

Programme:	Course Title:			Course Code:
B. Tech. (CSE)	Soft Computing			CSE-3212
Type of Course:	Prerequisites:			Total Contact Hours:
Program Elective	Mathematics II, Introduction to Data Science			40
Year/Semester:	Lecture Hrs/Week:	Tutorial Hrs/Week:	Practical Hrs/Week:	Credits:
3/Even	3	0	0	3

Learning Objective:

This course will cover fundamental concepts used in Soft Computing. The concepts of Fuzzy Set, Rough Set, different Artificial Neural Networks (ANNs) and optimization techniques using Genetic Algorithm (GA) and other evolutionary algorithms will be covered. Applications of Soft Computing techniques to solve a number of real life problems will also be discussed.

Course outcomes (COs):

On completion of this course, the students will have the ability to:		Bloom's Level
CO-1	Understand the importance of Soft computing techniques in various real life problem domains.	2, 3
CO-2	Understand, analyze and apply Fuzzy Set, Rough Set and different hybridization techniques.	2, 3, 4
CO-3	Understand, analyze and apply Genetic Algorithm and other Evolutionary algorithms for single-objective optimization problems and multi-objective optimization problems.	2, 3, 4
CO-4	Understand, analyze and apply different Artificial Neural Network techniques and its applications.	2, 3, 4

Course Topics	Lecture Hours	
UNIT – I Introduction to Soft Computing	2	
1.1 Concept of computing systems. "Soft" computing versus "Hard" computing, Characteristics of Soft computing	1	2
1.2 Basic elements of soft computing techniques, Some applications of Soft computing techniques	1	
UNIT – II Fuzzy Set	8	8
2.1 Introduction to Fuzzy logic, Fuzzy sets and	2	

membership functions		
2.2 Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences.	3	
2.3 Defuzzification techniques, Fuzzy logic controller design, Some applications of Fuzzy logic.	3	
UNIT- III Rough Sets and Its Applications	8	
3.1 Information Systems, decision tables, Indiscernibly relation, set approximation, approximation of family of sets, analysis of decision tables.	3	8
3.2 Information granulation using rough sets, decision rules in rough set models,	2	
3.3 Classification, and clustering methods based on fuzzy sets, rough sets and different hybrid techniques.	3	
UNIT – IV Genetic Algorithms	6	
4.1 Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques	1	6
4.2 Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc.	3	
4.3 Solving single-objective optimization problems using GAs.	2	
UNIT-V Other Evolutionary Algorithms	7	
5.1 Differential Evolution (DE) based algorithms and its application.	2	7
5.2 Ant Colony based algorithms and its application	2	
5.3 Particle Swarm Optimization (PSO) based algorithms and its application	2	
5.4 Other Evolutionary algorithms in recent Research	1	
UNIT - VI Evolutionary Algorithm for Multi-objective Optimization Problem	5	
6.1 Concept of multi-objective optimization problems (MOOPs) and issues of solving them, Multi-Objective Evolutionary Algorithm (MOEA)	1	5
6.2 Non-Pareto approaches to solve MOOPs, Pareto-based approaches to solve MOOPs	3	
6.3 Some applications with MOEAs	1	

UNIT-VII Artificial Neural Networks	4	4
7.1 Biological neurons and its working, Simulation of biological neurons to problem solving	1	
7.2 Different ANNs architectures, Training techniques for ANNs	2	
7.3 Applications of ANNs to solve some real life problems	1	

Textbook references (IEEE format):

Text Book:

1. Timothy J. Ross , “Fuzzy Logic with Engineering Applications”, 3rd Edition, Willey Publication, 2011.
2. David E. Goldberg , “Genetic Algorithms in Search, Optimization and Machine Learning”, 1st Edition, Pearson Publication, 1989.
3. Simon Haykin , “Neural Networks and Learning Machines”, 3rd Edition , Prentice Hall of India, 2010.
4. J. Stepaniuk , “Rough-Granular Computing in Knowledge Discovery and Data Mining”, 1st Edition, Springer, 2008.

Reference books:

1. F. Martin, Mc neill, and Ellen Thro, “Fuzzy Logic: A Practical approach”, 1st Edition , Academic Press Professional, 1994.
2. Kalyanmoy Deb , “Multi-Objective Optimization Using Evolutionary Algorithms”, 1st Edition , Wiley Publication, 2001.

Additional Resources:

Some web resources & other reference books can be provided if it will be required.

Evaluation Method	
Item	Weightage (%)
Quiz 1	10
Quiz 2	10
Assignment	10
Project	10
Mid Term Examination	25
Final Examination	35

*Please note, as per the existing institute’s attendance policy the student should have a minimum of 75% attendance. Students who fail to attend a minimum of 75% lectures will be debarred from the End Term/Final/Comprehensive examination.

CO and PO Correlation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1				1							1		
CO2	1	2	2	1	1	1							2		2
CO3	1	2	2	1	1	1							2		2
CO4	1	2	2	1	1	1							2		2

Last Updated On: 4th October, 2021

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Approved By: