ITE6015 Soft Computing

LT P JC
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Version : 1.00
Pre-requisite: Nil

Objective:

- To provide the comprehensive knowledge on soft computing techniques.
- To introduce hybrid soft computing techniques like neuro-fuzzy.
- To understand Genetic Algorithm based optimization.

Expected Outcome:

On completion of this course, students are able to

- Build intelligent systems.
- Develop practical applications using genetic algorithms and other optimization procedures.
- Use rough sets to represent uncertainty, ambiguity and vagueness.

Module	Topics	L Hrs	SLO
1	**Soft Computing** Introduction to intelligent systems and soft computing, intelligent systems, knowledge based system, knowledge representation and processing, soft computing techniques, tools and applications.	5	1,2
2	**Fuzzy logic systems** Introduction, fuzzy sets, fuzzy logic operations, generalized fuzzy operations, implication, fuzziness and fuzzy resolution, fuzzy relations, composition and inference, fuzzy decision making.	6	2
3	**Fuzzy logic control** Introduction, basics of fuzzy control, fuzzification, defuzzification, fuzzy control architecture, properties of fuzzy control, robustness and stability.	6	1,2
4	**Artificial Neural Networks** Introduction, learning and acquisition of knowledge, features of ANN, industrial and commercial applications of neural networks, fundamental neural network structures - McCulloch-Pitts model, Perceptron, Adaline, Madaline and Multilayer perceptron with back propagation algorithm. Unsupervised learning, recurrent networks, deep learning.	7	2,7
5	**Unsupervised Neural Networks** RBF networks, Hopfield network, SOM, Dynamic neural networks, and their applications for identification and control, chaos time series prediction and for chaos prediction.	6	2,7
6	**Evolutionary Computing** Introduction, overview of evolutionary computing, Genetic Algorithm (GA) and optimization, Genetic algorithm operators, integration of GA with neural network, integration of GA with fuzzy logic, known issues in GA, population-based incremental learning, evolutionary strategies and its applications.	7	2,7
7	**Rough Set** Theoretical foundation, Knowledge and classification,	5	1,2

	Equivalence Generalization and Specialization of Knowledge, Imprecise categories approximation and rough sets, Approximations of Set, Properties of Approximations, Approximations and Membership Relation		
8	**Expert talk on recent trends**	3	17
	Total Lecture Hours	**45**	
# Mode: Flipped Class Room, [Lecture to be videotaped], Min of 2 lectures by industry experts			

Text Books

Fakhreddine O. Karray, Clarence W. De Silva, Soft Computing and Intelligent Systems Design: Theory, Tools, and Applications, Fourth Impression, Pearson-Always Learning, 2011.

Reference Books

1. Z Pawlak, Rough sets: theoretical aspects of reasoning about data, Springer, 2013
2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, Neuro-fuzzy and soft computing: a computational approach to learning and machine intelligence, PHI Learning, 2010.
3. Timothy J.Ross, Fuzzy Logic with Engineering Applications, Third Edition, Wiley India, 2010.
4. Sanguthevar Rajasekaran, G A Vijayalakshmi Pai, Neural networks, fuzzy logic and genetic algorithms: synthesis and applications, PHI Learning, New Delhi, 2012.

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Compiled by: Prof.Chandramouliswaran

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