CVM UNIVERSITY
Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Electrical Engineering)**

Semester: **VI**

Course Code: **202050604**

Course Title: **Artificial Intelligence in Electrical Engineering**

Course Group: **Professional Elective Course-I**

Course Objectives: Artificial intelligence is one of the fastest growing sectors in engineering and technology. Use of AI technology improves the control of various electrical systems with speed and accuracy as important advantages. The course provides a basic platform to understand different AI techniques like ANN, Fuzzy logic and GA. It also includes the applications of such AI techniques to various electrical engineering fields like electrical machines, power systems, etc.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	0	3	50 / 18	50/ 17	0 / 0	0 / 0	100 / 35

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction:** Introduction, definition of AI difference between soft computing techniques and hard computing systems, expert systems brief history of ANN, Fuzzy and GA.	03

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2	**Artificial Neural Networks:** Introduction, History of neural network research, Basic concepts of Neural Networks, Human brain, Model of Artificial Neuron, Neural Network architectures, Single layer feed forward Network, Multi-layer feed forward network, recurrent networks, characteristics of NN, Learning Methods Perceptron, ADALINE MADALINE Networks. Architecture of Back propagation Network, Non-linear activation operators, single and multilayer ANN, learning methods like Back propagation, LM etc. training and testing of ANN. Example use of ANN in software.	**10**
3	**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. Example use of fuzzy logic in software.	**10**
4	**Genetic Algorithm:** Working principles, difference between GA and traditional methods, Different types of coding methods, fitness function, different types of GA operators : Roulette wheel selection, Mutation, GAs for constrained optimization, understating of working of GA using flow chart.	**10**
5	**Applications of AI to Electrical Engineering :** Applications of ANN, Fuzzy logic and GA in power systems operation and control for solving problems of load forecasting, voltage control, voltage stability, security assessment, feeder load balancing, AGC, Economic load dispatch, Unit commitment. Condition monitoring.	**12**

Reference Books:

1	Neural Networks, Fuzzy logic and Genetic algorithms By S. Rajasekaran, G. A. Vijayalakshmi PaiPHI publication
2	Optimization for Engineering Design by Kalyanmoy Deb PHI publication
3	Multi-objective Optimization using Evolutionary Algorithms By Kalyanmoy Deb Willey Publication
4	Artificial intelligence techniques in power systems by KEVIN WARWICK, ARTHUR EKWUE RAJ AGRAWAL

Supplementary learning Material:	
1	www.nptel.ac.in

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation

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Internal Evaluation: The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
30%	30%	20%	10%	10%	0%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	To learn design, train and use artificial neural networks.	**20**
CO-2	To understand fuzzy logic systems.	**20**
CO-3	To study genetic algorithm and its applications.	**20**
CO-4	To solve different problems of electrical engineering using various AI techniques.	**40**

Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025

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