

COMPUTATIONAL INTELLIGENCE AND APPLICATIONS

(Elective Subject)

Course Code:	17M1WEC332	Semester:	3 rd Semester, M. Tech (CSE/IT)
Credits:	3	Contact Hours:	L-3

Course Objectives

1. Fundamentals of key intelligent systems technologies including knowledge-based systems, neural networks, fuzzy systems, and evolutionary computation, and
2. Practice in integration of intelligent systems technologies for engineering applications.

Course Outcomes

This course provides the knowledge of analog and digital communication system analysis and design. After study through lectures and assignments, students will be able to

1. Gain a working knowledge of knowledge-based systems neural networks, fuzzy systems, and evolutionary computation;
2. Apply intelligent systems technologies in a variety of engineering applications;
3. Implement typical computational intelligence algorithms in MATLAB;
4. Present ideas and findings effectively; and
5. Think critically and learn independently

Course Contents

Unit	Topics	References (chapter number, page no. etc)	Lectures
1.	Introduction: Intelligence machines, Computational intelligence, paradigms Short history	Eberhart& Shi S. Haykin N. Sivanandam, S. N. Deepa	5
2.	Fuzzy Expert Systems: Rule-based expert system. Uncertainty management. Fuzzy Logic and Fuzzy Relationships. Fuzzy sets and operations of fuzzy sets. Fuzzy rules and fuzzy inference. Fuzzy expert systems. Adaptation of fuzzy systems. Case Studies	Eberhart& Shi S. Haykin N. Sivanandam, S. N. Deepa	7
3	Artificial Neural Networks: Fundamental neuro computing concepts: artificial neurons, activation functions, neural network architectures, learning rules. Supervised learning neural networks: multi-layer feed forward neural networks, simple recurrent neural networks, time-delay neural networks, supervised learning algorithms. Unsupervised learning neural networks: self-organizing feature maps. Radial	Eberhart& Shi S. Haykin N. Sivanandam, S. N. Deepa	9

	basis function networks. Deep neural networks and learning algorithms. Case studies		
4	Evolutionary computation: Chromosomes, fitness functions, and selection mechanisms. Genetic algorithms: crossover and mutation, Genetic programming. Evolution strategies. Case studies	Eberhart& Shi S. Haykin N. Sivanandam, S. N. Deepa	7
5	Swarm Intelligence: Foundations. cAnts, Termites, Gnats, Birds. Applications. Case Studies.	Eberhart& Shi S. Haykin N. Sivanandam, S. N. Deepa	7
6	Hybrid Intelligent Systems: Neural expert systems. Neuro-fuzzy systems. Evolutionary neural networks.	Eberhart& Shi S. Haykin N. Sivanandam, S. N. Deepa	7
Total Number of Lectures			42

Evaluation Scheme

1. Test 1 : 15 marks
2. Test 2 : 25 marks
3. Test 3 : 35 marks
4. **Internal Assessment** : 25 marks
 - 10 Marks : Class performance, Tutorials & Assignments
 - 10 Marks : Quizzes
 - 5 marks : Attendance

Text Books

1. 1 Computational Intelligence - Concepts to Implementations by Eberhart& Shi
2. S. Haykin, Neural Networks – A Comprehensive Foundation, Prentice Hall, 1999
3. N. Sivanandam, S. N. Deepa,” Principals of soft Computing”, Wiley India

Reference Books

1. Introduction to Genetic Algorithms by Melanie Mitchell
2. S. Russell and P. Norvig. Artificial Intelligence – A Modern Approach, Prentice Hall, 2010
3. A.P. Engelbrecht, Computational Intelligence: An Introduction, 2nd Edition, John Wiley & Sons, 2012.
4. H.K. Lam, S.S.H. Ling, and H.T. Nguyen, Computational Intelligence and Its Applications: Evolutionary Computation, Fuzzy Logic, Neural Network and Support Vector Machine, Imperial College Press, 2011.