Semester: 7th			
Paper code: AIDS401/AIML401/IOT401	**L**	**T/P**	**Credits**
Subject: Principles of Management for Engineers	**3**	**0**	**3**

Marking Scheme:

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End Term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper.
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To introduce students to the principles and functions of management in engineering environments.
2.	To develop the skills and knowledge required for effective decision-making in engineering contexts.
3.	To understand the dynamics of organizational behavior and its impact on engineering teams and projects.
4.	To equip students with project management skills for successful execution of engineering projects.

Course Outcomes:

CO1	Understand the fundamental principles of management, its evolution, and the roles of managers in engineering contexts.
CO2	Apply various decision-making models and techniques to solve engineering problems and make effective decisions.
CO3	Analyze individual and group behavior, motivation, leadership, and communication in engineering organizations.
CO4	Acquire project management skills and techniques to plan, execute, monitor, and control engineering projects effectively.

Course Outcomes (CO) to Programme Outcomes (PO)

Mapping (Scale 1: Low, 2: Medium, 3: High

CO/ PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	-	-	2	2	2	-	1	1	-	-	1	1
CO2	-	-	2	2	2	-	1	-	-	-	1	1
CO3	-	-	2	2	2	-	1	-	-	-	1	1
CO4	1	1	3	2	2	1	1	1	1	1	1	1

Course Overview:
Principles of Management for Engineers is an essential course providing a comprehensive understanding of management principles, leadership, decision-making, and organizational behavior in engineering contexts.

Unit I **[8]**
Definition of management: Science or art, manager vs entrepreneur; Types of managers managerial roles and skills; Evolution of management- scientific, human relations, system and contingency approaches; Types of Business Organizations, sole proprietorship, partnership, company, public and private enterprises; Organization culture and environment; Current trends and issues in management.

Unit II **[8]**
Nature and purpose of Planning: types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Decision making steps & processes. Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management.

Unit III **[8]**
Organizational Behavior: Directing, individual and group behavior, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

Unit IV **[8]**
Controlling, system and process of controlling : Controlling, system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

Textbooks:
1. Robins S.P. and Couiter M., Management, Prentice Hall India, 10th ed., 2009.
2. Stoner JAF, Freeman RE and Gilbert DR, Management, 6th ed., Pearson Education, 2004.
3. Tripathy PC & Reddy PN, Principles of Management, Tata McGraw Hill, 1999

Semester: 7th			
Paper code: AIML411T	**L**	**T/P**	**Credits**
Subject: Advances in Machine Learning	**3**	**0**	**3**

Marking Scheme:

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End Term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper.
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	Explore and comprehend advanced ML algorithms, their strengths, and weaknesses.
2.	Master techniques to interpret and explain ML model predictions for transparency and trust.
3.	Build and train deep learning models to address specific tasks and datasets.
4.	Apply the acquired knowledge to tackle real-world challenges in AI and ML domains.

Course Outcomes:

CO1	Analyze and apply advanced machine learning algorithms to solve complex real-world problems.
CO2	Evaluate and interpret ML models to understand their decision-making processes.
CO3	Implement deep learning architectures for tasks like image analysis, language processing, and sequence modeling.
CO4	Develop expertise in applying cutting-edge ML techniques to various AI applications and domains.

Course Outcomes (CO) to Programme Outcomes (PO)

Mapping (Scale 1: Low, 2: Medium, 3: High

CO/ PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	1	2	3	3	1	1	-	1	1	-	-	2
CO2	2	2	3	3	1	1	-	1	1	-	-	2
CO3	2	2	3	3	1	1	-	1	2	-	-	2
CO4	2	2	3	3	2	1	1	1	2	-	-	2

Course Overview:

This course explores advanced topics in machine learning for B.Tech AI and ML students. It covers recent developments in algorithms, model interpretability, deep learning architectures, and applications. Students gain hands-on experience with cutting-edge ML tools and frameworks.

Unit I **[8]**

Advanced ML Algorithms: Ensemble Learning and Ensemble methods: Bagging, Boosting, and Stacking, and Kernel Methods.
Reinforcement Learning: Q Learning, HMM model, Deep Reinforcement Learning

Unit II **[8]**
Model Interpretability and Explainability: Feature importance and SHAP values, LIME (Local Interpretable Model-agnostic Explanations), Explainable AI (XAI) techniques,

Unit III **[8]**
Deep Learning Architectures: Convolutional Neural Networks (CNN) for image analysis, Recurrent Neural Networks (RNN) for sequence data, Transformers and Attention mechanisms

Unit IV **[8]**
Applications of Advanced ML: Natural Language Processing (NLP) with BERT and GPT, Generative Adversarial Networks (GANs) for image synthesis, Transfer learning and domain adaptation

Textbooks:

1. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
2. "Pattern Recognition and Machine Learning" by Christopher M. Bishop
3. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

Reference Books:

1. "Interpretable Machine Learning" by Christoph Molnar
2. "Reinforcement Learning: An Introduction" by Richard S. Sutton and Andrew G. Barto
3. "Natural Language Processing in Action" by Lane, Howard, and Hapke

Semester: 7th			
Paper code: AIML411P	**L**	**T/P**	**Credits**
Subject: Advances in Machine Learning Lab	**0**	**2**	**1**

Marking Scheme:

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms

1. This is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which they appear is being offered from the list of practicals below.
3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important.
4. At least 8 experiments must be performed by the students.

Course Objectives:

1.	Explore and analyze state-of-the-art machine learning approaches.
2.	Develop practical skills in implementing advanced ML models and solving complex AI challenges.

Course Outcomes:

CO1	Understand the latest advancements in machine learning algorithms and techniques.
CO2	Apply advanced ML methods to real-world problems, demonstrating proficiency in using cutting-edge tools.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping

(Scale 1: Low, 2: Medium, 3: High)

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	1	-	-	-	-	-	-	1
CO2	2	2	2	2	1	1	1	1	1	1	1	2

List of Experiments:

1. Implement a deep neural network from scratch using TensorFlow or PyTorch, gaining hands-on experience in building complex neural architectures.
2. Utilize pre-trained models and perform transfer learning to solve real-world problems efficiently.
3. Implement a GAN to generate synthetic data and explore its applications in image generation and data augmentation.
4. Apply NLP techniques to process and analyze textual data, including sentiment analysis and named entity recognition.
5. Build RL agents and train them using OpenAI Gym or Stable Baselines to solve challenging tasks.
6. Understand the interpretability of ML models by using LIME or SHAP to explain model predictions.

7. Use AutoML and Hyperparameter tuning tools to automate the model selection and optimization process.
8. Analyze time series data, perform forecasting, and evaluate model performance using Prophet or statsmodels.
9. Compress and quantize large ML models to make them suitable for deployment on resource-constrained devices.
10. Explore federated learning concepts and implement distributed ML models using TensorFlow Federated.
11. Generate adversarial attacks on ML models and implement defense mechanisms to enhance model robustness.
12. Utilize Ray Tune to perform hyperparameter search and optimize ML models efficiently.

Semester: 7th			
Paper code: AIML413T	**L**	**T/P**	**Credits**
Subject: Machine Learning in Healthcare	**3**	**0**	**3**

Marking Scheme:

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End Term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper.
2. Question No aiml320t. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	Explain the role of machine learning in healthcare and its impact on medical decision-making.
2.	Apply machine learning algorithms to real-world healthcare datasets for predictive analysis.
3.	Evaluate the performance of machine learning models for medical applications using appropriate metrics.
4.	Develop healthcare solutions that utilize medical image analysis and provide interpretable results.

Course Outcomes:

CO1	Understand the fundamental machine learning algorithms and techniques used in healthcare applications.
CO2	Apply machine learning models to medical data for predictive modeling and disease diagnosis.
CO3	Analyze medical images using deep learning techniques for classification and segmentation tasks.
CO4	Design and develop healthcare decision support systems with ethical considerations in mind

Course Outcomes (CO) to Programme Outcomes (PO)

Mapping (Scale 1: Low, 2: Medium, 3: High

CO/ PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	-	-	2	2	2	-	1	1	-	-	1	1
CO2	-	-	2	2	2	-	1	-	-	-	1	1
CO3	-	-	2	2	2	-	1	-	-	-	1	1
CO4	1	1	3	2	2	1	1	1	1	1	1	1

Course Overview:

This course introduces students to the applications of machine learning in healthcare. It covers fundamental machine learning algorithms, data preprocessing for healthcare data, predictive modeling, medical image analysis, and healthcare decision support systems. Students will gain

insights into using ML techniques for medical diagnosis, treatment recommendation, and disease prediction.

Unit I **[8]**

Introduction to Healthcare Data and Machine Learning: Overview of healthcare data types and sources, Introduction to machine learning algorithms for healthcare, Data preprocessing and feature engineering for medical data

Unit II **[8]**

Supervised learning techniques for medical diagnosis: Unsupervised learning methods for clustering and anomaly detection, Evaluation metrics for healthcare predictions

Unit III **[8]**

Image processing and analysis in medical imaging: Deep learning for medical image classification and segmentation, Case studies: applications of ML in radiology and pathology,

Unit IV **[8]**

Building healthcare decision support systems using ML: Model interpretability and explainability in medical applications, Ethical considerations and challenges in ML healthcare deployments

Textbooks:

1. "Machine Learning in Medicine - A Complete Overview" by Ton J. Cleophas and Aeilko H. Zwinderman
2. "Healthcare Analytics Made Simple: Techniques in Healthcare Computing Using Machine Learning" by Aboelela E. Mady and Taposh Roy
3. "Machine Learning for Healthcare" by Le Lu, Yefeng Zheng, Gustavo Carneiro, and Lin Yang

Reference Books:

1. "Artificial Intelligence in Medicine" edited by Lei Xing and Alessandro Rizzo
2. "Machine Learning and Medical Imaging" edited by Guorong Wu, Dinggang Shen, Mert R. Sabuncu, and Pew-Thian Yap
3. "Healthcare Data Analytics" by Chandan K. Reddy, Charu C. Aggarwal, and Haesun Park

Semester: 7th			
Paper code: AIML413P	**L**	**T/P**	**Credits**
Subject: Machine Learning in Healthcare Lab	**0**	**2**	**1**

Marking Scheme:

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms

1. This is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which they appear is being offered from the list of practicals below.
3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important.
4. At least 8 experiments must be performed by the students.

Course Objectives:

1.	Gain hands-on experience in analyzing and modeling complex systems using network analysis, time series analysis, and simulation techniques. Understand the challenges and approaches for handling big data in complex systems and apply machine learning algorithms for predictions and decision-making.
2.	Explore the application of data science techniques in interdisciplinary fields to address complex challenges in today's interconnected world.

Course Outcomes:

CO1	Develop practical skills in data science techniques for analyzing complex systems and understanding their behavior.
CO2	Apply data science methodologies to solve real-world problems in various domains, such as social networks, finance, and healthcare, and gain insights into complex system dynamics.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping

(Scale 1: Low, 2: Medium, 3: High)

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	1	-	-	-	-	-	-	1
CO2	2	2	2	2	1	1	1	1	1	1	1	2

List of Experiments:

1. Data Preprocessing and Cleaning for Electronic Health Records (EHR) Data
2. Exploratory Data Analysis (EDA) on Medical Imaging Datasets
3. Building a Binary Classification Model for Disease Diagnosis
4. Implementing Multiclass Classification for Disease Severity Prediction
5. Applying Time Series Analysis for Patient Vital Sign Forecasting
6. Developing a Convolutional Neural Network (CNN) for Medical Image Classification
7. Building a Recurrent Neural Network (RNN) for Predicting Patient Readmission
8. Implementing Transfer Learning for Medical Image Feature Extraction

9. Evaluating Model Fairness and Bias in Healthcare Data
10. Applying Reinforcement Learning for Personalized Treatment Recommendations
11. Building an Explainable AI Model for Medical Diagnosis
12. Developing a Predictive Analytics System for Hospital Resource Management.

Semester: 7th			
Paper code: OAE409T	**L**	**T/P**	**Credits**
Subject: Web Intelligence	**3**	**0**	**3**

Marking Scheme:

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End Term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper.
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To introduce students to the fundamental concepts and challenges of Web Mining, Recommendation Systems, NLP, and Semantic Web.
2.	To familiarize students with various techniques and algorithms used in Web Intelligence applications.
3.	To enable students to develop AI-driven web-based applications using intelligent techniques.
4.	To encourage students to critically analyze and evaluate the performance of Web Intelligence solutions for real-world scenarios.

Course Outcomes:

CO1	Understand the core concepts and principles of web mining, recommendation systems, NLP, and semantic web technologies, and their significance in web-based applications.
CO2	Apply various intelligent techniques, algorithms, and models to analyze web data, build recommendation systems, and process natural language in web-related tasks.
CO3	Design and develop AI-driven web applications using web mining, recommendation systems, NLP, and semantic web technologies to improve user experience and personalization.
CO4	Evaluate and compare different web intelligence approaches, models, and algorithms to make informed decisions for building efficient and effective web-based solutions.

Course Outcomes (CO) to Programme Outcomes (PO)

Mapping (Scale 1: Low, 2: Medium, 3: High

CO/ PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	-	-	-	2
CO2	3	3	3	3	3	-	-	-	-	-	-	3
CO3	3	3	3	3	3	-	-	-	-	-	1	2
CO4	3	3	3	3	3	-	-	-	-	-	2	3

Course Overview:
Web Intelligence is an advanced course for B.Tech AI, ML, IIoT, and Data Science students to explore the integration of AI and intelligent techniques in web-related applications. The syllabus covers web mining, recommendation systems, natural language processing, and semantic web technologies.

UNIT I **[8]**
Introduction to Web Mining: History of web mining, state-of-art for web mining, web scraping, Web Databases, Knowledge Discovery in Databases, Similarity search in textual data, Text processing, Similarity functions: Jaccard, Euclidean, Cosine

UNIT II **[8]**
Key Components: Benchmarking, Click, Conversion, Direct Traffic, Filter, Funnel, Goal, Impression, Keyword, Landing Page, Organic Traffic, Paid Traffic, Types of Visitors, Tracking Code, Time on Site.

UNIT III **[8]**
Web Mining Essentials: Automated Reporting, Actionable Reporting, Web Testing, Dashboards, Segmentation, Classification and Regression for web mining, Ensemble learning for web data analytics.

UNIT IV **[8]**
Web Data Analytics: Significance of Web Mining, Web Analytics Process, Web Document Ranking: Graph Analysis with PageRank. Google Analytics: Acquisition analysis, Behavior Analysis, conversation Analysis

Textbooks:
1. Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity, 1st Edition, Avinash Kaushik
2. Google Analytics: Understanding Visitor Behavior 1st Edition, Justin Cutroni

Reference Books:
1. Google Analytics Breakthrough: From Zero to Business Impact 1st Edition, Feras Alhlou, Shiraz Asif, Eric Fettman

Semester: 7th			
Paper code: OAE409P	**L**	**T/P**	**Credits**
Subject: Web Intelligence Lab	**0**	**2**	**1**

Marking Scheme:

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms

1. This is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which they appear is being offered from the list of practicals below.
3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important.
4. At least 8 experiments must be performed by the students.

Course Objectives:

1.	To understand elements of web intelligence and scraping
2.	To provide knowledge on tools and techniques involved in web data analytics

Course Outcomes:

CO1	Understand the elements of web intelligence
CO2	Gain knowledge about web analytics techniques

Course Outcomes (CO) to Programme Outcomes (PO) Mapping

(Scale 1: Low, 2: Medium, 3: High)

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	1	1	-	-	-	-	1	1	1
CO2	2	2	2	1	1	-	-	-	-	1	1	1

List of Experiments:

1. To gain insights into web traffic patterns, user behavior, and popular content on a live website using web analytics tools.
2. To understand the presence and impact of Adwords on a website, and explore their relevance for marketing and revenue generation.
3. To learn to set up and configure Google Analytics for tracking website performance and user interactions.
4. To explore various open-source features of Google Analytics and utilize them to analyze website traffic and user engagement.
5. To apply advanced data mining techniques to extract valuable insights and patterns from web data, aiding decision-making and business intelligence.
6. To implement algorithms to rank web documents based on relevance and importance, improving search engine efficiency.
7. To apply knowledge discovery techniques to uncover valuable patterns and trends from web databases in practical applications.

8. To understand the Jaccard Similarity measure and implement it to compare sets, useful in various data analysis tasks.
9. To implement the Euclidean Similarity measure to quantify the similarity between data points, valuable in clustering and classification tasks.
10. To implement the Cosine Similarity measure to determine the similarity between documents and vectors, essential for text analysis and information retrieval.

Semester: 7th			
Paper code: OAE411T	**L**	**T/P**	**Credits**
Subject: Intelligent and Expert Systems	**3**	**0**	**3**

Marking Scheme:

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End Term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper.
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To introduce students to the core concepts and principles of intelligent systems and expert systems.
2.	To equip students with the knowledge and skills to design and develop rule-based expert systems.
3.	To enable students to apply intelligent systems in different domains and understand their practical applications.
4.	To create awareness among students about the ethical considerations and future trends in the field of intelligent systems.

Course Outcomes:

CO1	Understand the Basics of Artificial Intelligence and Expert Systems
CO2	Analyze the programming Logic in Artificial Intelligence
CO3	Evaluate various search methods in Artificial Intelligence
CO4	Gain Knowledge about the Expert Systems and the latest developments in Knowledge

Course Outcomes (CO) to Programme Outcomes (PO)

Mapping (Scale 1: Low, 2: Medium, 3: High

CO/ PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	1	2	3	3	1	1	-	1	1	-	-	2
CO2	2	2	3	3	1	1	-	1	1	-	-	2
CO3	2	2	3	3	1	1	-	1	2	-	-	2
CO4	2	2	3	3	2	1	1	1	2	-	-	2

Course Overview:

Intelligent and Expert Systems is an advanced course for B.Tech AI, ML, IIoT, and Data Science students, covering the principles and applications of AI-based intelligent systems and expert systems. Topics include knowledge representation, reasoning, rule-based systems, and applications in various domains.

Unit I **[8]**

Introduction: Expert systems and their history, Expert systems in daily life, Case study of expert systems. Emulation of human cognitive process, knowledge search trade-off, stored knowledge, semantic nets. An abstract view of modeling, elementary knowledge. Computational logic, analysis of compound statements using simple logic connectives, predicate logic, knowledge organization and manipulation, and knowledge acquisition.

Unit II **[8]**

Search methods and knowledge representation: Introduction to Fuzzy logic with examples, Bayesian probabilistic inference, possible world, representation, Structure knowledge: Graph, frames, and related structures. Object-oriented, representation- object classes, messages, and methods. Search and control strategies - Concepts, search problems, searching AND – OR graphs.

Unit III **[8]**

Knowledge organization and communication in expert systems: Knowledge organization-Indexing and retrieval techniques, integration of knowledge in memory organization systems, Perception and communication in expert systems. Overview of Linguistics, Basic passim techniques, semantic analysis and representation structures, natural language generation, and system.

Unit IV **[8]**

Pattern recognition and learning techniques: Pattern recognition system- understanding speech recognition, Image transformation, low-level processing, medium and high-level processing, vision system architecture, Rule-based system architecture, knowledge acquisition and validation, knowledge system building tools

Textbooks:

1. Russel (Stuart), 'Artificial Intelligence- Modern approach, Pearson Education series in AI', 3rd Edition, 2009.
2. Dan W Patterson, 'Introduction to Artificial intelligence and Expert systems', Prentice Hall of India Pvt. Ltd,2001

Reference Books:

1. Eugene Charniak, Drew Mc Dermot, 'Introduction to Artificial intelligence', Addison Wesley Longman Inc.,2009
2. George. F, William. A. Stubblefield, 'Artificial intelligence and the design of expert systems', The Benjamin Cummins Publishing Co., Inc 2nd Edition, 1992.

Semester: 7th			
Paper code: OAE411P	**L**	**T/P**	**Credits**
Subject: Intelligent and Expert Systems Lab	**0**	**2**	**1**

Marking Scheme:

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Examination: As per university examination norms from time to time

INSTRUCTIONS TO EVALUATORS: Maximum Marks: As per university norms

1. This is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under the intimation to the office of the HOD/ Institution in which they appear is being offered from the list of practicals below.
3. Instructors can add any other additional experiments over and above the mentioned in the experiment list which they think is important.
4. At least 8 experiments must be performed by the students.

Course Objectives:	
1.	To understand elements of Expert Systems.
2.	To gain knowledge on techniques and tools involved in developing expert systems

Course Outcomes:	
CO1	Understand the Basics of Artificial Intelligence and Expert Systems
CO2	Gain Knowledge about the Expert Systems and the latest developments in Knowledge

Course Outcomes (CO) to Programme Outcomes (PO) Mapping

(Scale 1: Low, 2: Medium, 3: High)

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	1	-	-	-	-	-	-	1
CO2	2	2	2	2	1	1	1	1	1	1	1	2

List of Experiments:

1. To familiarize students with installing and configuring essential Python libraries for data analysis, visualization, and scientific computing.
2. To develop practical applications that simulates human cognitive processes using artificial intelligence techniques to solve real-world problems.
3. To introduce students to fuzzy sets theory and its application in decision-making and pattern recognition tasks using Python libraries.
4. To create knowledge graphs to represent complex relationships between entities and enable effective data representation and analysis.
5. To enable students to visualize and analyze network graphs using Python libraries for understanding network structures and properties.
6. To apply pattern recognition techniques on textual data for tasks like sentiment analysis, topic modeling, and text classification.
7. To apply pattern recognition techniques on numerical datasets for tasks like anomaly detection, clustering, and regression.
8. To apply pattern recognition algorithms on medical datasets to assist in diagnosis, treatment planning, and medical research.

Faculties can motivate students to make a project on real life expert systems.

Semester: 7th			
Paper code: OAE421T	**L**	**T/P**	**Credits**
Subject: Digital & Smart Cities	**4**	**0**	**4**

Marking Scheme:

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End Term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper.
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:

1.	To familiarize students with the fundamental concepts and components of smart cities.
2.	To explore the role of AI, ML, and IoT in building innovative smart city solutions.
3.	To provide insights into the challenges and opportunities in the digital infrastructure of smart cities.
4.	To promote an understanding of the social, ethical, and governance aspects of smart city development.

Course Outcomes:

CO1	Acquire a comprehensive understanding of the concepts, technologies, and challenges associated with smart cities.
CO2	Develop the ability to apply AI and IoT technologies in designing smart city solutions and addressing urban challenges.
CO3	Gain knowledge of digital infrastructure components necessary for building smart cities, including data management and cybersecurity.
CO4	Appreciate the importance of sustainable and inclusive development principles in smart city planning and implementation.

Course Outcomes (CO) to Programme Outcomes (PO)

Mapping (Scale 1: Low, 2: Medium, 3: High

CO/ PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	3	2	-	-	1	1	1	1	1	1	2
CO2	2	2	-	3	3	-	-	-	-	-	-	2
CO3	2	2	2	3	3	-	1	-	1	-	-	-
CO4	2	2	-	3	3	-	-	-	-	-	1	-

Course Overview:

This course provides students with an in-depth understanding of digital and smart cities. It covers the fundamental concepts of smart cities, the role of AI, ML, and IoT in enabling smart solutions, and the importance of digital infrastructure and governance. Through case studies and real-world examples, students will gain insights into the challenges and opportunities in building sustainable and inclusive smart cities in the context of Indian and global scenarios.

UNIT I **[10]**

Unit 1: Introduction to Smart Cities: Introduction to smart cities: Concepts, components, and characteristics, Role of AI, ML, and IoT in enabling smart city solutions. Case studies of successful smart city implementations in India and worldwide.

UNIT II **[10]**

Digital Infrastructure for Smart Cities: Urban sensing and data collection technologies. Cloud computing, edge computing, and data centers in smart cities. Cybersecurity and privacy challenges in smart city infrastructures.

UNIT III **[10]**

AI and IoT Applications in Smart Cities: Smart transportation systems and traffic management. Energy-efficient buildings and smart grids. Healthcare and public safety solutions. Waste management and environmental monitoring.

UNIT IV **[10]**

Smart Governance and Citizen Engagement: E-governance and digital services for citizens. Open data initiatives and data-driven decision-making. Community engagement and participatory platforms. Social and ethical considerations in smart city development.

Text Books:

1. "Smart Cities: Digital Transformations, Smart Urban Infrastructures and Digital Innovation" by Matteo Zignani, Vincenzo Mighali, and Raffaele Giaffreda.
2. "Smart Cities: Foundations, Principles, and Applications" by Hossam Gabbar.

Reference Books:

1. "Smart Cities: Big Data Prediction Methods and Applications" by Robert J. Howlett and Lakhmi C. Jain.
2. "Internet of Things for Smart Cities: Technologies, Big Data and Security" by Fadi Al-Turjman.
3. "Artificial Intelligence and IoT for Smart Cities: Applications and Security" by Fahim Ahmed Shaikh.