Faculty of Engineering and Technology

Bachelor of Technology (Semester V/ Third Year)
In Effect from Academic Year 2023-24

Branch Name:	Computer Engineering / Information Technology
Program Code:	ET103/ET105
Course Title:	Soft Computing
Course Code:	2ET1030507T
Pre-requisite Course:	Mathematical background, Proficiency with algorithm, Critical problem-solving skill, Programming skill

Course Objectives: The Objective of this course is to make the students learn about the mapping between data structures & algorithms, designing and analyzing algorithms for real-world problems.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
					SEE		CCA		SEE		CCA		
	L	T	P	Total	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Unit No	Topics	Total Hours	Weightage (%)
1	**Introduction to Artificial Intelligence (AI) and Soft Computing** Introduction and definition of Artificial Intelligence, Intelligent Agents: Agents and Environments, Rationality, Nature of Environment, Structure of Agent, types of Agent, Soft Computing: Introduction of soft computing, soft computing Vs. hard computing, various types of soft computing techniques, Some applications of Soft computing techniques.	08	15
2	**Problem Solving by Intelligent Search** Searching for solutions, uninformed search strategies – Breadth-first search, depth-first search. Search with partial information (Heuristic search) Hill climbing, A*, AO*	07	15
3	**Fuzzy Logic** Introduction to Fuzzy Set: Fuzzy set theory, Fuzzy set Vs crisp set, Crisp relation & fuzzy relations, membership functions, Fuzzy Logic: Fuzzy Logic basics, Fuzzy Rules and Fuzzy Reasoning, Fuzzy inference systems: Fuzzification of input variables, defuzzification and fuzzy controllers	10	25
4	**Artificial Neural Network Introduction** Fundamental concept - Basic Models of Artificial Neural Networks –Important Terminologies of ANNs - McCulloch-Pitts Neuron, Neural Network Architecture: Perceptron, Single layer Feedforward ANN, Multilayer Feed Forward ANN, Activation functions, Supervised Learning: Delta learning rule, Back Propagation algorithm. Un-Supervised Learning algorithm: Self Organizing Maps	08	20

5	**UNIT-V: Genetic Algorithm** Biological Background, Traditional optimization and search techniques, genetic algorithm and search space, genetic algorithm vs. traditional algorithms, basic terminologies, simple genetic algorithm, general genetic algorithm, operators in genetic algorithm, stopping condition for genetic algorithm flow, constraints in genetic algorithm, problem-solving using genetic algorithm, the schema theorem, classification of genetic algorithm, Holland classifier systems, genetic programming, advantages and limitations and applications of genetic algorithm	10	25

Reference Books:

- Elaine Rich and Kevin Knight Artificial Intelligence Third Edition, Tata McGraw-Hill Education Pvt. Ltd., 2008. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach, Second Edition", Pearson Education.
- Samir Roy and Chakraborty, Introduction to soft computing, Pearson Edition. 2013
- S.N.Sivanandam, S.N.Deepa "Principles of Soft Computing" Second Edition, 2011
- Martin T Hagen, Neural Network Design, Nelson Candad, 2nd Edition, 2008.
- Bart Kosko, Neural Network & Fuzzy System, PHI Publication, 1st Edition, 2009.
- George J Klir, Bo Yuan, Fuzzy sets & Fuzzy Logic,Theory & Applications, PHI Publication, 1st Edition, 2009.
- S.Rajasekaran and G.A.VijayalakshmiPai "Neural Networks, Fuzzy Logic and Genetic Algorithms" PHI Learning, 2009.

Course Learning Outcomes (CLO):

Course Outcomes	Description	Bloom's Taxonomy Level
COL1	Understand the basic concepts of artificial intelligence and soft computing	1.Remembering 2.Understanding
COL2	Analyze various techniques of fuzzy logic, fundamental theory and concepts of neural network	1.Remembering 4. Analyze
COL3	Apply basic principles of AI in solutions that require problem-solving by intelligent search	3. Apply
COL4	Apply AI techniques to real-world problems to develop intelligent systems	3. Apply
COL5	Evaluate the performance of genetic algorithms to combinatorial optimization problems.	5. Evaluate

Mapping of CLO with PO and PSO :

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CLO1	L												M	
CLO2	M	H												M
CLO3	L	M	H	M	L				L				H	
CLO4		H	H	M	M				M				H	H
CLO5	L	M	H	M	M	M			H					H

H: High, M: Medium, L: Low