

# INTELLIGENCE ARTIFICIELLE INTERDISCIPLINAIRE - EN LIGNE (MIA)

## Les cours en intelligence artificielle interdisciplinaire - en ligne (MIA) sont offerts par la Faculté de génie

### **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, STA 2100.

### **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, STA 2100.

### **MIA 5150 Topics in Interdisciplinary Artificial Intelligence (3 units)**

Recent and advanced topics in the field of Interdisciplinary Artificial Intelligence and its related areas. Topics vary from year to year.

**Course Component:** Lecture

### **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 Strategy, Architecture and Governance (3 units)**

Cyber security planning principles, processes and practices. Cyber security program and risk frameworks. Threat actor profiles and motivations. Cyber risk assessment. Technical, managerial and human behavioural factors in cyber security. Security architecture and controls. Cyber threat intelligence. Case studies in cyber security crisis management.

**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