

## GAP YEAR PROGRAMME INTRODUCTION TO AI

**Course contact hours:** 45

**Recommended credits:** 6 ECTS – 3 US

**Language:** English

### Prerequisites

You do not need any previous specific knowledge to take this course.

### Objectives and Contextualization

Artificial Intelligence (AI) will transform many aspects of our lives in the future, and it is one of the most prominent sectors for employment.

This course introduces the fundamental concepts and techniques of artificial intelligence (AI). Students will learn about the history of AI, its applications in various fields, and the key challenges and limitations of current AI systems. Topics may include machine learning, natural language processing, deep learning, transfer learning, and probabilistic programming.

Students can develop practical programming and data analysis skills using popular AI tools and frameworks. In addition, students will gain hands-on experience in designing, implementing, and evaluating AI algorithms and systems through assignments and projects.

### Competencies

At the end of the course, students will develop the following generic competencies:

- Critical thinking
- Creative thinking applied to problem-solving.
- Capacity to learn autonomously.
- Capacity for generating new ideas.
- Ethical commitment.
- Basic knowledge of the field of study.
- Ability to work in a team.

### Learning Outcomes

After completing this course, students will be able to:

1. Identify the technical and ethical challenges of AI development and implementation.
2. Understand the societal impact of AI, including its potential benefits and challenges.

3. Discover real-world applications of AI in various fields, such as healthcare, finance, robotics, and autonomous systems.
4. Introduce the basics of natural language processing and how AI systems can process and understand human language.
5. Familiarize with popular AI algorithms, such as decision trees, k-nearest neighbors, and clustering methods.
6. Acquire basic hands-on experience with AI programming languages like Python and libraries like TensorFlow or PyTorch.
7. Judge actions associated with the implementation of AI in socioeconomic environments.
8. Carry out their research in the field of study.

## Content

### Part One: Introduction

Chapter 1: What is AI?

Chapter 2: Past, present, and future of AI

### Part Two: Fundamentals of AI

Chapter 3: Machine learning

Chapter 4: Natural language processing

Chapter 5: Deepfakes

Chapter 6: Cognitive modelling

Chapter 7: Neural networks and large language models (LLM)

### Part Three: AI and Business

Chapter 8: AI and strategy

Chapter 9: AI as the new UI interface

Chapter 10: Industry use cases

### Part Four: Ethics and AI

Chapter 11: AI in the workplace: Application areas and ethical concerns.

Chapter 12: AI challenges.

## Methodology

This course combines five complementary methodologies and approaches to teaching, each designed to cater to different learning styles and educational goals:

1. Lecture-Based Teaching: used mainly during Part One.
2. Active Learning: Students engage actively in the learning process through discussions, group work, problem-solving activities, and hands-on experiences.
3. Problem-Based Learning (PBL): Students learn by actively solving open-ended, real-world problems, encouraging critical thinking and problem-solving skills.

4. Socratic Method: The teacher poses thought-provoking questions to stimulate critical thinking and guide students to discover knowledge independently.
5. Cooperative Learning: Students work in small groups to achieve shared learning goals, fostering teamwork and peer support.

### Activities

Directed: (all in the classroom)

Class sessions (practice)	21 hours
Class sessions (theory)	8 hours
Assessment	6 hours

Supervised: (all in the classroom)

Project development	10 hours
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Autonomous work:

Project (group work)	50 hours
Independent readings	15 hours
Programming	25 hours
Reflective writing	10 hours
Online debate forums	5 hours

### Assessment

Continuous assessment elements enable students to engage with the course material in AI actively. They foster experiential learning and a deeper understanding of the subject, encourage critical thinking, and provide valuable feedback throughout the learning process. These are some of the suggested assessment elements:

1. Article Reviews: Students read and critically analyse academic articles or news reports about AI, summarizing key points and evaluating the arguments presented.
2. Python Programming Exercises: Provide students with coding exercises in Python to implement basic AI algorithms, such as linear regression, logistic regression, and k-nearest neighbors, and guide them through hands-on activities using popular AI libraries like TensorFlow or PyTorch, helping them build and train neural networks.
3. Natural Language Processing (NLP) Activity: Students work on an NLP task, such as sentiment analysis or text classification, using pre-trained language models like BERT or GPT.
4. Ethical AI Scenario Analysis: Present students with moral dilemmas related to AI, and in groups, have them discuss and propose responsible solutions to address these challenges.
5. Online Discussions: Forums in Canvas where students can converse about AI topics, share their perspectives, and respond to their peers' viewpoints.

6. Group Project: In small groups, students research and present the solution to a challenge of their choice that allows them to research and submit real-world AI applications in various industries, highlighting the impact of AI on society.
7. Exams: Students demonstrate that they have achieved a good level of understanding, knowledge, and skills related to the field of study. The exams mainly focus on creative thinking, i.e., their ability to reason logically, draw connections between concepts, and synthesize information effectively.

### Assessment Activities

Title	weighting	hours*	learning outcomes
Article Reviews	10%	20	1,2,3,7
Python Programming Exercises	5%	10	4,5,6
NLP Activity	5%	15	4,5,6
Ethical AI Scenario Analysis	5%	5	1,2,7
Online Discussions	5%	5	1,2,3,8
Group Project	25%	52	1,2,3,7,8
Participation	20%	39	1 to 8
Mid-term exam	10%	2	1,2,7
Final exam	15%	2	1,2,7

\*hours include autonomous work

### Bibliography

There is no mandatory textbook for this course. The following list shows some recommended readings, all related to the course content.

Ashri, R. (2019). *The AI-powered Workplace: How Artificial Intelligence, Data, and Messaging Platforms are Defining the Future of Work*. Apress.

Bartneck, C., Lütge, C., Wagner, A., and Welsh, S. (2021). *An Introduction to Ethics in Robotics and AI*. Springer Nature.

Boddington, P. (2023). *AI Ethics: a Textbook*. Springer Nature.

Russell, S. J. (2021). *Artificial Intelligence: A Modern Approach*. Pearson Education, Inc.

Taulli, T. (2023). *Introduction to Generative AI: The Potential for This Technology Is Enormous. In Generative AI: How ChatGPT and Other AI Tools Will Revolutionize Business*. Berkeley, CA: Apress.

Shin, D. D. (2023). *Algorithms, Humans, and Interactions: How do Algorithms Interact with People? Designing Meaningful AI Experiences*. Taylor and Francis.

Wilks, Y. A. (2023). *Artificial Intelligence: Modern Magic or Dangerous Future?* MIT Press.

Yao, M., Zhou, A., and Jia, M. (2018). *Applied Artificial Intelligence: A Handbook for Business Leaders*. Topbots Inc..

### Software

The course requires using a personal computer to install some packages for basic programming in Python. It also involves the use of Canvas as an LMS.