Academic Program: UG

Academic Year 2025-26

Syllabus

VII & VIII Semester B.E.

Artificial Intelligence and Machine Learning

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING & TECHNOLOGY,
DHARWAD – 580 002

(An Autonomous Institution approved by AICTE & Affiliated to VTU, Belagavi)

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SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for VII & VIII Semesters of UG program in Artificial Intelligence and Machine Learning is recommended by the Board of Studies of Artificial Intelligence and Machine Learning Department and approved by the Academic Council, SDM College of Engineering & Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2025 - 26 till further revision.

Principal Chairman BoS & HoD

College Vision and Mission

Vision

To develop competent professionals with human values

Mission

- To have contextually relevant Curricula.
- To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
- To enhance Research Culture.
- To involve the Industrial Expertise for connecting Classroom contents to real-life situations.
- To inculcate Ethics and soft-skills leading to overall personality development.

QUALITY POLICY:

In its quest to be a role model institution, committed to meet or exceed the utmost interest of all the stakeholders.

Core Values:

- Competency
- Commitment
- Equity
- Teamwork and Trust

Vision and Mission of the Department

Vision

To develop expert AIML professionals to serve the society by practicing values

Mission

1. To incorporate relevant Curricula.
2. To practice appropriate Teaching Learning techniques using modern teaching technological tools.
3. To enhance and embrace Research Culture.
4. To involve Industrial Expertise for exposure to the industrial environment.
5. To inculcate Ethical values and provide soft-skill leading to well rounded Personality Development

Program educational Objectives (PEO)

I. Develop into Artificial Intelligence and Machine Learning Professionals with expertise in providing solutions to Artificial Intelligence and Machine Learning problems

II. Pursue higher studies with a sound knowledge of basic concepts and skills in basic science, humanities, Artificial Intelligence and Machine Learning disciplines

III. Exhibit professionalism and teamwork by providing the environment for exploring current technology trends through collaborative and complementary work ethics

Program Outcomes (POs) and Program Specific Outcomes (PSOs)

Program Outcomes (POs):

1.Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4.Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6.The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8.Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9.Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10.Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11.Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific outcomes (PSOs):

13. An ability to develop logical reasoning, coding skills, analysis and mathematical modeling.
14. An ability to modify, debug, test and adapt software modules for varied application

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY, DHARWAD

Department of Artificial Intelligence & Machine Learning

VII Semester

Scheme of Teaching and Examinations 2025 – 26

Sl No	Course	Course Code	Course Title	Teaching Department	Teaching Hrs/Week			Examination				Credits
					Lecture L	Tutorial T	Practical P	Duration in Hrs	CIE Marks	SEE Marks	Total Marks	
1	PCC	22UAIC700	Generative AI	AIML	4	0	0	3	50	100	100	4
2	PEC	22UAIE72X	Program Elective Course - IV	AIML	3	0	0	3	50	100	100	3
3	PEC	22UAIE73X	Program Elective Course - V	AIML	3	0	0	3	50	100	100	3
4	OEC	22UAIO74X	Open Elective Course - II	AIML	3	0	0	3	50	100	100	3
5	PCCL	22UAIL701	Generative AI Laboratory	AIML	0	0	2	3	50	50	100	1
6	PROJ	22UAIL702	Major Project - I	AIML	0	0	12	3	50	50	100	6
Total											**600**	**20**

Program Elective Course – IV												
Sl No	Course	Course Code	Course Title	Teaching Department	Teaching Hrs/Week			Examination				Credits
					Lecture	Tutorial	Practical	Duration in Hrs	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
2	PEC - IV	22UAIE721	Agentic AI	AIML	3	0	0	3	50	100	100	3
3	PEC - IV	22UAIE722	Web and Social Network Mining	AIML	3	0	0	3	50	100	100	3

Program Elective Course – V												
Sl No	Course	Course Code	Course Title	Teaching Department	Teaching Hrs/Week			Examination				Credits
					Lecture	Tutorial	Practical	Duration in Hrs	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PEC – V	22UAIE731	AI for Cybersecurity	AIML	3	0	0	3	50	100	100	3
2	PEC – V	22UAIE732	MLOps	AIML	3	0	0	3	50	100	100	3

Open Elective Course – II												
Sl No	Course	Course Code	Course Title	Teaching Department	Teaching Hrs/Week			Examination				Credits
					Lecture	Tutorial	Practical	Duration in Hrs	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	OEC – II	22UAIO741	Applied AI	AIML	3	0	0	3	50	100	100	3
2	OEC – II	22UAIO742	Cyber Physical Systems	AIML	3	0	0	3	50	100	100	3

PCC: Professional Core Course, **PCCL:** Professional Core Course laboratory **L:** Lecture, **T:** Tutorial, **P:** Practical, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Evaluation. **PEC:** Program Elective Course, **OEC:** Open Elective Course, **PROJ:** Project. **TD:** Teaching department, **PSB:** Paper Setting Board.
Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses are added to supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course.
Open Elective Courses (OEC): Students belonging to a particular stream of Engineering and Technology are entitled to opt for the open electives offered by their parent Department and other departments provided that they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course are as prescribed by the DAP.
Major Project-I: The objective of the project work is to encourage development of independent learning, innovative attitude, communication skills, organization, time management, presentation skills, team work, punctuality, setting and meeting deadlines. In Major project, the students are expected to identify the state-of-the-art technology in their domain of interest by an extensive literature survey and select a topic from an emerging area relevant to their branch/interdisciplinary and define the problem for the project work. The project shall consist of a team of students not more than 2-4. Each batch shall be assigned with a faculty member. A committee constituted by HOD consisting of minimum 2 faculty members shall evaluate for CIE. There is SEE, a viva voce examination which shall be examined by two examiners constituted by the HoD. The rubrics of evaluation includes objectives defined, literature review, demonstration of the project work carried out, report, project presentation, communication skill and question and answer session.
AICTE activity point: Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the student's VIII semester grade card. The activities to earn the points can be spread over the duration of the program. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case a student fails to earn the prescribed activity points; VIII semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the VIII semester grade card.

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY, DHARWAD
Department of Artificial Intelligence & Machine Learning
VIII Semester
Scheme of Teaching and Examinations 2025 – 26

Sl No	Course	Course Code	Course Title	Teaching Department	Teaching Hrs/Week			Examination				Credits
					Lecture L	Tutorial T	Practical P	Duration in Hrs	CIE Marks	SEE Marks	Total Marks	
1	TS	22UAIL800	Technical Seminar.	AIML	0	0	2	-	50	-	50	1
2	PROJ or INT	22UAIL801	Major Project – II / Internship	AIML	12 Weeks			3	50	50	100	10
3	INT	22UAIL802	Summer Internship	AIML	4 Weeks			3	50	50	100	3
Total											**250**	**14**

TS: Technical Seminar, **PROJ:** Project. **INT:** Internship. **TD:** Teaching Department, **PSB:** Paper Setting Board, **L:** Lecture, **T:** Tutorial, **P:** Practical, **CIE:** Continuous Internal Evaluation, **SEE:** Semester End Evaluation.

Technical Seminar (TS): Students are expected to learn how to conduct a literature survey to identify the state-of-the-art technology in their chosen engineering domain. They are required to select an emerging topic beyond the syllabus relevant to their branch of study, understand the concept, analyze it, and present it effectively with technical innovations or novel work in a 15–20minute session, followed by a 5-minute question and answers with their classmates and faculty. Additionally, students must develop effective communication skills and understand the modalities of technical interactions. They are required to submit a seminar report following the format provided by the DUGC. The technical seminar is evaluated for CIE based on the rubrics prescribed by the DUGC.

Major Project - II: This project work is intended for students who do not undertake an internship. The objective of the project is to foster independent learning, an innovative mindset, communication skills, organization, time management, presentation skills, teamwork, punctuality, and the ability to set and meet deadlines. In this project, students are expected to conduct an extensive literature survey to identify state-of-the-art technology in their domain of interest, select a topic from an emerging area relevant to their branch or an interdisciplinary field, and define the problem for their project work. Each project team shall consist of 2 to 4 students and will be assigned a faculty mentor. The department shall conduct three project reviews as per the schedule provided by DAP, which must be recorded as part of the project evaluation for CIE, along with marks awarded by the faculty guide. A committee constituted by the HoD, consisting of a minimum of two faculty members, shall conduct the reviews and evaluate the CIE. For SEE, students must appear for a viva-voce examination, which will be assessed by a panel of two examiners—one internal and one external—constituted by the HoD. The rubrics of evaluation includes objectives defined, literature review, demonstration of the project work carried out, report, project presentation, communication skill and question and answer session.

Internship: The internship is intended for students who do not undertake a project. Students must undergo an internship in private industries, R&D organizations, Center of Excellence, laboratories of reputed institutions, government and semi-government organizations, PSUs, construction companies, or entrepreneurial organizations to gain exposure to the external professional environment. The internship shall be for a duration of 12 weeks during the VIII semester, either through placement or on an individual basis. Students are required to prepare a report on the work carried out during the internship and submit both the report and the internship certificate during the VIII semester. The department shall conduct three project reviews as per the schedule provided by DAP, which must be recorded as part of the project evaluation for CIE.A committee constituted by the HoD, consisting of a minimum of two faculty members, shall conduct the reviews and evaluate the CIE. For SEE, students must appear for a viva-voce examination, which will be assessed by a panel of two examiners—one internal and one external—constituted by the HoD. The rubrics of evaluation includes objectives defined, literature review, demonstration of the work carried out, report, project presentation, communication skill and question and answer session.

Summer Internship: Students must undergo an internship in private industries, R&D organizations, Center of Excellence, laboratories of reputed institutions, government and semi-government organizations, PSUs, construction companies, or entrepreneurial organizations to gain exposure to the external professional environment. The internship should be completed over a period of four weeks during the summer vacation after the IV or VI semester and must be completed before the VII semester. Students are required to prepare a report on the work carried out during the internship and submit both the report and the internship certificate during the VIII semester. The internal faculty will monitor student performance and award CIE marks in the VIII semester. Additionally, there will be a SEE, in which students must present their work before a panel of two examiners constituted by the HoD during the SEE of the VIII semester.
AICTE activity point: Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students' VIII semester grade card. The activities to earn the points can be spread over the duration of the program. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case a student fails to earn the prescribed activity points; VIII semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the VIII semester grade card.

VII Semester

22UAIC700	Generative AI	(4 - 0- 0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- To understand the fundamental concepts and technologies involved in Generative AI development.
- To study the principles of Gen AI models applied to various interdisciplinary tasks.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1 to 12) / PSO (13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** the fundamentals of Generative AI.	1	2	12, 13
CO-2	**Explain** and **design** effective prompts.	-	2	3,13
CO-3	**Apply** Open-Source Models and Programming Framework	-	4	13, 14
CO-4	**Design** and **implement** of agents.	-	2	11,12
CO-5	**Explain** the applications of Generative AI.	-	-	11

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	2.0	-	2.0	-	-	-	-	-	-	1.0	1.0	1.0	1.0

Pre-requisites: Knowledge of Artificial Intelligence.

Contents:

Unit I

Fundamentals of Generative AI: Introduction to Generative AI, Fundamentals of Machine Learning for Language Models, How Large Language Models work? Exploring ChatGPT, A World of Models. **8 Hrs**

Unit II

Mastering Prompt Engineering: The Art of Prompt Engineering, Designing Effective Prompts. **8 Hrs**

Unit III

Open-Source Models and Programming Framework: Rise of Open-Source Generative Models, Programming LLMs, Retrieval Augmented Generation. **8 Hrs**

Unit IV

Envisioning Future with Agents: Responsible AI Agents, Framework to develop and deploy AI systems. **8 Hrs**

Unit V

Applications: Economic Trends and Business Use Cases, The Leadership Guide to Generative AI, Generative AI in the Enterprise, Generative AI in Science and Research, Case Study. **7 Hrs**

Reference Books:

1. Altaf Rehmani, “Generative AI for Everyone”, 1/E, BPB Publications, 2024.
2. Numa Dhamani, “Introduction to Generative AI”, Kindle Edition, Manning Publication, 2024.
3. Charu C Aggarwal, “Neural Networks and Deep Learning”, 1/E, Springer International Publishing, 2018.
4. Josh Kalin, “Generative Adversarial Networks Cook Book”, 1/E, Packt Publishing, 2018.
5. Sergio Pereira, “Generative AI for Software Development” 1/E, O'Reilly Media, Inc., 2025

22UAIL701	Generative AI Laboratory	(0-0-2) 1

Contact Hours: 26

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- Understand the principles and concepts behind generative AI models
- Explain the knowledge gained to implement generative models using Prompt design frameworks.
- Apply various Generative AI applications for increasing productivity.
- Develop Large Language Model-based Apps.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12) / PSOs (13-16)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Apply** pre-trained and custom word embeddings to understand and represent semantic relationships.	1	2	4, 5, 13
CO-2	**Visualize** embeddings using dimensionality reduction techniques and analyze clusters for domain-specific terms.	-	2	4, 5, 13
CO-3	**Enhance** and **design** creative generative prompts using semantically similar words from embeddings.	-	2	3, 5, 10, 13, 14
CO-4	**Apply** pre-trained models from Hugging Face for sentiment analysis and summarization in practical scenarios.	-	2	1, 4, 5, 10, 13, 14
CO-5	**Build** practical GenAI-based apps using LangChain, Pydantic, and external APIs for tasks like chatbots and data retrieval.	4, 5, 13	2, 3, 6, 9, 10, 11	8, 12, 14

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3.0	2.0	1.0	3.0	3.0	2.0	-	1.0	2.0	2.0	2.0	1.0	3.0	1.0

Pre-requisites: NIL

Contents:

1 Explore pre-trained word vectors. Explore word relationships using vector arithmetic. Perform arithmetic operations and analyze results.

2 Use dimensionality reduction (e.g., PCA or t-SNE) to visualize word embeddings for Q 1. Select 10 words from a specific domain (e.g., sports, technology) and visualize their embeddings. Analyze clusters and relationships. Generate contextually rich outputs using embeddings. Write a program to generate 5 semantically similar words for a given input.

3 Train a custom Word2Vec model on a small dataset. Train embeddings on a domain-specific corpus (e.g., legal, medical) and analyze how embeddings capture domain-specific semantics.

4 Use word embeddings to improve prompts for Generative AI model. Retrieve similar words using word embeddings. Use the similar words to enrich a GenAI prompt. Use the AI model to generate responses for the original and enriched prompts. Compare the outputs in terms of detail and relevance.

5 Use word embeddings to create meaningful sentences for creative tasks. Retrieve similar words for a seed word. Create a sentence or story using these words as a starting point. Write a program that: Takes a seed word. Generates similar words. Constructs a short paragraph using these words.

6 Use a pre-trained Hugging Face model to analyze sentiment in text. Assume a real-world application, Load the sentiment analysis pipeline. Analyze the sentiment by giving sentences to input.

7 Summarize long texts using a pre-trained summarization model using Hugging face model. Load the summarization pipeline. Take a passage as input and obtain the summarized text.

8 Install langchain, cohere (for key), langchain-community. Get the api key (By logging into Cohere and obtaining the cohere key). Load a text document from your google drive. Create a prompt template to display the output in a particular manner.

9 Take the Institution name as input. Use Pydantic to define the schema for the desired output and create a custom output parser. Invoke the Chain and Fetch Results. Extract the below Institution related details from Wikipedia: The founder of the Institution. When it was founded. The current branches in the institution. How many employees are working in it. A brief 4-line summary of the institution.

10 Build a chatbot for the Indian Penal Code. We'll start by downloading the official Indian Penal Code document, and then we'll create a chatbot that can interact with it. Users will be able to ask questions about the Indian Penal Code and have a conversation with it.

Reference Books:

1. Altaf Rehmani, "Generative AI for Everyone", 1/E, BPB Publications, 2024.
2. Numa Dhamani, "Introduction to Generative AI", Kindle Edition, Manning Publication, 2024.
3. Charu C Aggarwal, "Neural Networks and Deep Learning", 1/E, Springer International Publishing, 2018.
4. Josh Kalin, "Generative Adversarial Networks Cook Book", 1/E, Packt Publishing, 2018.
5. Sergio Pereira, "Generative AI for Software Development" 1/E, O'Reilly Media, Inc., 2025

22UAIL702	Major Project - I	(0-0-12) 6

Contact Hours: 156

Course Learning Objectives (CLOs): Understand the domain, analyze through Modeling and Implementation through state-of-the-art technology available. Know Software Engineering Principles: Modeling, Estimation, Design standards and architectural issues through use of Standards etc. To write modular programs and handle exceptions to provide reliable solutions. To test and verify the programs for different scenarios.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Demonstrate** an ability to work in teams and manage the conduct of the research study and Summarize literature review for a given topic.	2, 4, 9	1, 8	12
CO-2	**Identify** problem from literature review.	2	1	12
CO-3	**Define** objectives for the problem and decide on methodology.	-	1, 2	-
CO-4	**Compare** and contrast the several existing methods for solving the chosen problem.	2, 3	5, 13, 14	6, 12
CO-5	**Demonstrate** the use of presentation techniques for effective communication and demonstration of ethics and societal concern in the given solution.	5, 6, 7, 10	8	11, 12
CO-6	**Analyze** requirement of solution for the given problem with teamwork and multidisciplinary approach.	9, 11, 13	3, 8, 14	1

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	2.0	3.0	3.0	3.0	3.0	2.0	3.0	2.0	3.0	3.0	2.0	1.0	2.0	2.0

Prerequisites: Different programming languages / tools.

Contents:

Major project phase-1 in which the students are expected to locate the state of the art technology in his domain of interest by an extensive literature survey and Select a topic from an emerging area relevant to their branch/interdisciplinary and define the problem for the project work. The material collection, survey, visits, data collection, preliminary design, analysis etc. is to be done in this phase. The project shall consist of a team of students not more than 4. Each batch shall be assigned with a guide. A committee consisting of minimum 3 faculty members of which guide is a member shall evaluate at the end for CIE. The weight age of marks shall be 50% for the committee and 50% for the guide. There is a SEE (viva voce) examination which shall be examined by two internal examiners appointed by COE based on the suggestions by the respective HoD.

General Instructions to Students:

1. Students are expected to perform extensive literature survey, identify problem statements and prepare synopsis in consultation with project guide/supervisor. Students are expected to submit synopsis- Initial (Registration Phase-1) approved by project guide, to the project coordinator as per the schedule notified. A copy is to be maintained with students and the guide. This registration/ Initial synopsis contains the description of the project concept created and acts as a base line for design and Implementation of the system.
2. Notification/schedules and evaluation procedures will be sent to all students in the Google groups created in the department.
3. Evaluation of problem statement/synopsis-Initial (registration phase-1), Literature Survey and SRS (Requirement Analysis Phase-1) are done in the 7th semester.

Sl No	Parameters for Assessment	% of weightage for CIE and SEE
P1	Project Synopsis/ Proposal Evaluation	15
P2	Literature survey/Technology used / Architectural design	15
P3	Requirement Analysis (SRS)	15
P4	Design methodology/Demonstration of tool used for designing	10
P5	Implementation modules	15
P6	Discussion of test cases /Project demonstration	15
P7	Project Report (Phase-1 and Phase-2)	10
P8	Paper Publication/Presentation	05

22UAIE721 Agentic AI (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- To explore the foundational concepts of large language models and agents.
- To understand the deployment of AI agents.
- To explore the declarative and structured framework for building modular AI software.
- To understand the foundational concepts of database agents.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1 to 12) / PSO (13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** large language models, agents and retrieval augmented generation.	1	2	12, 13
CO-2	**Build** AI agents and applications.	-	2	3,13

CO-3	**Describe** DSPy framework, MLOps, and MLflow.	-	4	13, 14
CO-4	**Implement** the database agent using LangGraph.	8	2, 9	11, 12
CO-5	**Explore** a new way to write and code with agents.	-	10	11

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3.0	2.0	1.0	2.0	-	-	-	3.0	-	-	1.0	1.0	1.0	1.0

Prerequisites: Knowledge of

1. Programming language (any)
2. Database Management Systems

Contents:

Unit I

Introduction to Agents: Large Language Models (LLMs), Agents, Retrieval Augmented Generation (RAG), Benefits of AI agents, Components of AI agents, AI agent examples, Agentic AI framework and AutoGen **8 Hrs**

Unit II

Building Agents/Applications: Building a Multimodal Knowledge Assistant, Enterprise trends for Generative AI, Key components of building successful agents and applications, Compound AI systems and the DSPy framework, Agents for Software Development, AI agents for Enterprise Workflows. **8 Hrs**

Unit III

DSPy: Build, debug and optimize AI agents using DSPy and MLflow, Building Agentic RAG with LlamaIndex.

Build AI agents with Google ADK: Build Your Intelligent Agent using Agent Development Kit (ADK), Building Agentic AI apps with Firebase (Genkit, Firebase AI frameworks), Configuring Vector Search in AlloyDB L200 **8 Hrs**

Unit IV

Multimodal Agents: Build Agents using Oracle AI agents, Watsonx.ai, Cloudera AI Agent Studio, Intel OpenVINO.

LangChain for LLM Application Development: Functions, Tools and Agents with LangChain, AI agents in LangGraph. **8 Hrs**

Unit V

Building Database Agent: Interact with tabular data and SQL databases using natural language, AI agents in Azure, Vertex AI, MLOps on Vertex AI, Understanding and applying text embeddings, Collaborative writing and coding with OpenAI Canvas.
From IDE to Cloud: Accelerate Software Development Life Cycle with AI agents, Agent2Agent(A2A) Protocol. **7 Hrs**

Reference Books:

1. Michael Lanhem, "AI Agents in Action", 1/E, Manning Publication, 2025.
2. Victor Dibia, "Multi Agent Systems with AutoGen", 1/E, Manning Publication, 2024.
3. Roberto Infante, "LangChain in Action – Agents and LLM Applications", 1/E, Manning Publication, 2024.
4. Anjanava Biswas and Wrick Talukdar, "Building Agentic AI Systems", 1/E, Packt Publishing, 2025.
5. Sinan Ozdemir, "Modern Automated AI Agents" 1/E, Pearson Publication, 2025

22UAIE722 Web and Social Network Mining (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- To introduce the foundational concepts of structure and modeling of web data and social networks.
- To understand and apply Supervised, Unsupervised and Semi – Supervised Algorithms web-based recommendations
- To explore the principles and techniques of web content mining, hyperlink analysis, and community discovery using link-based ranking algorithms such as PageRank and HITS.
- To analyze the user behavior through web usage mining, employing clustering, probabilistic models (PLSA, LDA), and co-clustering techniques.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1 to 12) / PSO (13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Describe** the fundamentals of web mining and social networks analysis.	1	2	12, 13
CO-2	**Explore** recommendation systems in the context of web and social data.	-	2	3, 13

CO-3	**Explain** web content mining techniques and web community discovery techniques.	-	4	13, 14
CO-4	**Analyze** user behavior and access patterns through web usage mining techniques.	8	2, 9	11, 12
CO-5	**Extract** and **analyze** evolving web communities from web archives.	-	10	11

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	2.0	1.0	2.0	-	-	-	3.0	2.0	2.0	1.0	1.0	1.0	1.0

Prerequisites: Knowledge of
1. Algorithms
2. Data Science

Contents:

Unit I

Introduction: Web Mining and Social Networks, Web Community and Social Network Analysis, Web Data Model, Textual, Linkage and Usage Expressions, Similarity Functions, Eigenvector, Principal Eigenvector, Singular Value Decomposition (SVD) of Matrix, Tensor Expression and Decomposition, Information Retrieval Performance Evaluation Metrics, Basic Concepts in Social Networks**.** **8 Hrs**

Unit II

Algorithms and Techniques: Content-based Recommendation, Collaborative Filtering Recommendation, Social Network Analysis. **8 Hrs**

Unit III

Web Content Mining: Vector Space Model, Web Search, Feature Enrichment of Short Texts, Latent Semantic Indexing, Automatic Topic Extraction from Web Documents
Web Linkage Mining: Web Search and Hyperlink, Co-citation and Bibliographic Coupling, PageRank and HITS Algorithms, Web Community Discovery, Web Graph Measurement and Modeling, Using Link Information for Web Page Classification **8 Hrs**

Unit IV

Web Usage Mining: Modeling Web User Interests using Clustering, Web Usage Mining using Probabilistic Latent Semantic Analysis, Finding User Access Pattern via Latent Dirichlet Allocation Model, Co-Clustering Analysis of weblogs using Bipartite Spectral Projection Approach, Web Usage Mining Applications. **8 Hrs**

Unit V

Web Mining and Recommendation Systems: User-based and Item-based Collaborative Filtering Recommender Systems, A Hybrid User-based and Item-based Web Recommendation System, User Profiling for Web Recommendation Based on PLSA and LDA Model, Combing Long-Term Web Achieves and Logs for Web Query Recommendation. **7 Hrs**

Reference Books:

1. Guandong Xu et al, "Web Mining and Social Networking, Techniques and Applications", Springer Publications, 2010.
2. Bing Liu, "Web Data Mining", 2/E, Springer Publications, 2011.
3. Matthew A. Russell and Mikhail Klassen, "Mining the Social Web", 3/E, O'Reilly Media, Inc., 2019.

22UAIE731	AI for Cybersecurity	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- To understand the fundamental principles of cryptography, including symmetric and asymmetric encryption.
- To explore the digital Signatures and their applications.
- To understand the importance of cryptography in secure communication.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12) / PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** the fundamental concepts of cryptography.	-	1	12
CO-2	**Apply** classical and modern techniques to encrypt the data.	-	2, 3	12, 13

CO-3	**Explain** digital signatures for verifying data integrity and sender authenticity.	-	1	12
CO-4	**Explain** and **implement** algorithms to protect the networks from spam and malwares.	-	2, 3	12, 13, 14
CO-5	**Explain** and **implement** algorithms to detect the anomalies in the networks.	5	2, 3	12, 13, 14

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	2.0	2.0	2.0	-	3.0	-	-	-	-	-	-	1.0	1.0	1.0

Pre-requisites: Knowledge of

1. Computer Networks
2. Programming Language

Contents:

Unit I

Cryptography: Introduction, Substitution Ciphers, Transposition Ciphers, One – time pads, Quantum Cryptography, Two Fundamental Cryptographic Principles. **7 Hrs**

Unit II

Symmetric Key Algorithms: DES, AES, Cipher Models, Other Ciphers, Cryptanalysis.

Public Key algorithms: RSA. **8 Hrs**

Unit III

Digital Signatures: Symmetric key signatures, Public key signatures, Message Digests, The Birthday attack. **8 Hrs**

Unit IV

Detecting Cyber Security Threats with AI - 1: Detecting Spam with Perceptron, Spam Detection with SVM, Detecting Malwares with Decision Trees. **8 Hrs**

Unit V

Detecting Cyber Security Threats with AI - 2: Network anomaly detection techniques, Classification of Network attacks, Tools. **8 Hrs**

Reference Books:

1. Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks", 5/E, Pearson, 2011.
2. William Stallings, “Cryptography and Network Security – Principles and Practice”, 8th Edition, Pearson, 2024.
3. Allessandro Parisi, “Hands on Artificial Intelligence for Cybersecurity”, 1st Edition, Packt Publishing, 2019.

22UAIE732	MLOps	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- Understand the basic principles and role of MLOps in machine learning projects.
- Study the principles to build, test, and deploy ML models using MLOps techniques.
- Introduce tools and platforms used for versioning, automation, and deployment in MLOps.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12) / PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** the fundamental concepts, benefits, and lifecycle of MLOps	1	2	12, 13
CO-2	**Apply** data and model versioning tools such as Git, DVC, and MLflow	-	2	4, 13
CO-3	**Build** and **automate** ML pipelines using CI/CD tools (GitHub Actions, Jenkins, GitLab CI/CD)	-	4	8, 11, 13
CO-4	**Deploy**, **serve**, and **monitor** ML models using tools like TensorFlow Serving, FastAPI, and Grafana	3	5, 9	10, 11
CO-5	**Use** Docker, Kubernetes, Kubeflow for scalable, secure ML operations	3	6	7, 14

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	2.0	3.0	1.5	2.0	2.0	-	1.0	2.0	1.0	1.0	1.0	1.0	1.0

Pre-requisites: Knowledge of

1. Python
2. Machine Learning
3. Software Development Life Cycle.

Contents:

Unit I

Introduction to MLOps: Understanding MLOps, Importance of MLOps in software development, Overview of MLOps and its role in machine learning, Difference between DevOps, MLOps, and DataOps, Key principles and best practices, CI/CD in traditional software vs. ML pipelines, Model development to deployment lifecycle. **7 Hrs**

Unit II

Data Management and Versioning in MLOps: Managing data and model versioning (Git, DVC, MLflow), Handling large datasets for ML, Data versioning tools: DVC, Pachyderm, Integrating data quality checks into workflows, Experiment tracking and model reproducibility (MLflow, Tensor Board **8 Hrs**

Unit III

CI/CD and Automation in MLOps: Automation in MLOps, Automating ML model training processes, Scalable training techniques (distributed training with Horovod Ray), Continuous Integration/ Continuous Deployment (CI/CD) for Machine Learning and MLOps, GitHub Actions, Jenkins, GitLab CI/CD for automated pipelines, Continuous training (CT) for model retraining, Evaluation metrics & validation strategies. **8 Hrs**

Unit IV

Model Deployment and Production Monitoring: MLOps Deployment Strategies: Blue-Green, Canary, A/B Testing, Online, batch, and streaming deployments, Model Serving and Scaling: TensorFlow Serving, TorchServe, FastAPI, Model optimization techniques (Quantization, ONNX), Monitoring & Model Performance Management: Prometheus & Grafana, detecting model drift, data drift, and concept drift, Strategies for retraining and updating ML models. **8 Hrs**

Unit V

Infrastructure, Orchestration & Security: Containerization & Orchestration: Docker, Kubernetes, Kubeflow, KServe, Managing compute resources with Kubeflow, Feature Store and Workflow Orchestration: Feast, Tecton, Apache Airflow, Kubeflow Pipelines, Security & Compliance in MLOps. **8 Hrs**

Reference Books:

1. Noah Gift and Alfredo Deza, “Practical MLOps: Operationalizing Machine Learning Models", 5/E, Pearson, 2011.
2. Oleg Iegorov, Faisal Masood and Krishnaram Kenthapadi, “Machine Learning with Kubernetes: Deploy, Manage, and Scale Models with Kubernetes”, 1/E, O'Reilly Media, 2011.
3. Mark Treveil and Alok Shukla, “Introducing MLOps”, 1/E, O'Reilly Media, 2020.
4. Google MLOps Whitepapers – https://cloud.google.com

22UAIO741	Applied AI	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- Introduce the fundamentals of Artificial Intelligence, machine learning types, and deep learning architectures.
- Familiarize students with AI frameworks such as TensorFlow and PyTorch, and concepts like transfer learning.
- Apply AI techniques to medical imaging, diagnostics, and disease prediction.
- Explore NLP applications in healthcare for clinical text analysis and treatment recommendations.
- Demonstrate AI-based solutions in agriculture for precision farming, crop prediction, and pest detection.
- Analyze the role of AI in smart cities for traffic, energy, and waste management.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12) / PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** the core concepts of AI, ML paradigms, and deep learning using tools like TensorFlow and PyTorch.	1	2	12, 13
CO-2	**Analyze** AI applications in medical imaging, diagnostics, and disease prediction.	-	2	3, 13

CO-3	**Apply** NLP techniques for clinical data processing and personalized healthcare.	-	4	13, 14
CO-4	**Implement** AI solutions in precision agriculture for monitoring, prediction, and pest detection.	8	2, 9	11, 12
CO-5	**Evaluate** the role of AI in smart cities for traffic, energy, and waste management with a focus on sustainability.	-	10	11

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3.0	2.0	1.0	2.0	-	-	-	3.0	2.0	2.0	1.0	1.0	1.0	1.0

Pre-requisites: Knowledge of

1. Programming Language (Any one).

Contents:

Unit I

Introduction to Artificial Intelligence: Definition and scope of AI, Applications of AI, Fundamentals of Machine Learning, Supervised, unsupervised, and reinforcement learning, Deep Learning Architectures, Neural networks, convolutional neural networks (CNNs), and recurrent neural networks (RNNs). **8 Hrs**

Unit II

AI in Healthcare: AI in Medical Imaging, Image classification, segmentation, and registration, Radiomics and quantitative imaging biomarkers, Applications of AI in radiology, pathology, and ophthalmology, AI in Diagnostics and Disease Prediction, Early detection of diseases using AI algorithms. **8 Hrs**

Unit III

Natural Language Processing (NLP) in Healthcare: Text mining and information extraction from clinical notes, Applications of NLP in electronic health records (EHR) analysis and clinical documentation, AI in Personalized Medicine and Treatment Planning, Treatment recommendation systems. **8 Hrs**

Unit IV

AI in Agriculture: AI applications in modern farming, Food security and Sustainability.
Precision Farming with AI: Soil analysis and monitoring, Machine learning models for precision irrigation and fertilization.
Predictive Analytics for Crop Yield: AI models for predicting crop health and yield.
8 Hrs

Unit V

AI for Smart cities: Overview of smart cities: Concepts and components, AI's evolving role in urban management and service delivery, AI for Traffic Management and Smart Mobility, AI in Energy Management and Sustainability, AI in Waste Management and Urban Sustainability. **7 Hrs**

Reference Books:

1. B. Mesko and N. Rado, "A Guide to Artificial Intelligence in Healthcare", Medical Futurist, 2019.
2. Rajesh Singh et al, "Artificial Intelligence in Agriculture", 1/E, New India Publisher, 2020.
3. Tipasa and Algeria, "Artificial Intelligence and Heuristics for Smart Energy Efficiency in Smart Cities", Springer Publications., 2022.

22UAIO742	Cyber Physical Systems	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- Define embedded systems and cyber-physical systems, providing concrete examples of their applications.
- Understand various modeling techniques for CPS, such as hybrid automata, state-space methods, and others.
- Grasp the key components and architecture of CPS, including the 5C architecture (Connection, Conversion, Cyber, Cognition, Configuration).

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12) / PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Distinguish** between cyber physical systems and other systems.	1	2	12, 13
CO-2	**Explain** various modeling formalisms for cyber physical systems and their properties.	-	2	3, 13

CO-3	**Explain** the principles of memory organization and bus structure of cyber physical systems.	-	4	13, 14
CO-4	**Explain** the concepts of power aware architecture & hardware software co design.	8	2, 9	11, 12
CO-5	**Explain** safety and security aspects of cyber physical systems, including potential vulnerabilities and mitigation strategies.	-	10	11

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	2.0	1.0	2.0	-	-	-	3.0	2.0	2.0	1.0	1.0	1.0	1.0

Pre-requisites: NIL

Contents:

Unit I

Fundamentals: Introduction, Cyber Physical Systems (CPS) in real world, Basic Principles of Design and Validation of CPS, Industry 4.0, AutoSAR, IIOT implications, Building Automation, Medical CPS. **8 Hrs**

Unit II

Platform Components: CPS HW platforms - Processors, Sensors, Actuators CPS Network – Wireless Hart, CAN, Automotive Ethernet Scheduling Real Time CPS tasks: Table-driven and Event driven schedulers Hybrid schedulers. **8 Hrs**

Unit III

Principles of Dynamical Systems: Dynamical Systems and Stability Controller Design Techniques Performance under Packet drop and Noise. **8 Hrs**

Unit IV

CPS implementation issues: From features to automotive software components Mapping software components to ECUs CPS Performance Analysis: Effect of scheduling, bus latency, sense and actuation faults on control performance, network congestion Building real-time networks for CPS. **8 Hrs**

Unit V

Intelligent CPS: Safe Reinforcement Learning - Robot motion control, Autonomous Vehicle control Gaussian Process Learning: Smart Grid Demand Response, Building Automation. **7 Hrs**

Reference Books:

1. Raj Rajkumar et al, “Cyber – Physical Systems", 1/E, Pearson Education, 2017.
2. Walid M. Taha et al, “Cyber – Physical Systems: A Model-Based Approach”, 1/E, Springer Publications., 2021.
3. Vidhur Gupta, “Cyber – Physical Systems: Programming the World”, 1/E, Educohack Press, 2024.

VIII Semester

22UAIL800	Technical Seminar	(0-0-2) 1

Contact Hours: 26

Technical Seminar: The students are expected to learn how to carry out literature survey to locate the state-of-the-art technology in engineering domain of their interest. They are required to carry out selection of an emerging topic beyond the syllabus relevant to the branch of study, understand the concept, analyze and present effectively for 15-20 minutes followed by 5 minutes of questions and answers before their classmates and faculty. They can also present the technical innovative/novel work carried out in the laboratory. They are also required to learn the effective communication and modalities of technical interactions. Further, they have to submit the seminar material in the form of a paper in IEEE format. All the students are required to attend all the session throughout the semester.

Course Outcomes:

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12) / PSOs (13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Demonstrate an ability to present the work carried out both in written and oral form.	10	-	-
CO-2	Demonstrate an ability to incorporate rapid changes in technology by undergoing life-long learning	12	2	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	-	2.0	-	-	-	-	-	-	-	3.0	-	3.0	-	-

Procedure to conduct technical Seminar:

- All the students are informed to select a topic from the field of their interest from their branch or relevant to their branch and register the topic with the faculty (ies) In charge of Seminar.

- Two faculty members assigned to carry out this activity. The faculty members prepare the schedule of the seminar spread over the entire semester and display the same in the notice board.
- Change of seminar topic is not allowed once registered, however in the case of genuine reasons only once change of topic may be permitted.
- Based on the number of hours mentioned in the scheme, 4-6 students shall present the seminar in one slot of 2/3 hours.
- The faculty members shall conduct the seminar session every week as per the schedule in the slot mentioned on the time table and carry out the evaluation.
- Attendance is compulsory for all the students for all the seminars.
- The students are required to submit two hard copies of report not exceeding 6 pages and one soft copy of seminar report one week prior to their date of presentation.
- Report shall be in IEEE format viz A4 size paper, Title: Bold, Times new Roman Font 14, Sub heading & Body of the text: Times new Roman font 12. Margin for left should be 1 ½.
- Student name, USN, seminar date should be mentioned on the report.
- Presentation is for about 15-20 minutes, followed by 5 minutes for questions and answers.
- Typical evaluation methodology: The seminar shall be evaluated for maximum 50 marks. The breakup of marks shall be: Presentation: a) 40 marks b) Report: 10 marks.

For presentation, the following points not limited to may be considered.

- Concept, understanding, depth of the knowledge, originality of the topic, Quality of PPT, communication skills etc.
- For report evaluation, the following points not limited to may be considered
- Adherence to IEEE format, relevance of topic, subject depth and originality in writing etc.
- The seminar is aimed at as an educative program for the students. This is because, the students shall listen to 60- 70 seminars on different topics from emerging areas is as good as undergoing a course on latest happenings in the related branch of Engineering.
- The departments going for Independent study in place of technical seminar shall plan, prepare the modalities and take the approval from Dean (AP)

The seminar is aimed at as an educative program for the students. This is because, the students shall listen to 60- 70 seminars on different topics from emerging areas is as good as undergoing a course on latest happenings in the related branch of Engineering.

22UAIL801	Major Project - II / Internship	(12 Weeks) 10

Contact Hours: **12 Weeks**

Course Learning Objectives (CLOs): Understand the domain, analyze through Modeling and Implementation through state-of-the-art technology available. Know Software Engineering Principles: Modeling, Estimation, Design standards and architectural issues through use of Standards etc. To write modular programs and handle exceptions to provide reliable solutions. To test and verify the programs for different scenarios.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Identify, formulate** the problem statement and prepare software requirement specification (SRS)	2, 8, 13	1, 5, 11, 12	7
CO-2	**Design** specification using standard diagrams and tools.	3, 8, 13, 16	1, 5, 11, 12	7
CO-3	**Implement** the system based on design specification using appropriate programming standards, tools, and practices.	8, 14, 16	1, 4, 5, 12	-
CO-4	**Verify and Validate** the given system using standard practices and tools.	8, 15	1, 4, 5, 12	-
CO-5	**Communicate** effectively with and learn from, the experts from different domains.	8, 9, 10	5, 12	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	2.0	3.0	3.0	2.0	2.0	-	1.0	3.0	3.0	3.0	2.0	2.0	3.0	3.0

Major project phase- II: This work is normally the continuation from phase –1in which the students are expected to go for material collection, survey, visits, data collection, preliminary design, analysis, model development, code writing, field work etc. The same project team formed for phase –1 will continue the work under the guidance of the same faculty member. For all the projects, problems may be domain specific or interdisciplinary also in nature. A committee consisting of minimum 3 faculty members of which guide is a member shall evaluate at the end for CIE. The weightage of marks shall be 50% for the committee and 50% for the guide. In the case of interdisciplinary project work; one faculty from each department will guide the project and assess their department students.

Evaluation and rubrics: There is a viva voce examination which shall be examined by two examiners one internal and one external to the college appointed by COE based on the suggestions by the respective HoD. The evaluation is to be done considering the parameters such as problem definition and its relevance, depth of knowledge, work carried out, quality of the report, Presentation & communication and interaction (question and answers) with preferably equal weightage to all parameters. However, the departments can have little flexibility in the rubrics based on the suitability. The students are required to submit a report on the project carried out.

Reference materials/books: The reference materials for the project work are as listed below but not limited to:

1. Engineering books.
2. Journals.
3. Manuals and data sheets.
4. Software packages.
5. Previous project reports.
6. Product information brochures.
7. Interaction with academia and industrial experts.
8. Internet etc.

22UAIL802	Summer Internship	(4 weeks) 3

Contact Hours: 4 weeks

Course Learning Objectives (CLOs):

The internship module aims to provide the student with a practice-oriented and hands-on working experience in the real world or industry, and to enhance the student's learning experience i.e. to integrate theory and practice. It gives an opportunity to develop a right work attitude, self-confidence, interpersonal skills and ability to work as a team in a real organizational setting. Also, to further develop and enhance operational, customer service, competency in specific areas related to student's area of career interest, skills in research, analysis and other life-long knowledge and skills in a real-world work

environment. Through Internship, students can get pre-employment training and the company or organization can assess the performance of the student and offer the student an employment opportunity after his/her graduation, if it deems fit.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Solve** real life challenges in the workplace by analyzing work environment and conditions, and selecting appropriate skill sets acquired from the course.	1, 2	4	12
CO-2	**Communicate and collaborate** effectively and appropriately with different professionals in the work environment.	5,10	8	6,7,11,12
CO-3	**Demonstrate** critical thinking, problem-solving skills and creativity and innovation by analyzing underlying issue/s to challenges.	1,2,3,4,5,13,14	6,7,8	12
CO-4	**Demonstrate** the application of knowledge and skill sets acquired from the course and workplace in the assigned job function/s.	1,2,3,4,5,13,14	6,7,8	12
CO-5	**Demonstrate** an ability to work as a professional in a heterogeneous team environment.	9,10,11	8	12

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	3.0	3.0	2.66	3.0	1.66	1.66	2.0	3.0	3.0	2.0	1.0	3.0	3.0

The students are to undergo internship in Private industries/R&D organizations/Centers of Excellence/Laboratories of Reputed Institutions/Govt. & Semi Govt. organizations, PSUs, construction companies, entrepreneurial organizations, inter departments within the college etc. to get exposure to the external world for a period of 4 weeks in the summer vacation after VI Sem and before start of VII semester. The students are to prepare a report on the internship work carried out. The internal faculty shall monitor the student

and award CIE marks. There is a SEE in which the student shall present his work before a panel of examiners consisting of HoD, Guide and one faculty member during VII semester.

CIE and SEE Evaluation (from 2023 - 24 batch)

Courses with LTP 3-0-0 and 4-0-0:

Continuous Internal Evaluation (CIE):

- Two Internal Assessments and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two sub divisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.
- Course Teacher Assessment (CTA): Minimum two components such as quiz, seminar, written assignment, any technical activity related to course each of 5marks. Total CTA marks-10
- CIE=40 (from tests)+10(from CTA) =50 marks

Semester End Examination (SEE):

- SEE is conducted for 100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question with maximum of three sub divisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.
- The Question paper is to be set for 100 marks for 3 and 4 credits courses.

PCC with LTP 2-0-2, 3-0-2 and 2-2-2

Continuous Internal Evaluation (CIE):

Theory CIE component:

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.

- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two sub divisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.

Course Teacher Assessment (CTA): Totally based on conduction of experiments as set by the course teacher.

Laboratory component assessment:

- 5 marks: for conduction, regularity, involvement, journal writing, etc. Minimum 75% of attendance is compulsory. If the performance is not satisfactory in laboratory the student shall be detained and required to reregister for the course as a whole whenever offered next.
- 5 marks: Lab Test. A Lab test as per the class time table has to be conducted at the end for50 marks and scale down to 5 marks.
- CIE for integrated course =40 (from IA tests)+10 (from CTA i.e. lab component) =50 marks.
- There will not be any remuneration for Final Lab Test since it is CTA of integrated course.
- Copy of the Marks list to be sent to the concerned course instructor immediately after the completion of test for that batch. Original Marks list to be maintained in the department.
- CIE=40(from tests)+10(from CTA i.e. lab component) =50 marks

Semester End Examination (SEE):

- SEE is conducted for100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question with maximum of three sub divisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.
- The Question paper is to be set for 100 marks for 3 and 4 credits courses.