

INSTITUTE	FACULTY OF TECHNOLOGY
PROGRAM	MASTER OF TECHNOLOGY in ELECTRICAL ENGINEERING
SEMESTER	1
COURSE TITLE	ARTIFICIAL INTELLIGENCE APPLICATION IN ELECTRICAL VEHICLES
COURSE CODE	01EV1106
COURSE CREDITS	4

Objective:

- 1 The objective of the course is to introduce learner to different AI techniques applied in various decision-making process in electric vehicles.

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

- 1 Solve the problems of electrical vehicles decision making with the help of AI techniques.
- 2 Design of ANN based systems for function approximation in signal estimation for EV drives or battery management.
- 3 Design of Fuzzy based systems for control of EV system.
- 4 Develop and evaluate control systems required in operations of electrical vehicles.

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Introduction The AI Problems, The Underlying Assumption, Introduction to AI Techniques, Difference between soft computing techniques and conventional computing systems, Expert systems, Brief history of ANN and Fuzzy Logic	4
2	Artificial Neural Network Introduction, History of neural network research, Basic concepts of Neural Networks, Human brain, Model of Artificial Neuron, Neural Network architectures, Perceptron, Single layer feed forward Network, Multi-layer feed forward network, Recurrent networks (RNN), Feedback networks and Radial Basis Function Networks	10

Contents : Unit	Topics	Contact Hours
3	Deep Learning Convolution Neural Network (CNN): Neuron in human vision, Shortcoming of feature selection, Filters and feature maps, Full Description of Convolution neural network (CNN), Max pooling, Principal component analysis, Autoencoder: Architecture, Sparsity	8
4	Fuzzy Logic Introduction, Comparison between Fuzzy and crisp logic, Fuzzy sets, Membership function, Basic fuzzy set operations, Properties of Fuzzy set, fuzzy relations, Fuzzy inference system, Mamdani, Sugeno, Fuzzy rule-based system, Defuzzification methods, Fuzzy Neural Networks	8
5	Applications ANN in battery management systems, Fuzzy logic based controller for speed control applications, Neuro-fuzzy control of drives	10
Total Hours		40

Textbook :

- 1 Neural Networks, Fuzzy logic and Genetic algorithms, S. Rajasekaran, G. A. Vijayalakshmi Pai, PHI publication, -
- 2 Deep learning with python: A Hands-on Introduction, Nikhil Ketkar, Apress, -
- 3 Artificial Intelligent Techniques for Electric and Hybrid Electric Vehicles, Chitra A, Holm-Nielsen JB, Sanjeevikumar P, Himavathi S, Wiley-Scrivener, 2020

References:

- 1 Principles of Soft computing, Principles of Soft computing, S. N. Deepa and S. Sivanandam, Wiley, 2nd Edition, -
- 2 Introduction to Neural Networks using MATLAB 6.0, Introduction to Neural Networks using MATLAB 6.0, S. Sivanandam, S. Sumathi, S. N. Deepa, McGraw Hill Education, -
- 3 Neural Network: A Comprehensive Foundation, second edition, Neural Network: A Comprehensive Foundation, second edition, Simon Haykin, Pearson Prentice Hall, -

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 and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
5.00	10.00	15.00	30.00	20.00	30.00

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 laboratory and classroom.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

Supplementary Resources:

- 1 https://onlinecourses.nptel.ac.in/noc24_cs38/preview