

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

CSE-Artificial Intelligence and Machine Learning/ Artificial Intelligence and Machine Learning, V-Semester

Open Elective AL 504 (C) Computational Intelligence

COURSE OBJECTIVES:

1. To introduce basic concepts, theories and techniques of computational intelligence.
2. Help students to learn the applications of computational intelligence techniques in the diverse fields of science, engineering, medicine, finance etc.

COURSE OUTCOMES:

After completing the course student should be able to:

1. Describe in-depth about theories, methods, and algorithms in computational Intelligence.
2. Compare and contrast traditional algorithms with nature inspired algorithms.
3. Examine the nature of a problem at hand and determine whether a computational intelligent technique/algorithm can solve it efficiently enough.
4. Design and implement Computation Intelligence algorithms and approaches for solving real-life problems.

Unit1:Introduction to Computational Intelligence (CI): Basics of CI, History of CI, Adaptation, Learning, Self-Organization, State Space Search and Evolution, CI and Soft Computing, CI Techniques; Applications of CI; Decision Trees: Introduction, Evaluation, Different splitting criterion, Implementation aspect of decision tree. Neural Network: Introduction, types, issues, implementation, applications.

Unit II:Fuzzy Set Theory: Fuzzy Sets, Fuzzy Set Characteristics, Basic Definition and Terminology, Fuzzy Operators,Fuzzy Relations and Composition, Member Function Formulation, Fuzzy Rules and Fuzzy Reasoning, Extension, Fuzzy Inference Systems, Input Space Partitioning and Fuzzy Modeling. Fuzziness and Defuzzification, Fuzzy Controllers, Different Fuzzy Models: Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models etc. Neuro Fuzzy Modeling, Introduction to Neuro Fuzzy Control.

Unit III:Rough Set Theory: Introduction, Fundamental Concepts, Knowledge Representation, Set Approximations and Accuracy, Vagueness and Uncertainty in Rough Sets, Rough Membership Function, Attributes Dependency and Reduction, Application Domain, Hidden Markov Model (HMM), Graphical Models, Variable Elimination, Belief Propagation, Markov Decision Processes.

Unit IV:Evolutionary Computation: Genetic Algorithms: Basic Genetics, Concepts, Working Principle, Creation of Offsprings, Encoding, Fitness Function, Selection Functions, Genetic Operators-Reproduction, Crossover, Mutation; Genetic Modeling, Benefits; Problem Solving; Introduction to Genetic Programming, Evolutionary Programming, and Evolutionary Strategies.

Unit V: Swarm Intelligence: Introduction to Swarm Intelligence, Swarm Intelligence Techniques: Ant Colony Optimization (ACO): Overview, ACO Algorithm; Particle Swarm Optimization (PSO): Basics, Social Network Structures, PSO Parameters and Algorithm; Grey wolf optimization(GWO); Application Domain of ACO and PSO; Bee Colony Optimization etc.; Hybrid CI Techniques and applications; CI Tools.

Reference Books:

1. Russell C. Eberhart and Yuhui Shi, Computational Intelligence: Concepts to Implementations, Morgan Kaufmann Publishers.
2. Andries P. Engelbrecht, Computational Intelligence: An Introduction, Wiley Publishing.
3. David E. Goldberg, Genetic Algorithm in Search Optimization and Machine Learning, Pearson Education.
4. Jagdish Chand Bansal, Pramod Kumar Singh, Nikhil R. Pal, Evolutionary and Swarm Intelligence Algorithms, Springer Publishing.
5. S. Rajasekaran, G.A. VijayalakshmiPai, “Neural Networks, Fuzzy Logic, Genetic Algorithms Synthesis and Applications”, PHI.
6. Fuzzy Logic with Engineering Applications, Timothy J. Ross, McGraw-Hill.
7. Neural Networks: A Comprehensive Foundation, Simon Haykin, Prentice Hall