

COURSE TITLE	ARTIFICIAL INTELLIGENCE
COURSE CODE	01CE1631
COURSE CREDITS	3

Objective:

- 1 Artificial Intelligence is now a day used in nontechnical and technical fields. In every branch of engineering the AI has been used and Electrical engineering is also one of them. In fact, the use of AI technique in Electrical engineering is inevitable. The branches of electrical Engineering like Electrical Power Systems, Power Electronics and Smart grid technologies are some of them. The course is aimed to provide exposure about the fundamentals of AI techniques and use of some basic machine learning algorithms to be used in electrical engineering and in other branches of electrical engineering too; the commonly used AI techniques from the application viewpoints will be covered in this course.

Course Outcomes: After completion of this course, student will be able to:

- 1 Learn the basic concepts of how to use various AI techniques.
- 2 Learn, realize and implement various basic machine learning algorithms
- 3 Learn the appropriateness and steps to use fuzzy systems and Genetic algorithm for engineering problem solving
- 4 Comprehend basic concepts of Neural network and use of machine learning for training

Pre-requisite of course: Basic Mathematics and Programming Knowledge

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Introduction Scope of the Course, Introduction to AI, Brief review of History of AI, Related fields	2
2	Introduction to Artificial Neural Networks Biological Neurons and Biological Neural Networks, Artificial Neural Networks, Activation Functions, Perceptron NN, Multilayer Perceptron NN, Back-propagation Neural Networks, Training Methods, Basic definition of supervised and unsupervised Learning	7
3	Introduction to Machine Learning Introduction (Different Types of Learning) Hypothesis Space, Inductive Bias, Evaluation and Cross Validation	2

Contents : Unit	Topics	Contact Hours
4	Main Algorithms used in Machine Learning Linear Regression, Decision Trees, Learning Decision Trees, K-nearest Neighbour, Collaborative Filtering, Overfitting, Dimensionality Reduction Technique, Feature Selection, Feature Extraction	7
5	Logistic Regression and Support Vector Machine Logistic Regression, Introduction to Support Vector Machine, The Dual Formation, Maximum Margin with Noise, Nonlinear SVM and Kernel Function, SVM: Solution to the Dual Problem	6
6	Advanced Learning methods and Clustering Introduction to Clustering, K- means Clustering, Agglomerative Hierarchical Clustering, Basics of Semi- Supervised and Reinforcement Learning, Introduction to Deep Learning	6
7	Fuzzy Logic Introduction Conventional set vs fuzzy set, Operations of fuzzy set, Membership function, Fuzzy rules, Fuzzy inference, De-fuzzification,, Application for control	6
8	Genetic algorithm Introduction Comparison with traditional optimisation Technique, Steps for GA, reproduction, Crossover, Mutation, Termination parameter of GA, Application	6
Total Hours		42

Textbook :

- 1 Machine Learning with Python for Everyone, Mark Fenner, Addison-Wesley Professional, 2019
- 2 Machine Learning, Anuradha Srinivasaraghavan, Vincy Joseph, Wiley, 2014
- 3 Neural Networks, Fuzzy Systems and Evolutionary Algorithms, S. Rajasekaran, G. A. Vijayalakshmi Pai, PHI Learning Private Limited, 2017
- 4 Machine Learning, Tom M. Mitchell , McGraw Hill, 2017

References:

- 1 Computational Intelligence An Introduction, Computational Intelligence An Introduction, Andries P. Engelbrecht, Wiley, 2007

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery
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Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	25.00	30.00	15.00	10.00	10.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the classroom.
- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- 1 <https://nptel.ac.in/>
- 2 https://www.tutorialspoint.com/machine_learning_with_python/index.htm
- 3 <https://www.coursera.org/learn/introduction-to-ai>
- 4 <https://www.coursera.org/learn/ai-for-everyone>
- 5 <https://www.coursera.org/learn/ai-for-everyone>
- 6 <https://www.coursera.org/learn/google-introduction-to-ai>
- 7 <https://www.coursera.org/learn/google-introduction-to-ai>
- 8 <https://www.coursera.org/specializations/machine-learning-introduction>
- 9 <https://www.coursera.org/specializations/machine-learning-introduction>
- 10 <https://pll.harvard.edu/course/machine-learning-and-ai-python>
- 11 <https://pll.harvard.edu/course/machine-learning-and-ai-python>
- 12 <https://online.stanford.edu/courses/cs229-machine-learning>
- 13 <https://online.stanford.edu/courses/cs229-machine-learning>
- 14 <https://developers.google.com/machine-learning/intro-to-ml>
- 15 <https://developers.google.com/machine-learning/intro-to-ml>
- 16 <https://developers.google.com/machine-learning/crash-course>
- 17 <https://mlcourse.ai/book/index.html>
- 18 https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ge20
- 19 https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_cs56
- 20 https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_cs159