MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)

Autonomous Programme

Bachelor of Engineering

Department of
Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

SCHEME and SYLLABUS

VII Semester and VIII Semester

(2022-23 Admitted Batch)

Academic Year 2025-26

VISION OF THE INSTITUTE

To be an institute of excellence in engineering education and research, producing socially responsible professionals.

MISSION OF THE INSTITUTE

- Create conducive environment for learning and research
- Establish industry and academia collaborations
- Ensure professional and ethical values in all institutional endeavors

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

VISION OF THE DEPARTMENT

To be a Center of Excellence for innovative teaching, learning and research to produce socially responsible professionals in the field of Artificial Intelligence and Machine Learning to address real-world problems.

MISSION OF THE DEPARTMENT

- Fostering innovation through cutting-edge teaching, transformative learning, and innovative research in field of artificial intelligence and machine learning with foundations of Computer Science and Engineering.
- Impart latest technology through industry-academia collaboration.
- Maintain high standards of ethical values involved in AI and ML applications with transparency of operations for moral concerns of the society.

PROGRAM **EDUCATIONAL OBJECTIVES (PEOs)**

PEO1: Acquire the fundamentals and expertise in basic science, Computer Science and Engineering, Artificial Intelligence and Machine Learning principles and excel as an IT professional or an entrepreneur.

PEO2: Pursue Higher Studies and Research.

PEO3: Adapt to the technological advancements by engaging in lifelong learning and exhibit professional ethics, teamwork and leadership qualities.

PEO to Mission Statement Mapping

Mission Statements	PEO1	PEO2	PEO3
M1: Fostering innovation through cutting-edge teaching, transformative learning, and innovative research in field of AIML with foundations of CSE.	3	3	2
M2: Impart latest technology through industry-academia collaboration.	3	2	2
M3: Maintain high standards of ethical values involved in AI and ML applications with transparency of operations for moral concerns of the society.	2	2	3

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Washington Accord Knowledge and Attitude Profile (WKs)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost,reuse of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in theengineering discipline.

WK7: Knowledge of the role of engineering insociety and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer topublic safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding andrespect, and of inclusive attitudes.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, natural science, computing engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

3. **Design/development of solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

4. **Conduct investigations of complex problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

5. **Engineering tool usage**: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

6. **The engineer and the world:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

8. **Individual and collaborative team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary settings.

9. **Communication:** Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

10. **Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

11. **Life-long learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Data Science and Analytics Expertise: Apply advanced data science techniques and analytical methods to extract meaningful insights from complex datasets, leveraging modern tools and technologies to support data-driven decision-making and innovation across various domains.

PSO2: AI & ML Competency: Apply computational skills, innovative thinking, and practical expertise in artificial intelligence and machine learning to create efficient solutions in real-world scenarios.

PSO3: Intelligent Systems Development: Demonstrate Computational knowledge, practical competency and innovative ideas in Artificial Intelligence & Machine Learning to create intelligent systems.

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

COURSE TYPES	
Basic Science Course	BSC
Engineering Science Course	ESC
Emerging Technology Course	ETC
Programming Language Course	PLC
Professional Core Course	PCC
Integrated Lab Professional Core Course	IPCC
Professional Core Course Laboratory	PCCL
Professional Elective Course	PEC
Open Elective Course	OEC
Project/Mini Project/Internship	PI
Humanities and Social Sciences, Management Course	HSMC
Ability Enhancement Course	AEC
Skill Enhancement Course	SEC
Universal Human Value Course	UHV
Non-credit Mandatory Course	MC

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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Semester-wise Credit Distribution

Curricular Component/Semester	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course (BSC)	3	4					**7**
Engineering Science Course (ESC)/ Emerging Technology Course (ETC)/Programming Language Course	3	3					**6**
Professional Core Course (PCC)/ Theory with Integrated Lab Professional Core Course(IPCC)/ Professional Core Course Laboratory(PCCL)	14	12	9	10	11		**56**
Professional Elective Course (PEC)			3	3	3	3	**12**
Open Elective Course (OEC)				3	3	3	**9**
Project/Mini Project/Internship (PI)			2	2	4	10	**18**
Humanities and Social Sciences, Management Course (HSMC)			4				**4**
Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC)	1	1	3	1			**6**
Universal Human Value Course (UHV)	1	1					**2**
Total Credits	**22**	**21**	**21**	**19**	**21**	**16**	**120**

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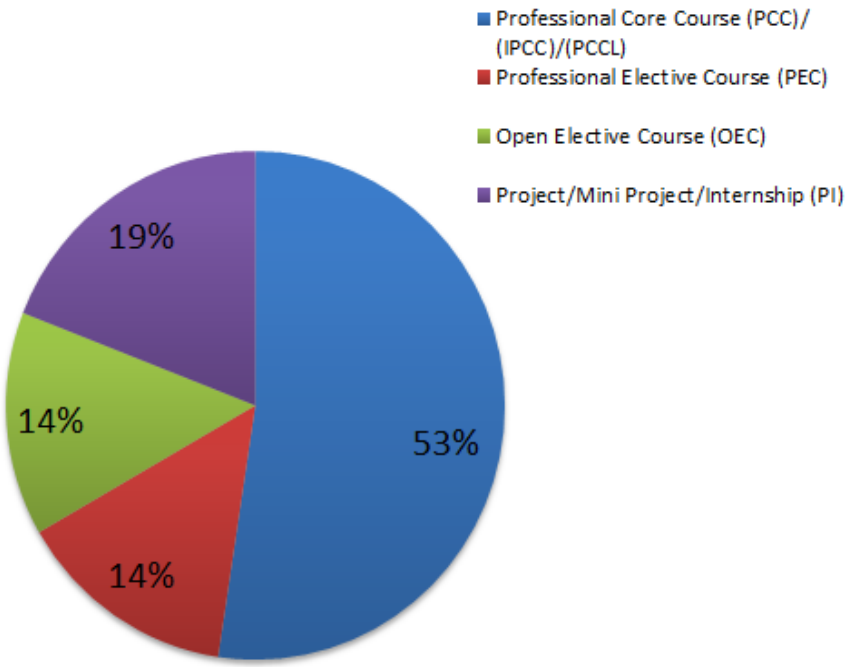
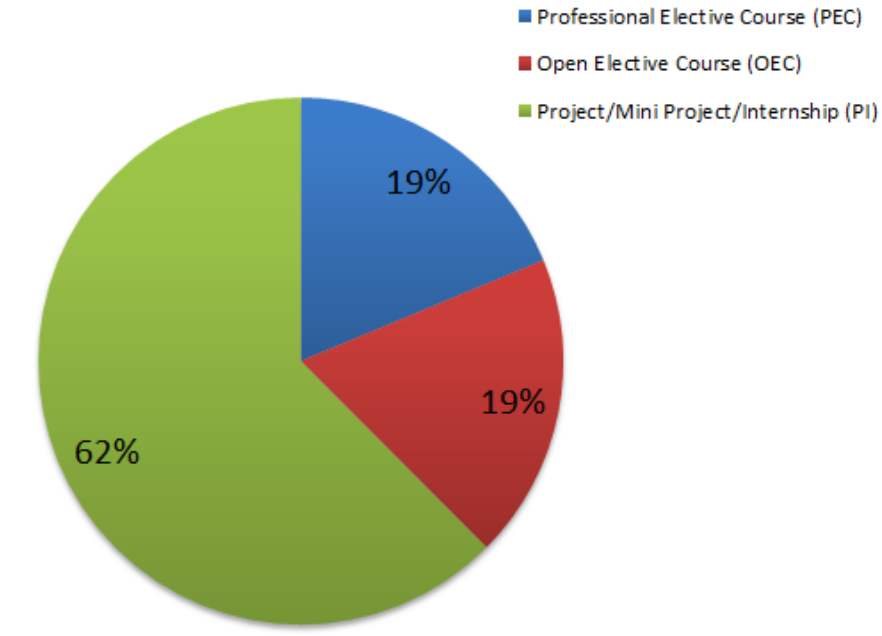
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Credit Distribution - VII Semester



Credit Distribution - VIII Semester



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

BE in Computer Science and Engineering (Artificial Intelligence and Machine Learning)
Scheme of Teaching and Examinations for 2022-23 Admitted Batch (2022 Scheme)

SEVENTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	22AI701	Cloud Computing	3	0	2	05	50	50	100	4
2	IPCC	22AI702	Prompt Engineering & AI Automation	3	0	2	05	50	50	100	4
3	IPCC	22AI703	Full Stack Technologies	2	0	2	04	50	50	100	3
4	PEC	22AI704x	Professional Elective Course-III	3	0	0	03	50	50	100	3
5	OEC	22AI755x	Open Elective Course-II	3	0	0	03	50	50	100	3
6	PROJ	22AI706	Capstone Project-II	0	0	8	04	50	50	100	4
Total							**24**	**300**	**300**	**600**	**21**

Professional Elective Course - III			
22AI704A	Reinforcement Learning	22AI704C	Machine Learning for Cyber Security
22AI704B	Augmented Reality and Virtual Reality	22AI704D	AI For Predictive Analytics and IoT
Open Elective Course - II			
22AI755A	Machine Learning Essentials	22AI755B	Python For Data Science

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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

BE in Computer Science and Engineering (Artificial Intelligence and Machine Learning)
Scheme of Teaching and Examinations for 2022-23 Admitted Batch (2022 Scheme)

EIGHTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PEC	22AI801	Professional Elective (Online Courses) Only through NPTEL	3	0	0	03	50	50	100	3
2	OEC	22AI802	Open Elective (Online Courses)Only through NPTEL	3	0	0	03	50	50	100	3
3	INT	22AI803	Internship (Industry/Research) (14-20 weeks)	0	0	12	12	100	100	200	10
Total							**18**	**200**	**200**	**400**	**16**

Professional Elective (Online Courses)			
22AI801A	BOS will publish courses based on the availability	22AI801B	
22AI801C		22AI801D	
Open Elective Course (Online Courses)			
22AI802A	BOS will publish courses based on the availability		

Go to Scheme

MALNAD COLLEGE OF ENGINEERING, HASSAN
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Course Title	**CLOUD COMPUTING**		
Course Code	**22AI701**	**(L-T-P) C**	**(3-0-2)4**
Exam	**3 Hrs**	**Hours/Week**	**5**
SEE	**50 Marks**	**Total Hours**	**52**

Course Objective: To enable students to understand the fundamentals of cloud computing, including its architecture, virtualization techniques, service models, security concerns, and practical exposure to platforms like AWS and Azure.

Course Outcomes: At the end of the course, students will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply virtualization and cloud service models (IaaS, PaaS, SaaS) to deploy and manage cloud-based applications using platforms like AWS and Azure.	1,5	1
2	Analyze various cloud architectures, deployment models, and security challenges to evaluate suitable solutions for real-world computing needs.	1,2	1
3	Design a scalable and secure cloud infrastructure using open-source tools or commercial platforms, integrating virtualization and cloud management frameworks.	1,3,4,5	1,3
4	Work effectively in teams and demonstrate the cloud computing concepts, tools, and solutions, demonstrating professional collaboration and technical articulation.	8,9,10,11	2,3

MODULE-1	**10 Hours**

Introduction: Introduction to cloud computing, History of cloud computing, Characteristics and Benefits, Challenges Ahead, Types of clouds: (Public cloud, private cloud and hybrid cloud), Economics of cloud, Building Cloud Computing platforms and technologies.

MODULE-2	**10 Hours**

Virtualization: Introduction to Virtualization, Characteristics of Virtualization, Taxonomy of Virtualization techniques, Types of Virtualization Techniques, Pros and Cons of Virtualization, Technology examples Xen: Paravirtualization, VMware: Full Virtualization.

MODULE-3	**10 Hours**

Cloud Computing Architecture: Introduction, cloud reference model, cloud computing services: Infrastructure as a service (IAAS), Platform as a service (PAAS) and Software as a service (SAAS), Aneka framework overview, Anatomy of the Aneka Container, Building Aneka clouds, Cloud Programming and Management, Open source platforms for private clouds.

MODULE-4	**10 Hours**

Cloud Security: Operating System (OS) Security, Virtual Machine (VM) Security, Security risks posed by shared images, ethical issues.

Cloud Platforms: Amazon Web Services (AWS) - Compute services, Storage services, Communication services, Microsoft Azure- Azure concepts, SQL Azure.

Go to Scheme

Experiments

1. Configure and deploy a virtual machine with specific CPU and memory requirements in AWS.
2. Create an IAM Group and attach policies using IAM services.
3. Exploring AWS CloudShell with basic shell commands using Cloud Shell services.
4. Working with Amazon S3 storage services.
5. Working with Amazon DynamoDB, create a simple NoSQL table and insert data.
6. Create and attach a volume to an EC2 instance using Elatic Block Storage.
7. Create a Simple SNS Topic and Send a Notification using (Simple Notification Service).
8. Set Up CloudWatch Alarm for EC2 CPU Usage and monitor logs using CloudWatch service.
9. Creating Lambda Functions Using the AWS to respond to an event using AWS Lambda.
10. Using Cloud Front to deliver a static website hosted on S3 with faster global access.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Cloud Computing:Theory and Practice	Dan C Marinescu	Second edition	Elsevier	2013
2.	Computing Principles and Paradigms	RajkumarBuyya , James Broberg, Andrzej Goscinsk,i	First editoin	Willey	2014

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Cloud Computing Implementation, Management and Security	John W Ritting house, James F Ransome	First edition	CRC Press	2013

EBooks and online course materials:

1. Handbook of Cloud Computing, Borko Furht · Armando Escalante, https://studytm.files.wordpress.com/2014/03/hand-book-of-cloud-computing.pdf
2. Cloud Computing, Sandeep Bhowmik https://industri.fatek.unpatti.ac.id/wp-content/uploads/2019/03/210-Cloud-Computing-Sandeep-Bhowmik-Edisi-1-2017.pdf.

Online Courses and Video Lectures:

1. Google Cloud Computing Foundation Course: https://swayam.gov.in/nd1_noc20_cs55/preview
2. Cloud Computing: https://www.coursera.org/browse/information-technology/cloud-computing

Go to Scheme

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Lab Activity 2) Project based Learning	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3				3							3		
CO2	3	3										3		3
CO3	3		3	3	3							2		2
CO4								3	3	3	2		2	3

Go to Scheme

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**PROMPT ENGINEERING AND AI AUTOMATION**		
Course Code	**22AI702**	**(L-T-P) C**	**(3-0-2)4**
Exam	**3 Hrs**	**Hours/Week**	**5**
SEE	**50 Marks**	**Total Hours**	**52**

Course Objective: To provide students with a comprehensive understanding of prompt engineering, large language models, text and image generation techniques, LangChain frameworks, vector databases, and autonomous AI agents, enabling them to design, implement, and optimize AI-powered applications across multiple domains.

Course Outcomes: At the end of the course, students will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	**Apply** prompting principles and LLM fundamentals – Demonstrate the ability to design effective prompts, understand large language models, and compare different generative AI models.	1,2	1
2	**Analyze** and Utilize ChatGPT for structured text generation tasks – Generate, format, and evaluate diverse text outputs using standard practices, while applying techniques like chunking, summarization, role prompting, and meta prompting.	1,2,4	1
3	**Develop** AI workflows using LangChain and vector databases – Implement advanced text generation, prompt chaining, retrieval-augmented generation (RAG), and memory retrieval with FAISS and Pinecone.	1,2,3,4	2
4	**Build** intelligent agents and image generation systems – Design autonomous agents with memory and tool usage, and apply diffusion models like DALL-E, Midjourney, and Stable Diffusion for creative AI-powered applications.	1-5,6,8,10,11	2,3

MODULE-1	**10 Hours**

The Five Principles of Prompting – Overview of the Five Principles of Prompting, Give Direction, Specify Format, Provide Examples, Evaluate Quality, Divide Labor

Introduction to Large Language Models for Text Generation – What Are Text Generation Models?, Vector Representations, Transformer Architecture, Probabilistic Text Generation, Historical Underpinnings, GPT Models (GPT-3.5, GPT-4, GPT-4V), Other Models: Gemini, Llama, Mistral, Claude, Quantization and LoRA, Model Comparison. **Standard Practices for Text Generation with ChatGPT** – Generating Lists, Hierarchical List Generation, JSON, YAML, Mock CSV Data, Explain Like I'm Five

MODULE-2	**10 Hours**

Standard Practices for Text Generation with ChatGPT Translation, Text Style and Feature Extraction, Summarization, Chunking, Tokenization and Estimating Token Usage, Sentiment Analysis, Least to Most Technique, Role Prompting, GPT Prompting Tactics (Thinking Time, Inner Monologue, Self-Eval), Classification, Meta Prompting.

MODULE-3	**10 Hours**

Advanced Techniques for Text Generation with LangChain – Introduction to LangChain, Chat Models, Prompt Templates, LangChain Expression Language (LCEL), Output Parsers, OpenAI Function Calling, Parallel Functions, Data Connections, Document Loaders, Text Splitters, Task Decomposition, Prompt Chaining, Document Chains (Stuff, Refine, Map-Reduce, Map Re-rank)

Vector Databases with FAISS and Pinecone – Retrieval Augmented Generation (RAG), Embeddings, Document Loading, Memory Retrieval with FAISS, RAG with LangChain, Hosted Databases with Pinecone, Self-Querying, Alternative Retrieval Mechanisms

MODULE-4	**10 Hours**

Autonomous Agents with Memory and Tools – Chain-of-Thought, Agents, ReAct, Using Tools, OpenAI Functions, Agent Toolkits, Custom Agents, Memory in Agents (long-term, short-term, conversation buffer types), Advanced Agent Frameworks (Plan-and-Execute, Tree of Thoughts), Callbacks, Token Counting
Introduction to Diffusion Models for Image Generation – OpenAI DALL-E, Midjourney, Stable Diffusion, Google Gemini for image and video generation, Model Comparison.
Advanced Techniques for Image Generation with Stable Diffusion.

LIST OF EXPERIMENTS – INTELLIGENT AGENTS DEVELOPMENT

1. **Installation of n8n and Building simple Agent**
   - Set up and configure n8n locally on your system.Create a ChatBot using Ollama model.
2. **AI Agent for food Order Processing**
   - Implement an AI agent triggered by a form submission for food orders.
   - Store order details in an Airtable database using a token key.
   - Apply **Filter** and **Set** nodes, create expressions to summarize the customer's order name, and update the Airtable record.
   - Use an **If** node to determine whether to process or cancel orders.
   - Employ a **Switch** node to handle different types of orders.
3. **Automated Motivational Quote Delivery**
   - Build a workflow that generates daily motivational quotes.
   - Integrate Gmail API to send emails and Google Sheets to retrieve recipient addresses.
   - Use the Ollama model to generate quotes dynamically.
4. **Advanced AI Customer Feedback System**
   - On receiving customer feedback, automatically route positive reviews via email.
   - Process negative reviews using an LLM to generate improvement suggestions, and send them separately.
5. **Build a WhatsApp agent**
   - Use API and communicate through your personal whatsApp.
6. **Scrape any website and turn into LLM ready data.**
   - Use Firecrawl
7. **Developing AI Agent by Applying Prompt Engineering from System to Action layers.**
   - Use system layer: role prompting, few-shot prompting
   - Use input layer: specific task request and finally use action layer.
8. **Restaurant Support AI Agent**
   - Develop a conversational AI agent for restaurant services.
   - Enable table reservation functionality and send confirmation emails to customers.
9. **Build a Voice AI Agent to compose and send mails through voice control.**
   - Use any LLM model.
10. **Mini Project**
    - Students demonstrate real-world applications by designing and implementing curated AI workflows using n8n.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Prompt Engineering for Generative AI	James Phoenix, Mike Taylor	1st edition	O'Reilly	2024

Reference Books:

1. The Art of Prompt Engineering with Chatgpt: A Hands-On Guide: 3 (Learn AI Tools the Fun Way!) by Nathan Hunter published in 2023.
2. What Is ChatGPT Doing ... and Why Does It Work? Paperback by Stephen Wolfram in 2023.
3. Prompt Engineering: The Art of Asking Hardcover by Yaswanth Sai Palaghat in 2023.

Web links and Video Lectures (e-Resources):

- https://youtu.be/_ZvnD73m40o
- https://youtu.be/jC4v5AS4RIM
- https://www.youtube.com/watch?v=QZosTTcg7F8&pp=ygUZcHJvbXB0IGVuZ2luZWVyaW5nIGNvdXJzZQ%3D%3D
- https://www.youtube.com/watch?v=6eul1pfGKwk&pp=ygUZcHJvbXB0IGVuZ2luZWVyaW5nIGNvdXJzZQ%3D%3D

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Lab Activity 2) Project based Learning	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**	**PSO3**
CO1	3	2										3		
CO2	3	3		2								3		
CO3	2	3	2	2									3	
CO4	3	3	3	3	3	2		2		2	3		3	3

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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**FULL STACK TECHNOLOGIES**		
Course Code	**22AI703**	**L-T-P-C**	**(2-0-2) 3**
Exam Hrs.	**3**	**Hours / Week**	**4**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To provide foundational and advanced knowledge of JavaScript, including DOM manipulation, event handling, and form validation. To develop skills in building dynamic front-end applications using React and managing back-end services with Express and MongoDB. To enable students to create full-stack MERN applications with modular architecture, API integration, and real-time data handling.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Apply JavaScript, React, Express, and MongoDB to develop dynamic MERN applications with interactive features, form validation, APIs, and database operations through projects.	1,5	1
2.	Analyze and integrate JavaScript, React, and MERN stack components to develop interactive, scalable full-stack applications.	2,5	1
3.	Design dynamic full-stack MERN applications integrating JavaScript, DOM, React, Express, GraphQL, and MongoDB with responsive, interactive interfaces	3,5	1
4.	Investigate complex problems by implementing and optimizing MERN applications in the integrated lab.	5, 9, 10, 12	1

Course Contents

Module 1	**6 Hrs**
Basic JavaScript Instructions, Statements, Comments, Variables, Data Types, Arrays, Strings, Functions, Methods & Objects, Decisions & Loops. Document Object Model: DOM Manipulation, Selecting Elements, Working with DOM Nodes, Updating Element Content & Attributes, Events, Different Types of Events, How to Bind an Event to an Element, Event Delegation, Event Listeners.	
Module 2	**6 Hrs**
Introduction to MERN: MERN components, Server less Hello world. React Components: Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition.	
Module 3	**8 Hrs**
React State: Initial State, Async State Initialization, Updating State, Lifting State Up, Event	

Handling, Stateless Components, Designing Components, State vs. Props, Component Hierarchy, Communication, Stateless Components. Express, REST API, GraphQL, Field Specification, Graph Based, Single Endpoint, Strongly Typed, Introspection, Libraries, The About API GraphQL Schema File, The List API, List API Integration, Custom Scalar types, The Create API, Create API Integration, Query Variables, Input Validations, Displaying Errors.

Module 4	**8 Hrs**

MongoDB: Basics, Documents, Collections, Databases, Query Language, Installation, The Mongo Shell, MongoDB CRUD Operations, Create, Read, Projection, Update, Delete, Aggregate, MongoDB Node.js Driver, Schema Initialization, reading from MongoDB, Writing to MongoDB. Modularization and Webpack, Back-End Modules Front-End Modules and Webpack Transform and Bundle, Libraries Bundle, Hot Module Replacement, Debugging Define Plugin: Build Configuration, Production Optimization.

Laboratory Component:

1. Write a script that Logs "Hello, World!" to the console. Create a script that calculates the sum of two numbers and displays the result in an alert box.
2. Create an array of 5 cities and perform the following operations: Log the total number of cities. Add a new city at the end. Remove the first city. Find and log the index of a specific city.
3. a. Read a string from the user, Find its length. Extract the word "JavaScript" using substring () or slice (). Replace one word with another word and log the new string. b. Write a function is Palindrome (str) that checks if a given string is a palindrome (reads the same backward).
4. Create an object student with properties: name (string), grade (number), subjects (array), displayInfo() (method to log the student's details) Write a script to dynamically add a passed property to the student object, with a value of true or false based on their grade. Create a loop to log all keys and values of the student object.
5. Create a button in your HTML with the text "Click Me". Add an event listener to log "Button clicked!" to the console when the button is clicked. Select an image and add a mouseover event listener to change its border color. Add an event listener to the document that logs the key pressed by the user.
6. Design and develop HTML and JavaScript program to perform the operation of a simple calculator.
7. Write a program to build a Chat module using HTML, CSS and JavaScript.
8. Build a React application to track issues. Display a list of issues (use static data). Each issue should have a title, description, and status (e.g., Open/Closed). Render the list using a functional component.

9. Create a component counter with a state variable count initialized to 0. Create Buttons to increment and decrement the count. Simulate fetching initial data for the Counter component using useEffect (functional component) or componentDidMount (class component). Extend the Counter component to double the count value when a button is clicked. Reset the count to 0 using another button.
10. Install Express (npm install express). Set up a basic server that responds with "Hello, Express!" at the root endpoint (GET /). Create a REST API. Implement endpoints for a Product resource: GET: Returns a list of products. POST: Adds a new product. GET /:id: Returns details of a specific product. PUT /:id: Updates an existing product. DELETE /:id: Deletes a product. Add middleware to log requests to the console. Use express. Json() to parse incoming JSON payloads.
11. Build a REST API with Node, Express, and MongoDB.
12. Install the MongoDB driver for Node.js. Create a Node.js script to connect to the shop database. Implement insert, find, update, and delete operations using the Node.js MongoDB driver. Define a product schema using Mongoose. Insert data into the products collection using Mongoose. Create an Express API with a /products endpoint to fetch all products. Use fetch in React to call the /products endpoint and display the list of products. Add a POST /products endpoint in Express to insert a new product. Update the Product List, after adding a product, update the list of products displayed in React.

Text Books:

1. Jon Duckett, "JavaScript & jQuery: Interactive Front-End Web Development", Wiley, 2014.
2. Vasan Subramanian, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node. Apress, 2019.

Reference Books:

1. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018.
2. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018.

E-resources:

1. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
2. https://www.udemy.com/course/the-full-stack-web-development
3. https://www.coursera.org/specializations/full-stack-react
4. https://www.fullstackpathway.com/
5. https://www.w3schools.com/go/index
6. https://github.com/vasansr/pro-mern-stack

MOOCs:

1. https://www.edx.org/learn/full-stack-development
2. https://www.coursera.org/professional-certificates/microsoft-full-stack-developer/
3. https://nptel.ac.in/courses/106106156
4. https://archive.nptel.ac.in/courses/106/105/106105084/

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2				3								3	
CO2		2			3								3	
CO3			3		3								3	
CO4					3				3	3		3		

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**REINFORCEMENT LEARNING**		
Course Code	**22AI704A**	**(L-T-P) C**	**(3-0-0)3**
Exam	**3Hrs**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To provide foundational and advanced knowledge of reinforcement learning techniques, enabling students to model and solve sequential decision-making problems using classical and deep learning approaches.

Course Outcomes: At the end of the course, students will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply temporal-difference learning techniques, including Sarsa and Q-learning, to optimize decision-making in reinforcement learning environments.	1	2
2	Analyze Markov Decision Processes and implement dynamic programming and Monte Carlo methods for policy evaluation and improvement	2	2
3	Evaluate the use of eligibility traces and planning techniques in reinforcement learning	3	2
4	Work collaboratively to present reinforcement learning solutions, showcasing effective communication of technical concepts and project results.	5, 8,11	3

MODULE-1	**10 Hours**
Introduction: Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe. Tabular Solution Methods: An n-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, Tracking a Nonstationary Problem, Optimistic Initial Values, Upper-ConfidenceBound Action Selection, Gradient Bandits.	
MODULE-2	**10 Hours**
Finite Markov Decision Processes: Agent– Environment Interface, Goals, Rewards, Markov Property, Markov Decision Processes, Value Functions and the Bellman Equation, Optimal Value Functions.	
MODULE-3	**10 Hours**
Dynamic Programming: Policy Evaluation, Improvement, Policy Iteration, Value Iteration, Generalized Policy Iteration, Asynchronous Dynamic Programming, Efficiency. Monte Carlo Methods: Prediction, Estimation of Action Values, Control, policy improvement.	
MODULE-4	**10 Hours**
Temporal-Difference Learning: TD Prediction, TD error, Advantages, Optimality of TD(0), Sarsa.Q-Learning: Exploration vs. Exploitation trade-off, The Q-function, The QLearning Update Rule.	

Go to Scheme

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Reinforcement learning : An introduction	Richard S.Sutton and Andrew G. Barto,	2nd edition	MIT Press	2019

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Deep Reinforcement Learning Hands-On,	Maxim Lapan, Packt Publishing	1st edition	Packt Publishing	2018
2.	Algorithms for Reinforcement Learning	Csaba Szepesvári	1st edition	Morgan & Claypool Publishers,	2010

E-Books and online course materials:

1. https://web.stanford.edu/class/psych209/Readings/SuttonBartoIPRLBook2ndEd.pdf

Online Courses and Video Lectures:

1. Reinforcement Learning - NPTEL IIT Madras - https://onlinecourses.nptel.ac.in/noc19_cs55/preview
2. Reinforcement Learning Specialization – Coursera
   https://www.coursera.org/specializations/reinforcement-learning

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) MOOC Course 2) Project based Learning	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**	**PS03**
CO1	2												3	
CO2		2											3	
CO3			2										3	
CO4					3			3			3			3

Go to Scheme

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**AUGMENTED REALITY AND VIRTUAL REALITY**		
Course Code	**22AI704B**	**(L-T-P) C**	**(3-0-0)3**
Exam	**3 Hrs**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To introduce AR/VR technologies, tools, and development platforms, and enable students to design interactive, optimized, and collaborative immersive applications for real-world scenarios.

Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply AR/VR development tools and 3D assets to build basic immersive applications	1,5	1,2
2	Analyze the performance and usability of AR/VR systems considering interaction design and sensor integration	2, 5	1,2
3	Design and develop collaborative, multi-user AR/VR applications integrating AI for real-time interaction	3, 5	2
4	Demonstrate effective teamwork and communication through AR/VR project presentations and collaborative development.	5, 8, 9, 11	1,2,3

MODULE-1	**10 Hours**
Overview of AR/VR technologies and their industry applications. Exploration of AR/VR devices (e.g., headsets, controllers). Introduction to key devices and software platforms (Unity, Unreal Engine, ARCore, ARKit). Creating and importing 3D assets.	
MODULE-2	**10 Hours**
Basic interactions and scripting in AR/VR environments. Best practices for designing user interfaces and interactions.	
MODULE-3	**10 Hours**
Optimizing AR/VR applications for performance, Deep dive into sensors, tracking, and motion systems, Building collaborative AR/VR systems for remote work, training, and real-time collaboration.	
MODULE-4	**10 Hours**
Virtual workspaces for multi-user interaction. Integrating AI for real-time object recognition and interaction. Case studies of AR/VR applications in healthcare, education, and retail. Discuss emerging technologies and future trends in AR/VR	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Handbook of Virtual Environments: Design, Implementation, and Applications, Second Edition (Human Factors and Ergonomics)	Kelly S. Hale, Kay M. Stanney	2nd edition	CRC Press	2014

Go to Scheme

2.	Creating Augmented and Virtual Realities Theory & Practice for Next-Generation Spatial Computing	Erin Pangilinan, Steve Lukas and Vasanth Mohan	1st edition	O'Reilly Media	2019
3.	Alan B Craig, William R Sherman and Jeffrey D Will	Developing Virtual Reality Applications: Foundations of Effective Design	1st edition	Morgan Kaufmann	2009

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Designing Virtual Systems: The Structured Approach	Gerard Jounghyun Kim	1st edition	Springer	2005
2.	3D User Interfaces, Theory and Practice‖,	Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev	2nd edition	Addison Wesley	2005
3.	Spatial Augmented Reality: Meging Real and Virtual Worlds	Oliver Bimber and Ramesh Raskar	1st edition	A K Peters LTD	2005

EBooks and online course materials:

1. https://www.oreilly.com/library/view/creating-augmented-and/9781492044185/

Online Courses and Video Lectures:

1. https://www.infivr.com/?gclid=CjwKCAiA2fmdBhBpEiwA4CcHzVFsS1EGag9py8rG_AUcVElTIZ0czGXDVZPRIn7TE_AY9FlgitZulxoCYhYQAvD_BwE
2. https://www.udemy.com/course/develop-augmented-reality-book-ar-business-card-with-unity

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Lab Activity 2) Project based Learning	20
Total		**50**

Go to Scheme

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**	**PSO3**
CO1	2				3							2	2	
CO2		2			3							2	2	
CO3			2		3								2	
CO4					3			3	3	3		2	2	3

Go to Scheme

Course Title	Machine Learning for Cyber Security		
Course Code	22AI704C	(L-T-P) C	(3-0-0)3
Exam	3Hrs	Hours/Week	3Hrs
SEE	50 Marks	Total Hours	40

Course Objective: To equip students with foundational knowledge of cyber security threats, legal frameworks, forensics, and organizational and privacy implications in the digital age.

Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply machine learning and deep learning techniques tailored for cybersecurity challenges.	1	1
2	Explore various malicious events and apply ML for malicious and various cybercrime event detection.	2	2
3	Develop solutions to detect and combat malware, spam, financial fraud, and other cybercrimes.	3	1
4	Demonstrate effective communication and collaboration through case studies, presentations, and team-based analysis of cybersecurity incidents.	5, 8,9,11	1, 3

MODULE-1 **11 Hours**

Basics of Machine Learning in Cybersecurity: What is machine learning?, Problems that machine learning solves, Why use machine learning in cybersecurity?, Current cybersecurity solutions.

Time Series Analysis and Ensemble Modelling: What is a time series?, Classes of time series models, Time series decomposition, Time series analysis in cybersecurity, Time series trends and seasonal spikes, Predicting DDoS attacks, Ensemble learning methods.

Segregating Legitimate and Lousy URLs: Introduction to the types of abnormalities in URLs, Using heuristics to detect malicious pages, Using machine learning to detect malicious URLs, Logistic regression to detect malicious URLs, SVM to detect malicious URLs, Multiclass classification for URL classification.

MODULE-2 **10 Hours**

Knocking Down CAPTCHAs: Characteristics of CAPTCHA, Using artificial intelligence to crack CAPTCHA, Types of CAPTCHA, reCAPTCHA, No CAPTCHA reCAPTCHA, Breaking a CAPTCHA, Solving CAPTCHAs with a neural network, Dataset, Packages, Theory of CNN, Model, Training the model, Testing the model.

Using Data Science to Catch Email Fraud and Spam: Email spoofing, Spam detection.

Efficient Network Anomaly Detection Using k-means: Stages of a network attack, Dealing with lateral movement in networks, Using Windows event logs to detect network anomalies, Ingesting active directory data, Data parsing, Modeling, Detecting anomalies in a network with k-means

MODULE-3 **11 Hours**

Decision Tree and Context-Based Malicious Event: Detection, Adware, Bots, Bugs, Ransomware, Rootkit, Spyware, Trojan horses, Viruses, Worms, Malicious data injection within databases, Malicious injections in wireless sensors.

Catching Impersonators and Hackers Red Handed: Understanding impersonation, Different types of impersonation fraud, Levenshtein distance

MODULE-4 **10 Hours**

Changing the Game with TensorFlow: Introduction to TensorFlow, TensorFlow for Windows users, Hello world in TensorFlow, Importing the MNIST dataset, Computation graphs, What is a computation graph?, Tensor processing unit, Using TensorFlow for intrusion detection.

Financial Fraud and How Deep Learning Can Mitigate It: Machine learning to detect financial fraud, Logistic regression classifier – under-sampled data, Deep learning time

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Hands-On Machine Learning for Cybersecurity	Soma Halder and Sinan Ozdemir	1st	Packt ISBN: 978-1-78899-228-2	2018
Reference Books:					
1.	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Nina Godbole and Sunit Belpure	1st	Wiley	2011
2.	Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives	B.B.Gupta,D. P.Agrawal, Haoxiang Wang	1st	CRC Press	2018
3.	Cyber Security Essentials	James Graham", Richard Howard and Ryan Otson	1st	CRC Press	2010
4.	Introduction to Cyber Security	Chwan-Hwa(john) Wu,J. David Irwin	1st	CRC Press	2013

EBooks and online course materials:

1. https://securityintelligence.com/free-ebook-practical-guide-to-staying-ahead-in-the-cybersecurity-

game/

2. https://www.pdfdrive.com/cyber-security-books.html

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted: Project based Learning	20

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 1 1**	**PSO 1**	**PSO 2**	**PSO3**
CO1	3				3						2		3	3
CO2		2		2			3		2			2		
CO3	3	3	3									3		2
CO4					3	2					2		3	3

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**AI FOR PREDICTIVE ANALYTICS AND IOT**		
Course Code	**22AI704D**	**(L-T-P) C**	**(3-0-0)3**
Exam	**3 Hrs**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To enable students to integrate predictive analytics with IoT technologies for intelligent decision-making in personal, industrial, and smart city applications.

Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply machine learning and data processing techniques to analyze diverse IoT data formats for real-time and predictive applications.	1	1
2	Analyze real-world IoT use cases across domains such as healthcare, smart homes, and smart cities to identify trends, anomalies, and patterns.	2	2
3	Design predictive models and AI-driven IoT systems for anomaly detection, maintenance forecasting, and health monitoring.	3	3
4	Demonstrate effective teamwork and communication through collaborative projects, presentations, and implementation of IoT-based predictive solutions.	5,8,9,11	1,3

MODULE-1	**10 Hours**
Principles and Foundations of IOT and AI : IOT reference model – IOT platforms – IOT verticals – Big data and IOT- Infusion of AI, Data Science in IOT – cross - industry standard for data mining – AI and IOT platforms (Chapter 1) Data Access and Distributed Processing for IOT: Data formats: TXT, CSV, XLSX, JSON, HDF5, SQL, NO Sql, HDFS data formats – Spark ML for IoT data	
MODULE-2	**10 Hours**
Personal IoT: Personal IOT – super shoes by MIT – Continuous glucose monitoring – Hypoglycemia prediction using CGM data – Heart Monitor – Digital assistants. Home IoT: IOT and smart homes – Human activity recognition – HAR using wearable sensors – HAR from videos – smart lighting – Home surveillance	
MODULE-3	**10 Hours**
AI for smart Cities IoT: Smart Cities – smart traffic management – parking – waste management – Policing – lighting governance – Challenges and benefits AI for the Industrial IoT: Introduction to AI- powered industrial IoT – Use Cases – predictive maintenance using AI, LSTM - Advantages and disadvantages – Electrical load forecasting in industry- STLF using LSTM	
MODULE-4	**10 Hours**
Anomaly Detection using IoT – Web based mobile health app using ML – Predict equipment failure using IoT sensor data – Analyze industrial equipment for defects –Detect change points in IoT sensor data – Detect voltage anomalies in household IoT devices	

Go to Scheme

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Hands-On Artificial Intelligence for IoT	Amita Kapoor	1st edition	Packet Publishing	2019
2.	Analytics for Internet of Things	Andrew Minteer	1st edition	Packt Publishing	2017

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	IoT Fundamentals: Networking Technologies , Protocols and Use Cases for Internet of Things	David Hanes , GonzaloS algueiro, Patrick Gross etete, Rob Barton and Jerome Henry	1st edition	Cisco Press	2017
2.	The Internet of Things, Enabling Technologies, Platform s, and Use Cases	Pethuru Raj, Anupama C. Raman	1st edition	CRC Press	2017
3.	Internet of Things Principles and Paradigms	Rajkumar Buyya, Amir Vahid Dastjerdi	1st edition	Morgan Kaufmann	2016

EBooks and online course materials:

1. https://www.ebooks.com/en-us/book/211350847/predictive-analytics-for-the-modern-enterprise/nooruddin-abbas
   ali/?srsltid=AfmBOopPrhyfiWcstZbLjPpGCWWbyFUg8RfG0ZIanO_hBHIlGt1x3Zyo

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Project based Learning 2) Report submission and presentation	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**	**PSO3**
CO1	2											3		
CO2		3											3	
CO3			4									3		
CO4					3			3	3		3	3		3

Go to Scheme

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**CAPSTONE PROJECT PHASE-II**		
Course Code	**22AI706**	**(L-T-P) C**	**(0-0-8) 4**
Exam	**3Hrs.**	**Hours/Week**	**4**
SEE	**50 Marks**	**Total Hours**	**50**

Course Objective:

Course Outcomes: Upon completion of the course the students will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Identify real-world problems and formulate well-defined problem statements.	1	1,2,3
2	Conduct effective literature review and define objectives using innovative approaches.	2,3,4	1,2,3
3	Design and implement efficient solutions using appropriate modern tools and technologies.	1-6, 8-11	1,2,3
4	Demonstrate project outcomes and communicate results effectively through presentations, reports, and publications.	1,2,5,8-11	1,2,3

Review I Evaluation: Design & Mid-Project Progress

Evaluates how well the suggestions from Phase I are incorporated, quality of the system design, progress of implementation using modern tools, and partial achievement of objectives.

Review II Evaluation: Final Implementation & Documentation

Final assessment covering complete implementation, demonstration of results, quality of the report, and dissemination through paper/poster presentations.

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Rubrics for Review I Evaluation

	Parameter	Good	Average	Poor	Score (50)
A	Incorporation of suggestions from Phase 1	Changes are made to problem statement as per modification suggested during phase 1 and new innovations are added	Few changes are made to problem statement as per the Modifications suggested during evaluation	Suggestions given during phase I evaluation are not incorporated	10
	10	8-10	5-7	<4	
B	Design	Design of system according to appropriate architectural model adhering to the SRS	Partially incorporated the design but clearly able to demonstrate the design	Does not match with the SRS. Incorrect design of modules	10
	8	6-8	3-4	<3	
C	Modern Tool	Implementation is efficient using latest tools and technology	Partial implementation but not modularized the code	Not started implementing the code	10
	4	4	1-3	0	
D	Work Progress	50% of the Objectives achieved	25% of the Objectives achieved as per time frame	Less than 25% objectives achieved as per timeframe	10
	6	5-6	2-4	1	
E	Presentation	Contents of Presentations are appropriate and well arranged, Proper eye contact with audience and clear voice with good spoken Language	Average contents for Presentation, less eye contact with audience and clear voice with average spoken Language	Need to include contents and presentation not planned well, No eye contact with audience and voice not with bad spoken Language	10
	8	6-8	3-5	<3	50

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Rubrics for Review II Evaluation

	Parameter	Good	Average	Poor	Score (50)
A	Presentation on Complete Implementation	Contents of Presentations are appropriate and well arranged, Proper eye contact with audience and clear voice with good spoken Language	Presentations are not satisfactory and average demonstration	Contents of presentations are not appropriate and poor presentation	10
	(10)	8-10	5-7	<4	
B	Demonstration of project output/ Implementation	Demonstrates all the defined objectives as per schedule	Demonstrates few of the defined objectives	Demonstrates very few defined objectives	20
	(10)	16-20	10-14	<8	
C	Project Report	Report is well written and includes all the details of the project, the results, performance of the system, etc,. and is according to the format given and concluded well	Report written well but have missed few details/specification, results, etc,. and needs some modification as per the given format and needs to conclude even better	Report not written well and have missed a lot of information of the project and not according to the given format and not concluded well	10
	(10)	8-10	5-7	<4	
D	Paper presentation	Publish paper in international journals	Presented paper in international/national conference/national journals	Poster presentation	10
	(10)	8-10	5-7	<4	50

<table>
<tr><th colspan="2">CIE Marks Distribution</th><th>SEE Marks Distribution</th></tr>
<tr><td>Review I</td><td>Review II</td><td rowspan="3">• Identification of Problem and Detailed Analysis: 20 marks
• Demonstration and Technical Skills: 30 marks
• Project Report Writing and Presentation:30 marks
• Paper presenation:10 marks
• Plagiarism & AI report: 10 marks</td></tr>
<tr><td>50 marks</td><td>50 marks</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2">Total: 100 marks -> Reduced to 50</td><td>Total: 100 marks -> Reduced to 50</td></tr>
</table>

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 1 1**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	2		2		1	2	2	2	3	2	2	2
CO2	2	3	2	3	2			2	2	2	3	3	2	2
CO3	3	2	3	2	3	2		2	2	3	3	3	3	3
CO4	2	2			2			3	3	3	2	2	2	2

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**MACHINE LEARNING ESSENTIALS**		
Course Code	**22AI755A**	**L-T-P-C**	**(3-0-0)**
Exam Hrs.	**3Hrs.**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To utilize the machine learning algorithms to solve real time problems.

Course outcomes: At the end of course, student will be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	**Apply** data preprocessing, data modeling, supervised and unsupervised machine learning algorithms to the given scenario	1	-
2.	**Analyze** the given problem and identify the appropriate data modeling and machine learning method to solve the same	2	-
3.	**Design and develop** a solution using appropriate machine learning algorithm	3	1
4.	Investigate the real world problem and develop a machine learning system to provide a solution for the same and commutate the results through report and presentation	5,9,10,12	2

Course Content:

Module 1	**10 Hours**

Introduction to Machine learning: Introduction, What is Human Learning, Types of Human Learning, What is Machine Learning, Types of Machine Learning, Problems not be solved using Machine Learning, Applications of Machine Learning, State of the art languages/tools in Machine Learning, Issues in Machine Learning.

Preparing to Model: Machine Learning Activities, Basic Types of Data in Machine Learning. Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing.

Module 2	**10 Hours**

Modeling and Evaluation: Introduction, Selecting a Model, Training a Model, Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model.

Supervised Learning-Classification: Example of Supervised Learning, Classification Model, Classification Learning Steps, Common Classification Algorithms- KNN, decision tree.

Module 3	**10 Hours**

Supervised Learning-Classification: Random forest model, Support vector machines.

Supervised Learning- Regression: Introduction, Example of Regression, Common Regression Algorithms- Simple Linear Regression, Multiple Linear Regression, Polynomial Regression Model, Logistic Regression.

Module 4	**10 Hours**

Unsupervised Learning: Unsupervised VS Supervised Learning, Application of Unsupervised Learning, Clustering. Finding pattern using Association rule.

Basics of Neural Networks: Exploring the artificial neuron, Types of activation function, Early implementations of ANN, Architectures of NN, Learning process in ANN, Backpropagation algorithm

Text Books:

1. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2023.
2. Machine Learning, Tom M. Mitchell, McGraw-Hill Education (INDIAN EDITION), 2013

Reference Books:

1. Hands-on machine learning with scikit-learn and tensorflow, Concepts, Tools, and Techniques to

Build Intelligent Systems. O'Reilly Media, AurélienGéron, Second Edition, 2019.
2. EthemAlpaydin, Introduction to Machine Learning, 2nd Ed., PHI Learning Pvt. Ltd., 2013
3. The Elements of Statistical Learning, T. Hastie, R. Tibshirani, J. H. Friedman, Springer; 1st edition, 2001

E-resources:

1. **https://www.geeksforgeeks.org/introduction-machine-learning/**
2. **https://www.javatpoint.com/types-of-machine-learning**

e-Books:

2. https://www.oreilly.com/library/view/hands-on-machine-learning/9781492032632/

MOOCS

1. https://swayam.gov.in/nd1_noc19_cs52/preview
2. https://www.coursera.org/learn/machine-learning

1. Three CIEs conducted for 20marks each and reduced to 10 marks: 30marks

2. Activity Details : Project based Learning : 20marks

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				3										
CO2	3	3									3				2
CO3	3		3		3								3		
CO4	3	3		3	2			3	3	3	3	2		3	

Go to Scheme

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**PYTHON FOR DATA SCIENCE**		
Course Code	**22AI755B**	**L-T-P-C**	**(3-0-0) 3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: Utilize the python constructs and libraries to perform data analysis.
Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Apply the python libraries to load, pre-process, analysis and visualize the data	1,5	1
2.	Analyze the given data and interpret the results using python libraries	2,5	1
3.	Develop a python program to solve the given problem	3,5	1
4.	Work collaboratively and demonstrate the applicability of python libraries to solve real world data science problems	9, 10, 12	2

Course Contents:

Module 1	**10 Hrs**

Introduction to NumPy: Understanding data types in python, basics of NumPy arrays, NumPy array attributes, array indexing, array slicing, reshaping array, array concatenation and splitting, Computations on NumPy Arrays.
Introduction to UFuncs, advanced UFancs features, Aggregation: Min, Max and in between, computation on arrays, rules of broadcasting, broadcasting in practice, comparisons, masks and Boolean logics, indexing, sorting arrays, NumPy's structured arrays.

Module 2	**10 Hrs**

Data Manipulation with Pandas: Introduction to pandas objects – Series object, DataFrame object, Index object, Data Indexing and selection for series and DataFrame, Operating on Data in Pandas, Handling missing data, Operating on Null values, combining datasets using Concat and Append, Merge and Join.
Aggregation and Grouping, Pivot tables, Vectorized string operations, working with Time series- Dates and Times in python, indexing by Time.

Module 3	**10 Hrs**

Visualization using Python: Importing matplotlib, setting styles, simple line plots, simple scatter plots, visualizing errors, density and contour plots, visualizing a three dimensional function, Histograms, binning and density, customizing plot legends, customizing ticks.
Three-Dimensional Plotting: Three-dimensional points and lines, three dimensional contour plots, surface triangulation.

Module 4	**10 Hrs**

Statistics : Measures of Central Tendency, Statistics with Python, Measuring Variance, Normal Distribution, Binomial Distribution, Poisson Discrete Distribution, Bernoulli Distribution, P-value, Exploring Correlation in Python, Create a correlation Matrix using Python, Pearson's Chi-Square Test.
Python Relational Database: Connect MySQL database using MySQL-Connector Python, Python: MySQL Create Table, Python MySQL – Insert into Table, Python MySQL – Select Query, Python MySQL – Update Query, Python MySQL – Delete Query.

Text Books:

1. Python for Data Analysis, Wes McKinney, 2nd edition, O'Reilly Media, ISBN: 978-1-491- 95766-0, 2018.
2. Python Programming and SQL, Mark Reed

Reference Books:

3. Python Data Science Handbook: Essential Tools for working with Data, Jake VanderPlas
4. Introduction to Data Science: Practical Approach with R and Python, B Uma Maheshwari , R. Sujatha
5. Introduction to Python for Data Science:Paul J. Deitel, Harvey M. Deitel, Harvey Deite

E-resources:

1. https://www.geeksforgeeks.org/basics-of-numpy-arrays/
2. https://www.w3schools.com/python/numpy/numpy_intro.asp

1. Three CIEs conducted for 20marks each and reduced to 10 marks : 30 marks
2. Activity Details : Project based Learning and Demonstration : 20 marks

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2				3								3	
CO2		2			3								3	
CO3			2		3								3	
CO4									2	2	2	2		2

Go to Scheme

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**Professional Elective (Online Courses) Only through NPTEL**			
Course Code	22AI801		L-T-P-C	(3-0-0) 3

Course Objective: To foster self-directed learning by providing access to expert-curated online courses through the SWAYAM-NPTEL platform, enhancing both theoretical knowledge and practical skills.

1. Students must register for **one course** from the list of approved NPTEL courses published by the department on the **SWAYAM-NPTEL portal**.
2. The selected course should be of **12 weeks duration** and carry **3 academic credits**.
3. On successful completion, there will be a **direct transfer of 3 credits** to the student's academic record.
4. Students are allowed to **complete this course at any time** between their **second and fourth year** of the program.
5. The **course result** will be formally **recorded in the eighth semester grade card**.

Go to Scheme

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**Open Elective (Online Courses) Only through NPTEL**			
Course Code	22AI802		L-T-P-C	(3-0-0) 3

Course Objective: To promote interdisciplinary and self-paced learning by offering access to expert-led online courses through the SWAYAM-NPTEL platform, thereby broadening student's academic exposure and practical understanding beyond their core domain.

1. Students must register for **one course** from the list of approved NPTEL courses published by the department on the **SWAYAM-NPTEL portal**.
2. The selected course should be of **12 weeks duration** and carry **3 academic credits**.
3. On successful completion, there will be a **direct transfer of 3 credits** to the student's academic record.
4. Students are allowed to **complete this course at any time** between their **second and fourth year** of the program.
5. The **course result** will be formally **recorded in the eighth semester grade card**.

Go to Scheme

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	**Internship (Industry/Research)**		
Course Code	**22AI803**	**(L-T-P) C**	**(0-0-12) 10**
Exam	**3Hrs.**	**Hours/Week**	**-**
SEE	**100 Marks**	**Total Duration**	90 Working Days (Approx. 14–15 Weeks)

Course Objective: To provide final-year students with real-world exposure through industry, research, or skill-based online internships, enhancing their technical competence, professional behavior, and employability as per NEP and AICTE regulations.

Course Outcomes: Upon completion of the course the students will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply domain knowledge to solve real-world or interdisciplinary problems	1	1,2,3
2	Collaborate effectively in teams or in a professional environment	2,6,8-11	1,2,3
3	Practice professional ethics and demonstrate responsibility in workplace settings	1,3,7-11	1,2,3
4	Document work effectively and present technical outcomes orally or in writing	1,2,4,5,8-11	1,2,3

Internship Types *(As per VTU Guidelines – Choose Any One)*:

1. Industry Internship
2. Research Internship
3. Post-Placement Internship
4. NSDC/IT-related Online Internship
5. NATS Internship
6. VTU Skill Enhancement Courses (15-credit equivalent)

Alternate Option: VTU Skill Enhancement Courses
If a valid internship is not available, students must complete **VTU- Skill Enhancement courses** (each worth 3 credits) or a **single 15-credit Skill Enhancement Course**.

Guidelines Summary:

- **Duration**: 90 Working Days (6–7 hours/day) in 8th Semester
- **Platform**: Mandatory registration and documentation via https://vtu.internyet.in
- **Documentation**: NOC, Completion Certificate, Structured Report, Work Diary
- **Eligibility**: Must complete before University examination schedule
- **Scheme**: Regular academic track under Scheme A (7th – subjects + Project work, 8th – internship)

Go to Scheme

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Rubrics for Review I Evaluation

Parameter	Good	Average	Poor	Score (50)
A. Application of Domain Knowledge	Demonstrates strong understanding of domain concepts with clear application to real-world problems	Basic application of domain concepts; limited scope or unclear relevance	Minimal application or poor understanding of domain relevance	**(20)**
	16-20	10-14	<8	
B. Communication Skills	Excellent clarity in oral/written communication with confident articulation of ideas	Adequate communication with minor gaps in articulation	Poor articulation or unclear communication	**(10)**
	8-10	5-7	<4	
C. Weekly Work Diary & Presentation	Diary is consistently maintained and presentation is structured and professional	Diary is mostly updated, presentation is average or needs improvement	Diary is poorly maintained or presentation lacks clarity	**(10)**
	8-10	5-7	<4	
D. Ethics and Integrity	Adheres to professional ethics; punctual and responsible	Some instances of delay or casual approach to tasks	Lacks sense of responsibility or ethical behavior	**(10)**
	8-10	5-7	<4	

Rubrics for Review II Evaluation

Parameter	Good	Average	Poor	Score (50)
A. Problem Solving and Technical Implementation	Demonstrates effective solution design using appropriate tools, models, or code implementations	Solution is partially implemented; needs refinement or deeper technical insight	Solution is either underdeveloped or not clearly explained	**(20)**
	16-20	10-14	<8	
B. Teamwork and Independent Contribution	Effectively works independently and in teams with clear contributions	Moderate contribution; needs improved collaboration or initiative	Relies heavily on others; lacks ownership or clarity in role	**(10)**
	8-10	5-7	<4	
C. Time Management and	Meets deadlines with clear progress and	Some delays, but manages to meet	Significant delays or lack of progress	**(10)**

Completion	milestone achievements	major deliverables	on tasks	
	8-10	5-7	<4	
D. Prototype / Final Output Presentation	Clear demonstration of a working prototype / research output; well-documented	Partial demonstration with some technical or structural gaps	No prototype or poorly demonstrated output	**(10)**
	8-10	5-7	<4	

CIE Marks Distribution		**SEE Marks Distribution**
Review I	Review II	• Application of Domain Knowledge: 25 marks • Teamwork, Professional Behavior, and Ethics during Internship: 15 marks • Technical Implementation and Demonstration of Work Done:30 marks • Internship Report Quality and Technical Documentation:20 marks • Presentation Skills & Oral Communication (Including viva & Q&A): 10 marks
50 Marks	50 marks	
Total: 100 marks		**Total: 100 marks**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**	**PSO3**
CO1	3	2	2		2	2	2	2	2	2	2	3	3	3
CO2		2				2		3	3	2	2	2	2	2
CO3	2		2				3	2	2	2	2		2	2
CO4	2	2		2	2			2	3	3	2	3	3	3

Go to Scheme