

**Jerash University**

**Faculty of Computer Science and Information Technology**

**Computer Sciences Department**

**Semester**: Fall Semester 2018/2019

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| **Course symbol and number:** 1001310 | **Course Name:** الذكاء الاصطناعي |
| **Teaching Language:** English | **Prerequisites:** 1001223 |
| **Credits:** 3 hours**.** | **Course Level:** 300 |

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| **Course Description** |
| This course offers a selective survey of key concepts and applications of artificial intelligence, and an introduction to a language commonly used for building AI systems. This includes types of problems and techniques in Artificial Intelligence. Problem-Solving methods. Major structures used in Artificial Intelligence programs. Study of knowledge representation techniques such as predicate logic, non-monotonic logic, and probabilistic reasoning. Application areas of AI such as game playing, expert systems, natural languages understanding and robotics. Project assignments in one of the AI programming languages.  Students study AI techniques in a variety of contexts with an emphasis on:  1. Generalizing search algorithms; topics include graphs, heuristics, optimization, recursion, pruning, and games.  2. Knowledge representation; topics include image processing, machine vision, constraint solvers, agent based modeling, and learning. |

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| **Course Objectives** |
| The goal is to introduce students to basic AI systems and tools for solving NP problems.   * Gain a historical perspective of AI and its foundations and establish the cultural background against which it has developed. * Know characteristics of programs that can be considered "intelligent". * Provide a thorough understanding of the types of problems solved using AI techniques and understand the different strategies for state space search. * Write prolog programs to solve AI problems. * Know a thorough treatment of the different types of heuristic search * Explore constraint satisfaction problems whose states and goal test conform to a standard, structured, and very simple representation. * Know classical examples of artificial intelligence such as game playing. |

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| **Learning Outcomes** |
| Upon completion of this course, the student will be able to:  1. Describe artificial intelligence.  2. Compare and contrast intelligent agents.  3. Describe and discuss knowledge.  4. Create an appropriate knowledge base for a given application.  5. Construct selection criteria using predicate calculus.  6. Compare and contrast various searching techniques.  7. Appraise various reasoning categories for a given knowledge base.  8. Discuss various forms and stages of learning.  9. Appraise the role of logic programming in expert systems applications.  10. Describe the role of knowledge engineering in expert systems development.  11. Construct objects, relationships, facts, rules, variables, input facilities, and file processing using a logic programming language.  12. Compose solutions with functional logic, resolution and unification, and negation as failure using a logic programming language. |

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|  | **Text Book(s)** |
| **Title** | Artificial Intelligence: A Modern Approach |
| **Author(s)** | Russell & Norvig |
| **Publisher** | Pearson |
| **Year** | 2016 |
| **Edition** | Third Edition |

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|  | **References** |
| **Books** | Luger, G.F. (2008). Artificial Intelligence Structures and Strategies for Complex Problem Solving. 6th edition, Pearson. ISBN: 0321545893. |
| **Internet links** | http://www.jpu.edu.jo/lms |
| **Course link** | [Click here](http://www.jpu.edu.jo/lms) |

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|  | **Instructors** |
| **Instructor** | Dr. Ghaith M. Jaradat |
| **Office Location** | الطابق السادس - 612 |
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| **Topics Covered** | | | |
| **Topics** | **Chapters in Text** | **Week number** | **Teaching hours** |
| **Introduction to AI:**   * Definition of AI, the foundation of AI, and the different application. | Chapter 1 | 1 | 3 |
| **Intelligent Agents:**   * Definition, types and environments. * Define the rational agents and its environment * Distinguish the characteristics and structure of each intelligent agent environment. * Know how to describe goal-based agent. | Chapter 2 | 2, 3 | 6 |
| **Assignment 1** |  |  |  |
| **Problem Solving:**   * Problem solving by searching (case studies). * Uniformed Search (Strategies). * Define the main elements of that constitute a problem and its solution with different examples. * Provide search techniques that use search tree and blind search tools. * Provide search techniques under partial information with ability to avoid repeated states. | Chapter 3 | 4, 5, 6 | 9 |
| **Informed (heuristic) Search Algorithms:**   * Best-first search, Greedy best-first search and A\* Search. * Heuristics and memory bounded A\* Search. * Provide informed search strategy that uses problem specific knowledge such as best first search, greedy best first search, A\* search and others. * Examine the nature of heuristics in 8-puzzle and explore local search algorithms. | Chapter 4 | 7, 8 | 6 |
| **Assignment 2** |  |  |  |
| **First Exam** |  |  |  |
| **Games & Adversarial Search:**   * Search methods to find optimal strategy and approximation approaches. * Explain the state of games and defining the different optimal decisions strategies such as minim ax algorithm. * Use pruning search strategies to reach the goal quickly such as Alpha-Beta pruning. | Chapter 5 | 9 | 3 |
| **Constraint Satisfaction Problems:**   * Definition, types, strategies and Heuristics. * Constraint Propagation and algorithms, and hard satisfiability problems. * Know the main features of CSP and apply backtracking search for CSP. * Apply the local search for CSP. * Apply the constraint graph using connected components and tree decomposition. | Chapter 6 | 10 | 3 |
| **Logical Agents:**   * Concepts of logic, inference and Knowledge base. * Knowledge representation and Propositional logic. * Provide an overview of all the fundamental concepts of logical representation and reasoning. * Provide the concepts of propositional logic PL and its semantics with depth reasoning patterns in PL. | Chapter 7 | 11, 12 | 6 |
| **Assignment 3** |  |  |  |
| **Second Exam** |  |  |  |
| **First-Order Logic:**   * Characteristics, relations and models of FOL. | Chapter 8 | 13 | 3 |
| **Inference in FOL:**   * FOL inference techniques. | Chapter 9 | 14 | 3 |
| **Uncertainty:**   * Probability, conditional independence, Bayes rule and Naïve Bayes classifier. | Chapter 13 | 15 | 3 |
| **Prolog:**   * Write intelligent agent programs using prolog. | Chapter 15 | 16 | 3 |
| **Assignment 4** |  |  |  |
| **Final Exam** |  |  |  |

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|  | **Evaluation** |  |
| **Assessment Tool** | **Expected Due Date** | **Weight** |
| Programming assignments and LMS |  | 20 % |
| First Exam |  | 20 % |
| Second Exam |  | 20 % |
| Final Exam | According to the University final examination schedule | 40 % |

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|  | **Policy** |
| **Attendance** | Attendance is very important for the course. In accordance with university policy, students missing more than the allowed absence rate 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. |
| **Exams** | All exams will be CLOSE-BOOK; necessary algorithms/equations/relations will be supplied as convenient. |

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| **Class Schedule & Room** |

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| **Office Hours** | | |
| Sun: 11-12:30  Mon: 9:30-11  Tues: 11-12:30  Wed: 9:30-11 | | |
|  | \* Or by an appointment through email |  |

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|  | **Teaching Assistant** |
| To announced later on. |  |

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|  | **Prerequisites** |
| **Prerequisites by course** | 1001223 |