

Course Type	Course Code	Name of Course	L	T	P	Credit
SDC (Minor)	NCSM402	SOFT COMPUTING LABORATORY	0	0	3	1.5
<b>Course Objective</b>						
Practical experiments will be set based on the topics covered in the theory subject, These lab components aim to provide hands-on experience in the core areas of soft computing, allowing students to experiment with algorithms, develop problem-solving skills, and understand the practical applications of soft computing techniques.						
<b>Learning Outcomes</b>						
Enhance the ability to implement different algorithms or techniques in soft computing domain.						
Unit No.	Topics to be Covered	Practical Hours	Learning Outcome			
1	Introduction to Soft Computing Tools	6	Familiarize students with the software/tools used in soft computing experiments, Basic programming in MATLAB/Python, installation of necessary libraries, and introduction to the interfaces used for the soft computing			
2	Implement genetic algorithms for optimization tasks	9	GA Basics: Implement basic genetic operators like selection, crossover, mutation, and fitness evaluation. Solving Optimization Problems: Apply GA to optimize a simple problem (e.g., traveling salesman problem, function optimization). Parameter Tuning: Experiment with different population sizes, crossover rates, and mutation rates to see how they affect the performance.			
3	Implement different types of neural networks and train them using real datasets.	9	Perceptron: Train a single-layer perceptron for simple classification tasks. Multilayer Perceptron (MLP): Implement a backpropagation algorithm for training an MLP on a dataset (e.g., Iris dataset). All other suitable NN models			
4	Implement basic fuzzy logic systems and solve problems using fuzzy logic	6	Fuzzy Set Operations: Create and manipulate fuzzy sets and perform union, intersection, and complement operations. Fuzzy Inference System (FIS): Implement a Mamdani-type fuzzy inference system for decision-making or control. Defuzzification Methods: Use centroid and weighted average methods for defuzzification. Applications: Build a simple fuzzy controller for applications like temperature control or speed control.			
5	Integrate different soft computing techniques to solve complex problems	6	Neuro-Fuzzy Systems: Implement a fuzzy system where the fuzzy rules are adapted using a neural network (ANFIS). Genetic Algorithm + Neural Networks: Use a genetic algorithm to optimize the weights of a neural network. Fuzzy + Genetic Algorithms: Apply fuzzy logic rules to control the crossover and mutation processes of a genetic algorithm.			
6	Project Implementation	6	Live tasks of industry or research topics in Soft computing for implementation as well as testing.			
						<b>Total: 42</b>

**Text Books:**

1. Soft Computing: A Fusion of Foundations, Methodologies, and Applications, Authors: S.N. Sivanandam, S. Sumathi, S.N. Deepa
2. David E. Goldberg, "Genetic Algorithms in Search, Optimization, and Machine Learning", Addison-Wesley Professional

**Reference Books:**

1. Jeff Heaton, "Introduction to Neural Networks for C#, Python, and JavaScript", Heaton Research, Inc.