

Planning and Quality Assurance Affairs

Form (A)

Course Specifications

General Information

Course name	Expert Systems
Course number	ITSE5304
Faculty	
Department	
Course type	Major Needs
Course level	5
Credit hours (theoretical)	3
Credit hours (practical)	0
Course Prerequisites	

Course Objectives

- 1 - Introduce the students to the importance of expert systems as one of the most practical and wide spread applications of Artificial Intelligence in the different domains: medical, financial, business, law, etc., as well as their advantages and limitations
- 2 - Give the necessary mathematical background for implementing expert systems using two of the most commercially successful approaches in the domain: the logical approach (knowledge based and fuzzy systems) and the biological approach (neural networks),
- 3 - Acquaint the students with expert systems shells and other programming environments that help build expert systems
- 4 - Give the students a hands on experience of a number expert systems development environments

Intended Learning Outcomes

Knowledge and Understanding	* a1- Master a working knowledge of knowledge-based systems, neural networks, fuzzy systems, and neurofuzzy computation * a2- Apply the concepts and technologies of expert systems in a variety of engineering as well as non-engineering fields * a3- Evaluate different logical inference techniques and how to select the most suitable for a given problem * a4- Evaluate different knowledge representation approaches and their suitability for a given domain * a5- Understand the importance of hybrid approaches in the development of expert systems to overcome the limitations of separately using each approach to the development task
Intellectual Skills	* b1. Master the logical and mathematical skills needed to understand and apply the new concepts introduced in the course such as knowledge representation, logical inference, fuzzy logic and fuzzy inference, the perceptron, MLP and back propagation * b2. Abstraction and modeling * b3- Problem solving;
Professional Skills	* c1. Create, query and manipulate a working knowledge base for an expert system in the chosen IDE * c2. Create, train and test a simple feedforward neural net to solve simple classification problems using MatLab * c3. Use MatLab fuzzy toolbox for fuzzy computations, fuzzy inference. * c4. Use MatLab GUI for fuzzy inference systems to design, implement, query and manipulate a fuzzy expert system * c5. Use MatLab ANFIS tool to learn and tune the rules of a fuzzy expert system
General Skill	* d1- Think critically * d2- Learn independently.

Course Contents

1 - Introduction to expert systems
2 - Rule based expert systems
3 - Introduction to Clips
4 - Dealing with uncertainty and inexact inference
5 - Semantic Networks and Frame Based Expert Systems
6 - Introduction to Fuzzy Logic
7 - Fuzzy rules and fuzzy inference
8 - Fuzzy expert systems: Case studies
9 - Fundamental neurocomputing concepts
10 - Backpropagation learning in MLP networks
11 - Neural expert systems
12 - Neurofuzzy expert systems

Teaching and Learning Methods

1 - Lectures
2 - Case Studies

Students Assessment

<u>Assessment Method</u>	<u>TIME</u>	<u>MARKS</u>
Mid-term 1	6th week	20%
Mid-term 2	12th week	20%
Projects	During 16 weeks	10%
Final Exam	16th week	50%

Books and References

Essential books	Joesph C. Giarratano and Gary D. Riley: Expert Systems, Fourth Edition, Thomson Course Technology, 2005
Recommended books	Michael Negnevitsky: Artificial Intelligence: A Guide to Intelligent Systems 2nd Edition, Addison Wesley; 2004 Peter Jackson: Introduction to Expert Systems, 3rd Edition, Addison Wesley Longman, 1998

Knowledge and Skills Matrix

Main Course Contents	Study Week	Knowledge and Understanding	Intellectual Skills	Professional Skills	General Skill
Introduction to expert systems	1	a1	b1		
Rule based expert systems	2	a2		c1	
Introduction to Clips	3	a1,a3	b1	c2	
Dealing with uncertainty and inexact inference	4-5	a2,a4	b3	c1,c2	
Semantic Networks and Frame Based Expert Systems	6-7	a4	b3	c2,c3	
Introduction to Fuzzy Logic	8-9	a5	b2	c3	d1
Fuzzy rules and fuzzy inference	10	a4,a5	b2-b3	c2-c5	d1
Fuzzy expert systems: Case studies	11	a3,a5	b3	c4	d1-d2
Fundamental neurocomputing concepts	12	a2	b3	c2,c4	d1-d2
Backproagation learning in MLP networks	13	a3	b1	c2	d2
Neural expert systems	14	a4	b2	c3	d2
Neurofuzzy expert systems	15	a1-a3	b1-b3	c3-c5	d1-d2