



COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ITCS 413 - Intelligent Systems

Weight: (2 - 2 - 3)

Prerequisite: ITCS 303

NQF Level Allocated: Level 8

NQF Notional Hours / Credits: 120 notional hours/ 12 NQF credit

Description:

This course is to cover the specialist theory, concepts, and methods of intelligent systems. It enables students to solve complex problems using various Artificial Intelligence (AI) techniques, and to develop effective intelligent systems using range of AI tools. It covers the concepts of intelligent agent and problem formulation; search-based problem solving techniques, such as A*; knowledge-based problem solving techniques: knowledge representation, knowledge reasoning, and expert systems.

Objective:

1. To critically understand the specialist theories, principles, and concepts of AI.
2. To study and critically analyze various AI techniques and knowledge representation methods including semantic nets, frames, propositional calculus, predicate calculus, and production system.
3. To solve complex real world problems using AI methods.
4. To develop effective AI systems using specialized AI tools and techniques.

SEMESTER:

ACADEMIC YEAR:

INSTRUCTOR:

OFFICE TEL:

EMAIL:

Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding		NQF Descriptor/ Level
A1	Concepts and Theories: Demonstrate critical knowledge and understanding of specialist theories, principles, concepts, and detailed knowledge of some of AI techniques and applications.	Knowledge: theoretical understanding [Level 8]
A2	Contemporary Trends, Problems and Research: N/A	N/A
A3	Professional Responsibility: N/A	N/A
B. Subject-specific Skills		NQF Descriptor/ Level
B1	Problem Solving: Identify and critically analyze problems, and solve these problems using range of specialized skills, and techniques of AI.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
B2	Modeling and Design: Formulate problems and knowledge, and design components needed to implement intelligent systems to meet the desired needs within realistic constraints.	Knowledge: Practical Application [Level 8]
B3	Application of Methods and Tools: Apply specialized AI tools and techniques to implement intelligent system components.	Knowledge: Practical Application [Level 8] Skills: Communication, ICT & Numeracy [Level 8]
C. Critical-Thinking Skills		NQF Descriptor/ Level
C1	Analytic skills: Critically evaluate AI algorithms, methods, and techniques in terms of efficiency, optimality, and completeness.	Generic Problem Solving & Analytical skills [Level 8]
C2	Synthetic: Integrate different AI components in order to develop effective and efficient intelligent system.	Generic Problem Solving & Analytical skills [Level 8]

C3	Creative Thinking and innovation:	N/A	N/A
D. General and Transferable Skills (other skills relevant to employability and personal development)			NQF Descriptor/ Level
D1	Communication: Demonstrate ability to communicate information in appropriate oral and written forms to a variety of audience.	Communication, ICT and Numeracy Skills [Level 8]	
D2	Teamwork and Leadership: Work effectively as a member/leader of a team in order to complete a pre-defined project.	Competence: Autonomy, Responsibility and Context [Level 8]	
D3	Organizational and Developmental Skills: Demonstrate ability to organize ideas and effectively allocate time in given assignments.	Competence: Autonomy, Responsibility and Context [Level 8]	
D4	Ethics and Social Responsibility:	N/A	N/A

Course Structure (Outline)

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Week	Hours		ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
	Lec.	Lab				
1	2	2	A1	Introduction And Intelligent Agents: AI and Intelligent Agent Concepts	Lecture/ Class Discussion	
2	2	2	A1, B2, B3	Problem Solving: Problem Definition And Formulation, Problem Solving Agents.	Lecture/ In-Class Supervised Work/ Lab Demonstration	In-Class Exercises/ In-Lab-Exercises
3	2	2	A1, B2, B3	Search-Based Problem Solving: Search Space Graph and Tree	Lecture/ In-Class and In-Lab Supervised Work	In-Class Exercises/ In-Lab-Exercises
4	2	2	A1, B1, B3, C1	Search-based Problem solving: Simple And Uniformed Search Strategies	Lecture/ In-Class and In-Lab Supervised Work	In-Class Exercises/ In-Lab-Exercises

5-6	4	4	A1, B1, B2, B3, C1, D3	Search-Based Problem Solving: Best First Search: Greedy, A* Search, Hill Climbing Algorithms	Lecture/ In-Class and In-Lab Supervised Work / Independent Learning	Assignment 1/ Lab Project1 (Week6)
7	2	2	A1, B3	Knowledge-Based Problem Solving: Concepts, Components	Lecture/ Lab Demonstration	Oral Participation/ In-Lab-Exercises
8	2	2	A1, B2, B3	Knowledge Representation: Propositional Logic, First Order Logic	Lecture/ In-Class Supervised Work / Lab Demonstration	In-Class Exercises/ In-Lab-Exercises
9	2	2	A1, B2, B3	Knowledge Representation: Production Rules	Lecture/ Lab Demonstration	Oral Participation/ In-Lab-Exercises
10	2	2	A1, B2, B3, C1	Knowledge Representation: Semantic Network, Frames And Objects	Lecture/ In-Class and In-Lab Supervised Work	Major Test/ In-Lab Exercises
11	2	2	A1, B3	Knowledge and Reasoning: Inference Engine	Lecture/ In-Lab Supervised Work	In-Lab Exercises
12	2	2	A1, B1, B3, C1	Knowledge and Reasoning: Forward And Backward Chaining	Lecture/ In-Class and In-Lab Supervised Work/ Debate	In-Class Exercises/ In-Lab Exercises
13	2	2	A1, B1, B3, C2, D3	Knowledge Based Systems: Concepts And Development	Lecture/ In-Lab Supervised Work / Independent Learning	Assignment 2/ In-Lab Exercises
14	2	2	A1, B1, B3, D3	Expert Systems	Lecture/ In-Lab Supervised Work	Lab Project2

15	2	2	B1, B2, B3, C1, C2, D1, D2, D3	Student Projects	Project Supervision	Evaluation of Project Report and Presentation
16	2	-	A1, B1, B2, C1, C2	All Topics		Final Exam

Teaching Materials:

Textbook(s):	1. Vinod Chandra S.S. and Anand Hareendran S. (2014) <i>Artificial Intelligence and Machine Learning</i> , PHI Learning, 1 st Edition, ISBN: 9788120349346
Handout(s):	Available on Moodle i.e. http://www.ahlia.edu.bh/moodle
Reference(s):	<ol style="list-style-type: none"> Alberich-Bayarri, A., Pastor, A.J., González, R.L. and Castro, F.G., (2019). How to Develop Artificial Intelligence Applications. In <i>Artificial Intelligence in Medical Imaging</i>. Springer, Cham. Slade, Stephen. (2017), <i>Artificial Intelligence Applications on Wall Street</i>. Routledge. Negenvistsky M. (2011) <i>Artificial Intelligence: A Guide to Intelligent Systems</i>, 3rd Edition, Pearson. Brachma R. J. and Levesque H. J. (2004) <i>knowledge representation and reasoning</i>, Morgan Kaufmann. Association for Advancement of Artificial Intelligence (AAAI) Website: http://www.aaai.org/home.html

ASSESSMENTS:

Type of Assessment	Description	ILOs	Weighting
Assignments	Students will be asked for two assignments, each worth 5%. The purpose of the assignments is to assess students where they have to demonstrate their extensive and detailed knowledge and critical understanding of key concepts, theories, methods, tools and techniques of AI. The assignment will also assess students' skills to solve and analyze different AI techniques, methods and tools.	A1, B1, B2, C1, D3	10%
Lab Projects	Students will be asked to develop two small programs, one using a procedural language to implement a search algorithm, and the second is to use AI language, such as PROLOG, to develop small intelligent software. Each worth 5%.	B1, B2, B3, D3	10%

Major Test	The major Test will be an in-class 90 minutes exam that will consist of short-answer, essay, and problem solving questions and cover the topics studied in the first 9 weeks.	A1, B1, B2, C1	20%
Project	Starting from week 4, the class will be divided into teams of 4-5 students and each will be asked to develop an intelligent system for solving hard problem using research-based or knowledge-based techniques. Students have to study the problem, plan and execute AI application. In the final week, each team will have to submit their research report explaining the research problem, research methods used, analysis and the conclusion highlighting the research findings and results. The report must explain precisely the work accomplished by each student. Each team will be required to make a presentation summarizing the research conducted and its findings. Each team member has to participate in the presentation. Team-based work will be examined and evaluated as a whole as well as the individual work of each student. Team members will be tested individually during the presentation by peers and the instructor.	B1, B2, B3, C1, C2, D1, D2, D3	20%
Final Exam	The final exam is comprehensive and of two hours duration. It will consist of short-answer, essay and problem-solving questions in AI.	A1, B1, B2, C1, C2	40%
In-Lab Exercises	Each of the lab exercises consists of a set of practical tasks to be implemented by students individually in class as shown in the above weekly structure. Students work will be observed and directly during the lab sessions.	B3	Formative
In-Class Exercises	In-class exercises consist of problem solving and analysis questions.	B1, B2, C1	Formative
Oral Participation	Students will be questioned orally to demonstrate their understanding and knowledge of the topics covered during class lectures.	A1	Formative
Overall			100%

Admissions	
Minimum number of students	5
Maximum number of students	20

Ahlia University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.ahlia.edu.bh/integrity for more information).