School of Science, Computing and Engineering Technolog

Unit Outline

COS40007

Artificial Intelligence for Engineering

Semester September 2025

Please read this Unit Outline carefully. It includes:

PART A Unit Summary

PART B Your Unit in more detail

PART C Further information

"Swinburne University of Technology recognises the historical and cultural significance of Australia's Indigenous history and the role it plays in contemporary education

Each day in Australia, we all walk on traditional Indigenous land

We therefore acknowledge the traditional custodians of the land that our Australian campuses currently occupy, the Wurundjeri people, and pay respect to Elders past and present, including those from other areas who now reside on Wurundjeri land"

PART A: Unit Summary

Unit Code(s)		COS40007
Unit Title		Artificial Intelligence for Engineering
Duration		2025 Semester 1
Total Contact Hours		150
Requisites:		
	Pre-requisites	COS10009 Introduction to Programming AND 100 credit points in BEng, BCompSc, or related double degrees.
	Co-requisites	Nil
	Concurrent pre-requisites	Nil
	Anti-requisites	Nil
	Assumed knowledge	Nil
Credit Points		12.5
Campus/Location		Ha Noi
Mode of Delivery		On-campus Lecture and Studios
Assessment Summary		Design Project (Group): 60% Portfolio (Individual): 40%

Aims

The unit of study aims to provide engineers with the knowledge and skills required to design and implement Artificial Intelligence (AI) and Machine Learning (ML) techniques that can effectively solve complex engineering problems. Engineering professionals must understand AI concepts and techniques for building intelligent systems.

Unit Learning Outcomes

Students who successfully complete this unit can:

1. Design, build and train datasets using machine learning algorithms to solve multidisciplinary engineering problems.
2. Demonstrate knowledge of a range of AI, machine learning and deep learning algorithms and their applications.
3. Assess, appraise and justify appropriate AI techniques to solve computational engineering problems.
4. Communicate effectively and succinctly through oral presentations and reports.

Graduate Attributes

The Swinburne Graduate Attributes describe our graduates' capability to use knowledge, skills, and behaviours to contribute to society meaningfully and positively. They include

professional, self-directed learning, and future-ready skills.

This unit contributes to the development of the following Swinburne Graduate Attributes:

- GA1 Communication - Verbal communication.
- GA2 Communication - Communicating using different media:
- GA3 Teamwork - Collaboration and negotiation.
- GA4 Teamwork – Teamwork roles and processes:
- GA5 Digital Literacies– Information literacy.
- GA6 Digital Literacies– Technical literacy

Other graduate attributes may be practised in the unit but are not formally taught as part of the unit content nor incorporated within formal assessment.

Content

- Different methods of Machine learning
- Machine Learning techniques
- Designing an Algorithm for data preparation
- Specifications of Machine Learning
- AI for Future Engineering Technologies

PART B: Your Unit in more detail

Unit Teaching Staff

Name	Role	Email	Consultation
Dr Bui Ngoc Dung	Unit Convenor & Lecturer	dbui@swin.edu.au	By email appointment

Learning and Teaching Structure

Category	Activity	Total Hours	Hours per Week	Teaching Period Weeks
In-person	Lectures	12 hours	1 hour	Weeks 1 to 12
In-person	Studio	24 hours	2 hours	Weeks 1 to 12

Week-by-Week Schedule

Week	Week Beginning	Teaching and Learning Activity	Student Task or Assessment
1	Sep 3	**Seminar**: Introduction to Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL). Applications of AI in Engineering **Studio**: Review Previous experience of AI, Data Exploration – Type of data in the Engineering process	
2	Sep 8	**Seminar**: A Systematic approach for developing AI models to solve Engineering Problem **Studio**: Data Pre-processing and Creating Ground Truth Data **Portfolio Assessment:** Formulating Engineering Process Data for building ML models	
3	Sep 15	**Seminar**: Machine Learning Algorithms **Studio**: Data separation, Parameter Tuning. Training and Model Selection **Portfolio Assessment Task:** Train and develop your first ML model	Submission of Portfolio Task
4	Sep 22	**Seminar**: Machine Learning with Python and Scikit-Learn	Submission of Portfolio Task

		Studio: Budling a Machine learning Classifier and Evaluation **Portfolio Assessment Task:** Test and Evaluate your ML model	
5	Sep 29	**Seminar**: Deep Learning with Keras and TensorFlow **Studio**: Image Labelling and Object Annotation **Portfolio Assessment Task:** Object annotation and develop a simple ResNet model	1. Submission of Portfolio Task 2. Group Formation and Project Allocation for Design Project
6	Oct 6	**Seminar**: Deep Learning and Computer Vision with Pytorch and YOLO **Studio**: Training and Evaluation of Deep Learning Model **Portfolio Assessment Task:** Develop a Deep Learning Model for a Custom Object	Submission of Portfolio Task
7	Oct 13	**Seminar**: Machine Learning for Time-Series Forecasting and Sequential Data **Studio**: Working with Time Series data, Forecasting, Design Project Review	1. Submission of Portfolio Task 2. Submission of Project Brief for Design Project
↵	Oct 20	**Seminar**: Unsupervised Learning **Studio**: Clustering + Design Project Progress	Submission of Progress Report for Design Project
↳	Oct 27	**Seminar**: Recommender system **Studio**: Recommender system + Design Project Progress	Submission of Progress Report for Design Project
10	Nov 3	**Seminar**: Working with unstructured, unlabelled and limited data, Ensemble Learning **Studio**: Ensemble Learning + Design Project Progress	Submission of Progress Report for Design Project
11	Nov 10	**Seminar**: Real-world Case Studies – Use of AI to Improve Engineering Process and Product -1 **Studio**: Design Project Presentation	Submission of Desing Project Presentation
12	Nov 17	**Seminar**: Real-world Case Studies – Use of AI to Improve Engineering Process and Product -2 **Studio**: Design Project Demonstration	Submission of Final report

Assessment

a) Assessment Overview

Tasks and Details	Individual or Group	Weighting	Mapped Unit Learning Outcomes	Mapped Graduate Attributes	Assessment Due Date
1. Portfolio	Individual	40%	1,2,3	GA1, GA2, GA5, GA6	**Weeks 3-7:** Portfolio Submission
2. Design Project	Group	60%	1,2,3,4	GA1, GA2, GA3, GA4, GA5, GA6	**Week 7:** Project Brief **Week 8-10:** Progress Report **Week 11:** Presentation **Week 12:** Demo/Video & Final Project Report

*Will be Assessed during On-campus Studios with the Tutor

Assessment Requirements	Details
b) Use of generative AI (genAI) in this unit	The valid use of genAI in this unit is as follows: 1. No AI for Individual Assessments: The Portfolio Tasks in this unit should be completed entirely without genAI assistance. 2. Project Report for Group Assessments: genAI may be used for brainstorming, creating structures, and generating ideas for improving work. Any use of genAI must be acknowledged, with prompts and outputs included in an appendix.
c) Hurdle requirements	To pass this unit, you must: (i) achieve an overall mark for the unit of 50% or more, and (ii) complete the project to an acceptable standard. A rubric will be used to determine if students have met the acceptable standard. The rubric is available on Canvas; and (iii) Achieve a minimum of 50% or more on the Portfolio (must pass at least 50% of the portfolio activities). Students who do not successfully achieve hurdle requirements (ii) and (iii) in full, will receive a maximum of 45% as the total mark for the unit.

d) Final assessment period	If the unit you are enrolled in has a final assessment (including invigilated exams), you will be expected to be available for the entire final assessment period, including any Special Exam period.

e) Submission requirements	Assignments and other assessments are generally submitted online through the Canvas assessment submission system, which integrates with Turnitin. Please ensure you keep a copy of all assessments that are submitted. In cases where a hard copy submission is required, an Assessment Cover Sheet must be submitted with your assignment. The standard Assessment Cover Sheet is available from the Submitting work webpage or www.swinburne.edu.au/studentforms/
f) Extensions and late submissions	Late Submissions - Unless an extension has been approved, late submissions will result in a penalty. You will be penalised 10% of your achieved mark for each working day the task is late, up to a maximum of 5 working days. After 5 working days, a zero result will be recorded.
g) Referencing	To avoid breaching academic integrity, you are required to provide references whenever you include information from other sources in your work and acknowledge when you have used Artificial Intelligence (AI) tools (such as ChatGPT). Further details regarding academic integrity are available in Section C of this document. Referencing convention required for this unit is IEEE. Helpful information on referencing can be found at http://www.swinburne.edu.au/library/referencing/
h) Group work guidelines	A group assignment is the collective responsibility of the entire group, and if one member is temporarily unable to contribute, the group should be able to reallocate responsibilities to keep to schedule. In the event of longer-term illness or other serious problems involving a member of the group, it is the responsibility of the other members to notify immediately the Unit Convenor or relevant Tutor. Group submissions must be submitted with an Assignment Cover Sheet signed by all members of the group. All group members must be satisfied that the work has been correctly submitted. Any penalties for late submission will generally apply to all group members, not just the person who submitted.

Required Textbook(s)

The required textbook(s) can be purchased from bookshops and may be available through

the Swinburne Library.

1. Prosise, Jeff. *Applied machine learning and AI for engineers*. → O'Reilly Media, Inc.", 2022.
2. Raschka, Sebastian, Yuxi Hayden Liu, and Vahid Mirjalili. *Machine Learning with PyTorch and Scikit-Learn: Develop machine learning and deep learning models with Python*. Packt Publishing Ltd, 2022.
3. Kapoor, Amita, Antonio Gulli, Sujit Pal, and Francois Chollet. *Deep Learning with TensorFlow and Keras: Build and deploy supervised, unsupervised, deep, and reinforcement learning models*. Packt Publishing Ltd, 2022.

Recommended Reading Materials

The library has a large collection of resource materials. It is recommended that you explore other sources to broaden your understanding.

A list of recommended online resources for relevant week activities can be found in Canvas.

PART C: FURTHER INFORMATION

For further information on any of these topics, refer to Swinburne's Student webpage http://www.swinburne.edu.au/student/

Student behaviour and wellbeing

All students are expected to: act with integrity, honesty and fairness; be inclusive, ethical and respectful of others; and appropriately use University resources, information, equipment and facilities. All students are expected to contribute to creating a work and study environment that is safe and free from bullying, violence, discrimination, sexual harassment, vilification and other forms of unacceptable behaviour.

The Student Charter describes what students can reasonably expect from Swinburne in order to enjoy a quality learning experience. The Charter also sets out what is expected of students with regards to your studies and the way you conduct yourself towards other people and property.

You are expected to familiarise yourself with University regulations and policies and are obliged to abide by these, including the Student Academic Misconduct Regulations, Student General Misconduct Regulations and the People, Culture and Integrity Policy. Any student found to be in breach of these may be subject to disciplinary processes.

Examples of expected behaviours are:

- conducting yourself in teaching areas in a manner that is professional and not disruptive to others
- following specific safety procedures in Swinburne laboratories, such as wearing appropriate footwear and safety equipment, not acting in a manner which is dangerous or disruptive (e.g. playing computer games), and not bringing in food or drink
- following emergency and evacuation procedures and following instructions given by staff/wardens in an emergency response.

Canvas

You should regularly log on to the Swinburne learning management system, Canvas. You can access Canvas via the Student login webpage or https://swinburne.instructure.com/ Canvas is updated regularly with important unit information and communications.

Communication

All communication will be via your Swinburne email address. If you access your email through a provider other than Swinburne, then it is your responsibility to ensure that your Swinburne email is redirected to your private email address.

Academic Integrity

Academic integrity is about taking responsibility for your learning and submitting work that is honestly your own. It means acknowledging the ideas, contributions and work of others; referencing your sources and acknowledging the use of generative artificial intelligence;

contributing fairly to group work; and completing tasks, tests and exams without cheating. Artificial intelligence tools should only be used where approved by the Unit Convenor.

Swinburne University uses the Turnitin system, which helps to identify inadequate citations, poor paraphrasing and unoriginal work in assignments that are submitted via Canvas. Your Unit Convenor will provide further details.

Plagiarism, collusion, contract cheating, unauthorised file sharing, falsification, fabrication, manipulation or misrepresentation of information, reuse of previous work and non- compliance with instructions in an invigilated or non-invigilated assessment item are all breaches of academic integrity and treated as academic misconduct. Examples of breaches of academic integrity include, but are not limited to:

- submitting work as your own for assessment that has been fully or partially completed by a third party, either paid or unpaid
- using output from artificial intelligence tools (e.g. ChatGPT) in whole or part without acknowledgement and/or without the approval of the Unit Convenor
- using another person's work or ideas as though it is your own work, without appropriate attribution
- working closely with another student or group of students (either past or current), to submit for assessment, some or all of the other student or students' work as your own work
- sharing without permission of the Unit Convenor, Swinburne resources or other material related to assessment to an entity or document repository site
- creating, intentionally modifying or inventing information that is intended to be submitted as part of an assessment item
- using the whole or part of a computer program written by another person as your own without appropriate acknowledgement
- poorly paraphrasing somebody else's work
- using a musical composition or audio, visual, graphic and photographic work created by another person without acknowledgment
- enabling others to cheat, including letting another student copy your work or by giving access to a draft or completed assignment
- letting someone or something else impersonate you, or you impersonate someone else in an invigilated or non-invigilated assessment item
- accessing, obtaining and/or providing to others unauthorised materials relating to an invigilated or non-invigilated assessment item.

The penalties for academic misconduct can be severe, ranging from a zero grade for an assessment task through to exclusion from Swinburne. For further details, see https://www.swinburne.edu.au/student-login/academic-integrity/

Student support

Swinburne offers a range of services and resources to help you complete your studies successfully. Your Unit Convenor or studentHQ can provide information about the study support and other services available for Swinburne students. For further information, see the Current students web page.

Special consideration

If your studies have been adversely affected due to serious and unavoidable circumstances outside of your control (e.g. severe illness or unavoidable obligation), you may be able to apply for special consideration (SPC).

Applications for Special Consideration are submitted via the SPC online tool normally no later than 5.00pm on the third working day after the submission/sitting date for the relevant assessment component. See https://www.swinburne.edu.au/life-at-swinburne/student- support-services/special-consideration-assistance/

Note: Submitting fraudulent (fake or altered) medical certificates is considered misconduct and can lead to serious penalties from Swinburne. In addition, your doctor may report fraudulent medical certificates as a prosecutable offence under the Victorian Crimes Act.

AccessAbility Services

If you are a student with a disability, medical or mental health condition or you have significant carer responsibilities, you may require reasonable adjustments to fully access and participate in education. Swinburne's AccessAbility Services can develop an Education Access Plan (EAP) that includes the services and reasonable adjustments that you need.

It is recommended that you register with AccessAbility Services when you first commence your course but you can contact the service at any time during your studies to find out about reasonable adjustments. Contact Accessibility Services to discuss further.

Review of marks

An independent marker reviews all fail grades for major assessment tasks. In addition, a review of assessment is undertaken if your final result is between 45 and 49 or within 2 marks of any grade threshold.

You can ask the Unit Convenor to check the result for an assessment item or your final result. Your request must be made in writing within 10 working days of receiving the result. The Unit Convenor can discuss the marking criteria with you and check the aggregate marks of assessment components to identify if an error has been made. This is known as local resolution. If you are dissatisfied with the outcome of the local resolution, you can lodge a formal complaint.

Feedback, complaints and suggestions

In the first instance, discuss any issues with your Unit Convenor. If your concerns are not resolved or you would prefer not to deal with your Unit Convenor, then you can complete a feedback form. See https://www.swinburne.edu.au/corporate/feedback/

Advocacy

Should you require assistance with any academic issues, University statutes, regulations, policies and procedures, you are advised to seek advice from an Academic Student Support Officer at Swinburne Student Life.

For an appointment, please call 19006412 or email swin@fe.edu.vn

For more information, please see https://portal.swin.edu.vn