

SOFT COMPUTING TECHNIQUES

22ECMC1T6B

Credits: 4

Lecture: 4 periods/week

Internal assessment: 40 marks
Semester end examination: 60 marks

Prerequisites: Linear Algebra, Statistics and Probability

Course Outcomes:

At the end of the course student will be able to:

- Understand the basic concepts of soft computing techniques and their applications
- Apply fuzzy logic to handle uncertainty and solve problems with an effective report
- Apply genetic algorithms to solve engineering problems
- Apply Nature Optimization algorithms for real-time problems

UNIT I

Introduction to Soft Computing: Concept of computing systems, "Soft" computing versus "Hard" computing, Characteristics of Soft computing

Applications of Soft computing techniques: Handwritten Script Recognition, Image Processing and Data Compression, Automotive Systems and Manufacturing, Soft computing based Architecture, Decision Support System

UNIT II

Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Sets, Fuzzy Sets, Crisp Relations, Fuzzy Relations. Fuzzy Systems: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based Systems, Defuzzification Methods and Applications

UNIT III

Fundamentals of Genetic Algorithms: Genetic Algorithms: History, Basic Concepts, Creation of Offsprings, Working Principle, Encoding, Fitness Function, Reproduction

Genetic Modelling: Inheritance Operators, Cross Over, Inversion, And Deletion, Mutation Operator, Bit-Wise Operators, Bit-Wise Operators used in GA, Generational Cycle, Convergence of Genetic Algorithms, Hybrid Systems

UNIT IV

Nature-Inspired Optimization Algorithms: Differential Evolution, Ant and Bee Algorithms, Particle Swarm Optimization, The Firefly Algorithm, Cuckoo Search, The Bat Algorithm, The Flower Algorithm, Parameter Tuning and Parameter Control

Learning Resources

Text Book:

1. Samir Roy and Udit Chakraborty, "Introduction to Soft Computing", Pearson Publications, 2013
2. S. Rajasekaran, G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications", 2017, PHI Learning
3. XIN- SHE YANG, "Nature-Inspired Optimization Algorithms", 2nd Ed., 2020, Elsevier

References:

1. S.N.Deepa, "Principles of Soft Computing, S.N.Sivanandam", Wiley India Pvt. Ltd., 2018
2. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning," Kluwer Academic Publishers, Boston, MA, 1989
3. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 2015
4. Kwang H. Lee, "First course on Fuzzy Theory and Applications", 2005, Springer
5. S. R. Jang, C.T. Sun and E. Mizutani, "Neuro Fuzzy and Soft Computing", 2004, PHI / Pearson Education
6. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", 2003, Addison Wesley

Web Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105173/>
- 2) <https://cse.iitkgp.ac.in/~dsamanta/courses/sca/index.html#resources>
- 3) <https://www.classcentral.com/course/youtube-introduction-to-soft-computing-47844>