COURSE HANDOUT

SOFT COMPUTING (COM-701)

B.E. (CSE) - VII Semester

ACADEMIC YEAR (2024-25)

Dr Surbhi Gupta

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Department of Computer Science and Engineering

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Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Internal Marks	Final Exam	Total
COM-701©	Soft Computing	PEC	**3**	**2**	**1**	0	50	100	150

COURSE OUTCOMES

At the end of the course the student will be able to:	
CO1	Identify intelligent systems leveraging the paradigm of soft computing techniques.
CO2	Analyze the various neural network architectures.
CO3	Design the methodology to solve optimization problems using fuzzy logic.
CO4	Develop the knowledge of genetic algorithm concepts and their applications.
CO5	Evaluate the hybrid system to revise the principles of soft computing in various applications

Unit-I

Introduction: What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

(8 Hours)

Unit-II

Artificial Neural Networks: - Basic concepts: Single Layer Perceptron, Multilayer Perceptron, Supervised and unsupervised learning, Back propagation, Networks-Kohen's self-organizing networks, Hopfield network, Feed forward network, Hopfield network. Neural Networks: Neural network models, layers in neural networks and their connections. Instar, Outstar, Weights on connections, Threshold function, Application: Adaline and Madaline.

(6 Hours)

Unit III

Fuzzy Systems: Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

(12 Hours)

Unit IV

Genetic Algorithm: History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

(8 Hours)

Unit V

Hybrid Systems: Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

(10 Hours)

Textbooks

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence	J.S. Ranga	Pearson	1st (2015)
2.	Fuzzy Logic and Genetic Algorithms: Synthesis & Applications	S.Rajasekaran, G. A. Vijayalakshmi	PHI	1st (2003)

Reference Books

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Soft Computing & Intelligent Systems: Theory & Applications	N. K. Sinha, M. M. Gupta	Academic Press /Elsevier	1st (2009)

COURSE PLAN		
Unit-I Introduction		
S.No	**Topics**	**Recommended Books**
1	Evolution of Soft Computing	Book 1, Ch.1
2	Hard and Soft computing	Book 1, Ch.1
3	Requirement and Areas of Soft computing	Book 1, Ch.1
4	Major Applications of Soft and Hard Computing	Book 2, Ch.2
Unit-II Artificial Neural Networks		
5	Basic concepts	Book 1, Ch.8
6	Architecture of ANN	Book 1, Ch.8
7	Supervised and unsupervised learning	Book 2, Ch.9
8	Kohen's self-organizing networks	Book 2, Ch.11
9	Hopfield network	Book 2, Ch.11
10	Adaline and Madaline	Book 2, Ch.9
Unit-III Fuzzy Logic		
11	Fuzzy Set theory	Book 1, Ch.1
12	Fuzzy versus Crisp set	Book 1, Ch.2
13	Fuzzy Operations	Book 1, Ch.2
14	Fuzzification and Defuzzification	Book 1, Ch.2
15	Predicate logic	Book 1, Ch.2
16	Fuzzy Classification	Book 1, Ch.3
Unit-IV Genetic Algorithm		
17	Basics of Genetic Algorithms (GA)	Book 2, Ch.8
18	Working Principle	Book 2, Ch.8
19	Fitness function	Book 2, Ch.9
20	GA Operators- Reproduction, Crossover, Mutation	Book 2, Ch.9
Unit-V Hybrid Systems		
21	Basics of Hybrid Systems	Book 1, Ch.8
22	Neuro- Fuzzy Hybrid Systems	Book 1, Ch.17, 18
23	Neuro-Genetic Hybrid Systems	Book 2, Ch.10
24	Fuzzy-Genetic Hybrid Systems	Book 2, Ch.10

ADDITIONAL WEB RESOURCES

1.	**NPTEL:** Introduction To Soft Computing, By Prof. Debasis Samanta https://onlinecourses.nptel.ac.in/noc20_cs17/preview
2.	**Published Sources:** 1. Ibrahim, D. (2016). An overview of soft computing. Procedia Computer Science, 102, 34-38. 2. Chaturvedi, D. K. (2008). Soft computing. *Studies in Computational intelligence*, *103*, 509-612. 3. ogly Aliev, R. A., & Aliev, R. R. (2001). *Soft computing and its applications*. World Scientific

GRADING AND ASSESSMENT

- **Sessional Test**: 20 marks
- **Assignment**: 20 marks
- **Attendance**: 10 marks
- **Final Examination**: 100 marks

COURSE POLICIES

- **Attendance**: Minimum 75% attendance is mandatory to appear in the final examination of the course.
- **Academic Integrity**: MIET's academic integrity policies apply. Plagiarism will not be tolerated.
- **Late Submissions**: Assignments and projects must be submitted by the specified timelines.

FACULTY INFORMATION

- **Office Hours**

  Monday - Friday (02:35 PM - 04:00 PM)

- **Contact Information**
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