MASTER OF INTERDISCIPLINARY APPLIED ARTIFICIAL INTELLIGENCE (ONLINE)

Overview

Summary

- Degree offered: Master of Interdisciplinary Artificial Intelligence (MIAI)
- Registration status options: Part-time
- Language of instruction: English
- Program option (expected duration of the program): within two years
- Academic units: Faculty of Engineering (http://engineering.uottawa.ca/), School of Engineering Design and Teaching Innovation (https://www.uottawa.ca/faculty-engineering/).

Program Description

The Systems Science and Engineering programs offers an online Master of Interdisciplinary Applied Artificial Intelligence.

The program provides qualified students with the opportunity for master's-level study in a broad range of areas that emphasize transdisciplinary work in the context of general systems analysis. The emphasis in Interdisciplinary Applied Artificial Intelligence is on the development of analytical and integration skills for use in the resolution of complex applied problems that require a broad-based perspective.

The graduate program in Interdisciplinary Artificial Intelligence is an interdisciplinary program specially designed for those who are interested in the analysis and modelling (mathematical and computer) of natural and man-made systems. It provides the professional with skills and knowledge required to understand, control, predict and optimize behaviour in a variety of fields from engineering and computer science to management.

In the program, students will:

1. Develop and demonstrate the ability to communicate with and integrate multi-disciplinary expertise related to system science.
2. Develop and demonstrate the ability to lead, design and manage large complex systems using current and emerging tools, techniques and applications of Artificial intelligence.
3. Develop skills in management, technology, communications, information architecture, data science, and gender / cultural awareness and demonstrate the ability to apply them in practice.

Other Programs Offered Within the Same Discipline or in a Related Area

- Graduate Diploma Systems Science and Engineering
- Master of Science Systems Science and Engineering (MCS)
- Master of Systems Science and Engineering

Fees and Funding

- Program fees:
  - The estimated amount for university fees (https://www.uottawa.ca/university-fees/) associated with this program are available under the section Finance your studies (http://www.uottawa.ca/graduate-studies/programs-admission/finance-studies/).
  - International students enrolled in a French-language program of study may be eligible for a differential tuition fee exemption (https://www.uottawa.ca/university-fees/differential-tuition-fee-exemption/).
- To learn about possibilities for financing your graduate studies, consult the Awards and financial support (https://www.uottawa.ca/graduate-studies/students/awards/) section.

Notes

- Programs are governed by the general regulations (http://www.uottawa.ca/graduate-studies/students/general-regulations/) in effect for graduate studies at the University of Ottawa.
- In accordance with the University of Ottawa regulation, students have the right to complete their assignments, examinations, research papers, and theses in French or in English.

Program Contact Information

Graduate Studies Office, Faculty of Engineering (https://engineering.uottawa.ca/graduate-studies-office/)
STE 1024
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Ottawa ON Canada
K1N 6N5

Tel.: 613-562-5347
Fax.: 613-562-5129
Email: engineering.grad@uottawa.ca

Twitter | Faculty of Engineering (https://twitter.com/uOttawaGenie/?lang=en)
Facebook | Faculty of Engineer (https://www.facebook.com/uottawa.engineering/)

Admission Requirements

For the most accurate and up to date information on application deadlines, language tests and other admission requirements, please visit the specific requirements (https://www.uottawa.ca/graduate-studies/programs-admission/apply/specific-requirements/) webpage.

To be eligible, candidates must:

- Have a bachelor's degree with a specialization or major in engineering, business, science, math, technology or statistics (or equivalent) with a minimum admission average of 70% (B).

- Undergraduate courses in probability, linear algebra, differential equations and computer programming are prerequisites for the core courses of the program.
- A minimum 2 years of experience and demonstrated proficiency in English are required.
- Students are responsible for having their own computers and a broadband connection to the Internet sufficient for videoconferencing.

Language Requirements

Most courses are delivered in English as the international language for advanced information technology. However, the program will provide an appropriately supportive environment for francophone students to develop professional competence in technical English at their own pace. Students have the right, as stipulated in the University's bilingualism regulations (Academic Regulations I-2), to complete all their work, including their thesis, in the official language of their choice (French or English). There are fully bilingual professors and advisors who can support students in French.

Applicants whose first language is neither French nor English must provide proof of proficiency in the language of instruction through one of the following two requirements or one of the language tests below.

- Proof of completion within the last five years, of a previous degree program in an English language university.
- Proof of recent prolonged residence and exercise of a profession in an English speaking country (normally at least four years over the last six years).

Language tests recognized by the University of Ottawa:

- TOEFL minimum score of 600 (paper-based) with a minimum score of 50 on the written and 50 on the spoken or a minimum score of 100 (internet-based).
- IELTS minimum score of 7 for 3 of the 4 tests (Reading, Listening, Writing, Speaking) and a minimum score of 6 in the fourth test.
- A score of at least 14 on the CANTEST, with no individual test score below 4.0, along with a minimum score of 4.5 on the oral component of the test.

Note:

- Candidates are responsible for any fees associated with the language tests.
- Test scores cannot be more than two-years-old as of September 1 of the year of potential entry into the program.

Notes

- The admission requirements listed above are minimum requirements and do not guarantee admission to the program.
- Admissions are governed by the general regulations (http://www.uottawa.ca/graduate-studies/students/general-regulations/) in effect for graduate studies.

Program Requirements
Master's

To receive the Master of Interdisciplinary Applied Artificial Intelligence – Online, a student enrolled in the program must successfully complete 30 course units of academic work: 12 compulsory units and 18 optional course units.

Requirements for this program have been modified. Please consult the 2024-2025 calendars (http://catalogue.uottawa.ca/en/archives/) for the previous requirements.

Students must meet the following requirements:

Compulsory Courses:

DTO 5310	Ethics for Design, AI and Robotics	3 Units
MIA 5100	Foundations and Applications of Machine Learning	3 Units
MIA 5126	Essential Concepts in Data Science	3 Units
MIA 5130	System optimization and management	3 Units
18 optional course units from the list of optional courses		18 Units

List of optional courses

DTO 5100	Foundations and Applications of Machine Learning	3 Units
DTO 5101	Foundations of Machine Learning for Scientists and Engineers	3 Units
DTO 5120	Essential Concepts in Data Science	3 Units
DTO 5140	Engineering Design	3 Units
DTO 6106	User Research and User Experience Principles and Practice	3 Units
DTO 6107	Interaction Design and Design Thinking	3 Units
MEM 5111	Creativity and Innovation	3 Units
MEM 5119	Project Information Management	3 Units
MEM 5120	Product Development and Management	3 Units
MEM 5121	Taguchi Methods for Engineering R D	3 Units
MEM 5122	Operational Excellence and Lean Six Sigma	3 Units
MEM 5265	Business Intelligence and Performance Management	3 Units
MEM 5280	Principles of Operations Management	3 Units
MEM 5300	Principles of Data Analytics	3 Units
MEM 6100	Complex Project Management	3 Units
MEM 6281	Supply Chain Management	3 Units
MEM 6285	Project Risk Management	3 Units
MEM 6287	Advanced Data Analytics	3 Units
MIA 5130	System optimization and management	3 Units
MIA 6160	Cyber Security Systems and Strategies	3 Units
MIA 6360	Artificial Intelligence and Cybersecurity	3 Units

Research
Research at the University of Ottawa

Located in the heart of Canada's capital, a few steps away from Parliament Hill, the University of Ottawa ranks among Canada's top 10 research universities. Our research is founded on excellence, relevance and impact and is conducted in a spirit of equity, diversity and inclusion.

Our research community thrives in four strategic areas:

- Creating a sustainable environment
- Advancing just societies

- Shaping the digital world
- Enabling lifelong health and wellness

From advancing healthcare solutions to tackling global challenges like climate change, the University of Ottawa's researchers are at the forefront of innovation, making significant contributions to society and beyond.

Research at the Faculty of Engineering

Areas of research:

- Chemical and Biological Engineering
- Civil Engineering
- Electrical Engineering and Computer Science
- Mechanical Engineering

For more information, refer to the list of faculty members and their research fields on **Uniweb**.

IMPORTANT: Candidates and students looking for professors to supervise their thesis or research project can also consult the website of the faculty or department **(**https://www.uottawa.ca/study/graduate-studies/academic-unit-contact-information/**) of their program of choice. Uniweb does not list all professors authorized to supervise research projects at the University of Ottawa.**

Courses

MIA 5100 Foundations and Applications of Machine Learning (3 units)
The capabilities and limitations of machine learning; problem formulation; supervised and unsupervised learning techniques; deploying, monitoring, and evaluating machine learning models; storytelling and assessing the results of learning; current advances in application areas such as business, law, arts, social sciences and education. Recommended prerequisite: Aptitude for analytics. Although no specific programming background is required, students should be comfortable with computing technologies.
Course Component: Lecture
Courses CSI 5155, DTO 5100, DTO 5101, ELG 5255, IAI 5100, IAI 5101, MIA 5100, SYS 5185 cannot be combined for units.

MIA 5110 Foundations of modeling and simulation (3 units)
Fundamental aspects of systems modelling and the simulation process. Elements of continuous system simulation. Issues relating to the numerical solution of ordinary differential equations. Elements of discrete event simulation Generation of random numbers and variates. Simulation validation and quality assurance. Introduction to simulation languages.
Course Component: Lecture
The following courses are recommended as prerequisites: CSI 1100, MAT 2341, (MAT 2324 or MAT 2331), MAT 2371, MAT 2375.

MIA 5126 Essential Concepts in Data Science (3 units)
An introduction to the foundations of data science using a case study approach; overview of the data science process: types of tasks and models, data manipulation, exploratory data analysis, data summarization and data visualization; predictive modeling, descriptive modeling; reporting and deployment.
Course Component: Lecture
The courses MIA 5126,CSI 4142, DTI 5125, DTI 5126, MAT 4373 cannot be combined for units.

MIA 5130 System optimization and management (3 units)
Analysis of user requirements and model design. Data mining. Use of optimization software. Systems thinking and its application to economic systems and hierarchical systems. Applications to economic systems simulation, modeling, optimization and management.
Course Component: Lecture
The following courses are recommended as prerequisites: CSI 1100, MAT 2341, (MAT 2324 or MAT 2331), MAT 2371, MAT 2375.

MIA 5310 Fundamentals of Cybersecurity (3 units)
Security policies. Security mechanisms. Security awareness. User authentication. Applied Encryption. External and internal firewalls. Intrusion Detection, Security of operating systems, databases and software. Security of Web applications. Design of security system and components. Devices for security analysis: sniffers, attack detectors. Ethical issues in computer security.
Course Component: Lecture
The courses CSI 4139, CEG 4799, SEC 5100 cannot be combined for units. It is recommended to have courses or practical experience equivalent to one of the following courses : CSI 3140, SEG 3102, CEG 3185.

MIA 6160 Cyber Security Systems and Strategies (3 units)
User, data and network security principles. Information systems security standards. Security risk analysis frameworks. Overview of cyber security mechanisms including authentication, access control, data encryption and integrity, and Public Key Infrastructure. Cyber security including security in the wireless, cloud and IoT environments. Payment card industry security standards and compliance.
Course Component: Lecture
The courses MIA 6160, DTI 6160 cannot be combined for units.

MIA 6360 Artificial Intelligence and Cybersecurity (3 units)
AI for threat intelligence and situational awareness. AI techniques for enhancing cybersecurity defenses, including performance analysis with respect to organizational goals. AI-enabled security solutions. Adversarial machine learning and countermeasures. AI-based evasion techniques to bypass traditional defense mechanisms. Threat modelling and risk assessment specific to AI-based systems. Monitoring and defending against adversarial attacks in AI systems. Ethical considerations in the design and deployment of AI systems. Practical implementations in developing AI-based cybersecurity solutions and evaluating their effectiveness.
Course Component: Lecture