

Department of Computer Engineering
Academic Term: July-Nov 2019(2019-2020)
B.E. (Computer) (semester VII)

Course Outcomes & Assessment Plan

Subject: Artificial Intelligence & Soft Computing (CSC703)

Credits-4

Syllabus:

1. Introduction to Artificial Intelligence(AI) and Soft Computing⁴

1.1 Introduction and Definition of Artificial Intelligence.

1.2 Intelligent Agents : Agents and Environments ,Rationality, Nature of Environment, Structure of Agent, types of Agent

1.3 Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques.

2. Problem Solving

2.1 Problem Solving Agent, Formulating Problems, Example Problems

2.2 Uninformed Search Methods: Depth Limited Search, Depth First Iterative Deepening (DFID), Informed Search Method: A* Search

2.3 Optimization Problems: Hill climbing Search, Simulated annealing, Genetic algorithm

3. Knowledge, Reasoning and Planning

3.1 Knowledge based agents

3.2 First order logic: syntax and Semantic, Knowledge Engineering in FOL Inference in FOL : Unification, Forward Chaining, Backward Chaining and Resolution

3.3 Planning Agent, Types of Planning: Partial Order, Hierarchical Order, Conditional Order

4. Fuzzy Logic

4.1 Introduction to Fuzzy Set: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, membership functions,

4.2 Fuzzy Logic: Fuzzy Logic basics, Fuzzy Rules and Fuzzy Reasoning

4.3 Fuzzy inference systems: Fuzzification of input variables, defuzzification and fuzzy controllers.

5. Artificial Neural Network

5.1 Introduction –Fundamental concept–Basic Models of Artificial Neural Networks –Important Terminologies of ANNs –McCulloch-Pitts Neuron

5.2 Neural Network Architecture: Perceptron, Single layer Feed Forward ANN, Multilayer Feed Forward ANN, Activation functions, Supervised Learning: Delta learning rule, Back Propagation algorithm.

5.3 Un-Supervised Learning algorithm: Self Organizing Maps

6. Expert System

6.1 Hybrid Approach -Fuzzy Neural Systems

6.2 Expert system : Introduction, Characteristics, Architecture, Stages in the development of expert system.

Course Objectives (CO):

1 To conceptualize the basic ideas and techniques of AI and SC.

2 To distinguish various search techniques and to make student understand knowledge representation and planning.

3 To become familiar with basics of Neural Networks and Fuzzy Logic.

4 To familiarize with Hybrid systems and to build expert system.

Course Outcomes: Students should be able to :-

CSC703.1 Identify the various characteristics of Artificial Intelligence and Soft Computing techniques.

CSC703.2 Choose an appropriate problem solving method for an agent to find a sequence of actions to reach the goal state.

CSC703.3 Analyse the strength and weakness of AI approaches to knowledge representation, reasoning and planning.

CSC703.4 Construct supervised and unsupervised ANN for real world applications.

CSC703.5 Design fuzzy controller system.

CSC703.6 Apply Hybrid approach for expert system design.

Mapping of CO and PO/PSO

Relationship of course outcomes with program outcomes: Indicate 1 (low importance), 2 (Moderate Importance) or 3 (High Importance) in respective mapping cell.

	PO1 (Engg Know)	PO2 (Ana)	PO3 (De sign)	PO4 (inve stiga)	PO5 (tools)	PO6 (engg Soci)	PO7 (Env)	PO8 (Eth)	PO9 (ind Team)	PO10 (comm.)	PO11 (PM)	PO12 (life Long)
CSC703.1	3	-										
CSC703.2	3	3	3		2							3
CSC703.3	3	3	3		3							3
CSC703.4	3	3	3		3							3
CSC703.5	3	3	3		3							3
CSC703.6												
Course To PO	3	3	3		3							3

CO	PSO1	PSO2
CSC703.1	3	
CSC703.2	3	3
CSC703.3	3	3
CSC703.4	3	3
CSC703.5	3	3
CSC703.6		
Course to PSO	3	3

Course Outcomes Target:

Upon completion of this course students will be able to

CSC703.1 Identify the various characteristics of Artificial Intelligence and Soft Computing techniques. **Target 2.5**

CSC703.2 Choose an appropriate problem solving method for an agent to find a sequence of actions to reach the goal state. **Target 2.5**

CSC703.3 Analyse the strength and weakness of AI approaches to knowledge representation, reasoning and planning. **Target 2.5**

CSC703.4 Construct supervised and unsupervised ANN for real world applications. **Target 2.5**

CSC703.5 Design fuzzy controller system. **Target 2.5**

CSC703.6 Apply Hybrid approach for expert system design. **Target 2.5**

CO Assessment Tools:

Assessment Tools:

Course Outcome	Assessment Tool Direct (weightage: 80%)	Assessment Tool Indirect (weightage=20%)
CSC703.1 Identify the various characteristics of Artificial Intelligence and Soft Computing techniques.	Test 1 (30%) Assignment 1 (20%) Module Test 1(10%) Quiz 1 (10%) University Exam (30%)	Course Exit Survey
CSC703.2 Choose an appropriate problem solving method for an agent to find a sequence of actions to reach the goal state.	Test1 (30%) Practical (20%) Module Test 1 (20%) Quiz 1 (10%) University Exam(30%)	
CSC703.3 Analyse the strength and weakness of AI approaches to knowledge representation, reasoning and planning.	Test 1(20%) Quiz 1 (10%) Practical (20%) Assignment 1(10%) Module Test 1 (10%) University Exam(30%)	
CSC703.4 Construct supervised and unsupervised ANN for real world applications.	Test 2 (20%) Quiz 2 (10%) Practical (20%) Assignment 2(10%) Module Test 2 (10%) University Exam (30%)	

CSC703.5 Design fuzzy controller system.	Test 2 (20%) Practical (20%) Quiz 2 (10%) Assignment 2(10%) Module Test 2(10%) University Exam (30%)	
CSC703.6 Apply Hybrid approach for expert system design.	Test 2 (20%) Practicals (20%) Quiz 2 (10%) Assignment 2(10%) Module Test 2(10%) University Exam (30%)	

Content Beyond Syllabus:

- Research Paper study individually

Curriculum Gap:

In order to achieve the course objectives, there are some topics listed below are not given much importance.

Guest Lecture: -

Department of Computer Engineering

Academic Term : Jan – May 2019

Subject : : Artificial Intelligence & Soft Computing

Subject Code: CSC703

CLASS : BE Computer

Semester: VII

Periods (Hours) per week	Lecture	4	
	Practical	2 hrs/ batch (4Batches)	
	Tutorial	--	
Evaluation System		Hours	Marks
	Theory examination	3	80
	Internal Assessment	--	20
	Practical Examination	--	--
	Oral Examination	--	25
	Term work	--	25
	Total	--	150

Time Table	Day	Time
	Tuesday	08.45am to 09.45am
	Tuesday	1:30pm to 2.30pm
	Wednesday	2.30pm to 3.30pm
	Thursday	1.30am to 2.30am

Course Content and Lesson plan

Module 1: Introduction to Artificial Intelligence(AI) and Soft Computing

Week	L No.	Date		Topic	Assessment methods	Books Referred	Teaching Methods
		Planned	Actual				
	1	02/07/2019	02/07/2019	Introduction and Definition of Artificial Intelligence.	Test 1 Module Test 1, Assignment 1, Quiz 1 Practical 1	1,2	Slides BB
	2	03/07/2019	03/07/2019	Intelligent Agents : Agents and Environments		1,2	Slides, BB
	3	04/07/2019	04/07/2019	Rationality, Nature of Environment,			
	4	05/07/2019	05/07/2019	Structure of Agent, types of Agent			
	5	09/07/2019	09/07/2019	Soft Computing: Introduction of soft computing, soft computing vs. hard computing,			
	6	10/07/2019	10/07/2019	various types of soft computing techniques			
	7	11/07/2019	11/07/2019	Module Test			

Module 2: Problem Solving

	8	12/07/2019	12/07/2019	Problem Solving Agent, Formulating Problems, Example Problems	Test 1 Module Test 1, Assignment 1, Quiz 1 Practical 2,	1,2	Slides, BB
	9	16/07/2019	16/07/2019	Uninformed Search Methods: Depth Limited Search		1,2	Slides, BB
	10	17/07/2019	17/07/2019	Depth First Iterative Deepening (DFID)			
	11	18/07/2019	18/07/2019	Informed Search Method: A*			

				Search			
	12	19/07/2019 23/07/2019	19/07/2019 23/07/2019	Optimization Problems: Hill climbing Search			
	13	23/07/2019 24/07/2019	23/07/2019 24/07/2019	Simulated annealing, Genetic algorithm		1,2	Slides, BB
Module 4: Knowledge, Reasoning and Planning							
	14	26/07/2019	26/07/2019	Knowledge based agents	Test 1 Module Test 1, Assignment 1, Quiz 1 Practical 3,4	1,2	Slides, BB
	15	29/07/2019	29/07/2019	First order logic: syntax and Semantic			
	16	31/07/2019	31/07/2019	Semantic net with example			
	17	01/08/2019	01/08/2019	Frame with example			
	18	02/08/2019	02/08/2019	Script with example			
	19	06/08/2019	06/08/2019	Knowledge Engineering in FOL Inference in FOL : Unification,			
	20	07/08/2019	07/08/2019	Forward Chaining			
	21	08/08/2019	08/08/2019	Backward Chaining			
	22	09/08/2019	09/08/2019	Resolution			
	23	19/08/2019	19/08/2019	Planning Agent, Types of Planning: Partial Order, Hierarchical Order, Conditional Order			
Module 4: Fuzzy Logic							
	24	21/08/2019	21/08/2019	Introduction to Fuzzy Set: Fuzzy set theory,	Test 2 Module Test 2, Assignment 2, Quiz 2 Practical 5,6	3	Slides, BB
	25	22/08/2019	22/08/2019	Fuzzy set versus crisp set,			
	26	23/08/2019	23/08/2019	Crisp relation & fuzzy relations, membership functions,			
	27	27/08/2019	27/08/2019	Fuzzy Logic: Fuzzy Logic basics,			
	28	28/08/2019	28/08/2019	Fuzzy Rules and Fuzzy Reasoning			
	29	29/08/2019	29/08/2019	Fuzzy inference systems: Fuzzification of input variables,			
	30	30/08/2019	30/08/2019	Defuzzification and fuzzy controllers.			
Module 5: Artificial Neural Network							
	31	04/09/2019	04/09/2019	Introduction –Fundamental concept–	Test 2 Module Test 2, Assignment 2, Quiz 2 Practical 7		
	32	05/09/2019	05/09/2019	Basic Models of Artificial Neural Networks –			
	33	06/09/2019	06/09/2019	Important Terminologies of ANNs			
	34	11/09/2019	11/09/2019	McCulloch-Pitts Neuron			
	35	12/09/2019	12/09/2019	Neural Network Architecture: Perceptron,			

	36	13/09/2019	13/09/2019	Single layer Feed Forward ANN			
	37	17/09/2019	17/09/2019	Multilayer Feed Forward ANN, Activation functions,			Slides, BB
	38	18/09/2019	18/09/2019	Supervised Learning			
	39	19/09/2019	19/09/2019	Delta learning rule,			
	40	20/09/2019	20/09/2019	Back Propagation algorithm.			
	41	24/09/2019	24/09/2019	Un-Supervised Learning algorithm:			
	42	25/09/2019	25/09/2019	Self Organizing Maps			
	43	27/09/2019	27/09/2019	Examples			
6.Expert System							
	44	1/10/2019	1/10/2019	Hybrid Approach -Fuzzy Neural Systems	Test 2 Module Test 2, Assignment 2, Quiz 2 Practical 8,9		
	45	3/10/2019	3/10/2019	Expert system : Introduction, Characteristics,			
	46	4/10/2019	4/10/2019	Architecture, Stages in the development of expert system,			
	47	9/10/2019	9/10/2019	Guest Lecture			
	48	10/10/2019	10/10/2019	Presentations			
	49	11/10/2019	11/10/2019	Presentations			
	50	12/10/2019	12/10/2019	Presentations			

Text Books:

- 1.Stuart J. Russell and Peter Norvig, "Artificial Intelligence A Modern Approach —Second Edition" Pearson Education.
- 2.Samir Roy and Chakraborty, —Introduction to soft computing , Pearson Edition.
- 3.S.N.Sivanandam, S.N.Deepa "Principles of Soft Computing" Second Edition, Wiley Publication.
- 4.S.Rajasekaran and G.A.VijayalakshmiPai "Neural Networks, Fuzzy Logic and Genetic Algorithms" PHI Learning.
- 5.N.P.Padhy, —Artificial Intelligence and Intelligent Systems , Oxford University Press

Reference Books:

- 1.Elaine Rich and Kevin Knight —Artificial Intelligence Third Edition, Tata McGraw-Hill Education Pvt. Ltd., 2008
- 2.Satish Kumar "Neural Networks A Classroom Approach" Tata McGrawHill.
- 3.Zimmermann H.S "Fuzzy Set Theory and its Applications"Kluwer Academic Publishers.
- 4.Hagan, Demuth, Beale,"Neural Network Design" CENGAGE Learning, India Edition.
- 5.J.-S.R.Jang "Neuro-Fuzzy and Soft Computing" PHI 2003.
- 6.JacekM.Zurada "Introduction to Artificial Neural Sytems" Jaico Publishing House.

Artificial Intelligence & Soft Computing Lab (CSL703)

Lab Outcomes:

Learner will be able to:-

- 1 To realize the basic techniques to build intelligent systems
- 2 To create knowledge base and apply appropriate search techniques used in problem solving.
- 3 Apply the supervised/unsupervised learning algorithm.
- 4 Design fuzzy controller system.

Description: The current applications from almost all domains, like games, robots, expert system, optimization or even the search engines are becoming smarter. We have moved to the era of knowledge processing from data and information processing. Therefore learning these technologies practically is very essential for a student to gain the proficiency. They will also learn and be able to appreciate the use of fusion of basic techniques.

LAB	Topic / Activity	Explanation of Activity
Lab 1	<ul style="list-style-type: none">• Identify the problem• PEAS Description• Problem formulation	Select a problem statement relevant to AI
Lab 2	Introduce AI programming Language	Introduce PROLOG programming.
Lab 3	<ul style="list-style-type: none">• Start Implementation• Knowledge Representation and Create Knowledge Base	Use AI programming languages Or C/JAVA
Lab 4	Implement search algorithms to reach goal state	Identify and analyse Algorithm to solve the problem
Lab 5	To implement Mc-Culloch Pitts Model for a problem	Apply to solve AND / OR/ XOR, etc.
Lab 6	To implement Fuzzy Controller system	Design an automobile or washing machine controller, etc. and implement
Lab 7	To implement Basic Supervised / Unsupervised Neural Network learning rules for a problem.	Design a NN using a learning method to generate knowledge for classification.
Lab 8	Case study on Hybrid Systems	Study the designing of Neuro Fuzzy systems
Lab 9	Case study of an Application	Printed Character Recognition, Face Recognition, etc.

Practical List

SR. NO.	EXPERIMENT NAME
1.	Identify the problem PEAS Description Problem formulation
2.	Introduce AI programming Language
3.	Start Implementation Knowledge Representation and Create Knowledge Base
4.	Implement search algorithms to reach goal state
5.	To implement Mc-Culloch Pitts Model for a problem
6.	To implement Fuzzy Controller system
7.	To implement Basic Supervised / Unsupervised Neural Network learning rules for a problem
8.	Case study on Hybrid Systems
9.	Case study of an Application