INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**BACHELOR OF TECHNOLOGY (CIVIL ENGINEERING)**
SEMESTER	**6**
COURSE TITLE	**SOFT COMPUTING TECHNIQUES**
COURSE CODE	**01CI0617**
COURSE CREDITS	**3**

Objective:

1. To Develop an understanding to soft computing techniques and its application
2. To Understand the use of Fuzzy Logic for the problems related to civil engineering
3. To Understand the use of Genetic Algorithms in optimization problems related to civil engineering
4. To Understand the artificial neural network and its application

Course Outcomes: After completion of this course, student will be able to:

1. Recognize the use of soft computing techniques in civil engineering field.
2. Apply the fuzzy logic for the solving problems related to civil engineering.
3. Apply the Artificial Neural Network for civil engineering problems.
4. Analyse the single-objective optimization problems using Genetic Algorithms.

Pre-requisite of course: Mathematics, Algebra, Differential Equations

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Soft Computing** Introduction of soft computing, Concept of a computing system, Difference between soft and hard computing, Characteristics of soft computing, Application of soft computing	3
2	**Fuzzy Logic** Introduction to Fuzzy logic, Fuzzy Set theory, Fuzzy set operations, Fuzzy relationships, rules, propositions, implications, interferences, Defuzzification techniques, Application of Fuzzy logic in classifications, patterns recognitions. Application of Fuzzy logic to civil engineering problems	12

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Contents : Unit	Topics	Contact Hours
3	**Artificial Neural Network** Introduction of Artificial Neural Network, Biological neuron and its working, Model of artificial neuron, ANN Architectures, Multi-Layer Feed Forward Network (MLFFN), Radial Basis Function Network (RBFN), Recurring Neural Network (RNN), Training Techniques, Supervised and Unsupervised learning methods, Error correction learning, Hebbian learning; Single layer perceptron – Multilayer perceptron, Least mean square algorithm, Back propagation algorithm. Applications Application of ANN to solve some civil engineering problems	16
4	**Genetic Algorithm** Concept of Genetic Algorithm, Use of GA, comparison of GA and traditional methods in optimization, Basic GA framework, Different architecture of GA, Terminology in GA, GA operators: Encoding, Crossover, selection, Mutation, etc, Application of GA in optimization problems related to civil engineering	11
Total Hours		**42**

Textbook :

1 An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press, 2000

2 Soft Computing, D. K. Pratihar, Narosa, 2008

References:

1 Fuzzy Logic: A Practical approach, Fuzzy Logic: A Practical approach, F. Martin, McNeil, and Ellen Thro, AP Professional, 2000

2 Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis, and Applications, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis, and Applications, S. Rajasekaran, and G. A. Vijayalakshmi Pai, Prentice Hall of India, 2007

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
5.00	20.00	30.00	25.00	10.00	10.00

Instructional Method:

1 At the start of the course, the course delivery pattern, prerequisite of the subject will be discussed

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Instructional Method:

2 Lectures will be taken in class room with the use of multi-media presentations, white board– mix of both

3 Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation

4 Minimum two internal exams will be conducted and average of two will be considered as a part of continuous evaluation

5 Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.

6 Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation

7 The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures

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