THE UNIVERSITY OF WINNIPEG

APPLIED COMPUTER SCIENCE

Course Number: **ACS-3953-050**
Course Name: Introduction to Artificial Intelligence
Course Webpage: https://nexus.uwinnipeg.ca/d2l/home/71876

Instructor Information

Instructor:	Qian Liu	
Office:	3D31	
E-mail:	qi.liu@uwinnipeg.ca	
Office Hours:	Thursday	2:00 – 3:00 pm
Class meeting time:	Thursday	6:00 pm – 9:00 pm 3D04

Important Dates

1. First Class: Thursday, September 4, 2025
2. Reading Week (no classes):   October 12-18, 2025
3. Midterm Exam: Thursday, October 23, 2025
4. Final Withdrawal Date w/o academic penalty*:   Wednesday, November 12, 2025
5. Last Class: Thursday, November 27, 2025
6. Final Exam: TBD
7. Final Exam Period: December 8 – 20, 2025
8. University closures: Truth and Reconciliation Day   Tuesday, September 30, 2025
   Thanksgiving   Monday, October 13, 2025
   Remembrance Day   Tuesday, November 11, 2025

*A minimum of 20% of the work on which the final grade is based will be evaluated and available to the student before the voluntary withdrawal date.

Course Objectives / Learning Outcomes

This course introduces the core concepts of Artificial Intelligence (AI) and practical implementation using Python. Students explore AI agents, heuristic and local search strategies, constraint satisfaction problems, adversarial search in games, logical agents, and machine learning. The curriculum emphasizes solving real-world problems such as optimization, game strategy, and logical reasoning through hands-on projects and examples. By the end of the course, participants have a solid foundation in AI principles

and the Python skills needed to develop intelligent solutions, preparing them for advanced study or careers in AI and related fields.

Note: Students not familiar with Python are strongly encouraged to take ACS-1905(3) or ACS/PHYS-2112(3).

Evaluation Criteria

1. Assignments (20%)
   - 4 assignments, worth 5% each
   - Individual due dates will be posted on Nexus
   - Assignments will be accepted up to 1 day late with a 20% penalty

   Course IDE:
   Jupyter Notebook will be used during classes, and it is expected that students will use Jupyter Notebook for assignments. Jupyter Notebook is a Web-based application for authoring documents that combine live-code with narrative text, equations and visualizations (Please download and make sure you can have it opened during the class https://docs.jupyter.org/en/latest/install/notebook-classic.html)

   Assignment submissions:
   All work is to be submitted electronically via Nexus. All coding is to be submitted in .ipynb format. Further details and submission procedure will be stated in each assignment.

   Students are responsible for backing up and protecting their assignment work.

2. Midterm Test (25%)
   - During the regular class time (see Important Dates)

3. Final Exam (55%)
   - Cumulative

Test / Exam Requirements

- Photo ID is required for the final exam.
- The use of computers, calculators, phones, or other electronic devices is not permitted during exams.
- Midterm and final exams are closed-book.

Students should contact the instructor as soon as possible if extenuating circumstances require missing a lab, assignment, test or examination. A medical certificate from a practicing physician may be required before any adjustments are considered.

Students with documented disabilities, temporary or chronic medical conditions, requiring academic accommodations for tests/exams (e.g., private space) or during lectures/laboratories (e.g., note-takers) are encouraged to contact Accessibility Services (AS) at 204-786-9771 or

accessibilityservices@uwinnipeg.ca to discuss appropriate options. All information about a student's disability or medical condition remains confidential.
https://www.uwinnipeg.ca/accessibility-services

Students may choose not to attend classes or write examinations on holy days of their religion, but they must notify their instructors at least two weeks in advance. Instructors will then provide opportunity for students to make up work examinations without penalty. A list of religious holidays can be found in the 2025-26 Undergraduate Academic Calendar online at
http://uwinnipeg.ca/academics/calendar/docs/important-notes.pdf

Final Letter Grade Assignment

Historically, numerical percentages have been converted to letter grades using the following scale. However, instructors can deviate from these values based on pedagogical nuances of a particular class, and final grades are subject to approval by the Department Review Committee.

A+	90 – 100%	B+	75 – 79%	C	60 – 64%
A	85 – 89 %	B	70 – 74%	D	50 – 59%
A-	80 – 84%	C+	65 – 69%	F	below 50%

Required Text Book / Reading List

• Class Notes will be available on Nexus

Prerequisite Information

• Data Structures and Algorithms (ACS-2947), one of MATH-1101, MATH-1103, MATH-1104, MATH-1201, MATH-1401, and any 3 credit hour Statistics course at or above the 1000 level with a minimum grade of C.
• Students not familiar with Python are strongly encouraged to take ACS-1905(3) or ACS/PHYS-2112(3).

Regulations, Policies, and Academic Integrity

Students are encouraged to familiarize themselves with the Academic Regulations and Policies found in the University Academic Calendar at:
https://uwinnipeg.ca/academics/calendar/docs/regulationsandpolicies.pdf
Particular attention should be given to subsections 8 (Student Discipline), 9 (Senate Appeals) and 10 (Grade Appeals).

Avoiding Academic Misconduct: Academic dishonesty is a very serious offense and will be dealt in accordance with the University's policies.

Detailed information can be found at the following:

- Academic Misconduct Policy and Procedures:
  https://www.uwinnipeg.ca/policies/docs/policies/academic-misconduct-policy.pdf and
  https://www.uwinnipeg.ca/policies/docs/procedures/academic-misconduct-procedures.pdf
- About Academic Integrity and Misconduct, Resources and FAQs:
  https://library.uwinnipeg.ca/use-the-library/help-with-research/academic-integrity.html

Uploading essays and other assignments to essay vendor or trader sites (filesharing sites that are known providers of essays for use by others who submit them to instructors as their own work) involves "aiding and abetting" plagiarism. Students who do this can be charged with Academic Misconduct.

Academic Integrity and AI Text-generating Tools: The use of AI tools in this course is prohibited. This includes all forms of generative AI, like ChatGPT, Claude, Gemini, etc., as well as AI writing and paraphrasing tools, such as Grammarly, Quillbot, etc. If you are unsure if the use of a specific technology is permitted, ask the instructor prior to using the tool for coursework. Suspected misuse of AI may result in a report to the Senate Academic Standards and Misconduct Committee.

Non-academic misconduct: Students are expected to conduct themselves in a respectful manner on campus and in the learning environment, irrespective of the platform being used. Behaviour, communication, or acts that are inconsistent with a number of UW policies could be considered "non-academic" misconduct. More detailed information can be found here:
- Respectful Working and Learning Environment Policy:
  https://www.uwinnipeg.ca/respect/respect-policy.html,
- Acceptable Use of Information Technology Policy:
  https://www.uwinnipeg.ca/policies/docs/policies/acceptable-use-of-information-technology-policy.pdf
- Non-Academic Misconduct Policy and Procedures:
  https://www.uwinnipeg.ca/policies/docs/policies/student-non-academic-misconduct-policy.pdf and https://www.uwinnipeg.ca/policies/docs/procedures/student-non-academic-misconduct-procedures.pdf

Copyright and Intellectual Property: Course materials are the property of the instructor who developed them. Examples of such materials are course outlines, assignment descriptions, lecture notes, test questions, and presentation slides—irrespective of format. Students who upload these materials to filesharing sites, or in any other way share these materials with others outside the class without prior permission of the instructor/presenter, are in violation of copyright law and University policy. Students must also seek prior permission of the instructor/presenter before, for example, photographing, recording, or taking screenshots of slides, presentations, lectures, and notes on the board. Students found to be in violation of an instructor's intellectual property rights could face serious consequences pursuant to the Academic Misconduct or Non-Academic Misconduct Policy; such consequences could possibly

involve legal sanction under the Copyright Policy:
https://copyright.uwinnipeg.ca/basics/copyright-policy.html

<u>Privacy</u>

Students have rights in relation to the collecting of personal data by the University of Winnipeg.
- Student Privacy: https://www.uwinnipeg.ca/privacy/admissions-privacy-notice.html
- Zoom Privacy: https://www.uwinnipeg.ca/privacy/zoom-privacy-notice.html
- Exam and Proctoring: https://www.uwinnipeg.ca/privacy/zoom-test-and-exam-proctoring.html

<u>Class Cancellation, Correspondence with Students and Withdrawing from Course</u>

When it is necessary to cancel a class due to exceptional circumstances, the course instructor will make every effort to inform students via UWinnipeg email and Nexus.

Students are reminded that they have a responsibility to regularly check their UWinnipeg e-mail addresses to ensure timely receipt of correspondence from the University and/or the course instructor*.*

Please let the course instructor know if you plan on withdrawing from the course. Note that withdrawing before the VW date does not necessarily result in a fee refund.

<u>Topics to be covered (tentative)</u>

1. Introduction to Python/Jupyter Notebook
2. Introduction to AI
3. AI agent
   - Environment types
   - Agent types
4. Search in simple environment
   - Tree search and Graph Search
   - Heuristic Search (A* search)
5. Search in complex environment
   - Gradient Descent
   - Simulated Annealing
   - Genetic Algorithms
   - Search in non-deterministic and partial observable environment
   - Constrained Optimization
6. Search in Games
   - Minimax Search, Alpha-beta pruning
   - Expect minimax
   - Perfect Information Monte Carlo Search

7. Constraint Satisfaction
   - Local consistency
   - Backtracking search
   - Forward checking
   - Constraint propagation
8. Logical agents
   - Knowledge-based agents
   - Wumpus world
   - Logic in general—models and entailment
   - Propositional (Boolean) logic
   - Equivalence, validity, satisfiability
   - Inference rules and theorem proving
   - Effective Propositional Model Checking
9. Reinforcement learning
   - Markov decision process
   - Bayesian network
   - Reinforcement learning

A permitted or necessary change in mode of delivery may require adjustments to important aspects of course outlines, like class schedule and the number, nature, and weighting of assignments and/or exams.

In order to ensure a safe and comfortable learning environment for everyone, we kindly ask that all students refrain from wearing or using scented products while attending class.