King Saud University
College of Computer and Information Sciences
Department of Computer Science

Course Syllabus
- CSC 361 -

Semester: Spring 2025
Course Title: Artificial Intelligence
Credit Hours: 3
Instructor: Prof. Hassan Mathkour-section 11453 **(**mathkour@ksu.edu.sa**)**
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Prof. Mohamed Maher Ben Ismail (mbenismail@ksu.edu.sa)

Website: http://staff.ksu.edu.sa/mbenismail
Office hours: Check the course website.

Goals of the course: The course provides an introduction to artificial intelligence. Topics include problem-solving using search (uninformed search, informed search, local search, constraint satisfaction problems, adversarial search), knowledge representation and inference procedures (propositional logic and first-order logic), and an introduction to machine learning.

Recommended textbooks:
Artificial Intelligence: A modern approach, Stuart Russell & Peter Norvig, Prentice Hall, (4^{th} edition, 2021).

Course Learning Outcomes:
Upon the completion of this course, the student should be able to:

- Understand what constitutes "Artificial" Intelligence and how to identify systems with artificial intelligence.
- Understand various Al search algorithms (uninformed, informed, local search, genetic algorithms, constraint satisfaction, adversarial search).
- Understand the fundamentals of knowledge representation (Propositional logic and First order logic) and inference.
- Develop an understanding of machine learning.
- Apply Artificial Intelligence techniques for problem-solving.
- Conduct a literature review about an Al-related topic in a small group and prepare a report.
- Communicate the literature review findings effectively in a seminar setting.

- Design and implement a simple Artificial Intelligence system.

Topics (tentative):

Introduction + History, Problem formulation, Uninformed search, Informed search and heuristics, Local search, Adversarial search, Adversarial search and Game playing, Constraint Satisfaction Problem, Markov Networks and Bayesian Networks, Markov Decision Process, First Order Logic and inference in FOL, Introduction to Machine Learning.

List of Topics	# Weeks	Contact Hours	List of Topics
Introduction + History	0.5	1.5	Introduction + History (Ch. 1 & Ch. 2) ▪ Overview of AI problems, Examples of successful recent AI applications. ▪ Definitions of agents with examples (e.g., reactive, deliberative)
Problem formulation	1	3	Problem formulation (Ch. 3) ▪ Toy problems ▪ Real-world problems
Uninformed search	1	3	Uninformed search (Ch. 3) ▪ Breadth-first search ▪ Depth-first search (+ With iterative deepening) ▪ Uniform cost search
Informed search and heuristics	1	3	Informed search and heuristics (Ch. 3) ▪ Heuristic construction, heuristic functions ▪ Greedy best-first search ▪ A* search
Local search	1.5	4.5	Local search (Ch. 4) ▪ Hill-climbing ▪ Local minima and the search landscape (Local vs global solutions) ▪ Genetic algorithms
Adversarial search	1	3	Adversarial search (Ch. 5) ▪ Games ▪ Optimal decisions in games ▪ Alpha-Beta pruning
Constraint Satisfaction Problem	1.5	4.5	Constraint Satisfaction Problem (Ch. 6) ▪ Constraint propagation ▪ Backtracking ▪ Local search
Logical Agent	1	4	Logical Agent and Propositional Logic (Ch. 7) ▪ Propositional logic ▪ Agents based on Propositional logic
First-Order Logic and inference in FOL	1.5	4.5	First Order Logic and Inference in FOL (Ch. 8 & Ch. 9) ▪ Using FOL ▪ Propositional Vs FO inference ▪ Forward chaining ▪ Backward chaining ▪ Resolution
Introduction to Machine Learning	2	6	Introduction to Machine Learning (Ch. 18) Forms of learning Supervised learning DTrees

Markov Networks and Bayesian Networks	1.5	4.5	Probabilistic reasoning (Ch. 14) ▪ Knowledge representations ▪ Semantics of Bayesian Net ▪ Exact inference in BN
Markov Decision Process	1.5	4.5	Making Complex Decisions (Ch. 17) ▪ Markov Decision Process ▪ Search vs MDP ▪ Policy, return, value and Q-value ▪ Bellman Equation ▪ Policy Iteration
Total	**15**	**45**	**Total**

Evaluation:

- Homework (5%)
- Quizzes (5%)
- Midterm exams (x2) (40%)
- Project (10%)
- Final exam (40%)

Notes for email communication:

- Your email header must start with *CSC361*
- File names must be “name of the task name-student ID”
- Send your email to mbenismail@KSU.edu.sa email address.
- Please write your name and your ID at the end of the email

Collaboration and attendance policies:

- Discussions about the course material are highly recommended. However, the student is not allowed to look at or copy any part of any homework or exam of other students. Plagiarism or cheating will not be tolerated, and a student caught with it will have an F grade.
- A student with an absence rate of more than 25% will be denied attending the final exam. An excuse for being absent is accepted only if it is legitimate and submitted within one week of the absence date.