

<b>Identification</b>	<b>Department</b>	Computer Science
	<b>Program</b>	Undergraduate
	<b>Subject</b>	CMS 415 – Artificial Intelligence – 3 KU (6 ECTS) credits
	<b>Term</b>	Spring 2023
	<b>Instructor</b>	<b>Mohammad AL-Qudah</b>
	<b>E-mail</b>	Mohammad.ali@khazar.org
	<b>Classroom/hours</b>	11 Mehseti str. (Neftchilar campus)
<b>Prerequisites</b>	CMS 215 Data Structures and Algorithms	
<b>Language</b>	English	
<b>Compulsory/Elective</b>	Electives	
<b>Text books and course materials</b>	<p><b><u>Core Textbooks:</u></b></p> <ol style="list-style-type: none"> <li>1. Michael Negnevitsky, Artificial Intelligence: Intelligent Systems Approach, 3/E, ISBN: 9781408225745, 2011.</li> <li>2. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Global Edition 3/E, ISBN: 9781292153964, 2017.</li> </ol> <p><b>Supplementary textbook</b></p> <p>1- Alberto Artasanchez; Prateek Joshi, Artificial Intelligence with Python: Your complete guide to building intelligent apps using Python 3.x and TensorFlow 2, 2nd Edition, ISBN 9781839219535, Publisher: Packt Publishing, Published: January 2020.</p>	
<b>Teaching methods</b>	<b>Case analysis</b>	
	<b>Group discussion</b>	+
	<b>Lab</b>	+
	<b>Lecture</b>	+
	<b>Course paper</b>	+

	<b>Others</b>	
<b>Evaluation Criteria</b>	<b>Methods</b>	<b>Percentage (%)</b>
	<b>Midterm Exam</b>	<b>30%</b>
	<b>Case studies</b>	
	<b>Activity</b>	<b>5%</b>
	<b>Quizzes (4)</b>	<b>15%</b>
	<b>Project (1)</b>	<b>10%</b>
	<b>Presentation</b>	
	<b>Laboratory Work (Assignments)</b>	
	<b>Final Exam</b>	<b>40%</b>
	<b>Other</b>	
	<b>Total</b>	<b>100%</b>
<b>Course objectives</b>	<p>This course provides students with the main fundamentals of Artificial Intelligence (AI). The course covers the main techniques that are used in AI examples (from chess-playing to self-driving cars). These techniques include search algorithms, probability, reasoning and inference, programming logic, expert systems, rule-based systems, fuzzy logic, machine learning, knowledge representation, pattern recognition, and natural language processing. The course helps students to use AI to solve specific problems in their future careers. The theoretical part of the course focuses on understanding concepts, structures, and algorithms, while the practical part (practical) includes a set of exercises to be performed using AI tools such as CLIPS,python, and Matlab.</p>	

<p><b>Learning outcomes</b></p>	<p>By successfully completing this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Know the definition of AI, the foundation of AI, and the different applications.</li> <li>2. Ability to define the rational agents and their environment</li> <li>3. Distinguish the characteristics and structure of each intelligent agent environment.</li> <li>4. Know how to describe a goal-based agent</li> <li>5. Define the main elements that constitute a problem and its solution with different examples</li> <li>6. Provide search techniques that use search trees and blind search tools</li> <li>7. Ability to provide search techniques under partial information with the ability to avoid repeated states</li> <li>8. Ability to write intelligent agent programs</li> <li>9. Provide an informed search strategy that uses problem-specific knowledge such as best-first search, greedy best-first search, A* search, and others.</li> <li>10. Examine the nature of heuristics in 8-puzzle and explore local search algorithms</li> <li>11. Explore search spaces systematically and optimization problems in both discrete and continuous spaces using online and offline searches</li> <li>12. Know the main features of CSP (Constraint Satisfaction Problems) and apply a backtracking search for CSP</li> <li>13. Apply the constraint graph using connected components and tree decomposition</li> <li>14. Explain the state of games and define the different optimal decision strategies such as the minimax algorithm.</li> <li>15. Use pruning search strategies to reach the goal quickly such as Alpha-Beta pruning.</li> <li>16. Provide an overview of all the fundamental concepts of logical representation and reasoning.</li> </ol>
---------------------------------	--

<b>Course outline</b>	<p>This course provides the student with the opportunity to learn the basics of Introduction to the tools, techniques, and concepts of Artificial Intelligence. The course combines theoretical foundations with practical applications. Topics include problem-solving, principles of knowledge representation and reasoning and learning methods of artificial intelligence. but students are expected to have a good understanding of the computing environment and concepts.</p>
<b>Course policy</b>	<p><b>Attendance</b></p> <p><i>Attendance is very important for the course. In accordance with university policy, students missing more than 25% of total classes are subject to failure. Penalties may be assessed without regard to the student's performance. Attendance will be recorded at the beginning or end of each class.</i></p> <p><b>Exams</b></p> <p><i>All exams will be CLOSE-BOOK; necessary algorithms/equations/relations will be supplied as convenient.</i></p> <p><b>Make ups:</b></p> <p><i>Unless arrangements are worked out in advance, missed assignments <b>cannot</b> be made up, and 10% per week will be deducted for late submissions. Exams' makeup must go through the department and faculty approvals process.</i></p> <p><b>Homework and Assignments:</b></p> <p><i>Several Lab assignments will be assigned. Most assignments will be submitted electronically using the teams or email system. <b>Homework and assignments must be submitted <u>before</u> their corresponding due date and time, as indicated in the assignment description.</b> Late submissions will be assessed a 10% penalty per day. All Lab Assignments must be submitted before the start of the next lab week and will not be graded thereafter.</i></p>

	<p><b><i>In-Class Computers and Handheld Devices:</i></b>  <i>Phone calls, text messages, instant messages, email, and general web surfing are <b>not allowed</b> during class time. Computers may only be used to follow the material in class. Violators will have their devices confiscated or asked to leave the room</i></p> <p><b><i>Cheating:</i></b>  <i>In this course, <b>all</b> assignments, exams, and project submissions implicitly imply that it is the sole work of the author, unless joint work is explicitly authorized. Help may be obtained from the instructor or other students to understand the description of the problem and any technology, but the solution must be the student's own work. If joint work is authorized, all contributing students must be listed on the submission. Any deviation from this is considered a cheating attempt, and as a minimum, will result in failure of the submission and as a maximum reporting the incident to the department and the faculty to apply the University rules.</i></p>
--	--

Tentative Schedule			
Week	Date/Day (tentative)	Topic	Textbook Assignments
1		Introduction to Artificial Intelligence State of the art of AI	Chapter 1 from Modern Approach book
2		Intelligent Agents	chapter2 from Modern Approach book)
3		Problem Solving and Search Algorithms 1st quiz and First Assignment	chapter3-and- 4 from Modern Approach book)
4		Continue Problem Solving and Search Algorithms	chapter3-and- 4 from Modern Approach book)
5		Game Playing and Constraint Satisfaction Problems  2nd Quiz	chapter6 from Modern Approach book).
6		Rule-based expert systems  Second Assignment	Chapter 02 from Intelligent Systems Approach book)
7		>>Continue Rule-based expert systems  Review midterm exam  • Start new topicFuzzy expert systems	Chapter04 and Chapter 05 from Intelligent Systems Approach book)
8		Midterm Exam	

9		Machine Learning Artificial Neural Networks – Supervised Learning Artificial Neural Networks – Unsupervised Learning Third Assignment	Chapter 07 Chapter 08 From A Modern Approach book
10		Evolutionary computation Evolutionary Computation – Genetic Algorithms) 3th Quiz	Chapter 09 From A Modern Approach book
11		Hybrid intelligent systems Neural Expert Systems and Neuro-fuzzy Systems Evolutionary Neural Networks and Fuzzy Evolutionary Systems	Chapter 11  Chapter 12 From A Modern Approach book
12		Reinforcement Learning	Chapter21 From A Modern Approach book
13		Natural Language Processing 4th Quiz	Chapter22 From A Modern Approach book
14		Continue Natural Language Processing	Chapter22 From A Modern Approach book
15		Project Presentation and review the material for final exam	
16		Final Exam	

This syllabus is a guide for the course and any modifications to it will be announced in advance

