



# Course Specification

— (Postgraduate)

**Course Title: Knowledge Based Systems**

**Course Code: 501829-3**

**Program: Master in Artificial Intelligence**

**Department: Computer Science**

**College: Computers and Information Technology**

**Institution: Taif University**

**Version: V2**

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## A. General information about the course:

### 1. Course Identification:

**1. Credit hours: ( 3 )**

### 2. Course type

A.  University  College  Department  Track

B.  Required  Elective

**3. Level/year at which this course is offered: ( Year: 1, Level: 1)**

### 4. Course general Description:

Knowledge-based systems has two essential elements which are the knowledge representation and the reasoning methods. To develop a KBS system, issues on knowledge engineering, various types of knowledge representations, reasoning strategies and KBS architecture are explored. Specifically, some selected advanced topics such as rule-based system, semantics networks, logic representation, frame-based system, model-based reasoning, case-based reasoning, qualitative reasoning, and examples of industrial applications will be covered.

### 5. Pre-requirements for this course (if any):

None.

### 6. Co-requirements for this course (if any):

None.

### 7. Course Main Objective(s):

The purpose of this course is to expose students the fundamental theories of knowledge-based systems and the implementation aspects in solving real world problems.

### 2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	36	80%
2	E-learning	9	20%
3	Hybrid <ul style="list-style-type: none"> <li>▪ Traditional classroom</li> <li>▪ E-learning</li> </ul>	0	0%
4	Distance learning	0	0%

### 3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	-





3.	Field	-
4.	Tutorial	-
5.	Others (specify): Mid-Term and Final Exams	-
<b>Total</b>		<b>45</b>

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and understanding</b>			
1.1	Explain and discuss various types of knowledge representation techniques and reasoning methods.	<b>K1</b>	Lecture, Brainstorming, Discussion	<b>Direct:</b> Quiz, Exam <b>Indirect:</b> Survey
1.2	Elaborate the process of knowledge engineering	<b>K1</b>	Lecture, Brainstorming, Discussion	<b>Direct:</b> Quiz, Exam <b>Indirect:</b> Survey
<b>2.0</b>	<b>Skills</b>			
2.1	Analyze and conduct a simple knowledge engineering practical exercise.	<b>S1</b>	Lecture, Problem Solving	<b>Direct:</b> Exam, Quiz, Project <b>Indirect:</b> Survey
2.2	Develop a small scale KBS (for example, expert system, case-based reasoning, qualitative reasoning etc.).	<b>S2</b>	Lecture, Project, Problem Solving	<b>Direct:</b> Exam, Quiz, Project <b>Indirect:</b> Survey
<b>3.0</b>	<b>Values, autonomy, and responsibility</b>			
3.1	Function effectively as a member or leader of a team engaged in activities appropriate to the field of machine learning.	<b>V2</b>	Discussion, Problem Solving	<b>Direct:</b> Project, Presentation <b>Indirect:</b> Survey

## C. Course Content:

No	List of Topics	Contact Hours
1.	Knowledge engineering – types of knowledge, knowledge acquisition, principles of knowledge engineering, modeling process, techniques, and tools	12
2.	Knowledge representations – rule-based system, semantic nets, logic, frame-based system,	9





3.	Reasoning – Backward chaining and Forward chaining in expert system, case-based reasoning, model-based reasoning, and qualitative reasoning	9
4.	Building KBS system: Identification of industrial problem	3
5.	Building KBS system: Knowledge modeling	3
6.	Building KBS system: Reasoning mechanism	3
7.	Building KBS system: Knowledge coding	6
<b>Total</b>		<b>45</b>

#### D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz 1: Knowledge engineering	3rd week	10%
2.	Quiz 2: Knowledge representation	6th week	10%
3.	Quiz 3: Reasoning	9th week	10%
4.	Student presentation on System Demo	14th week	30%
5.	Final Exam – all topics	15th Week	40%

\*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

#### E. Learning Resources and Facilities:

##### 1. References and Learning Resources:

<b>Essential References</b>	<ul style="list-style-type: none"> <li>Thomas B Cross. Knowledge Engineering 2017. Techtionary.com, 2017. (<a href="http://techtionary.com/books/knowledge-engineering/index.pdf">http://techtionary.com/books/knowledge-engineering/index.pdf</a>)</li> <li>Kendal Simon and Creen Malcolm. An Introduction to Knowledge Engineering, Springer 2007. DOI 10.1007/978-1-84628-667-4, eBook ISBN: 978-1-84628-667-4</li> <li>Cornelius Leondes, Knowledge-based Systems: Techniques and Applications, Four Volume set, (2000). eBook ISBN: 9780080535289.</li> </ul>
<b>Supportive References</b>	<ul style="list-style-type: none"> <li>Other references will be suggested in the classroom</li> </ul>
<b>Electronic Materials</b>	<ul style="list-style-type: none"> <li><a href="https://www.sanfoundry.com/best-reference-books-introduction-knowledge-based-systems-applications/">https://www.sanfoundry.com/best-reference-books-introduction-knowledge-based-systems-applications/</a></li> <li><a href="http://www.oas.org/en/topics/knowledge_society.asp">http://www.oas.org/en/topics/knowledge_society.asp</a></li> </ul>
<b>Other Learning Materials</b>	<ul style="list-style-type: none"> <li>Links provided by the instructor.</li> <li>Handouts and Presentations Slides prepared by the instructor.</li> </ul>



- Blackboard.

## 2. Educational and Research Facilities and Equipment Required:

Items	Resources
<b>facilities</b> (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<ul style="list-style-type: none"> <li>▪ Classroom (20 students/class)</li> <li>▪ Computer labs</li> </ul>
<b>Technology equipment</b> (Projector, smart board, software)	<ul style="list-style-type: none"> <li>▪ Video projector / data show</li> <li>▪ White board</li> </ul>
<b>Other equipment</b> (Depending on the nature of the specialty)	<ul style="list-style-type: none"> <li>▪ To be announced during the course!</li> </ul>

## F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
<b>Effectiveness of teaching</b>	Students Coordinator	<b>Indirect</b> (Course exit survey) <b>Indirect</b> (Feedback from Course Coordinator)
<b>Effectiveness of students assessment</b>	Faculty member Coordinator	<b>Indirect</b> (Feedback from Faculty member) <b>Indirect</b> (Feedback from Course Coordinator)
<b>Quality of learning resources</b>	Students Faculty member Coordinator Council Curriculum Committees	<b>Indirect</b> (Course exit survey) <b>Indirect</b> (Feedback from Faculty member) <b>Indirect</b> (Feedback from Course Coordinator) <b>Indirect</b> (Feedback from council) <b>Indirect</b> (Feedback from Graduate Committees)
<b>The extent to which CLOs have been achieved</b>	Students Faculty member Coordinator Curriculum Committees	<b>Indirect</b> (Course exit survey) <b>Indirect</b> (Feedback from Faculty member/ Course Coordinator/ Graduate Committee)
<b>Other</b>	-	-

**Assessor** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval Data:

<b>COUNCIL /COMMITTEE</b>	<b>GRADUATE PROGRAMS COMMITTEE – CS DEPT.</b>
<b>REFERENCE NO.</b>	<b>V2</b>
<b>DATE</b>	<b>5/5/2024</b>