

# **EE656A: ARTIFICIAL INTELLIGENCE, MACHINE LEARNING, DEEP LEARNING & ITS APPLICATIONS**

## **1. Course Description:**

This course focuses on the theoretical advancements in the field of Artificial Intelligence, Machine Learning, Deep Learning, and their real-life applications. It is best suited for the PG students of all departments and interdisciplinary programs.

## **2. Course Prerequisites:** Nil

## **3. Course Objectives:**

This course will provide the basic background as well as recent developments in the field of Artificial Intelligence (AI), Machine Learning, and Deep Learning. Illustration of different problems related to these fields will be discussed in the course along with their applications into different real-life problems but not limited to like signal processing, computer vision, intelligent control, transportation, prognosis and health management, bioinformatics, etc.

## **4. Course Contents:**

Artificial Intelligence (AI): Introduction, History, and Evolution

Agents of Artificial Intelligence

Introduction to Fuzzy System (FS), Artificial Neural Network (ANN), Evolutionary Computing (EC), Genetic Algorithm (GA), Simulated Annealing (SA), Particle Swarm Algorithm (PSO), etc.

Machine Learning: Unsupervised Learning, Supervised Learning, Semi supervised Learning, Reinforcement Learning

Clustering and Biclustering: K-means, Fuzzy c-means (FCM), Self-organizing maps (SOM), and other Clustering Algorithms

Classification: Support Vector Machines (SVM), K Nearest Neighbour (KNN), ANN, Fuzzy Rule Based, and other Classifiers

Curve fitting, Regression models, Prediction/Forecasting: ANN and Fuzzy Rule Based Regression Models

Performance Measures for Clustering, Biclustering, Classification, and Regression Algorithms

Deep Learning and Transfer Learning: Deep Neural Networks (DNN), Fuzzy Neural Networks (FNN), etc.

Case studies in the areas of signal processing, computer vision, intelligent control, transportation, prognosis and health management, bioinformatics, etc.

## **5. Lecture and Lab Schedule & Venue:**

*Course Instructor:* Prof. Nishchal K Verma, PhD ([nishchal@iitk.ac.in](mailto:nishchal@iitk.ac.in))

*Course and Lab TAs:* Mohd. Aquib ([aquib@iitk.ac.in](mailto:aquib@iitk.ac.in)) and Mr. Seetaram Maurya ([seetaram@iitk.ac.in](mailto:seetaram@iitk.ac.in))

*Lecture Schedule: Tuesday and Wednesday (12:00 to 13:15) Lecture Venue: T212*

*Lab schedule: Tuesday 14:00- 17:00*

*Lab Venue: ACES 107*

**6. Recommended mode of contact beyond formal contact hours:** EMail

(All Notices for the course will be sent by email to the course email list.)

**7. Evaluation Components & Policies:** The grading policy and marks distribution for the course is as follows:

Class Performance (Surprise quiz(zes)/ Assignment(s))	10%
Mid Semester Examination	20%
Course Project (Journal/ Research /Term Paper Analysis, Implementation, and Simulation Results)	30%
End Semester Examination	40%
<b>Total</b>	<b>100 %</b>

**Exams:** Examination will be held during the prescribed examination period.

**8. Course Policies:** Attendance, Honesty Practices, Withdrawal (as per DOAA Guidelines)

**9. Books & References:** This being a PG course there is no prescribed text. However, the following book is recommended:

(a) Russell, Stuart J.; Norvig, Peter (2010). Artificial Intelligence: A Modern Approach (3rd ed.). Upper Saddle River, New Jersey: Prentice Hall.

(b) Richard O. Duda, Peter E Hart, David G Stork (2000). Pattern Classification. 605 Third Avenue New York, NY, United States: Wiley-Interscience.

Apart from the above some reputed international journals/research literatures etc. may be followed.

**10. Course webpage:** <https://www.iitk.ac.in/idea/ee656.html>