राष्ट्रीय प्रौद्योगिकी संस्थान पटना / **NATIONAL INSTITUTE OF TECHNOLOGY PATNA**
संगणक विज्ञान एंव अभियांत्रिकी विभाग / **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**
अशोक राजपथ, पटना-८०००००५, बिहार / ASHOK RAJPATH, PATNA-800005, BIHAR
Phone No.: 0612-2372715, 2370419, 2370843, 2371929 Ext- 200, 202 Fax-0612-2670631 Website: www.nitp.ac.in

No:- Date:

CSXX2840:   Soft Computing

L-T-P-Cr:3-0-0-3

Pre-requisites: Fundamental knowledge of linear algebra, and algorithms

Objectives/Overview:

- To understand working of Neural Networks and their application for solving real world problems.
- To understand working of Fuzzy systems and their application for solving real world problems.
- To understand working of genetic algorithms and their application for solving real world problems.
- To learn evolutionary optimization techniques such as Particle Swarm Optimization, ant colony optimization and Differential Evolution.

UNIT I: **Lectures: 12**
Neural Networks(Introduction & Architecture): Artificial Neuron and its model, activation functions,
Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Gradient descent and convergence, Auto-associative and hetro-associative memory.Applications of neural networks.

UNIT II: **Lectures: 12**
Fuzzy Logic: Introduction to Set Theory, Fuzzy Set versus Crisp Set, Crisp Relation & Fuzzy Relations. Fuzzy systems: Crisp Logic, Fuzzy Logic- Introduction & Features of Membership Functions.
Fuzzy Rule Base System: Fuzzy Propositions, Formation, Decomposition & Aggregation of Fuzzy Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Decision-Making & Applications of Fuzzy Logic. Defuzzification.

UNIT II: **Lectures: 12**
Genetic Algorithm: Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Fitness Function, Genetic Modelling: Inheritance Operator, Cross Over, Selection, Mutation Operator. Application: Solving Single-Objective Optimization Problems using GAs. Differential Evolution: DE as modified GA, generation of population, operators and their implementation.

UNIT III: **Lectures: 12**
Particle Swarm Optimization:PSO Model, Global Best, Local Best, Velocity Update Equations, Position Update Equations, Velocity Clamping, Inertia Weight, Constriction Coefficients, Synchronous and Asynchronous Updates, Binary PSO. Ant Colony Optimization:Basic

Concepts, Ant System, Application.

Artificial Bee Colony: Historical Development, Types of Bees and Their Role in the Optimization Process.

Text/Reference Books

1) *Soft Computing*, Sivanandan and Deepa, Wiley
2) *Neural Networks Fuzzy Logic, and Genetic Algorithms.* S. Rajasekaran and G.A.VijaylakshmiPai.Prentice Hall of India.
3) *First Course on Fuzzy Theory and Applications*. K.H.Lee, Springer-Verlag.
4) *Fuzzy Logic, Intelligence, Control and Information*. Pearson Education.J. Yen and R. Langari
5) *Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition),* Collelo, Lament, Veldhnizer(Springer).