# ADA University, School of IT and Engineering

**CSCI 3613 – Artificial Intelligence**


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| **Instructor:** | **Samir T. Mammadov** |
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| **Office:** | **B315** |
| **Office hours:** | **Wednesday, 13:00-15:00** |
| | **Saturday, 16:00-18:00** |
| **Schedule:** | **Tuesday/Thursday, 8:30-9:45, B301 (10110)** |
| | **Thursday/Saturday, 14:30-15:45, B302 (10111)** |


## Synopsis

Artificial Intelligence (AI) is a broad and fast-growing subfield of Computer Science concerned with the construction of Intelligent Agents. This course provides an overview of methods, history, and impact of AI. It covers problem solving, heuristic search, planning, game playing, reasoning with propositional and predicate logic, reasoning under uncertainty, machine learning, applications (natural language processing, vision, robotics, as time permits). Students will solve a variety of AI problems using Python.

## Outcomes

Upon successful completion of this course, you should be able to:

- Formulate search problems and implement search algorithms using admissible heuristics.
- Formulate constraint satisfaction problems and find solutions using constraint graphs.
- Describe games as adversarial search problems and implement optimal and efficient solutions.
- Formulate nondeterministic search as Markov decision processes and solve the Bellman equations in reinforcement learning contexts.
- Formulate Bayes' nets for stochastic problems and use them to solve inference problems.
- Solve temporal applications using hidden Markov models and filtering algorithms.

## Prerequisites

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## Reading

Primary sources:

- Russell, S., Norvig, P. *Artificial Intelligence: A Modern Approach*, *4th edition.* 2022.
- Sutton, R., Barto, A. *Reinforcement Learning, 2nd edition.* 2018.

## Grading

- **Assignments** **40%**
- **Project** **20%**
- **Final** **40%**

## Topics

The following list gives an overview of the core topics intended to be covered during the semester. This list is not absolute and due to changes, by adding or removing some topics, as the instructor considers necessary.

- **Search**
  - **Uninformed Search**
  - **Informed (Heuristic) Search**

    - **Constraint Satisfaction Problems**
- **Games**
    - **Minimax**
    - **Alpha-Beta Tree Search**
    - **Monte Carlo Tree Search**
    - **Expectiminimax**
- **Uncertainty**
    - **Probabilistic Reasoning**
    - **Bayes Nets**
    - **Hidden Markov Models**
    - **Markov Decision Processes**
- **Reinforcement Learning**
    - **Learning from Rewards**
    - **Policy Search**

## Resources

**Support services on campus:**

- Students are encouraged to consult with the Writing Center for checking their papers and assignments. Please visit the Writing Center or contact them by email: writingcenter@ada.edu.az
- Adjusting to student life, pursuing academic and personal goals can be emotionally stressful and challenging. Students are encouraged to make individual appointments with the Office of Student Success to receive professional and psychological support. Please contact the Office of Student by email: studentsuccess@ada.edu.az

**Tips for success**

Students will need to read the course readings throughout the term to learn the material and to be able to contribute to class discussions.

Here are some words of wisdom from Dr. Morgan Liu of The Ohio State University on "How to Read an Academic Book or Article": Reading an academic article/book is not like reading a newspaper or novel. Following these guidelines will help keep you from being overwhelmed, and make you better prepared for discussions & essays.

1. Read actively, not passively. You read because you are trying to mine the text for insights. You are not reading because you have to get through it. Take an active posture while reading: you are trying to take something away from the reading.
2. Before you begin, ask yourself: what is my purpose for reading this? First ask yourself: What topic is the course covering this week? What are the active issues and recurrent themes? What sorts of insights do I hope to get out of the reading? The Reading Questions will help you get a grip.
3. Do not always read from start to finish. Read the introduction or opening paragraphs. Then skip to the back and read the conclusion to see where the thing is going. Flip through the article/book and take note of the section or chapter titles. Read the beginning & end of each section to see what they're about. Stop. Think about what this article/book is trying to accomplish and how it will get there. Get a sense of the overall arguments first, and how the author will develop them. Then step back, close your eyes and think, what are the most important parts that I must read? What can I skim over for now?
4. Read selectively. Do not read every word in the text. Read the most important parts first, and see what else you need to read as you go. You can always go back. You have my permission to skip the less important parts – no guilt, really!! But you got to be thoughtful to figure what those are. Better to read the most important parts thoughtfully, than try to get through the entire thing like a zombie.
5. Stop frequently and ask yourself: what did I just learn? Make notes as you go. Write down questions. Don't get bogged down in unimportant details. If your mind starts to wander, stop and refocus on the big picture: what's been happening in the text, and where is it.

## Disclaimer

**This syllabus, including the course schedule, is subject to change as necessary.**