

## Course Specifications

(4201 Expert System)

<b>Faculty:</b>	<i>HICIT- Higher Institute for Computers &amp; Information Technology-EI Shorouk Academy</i>		
<b>Programme(s) on which the course is given:</b>	Under graduate program in Computer Science		
<b>Major or minor element of programme:</b>	Compulsory		
<b>Department offering the programme</b>	Department of Computer Science		
<b>Department offering the course:</b>	Department of Computer Science		
<b>Year / Class</b>	4 <sup>th</sup> Year – 2 <sup>nd</sup> Semester		
<b>Date of specification approval</b>	1/8/2022		

### A- Basic Information

<b>Title:</b> Expert System	<b>Code:</b> 4201		
<b>Weekly Hours:</b>			
<b>Lecture</b> : 3	<b>Exercise:</b> -	<b>Practical</b> :3	<b>Total:</b> 6

### B- Professional Information

#### 1- Overall aims of course

This course introduces students to expert systems in general and to rule-based systems in specific. Students learn how to build a rule-based expert system in a variety of application areas. They also learn advanced programming techniques which include topics of inexact reasoning, intelligent database management methods, and how to develop a community of expert systems which cooperate over a blackboard structure. Students are also given the opportunity to demonstrate their understanding of the technology by building a rule-based expert system that addresses a real-world problem. The course prepares students for graduate research in the area of expert systems.

#### 2- Program ILOs Covered by Course

Program Intended Learning Outcomes			
Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
A7, A12, A21	B1, B3, B4, B5, B10	C1, C5, C6	D5, D11, D12

### 3- Intended learning outcomes of course (ILOs)

#### a- Knowledge and understanding.

- a1. Explain the fundamental principles of expert systems.[A7,A12]
- a2. Explain the skills required for building expert systems in different domains.[A12,A21]

#### b- Intellectual skills.

- b1. Construct different expert systems using an expert system shell and CLIPS.[B1,B4,B5]
- b2. Apply inexact reasoning for calculating different applications in rule based expert systems to obtain a high intellectual skills.[B3,B4,B10]

#### c- Professional and practical skills.

- c1. Implement rule-based expert systems, semantic networks, frames in CLIPS. [C1,C5,C6]
- c2. Develop rule-based expert systems using an expert system shell and CLIPS.[C1,C5,C6]

#### d- General and transferable skills

- d1. Write a technical report.[D5]
- d2. Work with a team to implement expert system program[D11,D12]

### 4- Contents

Topic	Hours	Lecture	Practical
Overview of expert systems	6	3	3
Review of knowledge representation	6	3	3
Review of inference techniques	6	3	3
Introduction to rule-based expert systems	6	3	3
Implementing rule-based ESs, Semantic Nets, Frames in prolog	6	3	3
Case-based reasoning	6	3	3
inexact reasoning	6	3	3
inexact classification	6	3	3
Knowledge acquisition	6	3	3
Knowledge elicitation, extraction	9	3	6
Applying the above concepts on different ES domains	6	3	3
Selected topics	3	3	-
Course Project	6	3	3

## 5- Teaching and learning methods

Teaching and learning methods	Used
<b>Active Learning</b>	
Lectures	√
Tutorial Exercises	√
Practical Lab	√
Discussions.	√
<b>Self – Learning strategy</b>	
Reading material	√
Websites search	√
Research and reporting	√
Self-studies	-
<b>Experimental strategy</b>	
Group work	√
Presentation	-
<b>Problem solving strategy</b>	
Problem solving/problem solving learning based	√
Case study	√
<b>Synchronous E-Learning</b>	
Virtual lab	-
Virtual class	-
Chat Room	-
Video lectures	√
<b>Asynchronous E-Learning</b>	
E-Learning	√

## 6- Student assessment methods

Methods	Assessment	Used
Electronic Midterm Exam	To assess the knowledge and understanding achieved by the student during the previous weeks. (online on e-learning hub )	√
Pencil-to-Paper Final Exam	To evaluate what the student gain at the end of the course, and to assess: the knowledge and understanding, general skills, and intellectual skills.	√
Course Project	To allow students work in team, and to evaluate knowledge, understanding, intellectual, and transferable skills. (online on e-learning hub , FTF)	√
Electronic Course Work & Quizzes	To keep the student always in the course, and to evaluate knowledge, understanding, intellectual, and transferable skills.(online on e-learning hub)	√

Practical Exam	to measure the ability of students to design and implement a software program(FTF).	√
Participation	To assess the knowledge and understanding achieved by the student during the previous weeks.	√

### Assessment Schedule

Assessment	Week #
Participation	Every week
Electronic Mid Term Exam	8
Final Exam	16
Course Project	3-14
Electronic/hard copy Course Work & Quizzes	2-14
Practical Exam	15

### Assessment Weight

Assessment	Weight %
Participation	5%
Electronic Mid Term Exam	
Final Exam	70%
Course Project	10%
Electronic/hard copy Course Work & Quizzes	5%
Practical Exam	10%
<b>Total</b>	<b>100</b>

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- Course Work & Quizzes:
  - o Short Exams, Assignments, Researches, Reports, Presentations on e-learning hub
  - o Class/Project discussion in a virtual classroom

### 7- List of references

Essential books (text books)	<ul style="list-style-type: none"> <li>• Puppe, F. (2011, November 15). <i>Systematic Introduction to Expert Systems: Knowledge Representations and Problem-Solving Methods</i>. Springer. <a href="https://doi.org/10.1007/978-3-642-77971-8">https://doi.org/10.1007/978-3-642-77971-8</a></li> <li>• Ignizio, J. P. (1991, December 1). <i>Introduction to Expert Systems</i>.</li> <li>• Giarratano, J. C., &amp; Riley, G. D. (2004, October 15). <i>Expert Systems: Principles and Programming</i>. <a href="https://doi.org/10.1604/9780534384470">https://doi.org/10.1604/9780534384470</a></li> <li>• Riley, G. (2022, May 2). <i>Adventures in Rule-Based Programming: A CLIPS Tutorial</i>.</li> </ul>
<b>Course notes</b>	<a href="http://www.sci.brooklyn.cuny.edu">http://www.sci.brooklyn.cuny.edu</a>

<b>Recommended books</b>	<ul style="list-style-type: none"> <li>I. N. d. Silva, R. A. Flauzino (Eds.) “Application of Expert Systems - Theoretical and Practical Aspects.” London, United Kingdom, IntechOpen, 2020 [Online]. Available from: <a href="https://www.intechopen.com/books/9401">https://www.intechopen.com/books/9401</a> doi: 10.5772/intechopen.85202</li> <li>Adane, N. T., &amp; Alemu, K. T. (2015, June 29). <i>A Quick Guide to an Introduction to Expert System Using PROLOG</i>.</li> <li></li> </ul>
<b>Periodicals ,website</b>	<b>Powerpoint presentations of all course materials</b> <b>All labs material</b> <b>[<a href="https://learn.sha.edu.eg/course/view.php?id=1364">https://learn.sha.edu.eg/course/view.php?id=1364</a>]</b>
<b>Videos link</b>	<b>Video of lectures and sections</b> <b>[<a href="https://drive.google.com/drive/folders/1CX8pLCVDMIVx2IY3_FlcXRd_tgA5cGBJ">https://drive.google.com/drive/folders/1CX8pLCVDMIVx2IY3_FlcXRd_tgA5cGBJ</a></b> <b><a href="https://drive.google.com/drive/folders/1pXT1mqUy3IYGnETTBcC4qq6zeMzb5Hld">https://drive.google.com/drive/folders/1pXT1mqUy3IYGnETTBcC4qq6zeMzb5Hld</a>]</b>

## 8- Required Facilities

To assess professional and practical skills given the following facilities:

a. Tools & SW (Technologies facilities):

- **CLIPS(C Language Integrated Production System) is rule-based programming language for building expert system**
- **Jess(Java Expert System Shell) an expert system shell and scripting language written entirely in Sun Microsystem's Java language**
- **Microsoft TEAMS to create virtual classrooms for lectures, discussions for project**
- **Academy Portal(MOODLE) to make electronic quizzes and electronic midterm exam**
- **Academy Portal(MOODLE) to upload project deliverable and assignment**
- **Academy portal(MOODLE) to upload electronic material**

b. Teaching facilities:

	<i>Lecture</i>	<i>class</i>	<i>Lab</i>
Whiteboard	used	-	used
Pc/laptop	used	-	used
Data show	used	-	used
Webinars	MS TEAMS	-	MS TEAMS
Social-Media	Facebook Page for 4 <sup>th</sup> year	-	Facebook Page for 4 <sup>th</sup> year
Chat-Room	Chat-Teams	-	Chat-Teams
Videos	Stream-MOODLE	-	Stream-MOODLE
Website	MOODLE	-	MOODLE

## 9- Course Matrices

### 9.1 Course Content/ILOs Matrix

Course Contents	a1	a2	b1	b2	c1	c2	d1	d2
Overview of expert systems	x							
Review of knowledge representation	x	x						
Review of inference techniques	x	x						
Introduction to rule-based expert systems	x	x	x	x				
Implementing rule-based ESs, Semantic Nets, Frames in prolog	x	x	x	x	x	x		
Case-based reasoning	x							
inexact reasoning	x	x						
inexact classification	x	x						
Knowledge acquisition	x							
Knowledge elicitation, extraction	x							
Applying the above concepts on different ES domains	x	x	x	x	x	x		
Selected Topics			x	x				
Course Project	x	x	x	x	x	x	x	x

### 9.2 Learning Methods /ILOs Matrix

Learning Methods	Knowledge and understanding		Intellectual skills		Professional and practical skills		General	
	a1	a2	b1	b2	c1	c2	d1	d2
Lectures	x	x	x	x				
Tutorial Exercises			x	x	x	x		
Reading material	x	x	x	x	x	x		
Websites search	x	x	x	x		x		
Research and reporting	x	x					x	x
Group work					x	x	x	x
Case study			x		x	x		
Practical Lab			x	x	x	x		
Discussions.			x	x	x	x	x	x

### 9.3 Assessment Methods /ILOs Matrix

Assessment Methods	Knowledge & understanding		Intellectual skills			Professional & practical skills		General	
	a1	a2	b1	b2	c1	c2	d1	d2	
Electronic Mid Term Exam	X	X	X	X					
Final Exam	X	X	X	X					
Electronic/hard copy Course Project	X	X	X	X	X	X	X	X	
Electronic /hard copy Course Work & Quizzes	X	X	X	X	X	X	X	X	
Practical Exam	X	X	X	X	X	X			

### 9.4 Course ILOs Vs Program ILOs

Course ILOs \ Prog ILOs		Knowledge & understanding			Intellectual skills					Professional and practical skills			General		
		A7	A12	A21	B1	B3	B4	B5	B10	C1	C5	C6	D5	D11	D12
Knowledge and Understanding	a1	√	√												
	a2		√	√											
Intellectual skills	b1				√		√	√							
	b2					√	√		√						
Professional and practical skills	c1									√	√	√			
	c2									√	√	√			
General skills	d1												√		
	d2													√	√

Course coordinator: Dr Khaled El-Menshawy ( )

Head of Department: Dr. Ahmed El Abbassay ( )

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