1. **Course number and name**
   CMP 433 – Artificial Intelligence

2. **Credits and contact hours**
   3 credit hours, 3 contact hours

3. **Instructor's or course coordinator's name**
   Dr. Michel Pasquier

4. **Textbook, title, author, and year**
   S. Russel and P. Norvig. *Artificial Intelligence: A Modern Approach*, 3rd edition, Prentice Hall, 2010.

   **Other supplemental materials**
   I. Bratko. *Prolog Programming for Artificial Intelligence,* 3rd edition, Addison-Wesley, 2001.
   D. Poole and A. Mackworth. *Artificial Intelligence: Fundamental of Computational Agents,* 1st edition, Cambridge University Press, 2010. (online)

5. **Specific course information**
   a. **Brief description of content of the course (catalog description)**
      Introduces the fundamental concepts and techniques of artificial intelligence. Studies the structure and components of intelligent agents and systems. Includes problem-solving methods, knowledge representations, formal logic, and probabilistic reasoning. Examines selected advanced topics such as expert systems, planning, machine learning and approximate reasoning, as well as case studies of AI in the real world.

   b. **Prerequisites or co-requisites**
      Prerequisites: CMP 305/COE 311 (Data Structures and Algorithms)

   c. **Indicate whether a required, elective, or selected elective course in the program**
      Selected Elective

6. **Specific goals for the course**
   a. **Specific outcomes of instruction**
      This course requires the student to demonstrate the following:
      1. Explain what AI is about and its importance for Computer Science, IT, and society.
      2. Describe the structure and components of various types of intelligent agents and systems.
      3. Apply problem solving principles and employ various heuristic search techniques.
      4. Characterize constraint satisfaction problems and use CSP-specific algorithms.
      5. Apply game-theoretic principles and algorithms to games and multi-agent problems.
      6. Represent complex knowledge using formal logic and apply inference algorithms.
      7. Model partial or uncertain knowledge using belief nets and probabilistic reasoning.

8. Use a modern simulation package, such as AIspace, to explore and apply AI theories.

**b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course**

This course contributes in a significant way to the accomplishment of the following program outcomes:

| Program outcome | Emphasis in this course |
|---|---|
| (a) an ability to apply knowledge of computing and mathematics appropriate to the discipline | ● |
| (b) an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution | ● |
| (c) an ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs | ◑ |
| (d) an ability to function effectively on teams to accomplish a common goal | ○ |
| (e) an understanding of professional, ethical, legal, security and social issues and responsibilities | |
| (f) an ability to communicate effectively with a range of audiences | |
| (g) an ability to analyze the local and global impact of computing on individuals, organizations, and society | |
| (h) recognition of the need for and an ability to engage in continuing professional development | ○ |
| (i) an ability to use current techniques, skills, and tools necessary for computing practice | ◑ |
| (j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices | ◑ |
| (k) An ability to apply design and development principles in the construction of software systems of varying complexity | |

Emphasis: ● High; ◑ Medium; ○ Low; Blank – Nothing Specific Expected

**7. Brief list of topics to be covered**

i. Introduction to AI
ii. Intelligent agents and systems
iii. Problem solving and the state-space search approach
iv. Formulation, heuristics, and advanced search algorithms
v. Constraint satisfaction problems and techniques
vi. Game-theoretic principles and algorithms
vii. Introduction to logic and knowledge-based systems
viii. Logical inference and reasoning algorithms
ix. Knowledge structures, frames, and semantic nets
x. Logic programming using Prolog
xi. Belief networks and probabilistic reasoning
xii. Introduction to AIspace software, AI project