



KIET GROUP OF INSTITUTIONS
(An Autonomous Institution, Affiliated to AKTU, Lucknow, UP)

Approved by AICTE, New Delhi

Delhi-NCR, Ghaziabad-Meerut Road, Ghaziabad-201206

EVALUATION SCHEME & SYLLABUS

FOR

B. Tech (Minor Degree)
in
Artificial Intelligence and Machine Learning

[Effective from the Session: 2025-26]

DEPARTMENT OF CSE(AI) AND CSE(AI&ML)

Minor Degree in Artificial Intelligence and Machine Learning

S No.	Semester	Course Category (UGC)	BOS	Course Code	Course Name	Type	Academic Learning (AL)			Continuous Internal Examination (CIE)			End Sem Examination	Total Marks	Total Credits
							L	T	P	MSE	CA	TOTAL			
1	3rd sem	Major (core)	CSE(AIML)	AI201B	Machine Learning Essentials	B	3	0	2	80	20	100	100	200	4
2	4th sem	Major (core)	CSE(AI)	AI301E	Generative AI Foundations & Applications	B	3	0	2	80	20	100	100	200	4
3	5th sem	Major (core)	CSE(AI)	AI303E	Generative AI Architecture & Development for Enterprise	B	3	0	2	80	20	100	100	200	4
Lab/Practical															
4	6th sem	Research Project / Dissertation	CSE(AI))	AI306P	Minor Project	P	0	0	8	-	100	100	100	200	4
Total Hours : 23 hrs.							9	0	14					800	16

Course Code AI201B			Course Name: Machine Learning Essentials				L	T	P	C		
Pre-requisites: Introduction to AI, Python							3	0	2	4		
Course Objectives:												
The objective of this course is to have a basic understanding of all the concepts and algorithms of Machine Learning and to apply in real world problems, report on the performance metrics with model optimization.												
Course Outcome: After completion of the course, the student will be able to												
1. Understand fundamental Machine Learning concepts, including supervised, unsupervised, and reinforcement learning.												
2. Implement regression, classification, and ensemble learning techniques using industry-standard tools like Scikit-learn and TensorFlow.												
3. Apply dimensionality reduction and clustering methods for unsupervised learning and data analysis.												
4. Optimize ML models using hyperparameter tuning, probabilistic modeling, and advanced optimization techniques.												
5. Deploy ML models with MLOps practices, ensuring fairness, transparency, and cloud-based implementation.												
Co-PO Mapping (scale 1: low, 2: Medium, 3: High)												
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	3	3	3	3	3	3
CO2	3	3	3	3	3	2	3	2	3	3	3	3
CO3	3	3	3	3	3	2	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3
Unit1	Supervised Learning-Regression and Classification											15 hours
Overview of ML, types (supervised, unsupervised, reinforcement), and state-of-the-art applications (e.g., predictive maintenance, customer churn prediction).Linear Regression: Hypothesis function, Cost function, gradient descent (batch, stochastic, mini-batch), learning rate tuning, and regularization techniques (Lasso, Ridge) for robustness.Polynomial Regression: Bias-variance trade-off, cost functions (MSE, RMSE, MAE, R ²), and cross-validation for model selection.Logistic Regression: Activation functions (sigmoid, SoftMax), and state-of-the-art performance metrics (ROC-AUC, precision-recall curves).Tools: Use of sci-kit-learn, TensorFlow 2.x, and pandas for data handling, reflecting industry-standard libraries.												
Case Study: Customer Churn Prediction using Sagemaker Notebooks/ Sagemaker Studio												
Unit 2	Supervised Learning-Decision Tree, Ensemble Learning, SVM, Instance-Based Learning, Bayesian Networks											12 hours
Decision Trees: CART (Gini impurity), ID3 (entropy, information gain), and state-of-the-art feature importance analysis.Regularization: Hyperparameter tuning (max depth, min samples split) to prevent overfitting.Ensemble Learning: Bagging: Random Forests with out-of-bag (OOB) evaluation.Boosting: AdaBoost, Gradient Boosting, and XGBoost (state-of-the-art for structured data). SVM: Linear SVM, nonlinear SVM with polynomial and RBF kernels, and SVM regression.Instance-Based Learning: KNN with distance-weighted voting and efficient implementation via KD-Trees.Bayesian Networks: Probabilistic modeling, state-of-the-art Naive Bayes variants (e.g., Gaussian NB), and Expectation-Maximization (EM) for hidden variables.												
Case Study: Decision Tree/ XGBoostusing Sagemaker Notebooks/ Sagemaker Studio												
Unit 3	Unsupervised Learning - PCA & Clustering											8 hours
Dimensionality Reduction: PCA, Incremental PCA for large datasets, and visualization with t-SNE. Clustering:K-Means with elbow method and silhouette analysis. Hierarchical clustering with dendrograms.DBSCAN, RT DBSCAN, and Optics for density-based clustering												
Case Study: Based on SVM/ KNN using Sagemaker Notebooks/ Sagemaker Studio												
Unit 4	Machine Learning Engineering on AWS											25 hours
Machine Learning (ML) Engineering on Amazon Web Services (AWS), build, deploy, orchestrate, and operationalize ML solutions at scale.AWS services such as Amazon SageMaker AI, analytics tools such as Amazon EMR to develop robust, scalable, and production-ready machine learning applications.												
Unit5	Deep Learning and Reinforcement Learning											15 hours
Deep Learning: Overview of Deep Learning (DL) concepts. AWS services for DL Reinforcement Learning: Q Learning, Markov Decision Processes (MDP):Markov Property, State Transition Probability using Amazon Sagemaker RL and												

AWS Robomaker, Gaussian Mixture Models (GMM): State-of-the-art anomaly detection with GMM. Optimization: Gradient-based techniques (e.g., Adam optimizer) using AWS Model Tuning and hyperparameter tuning with tools like Optuna. Deep Learning using AWS, Ethics: Bias mitigation with Fairness Indicators, privacy considerations, and transparency in ML models using Sagemaker clarify configure security, and Amazonmacie.

AWS Cloud Quest: Machine Learning

Exam Readiness: AWS Certified Machine Learning Engineer - Associate (MLA-C01)

Exam Prep Official Practice Question Set: AWS Certified Machine Learning Engineer - Associate (MLA-C01)

Exam Prep Enhanced Course: AWS Certified Machine Learning Engineer - Associate (MLA-C01)

					Total Hours	75 hours
Textbook						
1. Géron, A. (2019). Hands-on machine learning with scikit-learn, Keras, and TensorFlow: Concepts, tools, and techniques to build intelligent systems. O'Reilly Media.						
2. Alpaydin, E. (2020). Introduction to machine learning (4th ed.). MIT Press.						
Reference Books						
1. NORVIG, P. R. (2021). Artificial intelligence: A modern approach, 4th edition, Pearson						
2. Mitchell, T. M. (1997). Machine learning.						
Mode of Evaluation:						
Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE 1	MSE 2	CA1	CA2	CA3(ATT)	100	200
40	40	8	8	4		
80		20				

Course Code AI301E				Course Name: Generative AI Foundations & Applications				L	T	P	C	
Pre-requisite: Introduction to AI, Python, ML Essentials								3	0	2	4	
Course Objectives:												
The objective is to apply key AWS services for text, speech, document processing, and generative AI applications, build AI-powered solutions using Amazon Q, Lex, Kendra, QuickSight, and demonstrate readiness for the AWS Certified AI Practitioner exam through hands-on projects.												
Course Outcome: After completion of the course, the student will be able to												
1. Apply AWS services like Amazon Textract, Transcribe, and Comprehend for intelligent document processing and NLP tasks.												
2. Describe the core concepts, use cases, risks, and business applications of Generative AI on AWS.												
3. Design and build conversational interfaces and intelligent search solutions using Amazon Lex and Kendra.												
4. Create generative AI-powered business analytics dashboards using Amazon Q and QuickSight.												
5. Demonstrate readiness for the AWS Certified AI Practitioner exam through hands-on labs and mock assessments.												
Co-PO Mapping (scale 1: low, 2: Medium, 3: High)												
CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	-	-	-	-	2	-	2
CO2	2	2	2	2	3	-	-	-	-	2	-	2
CO3	2	2	3	2	3	-	-	-	2	2	2	2
CO4	2	2	3	2	3	-	-	-	2	2	2	2
CO5	3	2	2	2	3	-	-	-	-	2	2	2
Unit 1	Speech, Text, and Document AI on AWS										15 hours	
Amazon Transcribe: Speech to Text, Amazon Textract: Intelligent Document Processing, Amazon Comprehend: Natural Language Processing (NLP)												
Case Study: <i>Getting Started with Textract, Transcribe, Comprehend Custom Classification, Entity Recognition, Automated Invoice Processing System</i>												

Unit 2	Generative AI Foundations on AWS				15 hours	
Introduction to Generative AI: Art of the Possible, Planning a Generative AI Project, Building a Generative AI-Ready Organization, Amazon Bedrock Overview: Foundation Models (FMs) <i>Case Study: Planning Generative AI Projects, Content Generator for E-commerce</i>						
Unit 3	Practical Generative AI Implementation				15 hours	
Amazon Q Introduction, Amazon Q Developer, Amazon Q Business Setup, Generative BI with Amazon Q in QuickSight <i>Case Study Code Optimization with Q Developer, Business Case Setup, QuickSight Dashboards, Internal AI Assistant for Developers</i>						
Unit 4	Specialized AWS AI Services				15 hours	
Amazon Lex: Conversational AI, Amazon Kendra: Intelligent Search, Additional Smart Search Solutions <i>Case Study: Setup of Kendra Search Index, Conversational Bot with Lex, Smart Customer Support Chatbot</i>						
Unit 5	AWS AI Certification Preparation				15 hours	
Generative AI Essentials on AWS (Deep Dive), Exam Prep Enhanced Course: AWS Certified AI Practitioner, Official Practice Question Set for AWS AI Practitioner <i>Certification Readiness Project</i>						
Total Hours					75 hours	
Textbook						
1. Géron, A. (2022). Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (3rd ed.). O'Reilly Media. 2. Amazon Web Services. (2020). AWS Certified Machine Learning Specialty: Official Study Guide. Wiley						
Reference Books						
1. Cross, J. (2022). Natural Language Processing with AWS AI Services. Packt Publishing. 2. Snively, B., & Barth, A. (2024). Practical Generative AI with Amazon Bedrock (Draft Edition). O'Reilly Media. 3. Amazon Web Services. (2024). Architecting Generative AI Solutions on AWS (Training Material). AWS Training Resources.						
Mode of Evaluation:						
Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE 1	MSE 2	CA1	CA2	CA3(ATT)	100	200
40	40	8	8	4		
80		20				