



**R.M.K. ENGINEERING COLLEGE**  
RSM Nagar, Kavaraipettai – 601 206



**Department of Artificial Intelligence and Data Science**

**Course Outcomes**

**ODD Semester 2025-26**

Sl. No.	Semester	Theory/ Practical	Course Code	Course Name
1.	3	Theory	24GE301	Universal Human Values 2: Understanding Harmony
2.	3	Theory	24MA301	Discrete Mathematics
3.	3	Theory	24CS301	Computer Organization and Architecture
4.	3	Theory + Lab	24AI301	Artificial Intelligence and Decision Making
5.	3	Theory + Lab	24CS303	Database Management Systems
6.	3	Theory + Lab	24CS302	Advanced Java Programming
7.	3	Practical	24ME311	Product Development Lab – 1
8.	3	Practical	24CS311	Aptitude and Coding Skills I
9.	5	Theory	22CS006	Open Elective I – Introduction to Computer Networks
10.	5	Theory	22AI905	Professional Elective II – Stream Processing and Analytics
11.	5	Theory	22CS911	Professional Elective III – Data Engineering in Cloud
12.	5	Theory + Lab	22AI501	Deep Learning
13.	5	Theory + Lab	22AI502	Data Exploration, Feature Engineering and Visualization
14.	5	Practical	22CS511	Advanced Aptitude and Coding Skills I
15.	5	Practical	22AI512	Internship and Career Readiness Course
16.	5	Theory	22AI924	Medical Image Analytics
17.	5	Theory	22EC907	Sensors and Actuator Devices
18.	7	Theory	22CS603	Professional Ethics
19.	7	Theory	22CS005	Open Elective III – UI/UX Design
20.	7	Theory	22EC012	Open Elective IV – Industrial IoT Applications
21.	7	Theory	22CS910	Professional Elective VI – DevOps
22.	7	Theory + Lab	22AI701	Frameworks for Data Analytics
23.	7	Theory + Lab	22AI702	Natural Language Processing
24.	7	Practical	22AI711	MLOps
25.	7	Theory	22AI932	Smart and Interactive Healthcare Technologies
26.	7	Theory	22EC978	Robot Operating System

## ODD Semester 2024-25

### 3<sup>rd</sup> Semester – B.Tech. Artificial Intelligence and Data Science

24GE301 - UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY	
COs	
CO1	Develop self-awareness and a deeper understanding of their surroundings, including family, society, and nature
CO2	Identify and resolve inner conflicts based on natural acceptance.
CO3	Become more responsible towards life, and handle problems with sustainable solutions by considering human relationships and natural harmony
CO4	Enhance their critical thinking and analyzing skills.
CO5	Develop a stronger commitment towards human values, relationships, and societal well-being.
CO6	Apply what they have learnt in different day-to-day settings in real life, and take the initial steps towards integrating these values into daily life.

22MA301- DISCRETE MATHEMATICS	
COs	
CO1	Examine the validity of the arguments
CO2	Apply various proof techniques and principles using analytic and combinatorial methods.
CO3	Develop the recurrence relation for the sequence
CO4	Implement graph theory techniques to solve real time problems
CO5	Apply the concepts of groups, rings, and fields in solving algebraic problems
CO6	Solve problems in Lattices and Boolean algebra

24CS301 – COMPUTER ORGANIZAION AND ARCHITECTURE	
COs	
CO1	Explain the basic principles and operations of digital computers.
CO2	Analyse the performance of computers by identifying factors that contribute to performance.
CO3	Compare various I/O methods and understand memory management principles.
CO4	Explain data flow in arithmetic algorithms.
CO5	Demonstrating the concept of parallelism in hardware and software.
CO6	Design hardware to solve computationally intensive problems.

### 24AI301 – ARTIFICIAL INTELLIGENCE AND DECISION MAKING

COs	
<b>CO1</b>	Implement various search strategies
<b>CO2</b>	Apply search strategies in problem solving and game playing using heuristic function
<b>CO3</b>	Implement logical agents and first-order logic problems
<b>CO4</b>	Apply problem-solving strategies with knowledge representation mechanism for solving hard problems
<b>CO5</b>	Represent uncertain knowledge and build a decision network using a real-world scenario
<b>CO6</b>	Implement AI algorithms to solve real-world problems

### 24CS303 – DATABASE MANAGEMENT SYSTEMS

COs	
<b>CO1</b>	Map ER model to Relational model to perform database design effectively.
<b>CO2</b>	Implement SQL and effective relational database design concepts.
<b>CO3</b>	Apply relational algebra, calculus and normalization techniques in database design.
<b>CO4</b>	Understand the concepts of transaction processing, concurrency control, recovery procedure and data storage techniques.
<b>CO5</b>	Evaluate and implement transaction processing, concurrency control mechanisms, and recovery procedures to maintain data integrity.
<b>CO6</b>	Analyze and optimize database queries and understand the features and applications of advanced and distributed database systems, including NoSQL.

### 24CS302 – ADVANCED JAVA PROGRAMMING

COs	
<b>CO1</b>	Implement various data structures by utilizing core Java features and libraries
<b>CO2</b>	Demonstrate proficiency in handling Java I/O operations, including file manipulation for efficient data storage and retrieval.
<b>CO3</b>	Apply and Analyze the Stream API for functional programming and data processing.
<b>CO4</b>	Implement advanced object serialization for complex data structures.
<b>CO5</b>	Utilize regular expressions for text parsing and string manipulation.
<b>CO6</b>	Build applications using advanced Java programming techniques.

### Laboratory

### 24ME311 - PRODUCT DEVELOPMENT LAB - 1

COs	
<b>CO1</b>	Identify, collect, and interpret relevant scholarly literature in the chosen research area.
<b>CO2</b>	Evaluate existing research to identify gaps and formulate precise research questions.
<b>CO3</b>	Apply brainstorming techniques to generate innovative and diverse research ideas.
<b>CO4</b>	Analyze reviewed literature and research gap to effectively present a research problem with clarity and rationale

<b>CO5</b>	Develop skills in using evidence to create and present an engaging and critical argument
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<b>24CS311 - APTITUDE AND CODING SKILLS I</b>	
COs	
<b>CO1</b>	Develop vocabulary for effective communication skills
<b>CO2</b>	Build the logical reasoning enhance critical thinking
<b>CO3</b>	Develop error correction and debugging skills in programming
<b>CO4</b>	Apply programming skills to develop programs efficiently
<b>CO5</b>	Solve problems using quantitative skills
<b>CO6</b>	Develop effective reading and listening skills

### 5<sup>th</sup> Semester – B.Tech. Artificial Intelligence and Data Science

<b>22CS006 – OPEN ELECTIVE I – INTRODUCTION TO COMPUTER NETWORKS</b>	
COs	
<b>CO1</b>	Understand the fundamental concepts of computer networks.
<b>CO2</b>	Apply the various routing protocols to solve real-world problems.
<b>CO3</b>	Understand the layered architecture.
<b>CO4</b>	Apply the simulation tools to implement various protocols used in the various layers.
<b>CO5</b>	Analyze the various application layer protocols.
<b>CO6</b>	Apply the mathematical knowledge to do performance analysis of various routing protocols.

<b>22AI905 – PROFESSIONAL ELECTIVE II – STREAM PROCESSING AND ANALYTICS</b>	
COs	
<b>CO1</b>	Outline the framework for real time stream processing
<b>CO2</b>	Illustrate various algorithms for data streaming
<b>CO3</b>	Identify frequent item sets by mining from data streams
<b>CO4</b>	Introduce approaches to evaluate stream learning algorithms.
<b>CO5</b>	Use tools for distributed data flow management
<b>CO6</b>	Design solutions to stream processing problems

<b>22CS911 – PROFESSIONAL ELECTIVE III – DATA ENGINEERING IN CLOUD</b>	
COs	
<b>CO1</b>	Understand data engineering, pipelines & access data in the cloud
<b>CO2</b>	Build secure & scalable data pipelines using AWS services
<b>CO3</b>	Choose the right data storage & secure your data pipelines
<b>CO4</b>	Process big data for machine learning with cloud tools
<b>CO5</b>	Analyze & visualize data and automate data pipelines

<b>CO6</b>	Apply best practices in data governance, compliance, and ethics throughout the data engineering process, ensuring responsible handling and usage of data
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### 22AI501 – DEEP LEARNING

COs	
<b>CO1</b>	Demonstrate the basics of deep neural networks to solve real world problems.
<b>CO2</b>	Implement deep learning models.
<b>CO3</b>	Elaborate CNN and RNN architectures of deep neural networks.
<b>CO4</b>	Use autoencoders in neural networks.
<b>CO5</b>	Illustrate the various deep generative models.
<b>CO6</b>	Apply deep generative models to solve real world problems.

### 22AI502 – DATA EXPLORATION, FEATURE ENGINEERING AND VISUALIZATION

COs	
<b>CO1</b>	Outline exploratory data analysis and the phases involved in data analysis.
<b>CO2</b>	Demonstrate various statistical techniques for data analysis.
<b>CO3</b>	Present the basics of feature engineering on different types of data.
<b>CO4</b>	Perform data analysis and apply visualization techniques.
<b>CO5</b>	Apply the methods of time series analysis.
<b>CO6</b>	Develop dashboards using different datasets by applying data engineering and feature extraction techniques.

### Laboratory

#### 22CS511 – ADVANCED APTITUDE AND CODING SKILLS I

COs	
<b>CO1</b>	Develop advanced vocabulary for effective communication skills
<b>CO2</b>	Build an enhanced level of logical reasoning and quantitative skills.
<b>CO3</b>	Develop error correction and debugging skills in programming
<b>CO4</b>	Apply advanced data structures and algorithms in problem solving
<b>CO5</b>	Develop coding solutions for real-world problems.
<b>CO6</b>	Develop advanced vocabulary for effective reading skills.

#### 22AI512 – INTERNSHIP AND CAREER READINESS COURSE

COs	
<b>CO1</b>	Apply the basics of Data Warehouse concepts
<b>CO2</b>	Apply ETL Tools for Data processing
<b>CO3</b>	Write queries using SQL and NoSQL
<b>CO4</b>	Apply the features of python
<b>CO5</b>	Elaborate the fundamentals of Cloud and various services
<b>CO6</b>	Demonstrate the basic algorithms in AI, ML and summarize the basics of Prompt Engineering

### 22AI924 – MEDICAL IMAGE ANALYSIS

COs	
<b>CO1</b>	Demonstrate a comprehensive understanding of various medical imaging modalities
<b>CO2</b>	Apply machine learning and deep learning techniques
<b>CO3</b>	Develop solutions by preprocessing medical images, implementing machine learning and deep learning algorithms.
<b>CO4</b>	Understand the ethical considerations and regulatory requirements associated with deploying machine intelligence models in healthcare settings
<b>CO5</b>	Elaborate on recent advances and research trends in machine intelligence for medical image analysis
<b>CO6</b>	Illustrate the applications of ML and DL in medical image analysis

### 22EC907 – SENSORS AND ACTUATOR DEVICES

COs	
<b>CO1</b>	Build schematic for IoT solutions with sensors.
<b>CO2</b>	Design and develop IoT based sensor systems.
<b>CO3</b>	Select the appropriate sensors for various industrial applications
<b>CO4</b>	Evaluate the wireless sensor technologies for IoT.
<b>CO5</b>	Design and develop an IoT Prototype project.
<b>CO6</b>	Identify the appropriate actuators for IoT.

## 7<sup>th</sup> Semester – B.Tech. Artificial Intelligence and Data Science

### 22CS603 – PROFESSIONAL ETHICS

COs	
<b>CO1</b>	Summarize the importance of human values in work place
<b>CO2</b>	Discuss the senses of engineering ethics, moral dilemmas, moral autonomy and uses of ethical theories
<b>CO3</b>	Describe the role of engineers as responsible experimenters and necessity of codes of ethics in engineering.
<b>CO4</b>	Explain safety, risk, responsibilities and rights in the society
<b>CO5</b>	Analyze the global issues related to environmental ethics, computer ethics, weapons development and the role of engineers as expert witnesses and advisors.
<b>CO6</b>	Apply ethics in society and discuss the ethical issues related to engineering

### 22CS005 – OPEN ELECTIVE III – UI/UX DESIGN

COs	
<b>CO1</b>	Create visually appealing and functional interfaces that enhance user interaction.
<b>CO2</b>	Ensure products are intuitive, accessible, and meet user needs.
<b>CO3</b>	Build and test design concepts to optimize user experience.
<b>CO4</b>	Evaluate and refine designs based on user feedback.

<b>CO5</b>	Structure content effectively for intuitive navigation.
<b>CO6</b>	Design engaging interactions that improve usability.

### 22EC012 – OPEN ELECTIVE IV – INDUSTRIAL IoT APPLICATIONS

COs	
<b>CO1</b>	Describe IoT, IIoT
<b>CO2</b>	Understand various IoT Layers and their relative importance
<b>CO3</b>	Interpret the requirements of IIoT sensors and understand the role of actuators.
<b>CO4</b>	Study various IoT platforms and security.
<b>CO5</b>	Realize the importance of Data Analytics in IoT.
<b>CO6</b>	Design various applications using IIoT in manufacturing sector.

### 22CS910 – PROFESSIONAL ELECTIVE VI - DEVOPS

COs	
<b>CO1</b>	Understand the core principles and philosophies of DevOps
<b>CO2</b>	Implement version control systems for code management and collaboration
<b>CO3</b>	Automate software delivery pipelines using CI/CD tools
<b>CO4</b>	Utilize containerization technologies for packaging and deploying applications
<b>CO5</b>	Configure infrastructure as code (IaC) for repeatable deployments
<b>CO6</b>	Monitor and maintain applications in a production environment

### 22AI701 – FRAMEWORKS FOR DATA ANALYTICS

COs	
<b>CO1</b>	Apply the fundamentals of Big Data analytics and framework to store and process the big data
<b>CO2</b>	Demonstrate the Hadoop framework Hadoop Distributed File System and MapReduce
<b>CO3</b>	Apply MongoDB for data manipulations
<b>CO4</b>	Apply data analysis using Hadoop ecosystem
<b>CO5</b>	Implement MapReduce programming model and to process the big data along with Hadoop technologies
<b>CO6</b>	Illustrate advanced frameworks and tools for more efficient big data access and processing

### 22AI702 – NATURAL LANGUAGE PROCESSING

COs	
<b>CO1</b>	Elaborate the fundamentals of natural language processing
<b>CO2</b>	Perform word level analysis in NLP
<b>CO3</b>	Implement different ML models for NLP
<b>CO4</b>	Analyze the syntax and semantics using various methods
<b>CO5</b>	Analyze text at the word level
<b>CO6</b>	Apply NLP to solve real-world problems

## Laboratory

22AI711 - MLOPS	
COs	
<b>CO1</b>	Design and implement a Machine Learning Project
<b>CO2</b>	Apply data engineering and ML model engineering and develop a model
<b>CO3</b>	Apply model testing and validation
<b>CO4</b>	Build and Deploy a ML model using CI/CD pipeline

22AI932 - SMART AND INTERACTIVE HEALTHCARE TECHNOLOGIES	
COs	
<b>CO1</b>	Illustrate the need and challenges of personalized healthcare
<b>CO2</b>	Apply basic aspects of telehealth and telemedicine
<b>CO3</b>	Demonstrate M-Health evolution, regulation and applications
<b>CO4</b>	Elaborate the use of virtual reality and games in healthcare
<b>CO5</b>	Elaborate the importance of IoT in healthcare through its applications
<b>CO6</b>	Apply smart and interactive technologies for healthcare applications

22EC978 – ROBOT OPERATING SYSTEM	
COs	
<b>CO1</b>	Understand the robotics design and implementation.
<b>CO2</b>	Comprehend, classify and analyze the behavior of different types of sensors and actuators.
<b>CO3</b>	Understand the ROS fundamentals
<b>CO4</b>	Gain the knowledge about the types of actuators: electrical, pneumatic, and hydraulic, performance criteria and selection.
<b>CO5</b>	Design robotic applications using ROS.
<b>CO6</b>	Design Robots with Localization.

## EVEN Semester 2025-26

Sl. No.	Semester	Theory/ Practical	Course Code	Course Name
27.	4	Theory + Lab	24MA401	Probability and Statistics
28.	4	Theory + Lab	24CS402	Design and Analysis of Algorithms
29.	4	Theory + Lab	24IT402	Web Development Frameworks
30.	4	Theory + Lab	24AI401	Machine Learning
31.	4	Theory + Lab	24AI402	Foundations of Data Science
32.	4	Theory + Lab	24CS304	Operating Systems
33.	4	Practical	24ME411	Product Development Lab – 2
34.	4	Practical	24CS411	Aptitude and Coding Skills II
35.	6	Theory	22CS002	Open Elective II – Cloud Foundations
36.	6	Theory	22AI602	Automata Theory and Compiler Design
37.	6	Theory	22AI903	Professional Elective IV – Text and Speech Analysis
38.	6	Theory + Lab	22CS602	Object Oriented Software Engineering
39.	6	Theory + Lab	22AI601	Reinforcement Learning
40.	6	Practical	22CS611	Advanced Aptitude and Coding Skills II
41.	6	Practical	22AI611	Mini Project

## EVEN Semester 2024-25

### 4<sup>th</sup> Semester – B.Tech. Artificial Intelligence and Data Science

24MA401 – PROBABILITY AND STATISTICS	
COs	
<b>CO1</b>	Compute the statistical measures of standard distributions.
<b>CO2</b>	Apply joint, marginal and conditional distributions to solve practical problems.
<b>CO3</b>	Determine the correlation and regression for two dimensional random variables
<b>CO4</b>	Employ the concept of testing of hypothesis to solve real life problems.
<b>CO5</b>	Apply the concept of analysis of variance for various experimental designs.
<b>CO6</b>	Prepare the control charts for variables and attributes for analyzing the data.

24CS402 – DESIGN AND ANALYSIS OF ALGORITHMS	
COs	
<b>CO1</b>	Understand the different algorithm design paradigms.
<b>CO2</b>	Design algorithms for real world problems using algorithmic design techniques.
<b>CO3</b>	Analyse the efficiency of simple recursive and non-recursive algorithms.
<b>CO4</b>	Analyse the algorithm's worst, best and average case behaviour in terms of time and space.
<b>CO5</b>	Understand the approximation algorithms for solving NP Hard problems.
<b>CO6</b>	Solve the problems by selecting suitable algorithmic design techniques.

### 24IT402 – WEB DEVELOPMENT FRAMEWORKS

COs	
<b>CO1</b>	Understand and apply modern web technologies including HTML5, CSS3, JavaScript, and advanced TypeScript concepts to build dynamic web components.
<b>CO2</b>	Develop responsive and modular front-end applications using ReactJS, including component creation, state management, and routing.
<b>CO3</b>	Implement advanced React features like hooks (useState, useEffect, useRef), React Router, and REST API integration using Axios for dynamic content handling.
<b>CO4</b>	Utilize higher-order components (HOCs), lazy loading, and server-side rendering to optimize and abstract React applications.
<b>CO5</b>	Perform unit testing using Jest and RTL, and manage global application state efficiently using Context API and Redux.
<b>CO6</b>	Design and deliver scalable and real-world enterprise web applications with complete user interface flow, security, and error handling.

### 24AI401 – MACHINE LEARNING

COs	
<b>CO1</b>	Explain the basics of Machine Learning and model evaluation.
<b>CO2</b>	Study dimensionality reduction techniques.
<b>CO3</b>	Understand and implement various classification algorithms.
<b>CO4</b>	Understand and implement various unsupervised learning techniques.
<b>CO5</b>	Build Neural Networks and understand the different types of learning.
<b>CO6</b>	Use Machine Learning Algorithms to build applications.

### 24AI402 – FOUNDATIONS OF DATA SCIENCE

COs	
<b>CO1</b>	Explain the fundamentals of data science.
<b>CO2</b>	Illustrate the basics of data for analysis.
<b>CO3</b>	Identify relationships between variables.
<b>CO4</b>	Implement various data pre-processing strategies.
<b>CO5</b>	Implement data wrangling for further processing of data.
<b>CO6</b>	Apply Data preprocessing on real-time data sets.

### 24CS304 – OPERATING SYSTEMS

COs	
<b>CO1</b>	Demonstrate the basic concepts of operating systems and process.
<b>CO2</b>	Implement process management techniques using inter-process communication.
<b>CO3</b>	Implement the concepts of process synchronization and deadlocks.
<b>CO4</b>	Apply various memory management schemes for the suitable scenario.
<b>CO5</b>	Describe various I/O and file management techniques.
<b>CO6</b>	Develop practical skills in developing system-level programming.

## Laboratory

24ME411 - PRODUCT DEVELOPMENT LAB - 2	
COs	
<b>CO1</b>	Interpret stakeholder needs and document comprehensive functional requirements for the proposed system.
<b>CO2</b>	Develop functional block diagrams or flowcharts to represent system interactions and functional relationships.
<b>CO3</b>	Analyze functional specifications that define roles, behaviors, constraints, and performance expectations for each function.
<b>CO4</b>	Evaluate the defined functional model through verification and validation techniques to ensure alignment with original requirements.
<b>CO5</b>	Analyze and present functional design solutions aligned with the identified research problem and gap.

24CS411 - APTITUDE AND CODING SKILLS II	
COs	
<b>CO1</b>	Develop advanced vocabulary for effective communication skills.
<b>CO2</b>	Build an enhanced level of logical reasoning and quantitative skills.
<b>CO3</b>	Develop error correction and debugging skills in programming.
<b>CO4</b>	Apply data structures and algorithms in problem solving.
<b>CO5</b>	Develop advanced vocabulary for effective reading skills.
<b>CO6</b>	Apply advanced algorithm design techniques to develop programs.

## 6<sup>th</sup> Semester – B.Tech. Artificial Intelligence and Data Science

### 22CS002 – OPEN ELECTIVE II – CLOUD FOUNDATIONS

COs	
CO1	Describe the different ways a user can interact with Cloud.
CO2	Discover the different compute options in Cloud and implement a variety of structured and unstructured storage models.
CO3	Discuss the different application managed service options in the cloud and outline how security in the cloud is administered in Cloud.
CO4	Demonstrate how to build secure networks in the cloud and identify cloud automation and management tools.
CO5	Discover a variety of managed big data services in the cloud.
CO6	Use Cloud services to build applications.

### 22AI602 – AUTOMATA THEORY AND COMPILER DESIGN

COs	
CO1	Construct deterministic and non-deterministic finite automata.
CO2	Design context free grammars for formal languages using regular expressions.
CO3	Use PDA and Turing Machines for recognizing context-free languages.
CO4	Design a lexical analyzer.
CO5	Design syntax analyzer.
CO6	Design a simple code generator and apply different code optimizations.

### 22AI903 – PROFESSIONAL ELECTIVE IV – TEXT AND SPEECH ANALYSIS

COs	
CO1	Apply the fundamental techniques in text processing for various NLP tasks.
CO2	Implement advanced language models and improve text classification accuracy.
CO3	Designing text processing systems using state-of-the-art techniques.
CO4	Design, implement, and evaluate ASR and TTS systems.
CO5	Apply advanced speech recognition methodologies in practical applications.
CO6	Use information Retrieval Techniques to build and evaluate text processing systems.

### 22CS602 – OBJECT ORIENTED SOFTWARE ENGINEERING

COs	
CO1	Summarize software engineering principles and activities involved in building large software programs
CO2	Describe the different phases of software development.
CO3	Explain the basics of OOAD and develop software using object oriented design.
CO4	Illustrate the different stages of the design process with a case study.
CO5	Develop mini-projects using the application of object oriented analysis and design.
CO6	Apply different testing strategies to develop efficient projects.

### 22AI601 – REINFORCEMENT LEARNING

COs	
<b>CO1</b>	Outline the concepts of Reinforcement Learning.
<b>CO2</b>	Solve problems using Dynamic Programming and Monte Carlo Decision Process.
<b>CO3</b>	Implement the concept of Temporal difference Learning (TDL) to solve real world problems.
<b>CO4</b>	Apply functional approximation in reinforcement learning.
<b>CO5</b>	Implement Deep Reinforcement Learning to solve real world problems.
<b>CO6</b>	Solve real-world problems using Reinforcement Learning.

### Laboratory

### 22CS611 – ADVANCED APTITUDE AND CODING SKILLS II

COs	
<b>CO1</b>	Develop advanced vocabulary for effective communication and reading skills.
<b>CO2</b>	Build an enhanced level of logical reasoning and quantitative skills.
<b>CO3</b>	Develop error correction and debugging skills in programming.
<b>CO4</b>	Apply data structures and algorithms in problem solving.
<b>CO5</b>	Develop coding solutions for real-world problems.
<b>CO6</b>	Engage in collaborative projects and provide constructive feedback during code reviews.