

COURSE CODE	COURSE TITLE	L	T	P	C
1152IT118	SOFT COMPUTING	3	0	0	3

**Course Category:**

~~Foundation (0) / Program Core (1) / Program Elective (2) / Allied Elective (3) / University Elective (4) / Value Education Elective (5) / Independent Learning (6) / Industry Higher Learning Institute Interaction (7).~~

**a.Preamble :**

This course provides an introduction to neuro, optimization and genetic algorithms, neural networks, neuro fuzzy modeling and applications of computational intelligence,

**b.Prerequisite Courses:**

Design and analysis of algorithms Fundamental of computer programming

**c.Related Courses:**

Artificial Intelligences  
Robotics

**d.Course Educational Objectives :**

Students undergoing this course are expected

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- To provide the mathematical background for carrying out the optimization associated with neural network learning.
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing

**e.Course Outcomes :**

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Discuss the concepts of Fuzzy set theory	K1
CO2	Apply various soft computing frame works	K2
CO3	Design of various neural networks	K2
CO4	Use fuzzy logic	K2
CO5	Apply genetic programming	K2

**f.Correlation of COs with POs :**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M			M							
CO2												
CO3	M		M									
CO4					M							
CO5		M		M								

H- High; M-Medium; L-Low

### **g.Course Content :**

#### **UNIT I FUZZY SET THEORY**

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling,

#### **UNIT II OPTIMIZATION AND GENETIC ALGORITHMS**

Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton’s Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search, Simple GA, crossover and mutation, genetic algorithms in search and optimization

#### **UNIT III NEURAL NETWORKS**

Supervised Learning Neural Networks – Perceptrons - Adaline – Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.

#### **UNIT IV NEURO FUZZY MODELING**

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum, Neuro-fuzzy systems: neuro-fuzzy modeling; neuro-fuzzy control

#### **UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE**

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction , Pattern Recognitions, Image Processing, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems Share Market Analysis, Natural Language Processing

### **a. Learning Resources**

#### **i.TEXT BOOK**

1. J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, 2004, Pearson Education 2004.

## **ii. REFERENCE BOOKS**

1. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
2. Davis E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N. Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.

## **iii. Online resources**

- [www.amazon.com/Soft-Computing-Applications.../dp/1852333081](http://www.amazon.com/Soft-Computing-Applications.../dp/1852333081)  
[www.myreaders.info/01 Introduction to Soft Computing.pdf](http://www.myreaders.info/01 Introduction to Soft Computing.pdf)