

Code CSA4005	Expert Systems and Fuzzy Logic	Course Type	LT
		Credits	3
Course Objectives: <ul style="list-style-type: none">Students will be able to explain and describe the concepts central to the creation of knowledge bases and expert systems.Students will be knowledgeable about the tools and the processes used for the creation of an expert system.Student will know methods used to evaluate the performance of an expert system.To impart knowledge on fuzzy logic principles.To use the fuzzy logic and neural network for application related to design and manufacture.			
Course Outcomes: At the end of the course, students should able to <ul style="list-style-type: none">Develop the skill in basic understanding on Expert SystemsDevelop rule based and frame-based expert systemsDevelop neural expert systems and prolog programmingDevelop the skill in basic understanding on fuzzy and neural networkExplore the functional components of neural classification conductor and the functional components of fuzzy logic classification on controller.			
Student Outcomes (SO): a, b, c, l <ul style="list-style-type: none">a. An ability to apply the knowledge of mathematics, science and computing appropriate to the discipline.b. An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.c. An ability to design, implement and evaluate a system / computer-based system, process, component or program to meet desired needs.l. An ability to apply mathematical foundations, algorithmic principles and computer science theory in the modelling and design of computer-based systems (CS).			
Module No.	Module Description	No.of Hours	SO
1	Introduction: Introduction to Expert System – characteristic and types of Expert System –Architecture and Development Process of Expert System – Inference Engine – Knowledge Base. Logic and Inferences: Propositional Logic - First Order Logic (FOL) - Resolution method for FOL - Forward and Backward chaining.	6	a, b, c
2	Rule-Based And Frame-Based Expert Systems: Rule-based Expert systems: Structure of rule based expert system - Conflict resolution - Uncertainty Management - Advantages & disadvantages of rule-based expert systems - Example - Introduction to JESS. Frame-based Expert systems: Inheritance in frame-based expert systems, Methods and demons, Interactions of frames and rules, Example.	6	a, b, c
3	Neural Expert Systems And Prolog Programming: Artificial Neural Network and Neural Expert Systems: How brain works, the Neuron as a single computing element, Perceptron, Multilayer FFNN,	6	a,b, c

	Backpropagation algorithm, Recurrent networks, Neural expert system. Introduction to Prolog Programming language: Syntax and meaning of Prolog Programs, Using Data Structures, Controlling Backtracking, Input and Output, Built-in Predicates, Using Prolog Grammar Rules.		
4	Introduction To Fuzzy Logic Principles: Basic concepts of fuzzy set theory – operations of fuzzy sets – properties of fuzzy sets – Crisp relations – Fuzzy relational equations – operations on fuzzy relations – fuzzy systems – propositional logic – Inference – Predicate Logic – Inference in predicate logic – fuzzy logic principles – fuzzy quantifiers – fuzzy inference – fuzzy rule based systems – fuzzification and defuzzification – types.	5	a,b,c
5	Advanced Fuzzy Logic Applications: Fuzzy logic controllers – principles – review of control systems theory – various industrial applications of FLC adaptive fuzzy systems – fuzzy decision making – Multiobjective decision making – fuzzy classification – means clustering – fuzzy pattern recognition – image processing applications – systactic recognition – fuzzy optimization.	5	a, b, c
5	Guest Lecture on Contemporary Topics	2	
	Total Hours:	30	

Mode of Teaching and Learning: *Flipped Class Room, Activity Based Teaching/Learning, Digital/Computer based models, wherever possible to augment lecture for practice/tutorial and minimum 2 hours lectures by industry experts on contemporary topics*

Mode of Evaluation and assessment:

The assessment and evaluation components may consist of unannounced open book examinations, quizzes, student's portfolio generation and assessment, and any other innovative assessment practices followed by faculty, in addition to the Continuous Assessment Tests and Term End Examinations.

Text Book(s):

1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson, 2010.
2. M. Negnevitsky, Artificial Intelligence: A Guide to Intelligent Systems, 3rd Edition , Addison Wesley, 2011.

Reference Book(s):

1. D. Khemani, A first course in Artificial Intelligence, McGraw Hill Education (India) Pvt. Ltd, 2013.
2. S. Kaushik, Artificial Intelligence, CENGAGE Learning, 2011.
3. I. Bratko, Prolog Programming for Artificial Intelligence, Pearson, 4th Edition, 2011.
4. Rajasekaran. S.. Vijayalakshmi Pai. G.A. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice Hall of India Private Limited, 2003
5. Timothy J.Ross, "Fuzzy logic with Engineering Applications", McGraw Hill, 1995

Recommendation by the Board of Studies on	17.01.2020
Approval by Academic council on	20.01.2020
Compiled by	Dr S Sountharajan