

**NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)**



Affiliated to

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY UTTAR PRADESH, LUCKNOW



Evaluation Scheme & Syllabus

For

Minor Degree / Specialization

in

Artificial Intelligence & Machine Learning

School of Computer Science in Emerging Technologies

(Effective from the Session: 2023-24)

**NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)**

**Minor Degree / Specialization
Artificial Intelligence & Machine Learning**

EVALUATION SCHEME

Sl. No.	Subject Codes	Subject Name	Periods			Evaluation Scheme				End Semester		Total	Credit	Sem
			L	T	P	AA	QZ	TOTAL	PS	TE	PE			
1	AMSML0301	Introduction to AI & Machine Learning	3	0	0	25	25	50		100		150	3	III
2	AMSML0401	Introduction to Data Analytics	3	0	0	25	25	50		100		150	3	IV
3	AMSML0501	Deep Learning and Neural Network	3	0	0	25	25	50		100		150	3	V
4	AMSML0601	Specific topics in Artificial Intelligence	3	0	0	25	25	50		100		150	3	VI
5	AMSML0701	Applications of AI	3	0	0	25	25	50		100		150	3	VII
6	AMSML0351	Introduction to AI & Machine Learning Lab	0	0	2				25		25	50	1	III
7	AMSML0451	Introduction to Data Analytics Lab	0	0	2				25		25	50	1	IV
8	AMSML0551	Deep Learning and Neural Network Lab	0	0	2				25		25	50	1	V
9	AMSML0751	Capstone Project	0	0	2				50		50	100	2	VII
		GRAND TOTAL										1000	20	

Abbreviation Used: -

L: Lecture, T: Tutorial, P: Practical, AA: Assignment Assessment, QZ: Quiz, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam.

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Branch wise Minor Degree / Specialization Details

S.no.	Name of Minor Degree/Specialization	Streams/Branches of B.Tech. Programs whose students are eligible to opt for the Minor Degree	Streams/Branches of B.Tech. Programs whose students are eligible to opt for the Specialization
1	Artificial Intelligence and Machine Learning	All Branches except CSE and EC related Branches	CSE and EC related Branches
2	Data Science	All Branches except CSE and EC related Branches	CSE and EC related Branches
3	E-mobility	All Branches except ME related Branches	Only ME Branch
4	VLSI Design	All Branches except EC related Branches	Only EC Branch

Guidelines for assessment of Minor Degree / Specialization Program

For Theory Paper

Internal (50)		External (100)
AA (25)	QZ(25)	
5 Assignments of 5 marks each	5 Quiz papers of 5 marks each	Theory Examination will be Conduct at the end of Semester

For Practical Paper

Internal (25)	External (25)
On the basis of continuous Assessment	Practical Examination will be Conduct at the end of Semester

Course code	AMSML0301	L T P	Credit
Course title	INTRODUCTION TO AI & MACHINE LEARNING	3 0 0	3
Course objective: To review and strengthen important mathematical concepts required for AI & ML. Introduce the concept of learning patterns from data and develop a strong theoretical foundation for understanding state of the art Machine Learning algorithms.			
Pre-requisites: Basics of a programming language, Statistics, Mathematics, Analytical Skills			
Course Contents / Syllabus			
UNIT-I	Introduction to AI	12 Hours	
Defining Artificial Intelligence, Defining AI techniques, Using Predicate Logic, and Representing Knowledge as Rules, Representing simple facts in logic, Computable functions, and predicates, Procedural vs Declarative knowledge, Logic Programming, Mathematical foundations: Matrix Theory and Statistics for Machine Learning.			
UNIT-II	Idea of Machine Learning	8 Hours	
Idea of Machines learning from data, Classification of problem -Regression and Classification, Supervised and Unsupervised learning.			
UNIT-III	Linear Regression	10 Hours	
Model representation for single variable, Single variable Cost Function, Gradient Decent for Linear Regression, Gradient Decent in practice.			
UNIT-IV	Logistic Regression	7 Hours	
Classification, Hypothesis Representation, Decision Boundary, Cost function, Advanced Optimization, Multi-classification (One vs All), Problem of Overfitting.			
UNIT-V	Clustering Algorithms	5 Hours	
Discussion on clustering algorithms and use-cases centered around clustering and classification.			
Course outcome: After completion of this course students will be able to			
CO 1	Design and implement machine learning solutions to classification, regression, and clustering problems.	K1	
CO 2	Evaluate and interpret the results of the different ML techniques.	K4	
CO 3	Design and implement various machine learning algorithms in a range of Real-world applications.	K3	
CO 4	Apply different machine learning algorithms.	K4	
CO 5	Analyze data models to study patterns	K2	
Textbooks:			
1) Tom Mitchell, Machine Learning, McGraw Hill, 2017.			

2) Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2011.

3) T. Hastie, Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2011.

Reference Books:

1) Saroj Kaushik, Artificial Intelligence, Cengage Learning, 1st Edition 2011.

2) Anindita Das Bhattacharjee, "Practical Workbook Artificial Intelligence and Soft Computing for beginners, Shroff Publisher-X team Publisher.

3) Yuxi (Hayden) Liu, "Python Machine Learning by Example", Packet Publishing Limited, 2017.

Course Code	AMSML0401	L T P	Credit
Course Title	INTRODUCTION TO DATA ANALYTICS	3 0 0	3
Course objective: Provide you with the knowledge and expertise to become a proficient data scientist. Demonstrate an understanding of statistics and machine learning concepts that are vital for data science; Produce Python code to statistically analyze a dataset; Critically evaluate data visualizations based on their design and use for communicating stories from data;			
Pre-requisites: Basics of a programming language, Statistics, Mathematics, Analytical Skills.			
Course Contents / Syllabus			
UNIT-I	Introduction to Data Science	7 HOURS	
Introduction to Data Science, Different Sectors using Data science, Purpose and Components of Python in Data Science.			
UNIT-II	Processes of Data Analytics	7 HOURS	
Data Analytics Process, Knowledge Check, Exploratory Data Analysis (EDA), EDA- Quantitative technique, EDA- Graphical Technique, Data Analytics Conclusion, and Predictions.			
UNIT-III	Feature Generation and Selection	11 HOURS	
Feature Generation and Feature Selection (Extracting Meaning from Data)- Motivating application: user (customer) retention- Feature Generation (brainstorming, the role of domain expertise, and place for imagination)- Feature Selection algorithms.			
UNIT-IV	Data Visualisation	10 HOURS	
Data Visualization- Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects- Exercise: create your own visualization of a complex dataset.			
UNIT-V	Application of Data Science	7 HOURS	
Applications of Data Science, Data Science and Ethical Issues- Discussions on privacy, security, ethics- A look back at Data Science- Next-generation data scientists.			
Course outcome: After completion of this course students will be able to			
CO1	Explain how data is collected, managed and stored for data science.	K1	
CO2	Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists.	K2	
CO3	Apply various processes to extract features of data.	K3	
CO4	Understand the key techniques and theory behind data visualization.	K2	
CO5	Understand key applications of data science that are commonly linked to ethical issues.	K2	
Textbooks:			
1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.			
2. Jake Vander Plas, Python Data Science Handbook , Shroff Publisher Publisher /O'Reilly Publisher			

Media.

3. Philipp Janert, Data Analysis with Open Source Tools, Shroff Publisher Publisher /O'Reilly Publisher Media.

Reference books:

1. Jo e l Grus, Data Science from Scratch, Shroff Publisher Publisher /O'Reilly Publisher Me dia
2. Annalyn Ng, Kenneth Soo, Numsense! Data Science for the Layman, Shroff Publisher Publisher

Course code	AMSML0501	L T P	Credits
Course title	DEEP LEARNING AND NEURAL NETWORK	3 0 0	3
Course objective: To strengthen important Mathematical concepts required for Deep learning and neural network. To get a detailed insight into advanced algorithms of ML.			
Pre-requisites: Basics of a programming language, Statistics, Mathematics, Analytical Skills			
Course Contents / Syllabus			
UNIT-I	NEURAL NETWORK		8 Hours
Information flow in a neural network, understanding basic structure, and ANN.			
UNIT-II	TRAINING NEURAL NETWORK		8 Hours
Training a Neural network, how to determine hidden layers, recurrent neural network.			
UNIT-III	CONVOLUTIONAL NEURAL NETWORK		10 Hours
Convolutional neural networks, image classification, and CNN.			
UNIT-IV	RECURRENT NEURAL NETWORK		8 Hours
RNN and LSTMs. Applications of RNN in real world.			
UNIT-V	TENSORFLOW AND KERAS		9 HOURS
Creating and deploying networks using tensorflow and keras.			
Course outcome: After completion of this course students will be able to			
CO1	Understand the basics of Neural Networks.		K4
CO2	Analyze ANN model and understand the ways of accuracy measurement.		K4
CO3	Develop a convolutional neural network for multi-class classification in images		K6
CO4	Apply RNNs to Time Series Forecasting, NLP, Text and Image Classification.		K3
CO5	Creating the networks using tensorflow and keras.		K6
Textbooks:			
1. John Paul Mueller, Luca Massaron, Deep Learning for Dummies, John Wiley & Sons			

Course code	AMSML0601	L T P	Credits
Course title	SPECIFIC TOPICS IN ARTIFICIAL INTELLIGENCE	3 0 0	3
Course objective: To give fundamental knowledge to the students so that they can understand what the AI is and study important topics related to the field.			
Pre-requisites: Basics of a programming language, Statistics, Mathematics, Analytical Skills			
Course Contents / Syllabus			
UNIT-I	INTRODUCTION TO DEEP LEARNING	8 Hours	
Bayesian Filtering; Recurrent Neural Networks, Deep Neural Networks, Deep Reinforcement Learning.			
UNIT-II	SPECIAL NETWORKS	8 Hours	
Self- Play Networks, Generative Adversarial Networks, Learning from Concept-Drifting Data Streams.			
UNIT-III	SIGNAL PROCESSING	8 Hours	
Audio Signal Processing Basics, mir toolbox contains many useful audios processing library functions, VOICEBOX: Speech Processing Toolbox for MATLAB, Audio processing in Matlab.			
UNIT-IV	KNOWLEDGE-BASED SYSTEMS	8 Hours	
Architectures for second-generation knowledge-based systems, Distributed AI and its applications.			
UNIT-V	NEUROCOMPUTING	8 HOURS	
An introduction to neurocomputing and its possible role in AI, The role of uncertainty measures and principles in AI.			
Course outcome: After completion of this course students will be able to			
CO1	Design and implement Artificial Neural networks.	K1	
CO2	Decide when to use which type of NN.	K2	
CO3	Implement signal processing using MATLAB	K4	
CO4	Understand Knowledge representation and Distributed AI along with its applications.	K2	
CO5	Understand basic concepts of Neuro Computing.	K2	
Textbooks:			
1. Dr. Nilakshi Jain, Artificial Intelligence: Making a System Intelligent, John Wiley & Sons.			
2. Artificial Intelligence & Soft Computing for Beginners, 3rd Edition-2018, by Anindita Das, Shroff Publisher Publisher.			
Reference Books:			
1. New Artificial Intelligence (Advanced), Takashi Mae da and Furnia Aoki, Ohmsha Publisher.			

Course code	AMSML0701	L T P	Credits
Course title	APPLICATIONS OF AI	3 0 0	3
Course objective:			
To give deep knowledge of AI and how AI can be applied in various fields to make the life easy.			
Pre-requisites: Basics of a programming language, Statistics, Mathematics, Analytical Skills			
Course Contents / Syllabus			
UNIT-I	NATURAL LANGUAGE PROCESSING	8 Hours	
Linguistic aspects of natural language processing, A.I. And Quantum Computing, Applications of Artificial Intelligence (AI) in business.			
UNIT-II	APPLICATIONS TO REAL LIFE	8 Hours	
Emotion Recognition using human face and body language, AI-based system to predict the diseases early, Smart Investment analysis, AI in Sales and Customer Support.			
UNIT-III	ROBOTICS PROCESSES	8 Hours	
Robotic Processes Automation for supply chain management.			
UNIT-IV	AI MODELLING	8 Hours	
AI-Optimized Hardware, Digital Twin i.e. AI Modelling, Information Technology & Security using AI.			
UNIT-V	BLOCKCHAIN IN AI	8 Hours	
Recent Topics in AI/ ML: AI/ML in Smart solutions, AI/ML in Social Problems handling, Blockchain and AI.			
Course outcome: After completion of this course students will be able to			
CO1	Design and implement AI	K1	
CO2	Decide when to use which type of AI.	K2	
CO3	Understand automation and robotics	K2	
CO4	Implement AI Models and Understand Security Concepts in AI	K4	
CO5	Understand the concepts of Blockchain Technology.	K2	
Textbooks:			
1. Sameer Dhanrajani, AI and Analytics, Accelerating Business Decisions, John Wiley & Sons.			
2. Life 3.0: Being Human in the Age of Artificial Intelligence by Max Tegmark, published July 2018.			
Reference Books:			
1. Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems Bernard Marr, Matt Ward, Wiley.			

Course code	AMSML0351	L T P	Credit
Course title	INTRODUCTION TO AI & MACHINE LEARNING LAB	0 0 2	1
List of Experiments:			
Sr. No.	Name of Experiment	CO	
1	Implementation of logical rules in Python.	CO1	
2	Using any data apply the concept of: <ul style="list-style-type: none"> • Linear regression • Gradient decent • Logistic regression 	CO1	
3	To add the missing value in any data set.	CO2	
4	Perform and plot under fitting and overfitting in a data set.	CO2	
5	Implementation of clustering and classification algorithms.	CO3	
Lab Course Outcome: After completion of this course students will be able to			CO
CO 1	Understand various AI Techniques.	K2	
CO 2	Understand the clustering models.	K1	
CO 3	Implement classification models.	K3	

Course code	AMSML0451	L T P	Credit
Course title	INTRODUCTION TO DATA ANALYTICS LAB	0 0 2	1
List of Experiments:			
S.No.	Name of Experiment	CO	
	Class and Methods	CO1	
1	Python program to demonstrate instantiating a class.	CO1	
2	Python program to demonstrate use of class method and static method	CO1	
3	Python program to implement constructors.	CO1	
4	Python program to show that the variables with a value assigned in the class declaration, are class variables and variables inside methods and constructors are instance variables.	CO1	
5	Python program to create Bank-account class with deposit, withdraw function	CO1	
	Inheritance		
6	Python program to demonstrate single inheritance	CO1	
7	Python program to demonstrate multilevel inheritance	CO1	
8	Python program to demonstrate multiple inheritance	CO1	
9	Python program to demonstrate hierarchical inheritance	CO1	
10	Python program to demonstrate hybrid inheritance	CO1	
	Polymorphism		
11	Python program to demonstrate in-built polymorphic function	CO1	
12	Python program to demonstrate user defined polymorphic functions	CO1	
13	Python program to demonstrate method overriding	CO1	
	Functional Programming		
14	Python program to demonstrate working of map	CO2	
15	Python program to demonstrate working of filter	CO2	
16	Python program to demonstrate working of reduce	CO2	
17	Python program to demonstrate immutable data types	CO2	
18	Python program to demonstrate Monkey Patching in Python	CO3	
19	Python program to demonstrate decorators with parameters in python	CO3	
20	Python program to demonstrate conditional decorators	CO3	
Course outcome: At the end of course, the student will be able to			
CO 1	Write programs to create classes and instances in python and implement the concept of inheritance and polymorphism using python.	K3	
CO 2	Write programs using functional programming in python.	K3	
CO 3	Write programs to create GUI-based Python applications and to solve real-world problems.	K4	

Course code	AMSML0551	L T P	Credit
Course title	DEEP LEARNING AND NEURAL NETWORK LAB	0 0 2	1

List of Experiments:

Sr. No.	Name of Experiment	CO
1	Introduction to Kaggle and how it can be used to enhance visibility.	CO1
2	Build general features to build a model for text analytics.	CO1
3	Build and deploy your own deep neural network on a website using tensor flow.	CO2

Lab Course Outcome: After completion of this course students will be able to		CO
CO 1	Understand various AI Techniques.	K2
CO 2	Understand the clustering models.	K1
CO 3	Implement classification models.	K3