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: 2022-23)

NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
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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

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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 Al 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-worldapplications.	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. Has tie, Tibsherany, J. Friedman. The Elements of Statistical Learning, 2e, 2011.

Reference Books:

1) Saroj Kaushik, Arti ficial Intelligence, Cengage Learning, 1st Edition 2011.
2) Anindita Das Bhattacharjee, "Practical Workbook Artificial Intelligence and SoftComputing for beginners, Shroff Publisher-X team Publisher.
3) Yuxi (Hayden) Liu, "Python Machine Learning by Example", Packet PublishingLimited, 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 Al 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 Al and its applications.

UNIT-V	NEUROCOMPUTING	8 HOURS

An introduction to neurocomputing and its possible role in Al, The role of uncertainty measures and principles in Al.

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 Comp uting 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 Al and how Al can be app lied in variousfields 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, Al-based system to predict the diseases early, Smart Investment analysis, Al 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. Al Modelling, Information Technology & Security using Al.

UNIT-V	BLOCKCHAIN IN AI	8 Hours

Recent Topics in Al/ ML: Al/ML in Smart solutions, Al/ML in Social Problems handling, Blockchain and Al.

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 Jul y 2018.

Reference Books:

1. Artificial Intelligence in Practice: How 50 Successful Companies Use d AI and Machine Learning to Solve ProblemsBernard 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: • 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 h ow it can be used to enhance visibility.	CO1
2	Build general features to build a mode l 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