

Course Outline

1. COURSE INFORMATION

Session Offered	Winter 2024	
Course Name	Artificial Intelligence	
Course Code	ENGTECH 4A13 C01	
Date(s) and Time(s) of lectures	Saturday 1:00-4:00 pm – Online	
Program Name	Manufacturing Engineering Technology	
Calendar Description	Theories and practices that capture the key elements of machine intelligence which is shaping various industry fields and daily life.	
Instructor(s)	Dr. Alireza Fatehi	E-Mail: fatehia@mcmaster.ca Office Hours & Location: By appointment, Online Tuesday: 17:00 pm – 17:30 pm

2. COURSE SPECIFICS

Course Description	<p>The ubiquitous nature of machine intelligence and its increasing impact on today's society, make the necessity to offer a practical AI course. This course covers the fundamentals and hands-on modules of classic and advanced AI techniques. The students will understand various AI models and tools such search and optimization, probabilistic methods, and pattern recognition techniques to solve problems including real world problems. The skill of management of training data will also be taught. Applications in areas such as manufacturing and automation, bio and healthcare, automotive, and energy, will be discussed. To establish a foundation for AI study, self-motivation and active practices are highly recommended.</p>		
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	
	L	Laboratory, workshop or fieldwork	
	T	Tutorial	
	DE	Distance education	36
	Total Hours		36
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	ISBN-13: 978-0-13-604259-4 ISBN-10: 0-13-604259-7	Textbook Title: Artificial Intelligence: A Modern Approach	Authors: Stuart J. Russell and Peter Norvig Publisher: Pearson
	Other Supplies	Source	
Prerequisite(s)	None		
Corequisite(s)	None		
Antirequisite(s)	None		
Course Specific Policies	Students are expected to attend all lectures, and to complete and submit all assignment exercises and quizzes.		

	<p>Assignments will be submitted through Avenue as per posted due dates. Submission after the deadline or by e-mail will not be considered for marking or review.</p> <p>Email submissions and late submissions are not allowed.</p> <p>For any issue regarding the course (lecture/project/mark and so on) email me from within Avenue to my avenue email.</p>		
Departmental Policies	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during class time unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>The instructor has the right to submit work to software to identify plagiarism.</p>		
3. SUB TOPIC(S)			
Week 1	Jan 13	An introduction to the concept and history of AI	
Week 2	Jan 20	Python ecosystem for AI and data processing	
Week 3	Jan 27	Regression problem and data processing	
Week 4	Feb 3	polynomial regression, logistic regression	
Week 5	Feb 10	Artificial neural network (ANN) and nonlinear regression	
Week 6	Feb 17	Evolutionary computation	
-	Feb 24	Midterm Recess (no classes)	
Week 7	Mar 2	Midterm Exam	
Week 8	Mar 9	Fundamentals of digital image processing and object detection	
Week 9	Mar 16	Object Detection using ANN	
Week 10	Mar 23	Deep learning and convolutional neural networks (CNN)	
Week 11	Mar 30	Good Friday Holiday (no classes)	
Week 12	Apr 6	Project presentation	
<p>Classes end: Wednesday, December 6th, 2023</p> <p>Final Examination Period: Friday, December 8th to Thursday, December 21st</p> <p>All examinations MUST be written during the scheduled examination period.</p>			
<p>Note that this structure represents a plan and is subject to adjustment term by term.</p> <p>The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification</p>			

becomes necessary, reasonable notice and communication with the students will be given with an explanation and the opportunity to comment on changes.

4. ASSESSMENT OF LEARNING *including dates*	Weight
Assignments	10%
Course Projects	30%
Mid-term test	30%
Final examination (tests cumulative knowledge)	30%
TOTAL	100%

DETAILS OF THE ASSESSMENT SCHEMA

Assignment (10%):

There are five Assignments in this course to practice basic concepts and formulation of the topics. Each assignment has 2% of the final marks.

Course Project (30%):

For the course project, students will find or define a real-world problem and solve it by AI technique(s). The project will require you to have a good understanding of the topics and will assess your ability to apply the concepts to solve *situational* problems. You are expected to do some exploratory reading to solve the project. A detailed rubric will be given for the project, explaining the passing criteria.

Midterm Exam (30%):

The midterm exam is to check your understanding of the topics delivered in the first half of the semester. The midterm exam will be administered through Avenue.

Final Exam (30%):

The final exam is to check your understanding of the topics delivered in the semester. The final exam will be administered through Avenue.

TO PASS THE COURSE YOU MUST ACHIEVE 50% OF THE TOTAL MARKS.

Percentage grades will be converted to letter grades and grade points per the University calendar.

5. LEARNING OUTCOMES

1. Be familiar with classic AI methods as well as newly emerged techniques such as Deep Learning.
2. Be capable of connecting theory with practice through transferable skills.
3. Understand applications of AI based on various techniques and tools.
4. Know how to handle AI data properly and efficiently.
5. Understand the limits of artificial general intelligence.
6. Apply bio-inspired search methods for optimization problems.
7. Be able to code and debug independently of classic AI/ML methods from scratch without using libraries or tools.
8. Be able to apply advanced libraries or tools, such as Tensorflow, Keras, scikit-learn, and OpenCV-Python, for complicated AI problems.
9. Design, evaluate and improve AI models for real-world problem solving.

6. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS

ANTI-DISCRIMINATION

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/>

The following illustrates only three forms of academic dishonesty: The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

COMMUNICATIONS

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests. <http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf>

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.