

**BI 402 ECO INFORMATICS AND PREDICTIVE
ECOLOGY (ELECTIVE-V)**

Course Description and Objectives:

This course links the concepts of fuzzy logic and artificial neural networks for ecological applications. The main objective of this course is to provide insights into the design and application genetic algorithms in ecology and also enabling the students to utilize the knowledge of evolutionary computation in prediction and elucidation of Stream Ecosystems in Prediction and Elucidation of Stream Ecosystems

Course Outcomes :

1. Students will be able to perform Fuzzy knowledge based modeling
2. They will able to perform the designing of genetic algorithms
3. They will able to predict the future of ecosystems
4. They will able to incorporate the scope of utilizing adaptive agents in ecological studies
5. They will able to conduct independent study in river ecosystems for river management

Unit I: Ecological Applications of Fuzzy Logic and unsupervised artificial neural networks :

Fuzzy Sets and Fuzzy Logic, Fuzzy Approach to Ecological Modelling and Data Analysis, Fuzzy Classification, Fuzzy Regionalisation, Fuzzy Knowledge-Based Modelling, Computation of Self organizing Map with an abundant Datasets: SOM algorithm, Utilization of Self organizing Map

Unit II: Ecological Applications of Genetic Algorithms :

Ecology and Ecological Modelling, Genetic Algorithm Design Details, Applications of Genetic Algorithms to Ecological Modelling, Predicting the Future with Genetic Algorithms, The Next Generation: Hybrids Genetic Algorithms.

Unit III: Ecological Applications of Evolutionary Computation

The Challenges of Ecological Modelling, The Basic Evolutionary Algorithm, Equation Discovery, Optimisation of Difference Equations, Evolving Differential Equations, Rule Discovery, Modelling Individual and Cooperative Behaviour, Predator-Prey Algorithms, Modelling Hierarchical Ecosystems.

Unit IV: Ecological Applications of Adaptive Agents :

Adaptive Agents Framework, Individual-Based Adaptive Agents, State Variable-Based Adaptive Agents (Explain the concept using Algal Species Simulation by Adaptive Agents: Embodiment of Evolutionary Computation in Agents, Adaptive Agents Bank, Pelagic Food Web Simulation by Adaptive Agents).

Unit V: Prediction and Elucidation of Stream Ecosystems :

Study Sites, Data Sources and Modelling Techniques (Explain with an example of any river basin), Classification Trees: Model Development and Validation, Application of Predictive Classification Trees for River management, Artificial Neural Networks: Model Development and Validation, Application of Predictive Artificial Neural Networks for River Management, Prediction of environmental standards.

Text Book :

1. Ecological Informatics, Dr. Friedrich Recknagel (Ed.), 2006 Springer-Verlag Berlin Heidelberg

Reference book :

1. Ecoinformatics Tools & Techniques R. A. Reddy, 2003, Sbs Publishers & Distributors Pvt.