



# Course Outline (Higher Education)

<b>School:</b>	School of Engineering, Information Technology and Physical Sciences
<b>Course Title:</b>	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
<b>Course ID:</b>	ITECH7001
<b>Credit Points:</b>	15.00
<b>Prerequisite(s):</b>	Nil
<b>Co-requisite(s):</b>	An approved mathematics or information technology elective.
<b>Exclusion(s):</b>	ITECH2111
<b>ASCED:</b>	020119

**Description of the Course :**

This course exposes students to the theory and practical methods associated with the field of artificial intelligence (AI). Students will gain an appreciation for the philosophy, history and applications of artificial intelligence. They will gain an understanding of the functioning of core algorithms within AI, and skills in the application of software tools which implement those algorithms. Areas covered will include knowledge representation, logic and automated reasoning, search, and modelling uncertainty, with a particular emphasis on techniques associated with various areas of machine learning, including unsupervised, supervised and reinforcement learning. Students will also be required to consider the ethics associated with the development and deployment of AI technology within society, and understand the importance of factors such as fairness, safety and explainability.

**Grade Scheme:** Graded (HD, D, C, etc.)

**Placement Component:** No

**Supplementary Assessment:** Yes

Where supplementary assessment is available a student must have failed overall in the course but gained a final mark of 45 per cent or above and submitted all major assessment tasks.

**Program Level:**

Level of course in Program	AQF Level of Program					
	5	6	7	8	9	10
Introductory	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	✓	<input type="checkbox"/>
Intermediate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Advanced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Learning Outcomes:****Knowledge:**

- K1.** Identify and explain a range of artificial intelligence algorithms and methodologies for solving complex problems.
- K2.** Recognise and outline historical and current progress across a range of artificial intelligence approaches.
- K3.** Explain how to design and deploy artificial intelligence so as to produce beneficial and equitable outcomes for society.

**Skills:**

- S1.** Represent knowledge using different techniques to solve complex problems;
- S2.** Select, set up and apply appropriate algorithmic approaches for solving a variety of complex problems and real world situations.
- S3.** Prepare data for use as input to machine learning systems.
- S4.** Interpret, compare and report on algorithm output and performance in different contexts.

**Application of knowledge and skills:**

- A1.** Display initiative and judgement in adapting algorithms to unique and diverse contexts.
- A2.** Research and interpret appropriate developments in Artificial Intelligence.

**Course Content:**

1. History and philosophy behind artificial intelligence; current and future applications of artificial intelligence;
2. Logic and search;
3. Knowledge representation, and reasoning - including reasoning with uncertainty;
4. Agent-based AI;
5. Evolutionary computation – genetic algorithms, genetic programming and coevolutionary systems;
6. Clustering and unsupervised learning;
7. Supervised learning;
8. Neural networks and deep learning;
9. Reinforcement learning;
10. The ethics of AI; fairness, safety and explainability.

**Values:**

- V1.** Appreciate the importance of artificial intelligence for the development of human society.
- V2.** Appreciate the ethical implications of artificial intelligence and the need to ensure that systems are developed and deployed in a manner which benefits all members of society.

### Graduate Attributes

The Federation University FedUni graduate attributes (GA) are entrenched in the Higher Education Graduate Attributes Policy (LT1228). FedUni graduates develop these graduate attributes through their engagement in explicit learning and teaching and assessment tasks that are embedded in all FedUni programs. Graduate attribute attainment typically follows an incremental development process mapped through program progression. **One or more graduate attributes must be evident in the specified learning outcomes and assessment for each FedUni course, and all attributes must be directly assessed in each program**

Graduate attribute and descriptor		Development and acquisition of GAs in the course			
		Learning Outcomes (KSA)	Code A. Direct B. Indirect N/A Not addressed	Assessment task (AT#)	Code A. Certain B. Likely C. Possible N/A Not likely
GA 1 Thinkers	Our graduates are curious, reflective and critical. Able to analyse the world in a way that generates valued insights, they are change makers seeking and creating new solutions.	K1, K2, S1, S2, S3, S4, A1	A	AT1, A2, AT3	A
GA 2 Innovators	Our graduates have ideas and are able to realise their dreams. They think and act creatively to achieve and inspire positive change.	K2, A4	A	AT2	B
GA 3 Citizens	Our graduates engage in socially and culturally appropriate ways to advance individual, community and global well-being. They are socially and environmentally aware, acting ethically, equitably and compassionately.	K3	A	AT3	A
GA 4 Communicators	Our graduates create, exchange, impart and convey information, ideas, and concepts effectively. They are respectful, inclusive and empathetic towards their audience, and express thoughts, feelings and information in ways that help others to understand.	N/A	N/A	N/A	N/A
GA 5 Leaders	Our graduates display and promote positive behaviours, and aspire to make a difference. They act with integrity, are receptive to alternatives and foster sustainable and resilient practices.	N/A	N/A	N/A	N/A

### Learning Task and Assessment:

Learning Outcomes Assessed	Learning Tasks	Assessment Type	Weighting
K1, K2, S1, S2, S3	Weekly tasks such as on-line quizzes; discussion of ideas in an on-line forum; and recording a journal on how to solve problems using AI techniques.	Journal, forum, quizzes and/or exercises	20% - 30%

Learning Outcomes Assessed	Learning Tasks	Assessment Type	Weighting
K3, S1, S2, S3, S4, A1, A2	Students will conduct research to select a small set of algorithms, design a suitable knowledge representation and data abstraction, and setup and apply the algorithms on a complex problem. Students will conduct experiments and write a report justifying their choices, as well as interpreting and comparing the algorithms.	Written Report	20% - 30%
K1, K2, K3, S1, S2, S3	Questions covering a range of algorithms, methodologies, knowledge representations, appropriate algorithm setups and data abstraction methodologies.	Test(s)	40% - 60%

**Adopted Reference Style:**

APA