • **Coded form of Inequalities** • **Either-Or Case** • **Neither -Nor Case** **Single Statement Inequalities**.
3	**VerbalEnglish**	**Textbook:** Objective General English **Author:** R.S Agarwal **Publishing house:** S. Chand	***National Exams:*** ***1.UPSC Civil Services Exam*** (***https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-***	12	**1. Application of Adjectives and Determiners:** • Identification of Errors • Comparative and Superlative Forms • Types of Adjectives

		1. Application of Adjectives and Determiners 2. Conjunction and Connectors 3. Rearrangement of Sentences. 4. Multiple Fillers-Level 1 5. Reading Comprehension 6. Precise Writing Notice Writing	***010223.pdf), pg 25-26*** ***2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21*** ***3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22*** ***4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)*** ***State Level Exams:*** ***1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1*** **Miscellaneous Services Recruitment Examination** (https://adda247jobs-wp- assets-prod.adda247.com/jobs/wp-content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf) ***pg 1***		• Determiners in Context **2. Conjunctions and Connectors:** • Sentence Combining • Coordinating vs. Subordinating Conjunctions • Transition Words and Phrases • Connectors for Cause and Effect **3. Rearrangement of Sentences:** • Jumbled Sentences • Paragraph Sequencing **4. Multiple Fillers - Level 1:** • Cloze Passages • Sentence Completion **5. Reading Comprehension:** • Inference Questions • Vocabulary in Context • Main Idea and Supporting Details • Critical Thinking Questions **6. Precise Writing:** • Summarizing • Paraphrasing **8.** Editing for Conciseness
4	**Data Interpretation**	**Textbook:** Quantitative Aptitude for Competitive Examination	***National Exams:*** ***1. UPSC Civil Services Exam (https://upsc.gov.in/sites/defa***	12	**7.** Application of Data Analysis based on Bar Chart

		Author: R.S Agarwal **Publishing House:** S. Chand Advanced Level: Bar Graph	***ult/files/Notif-CSP-23-engl-010223.pdf), pg 25-26*** ***2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21*** ***3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22*** ***1. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)*** ***2. RBI Grade B (https://rbidocs.rbi.org.in/rdocs/Content/PDFs/DADVTGRB09052023FA65E4FB1C2CF473396B4FD7E5F69CDDE.PDF), pg 22-23*** ***State Level Exams:*** ***1. Civil Services ExecutiveExam(WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement), pg 1***		

			2. **Miscellaneous Services Recruitment Examination** (https://adda247jobs-wp-assets-prod.adda247.com/jobs/wp-content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf***) pg 1***		