UNSW Course Outline

ZEIT4150 Fundamentals of Artificial Intelligence - 2024

Published on the 09 Feb 2024

General Course Information

Course Code : ZEIT4150
Year : 2024
Term : Semester 1
Teaching Period : Z1
Is a multi-term course? : No
Faculty : UNSW Canberra
Academic Unit : School of Systems and Computing
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : UNSW Canberra at ADFA
Campus : UNSW Canberra
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

ZEIT4150 (Fundamentals of Artificial Intelligence) is a 6 Units of Credits (UoC) course. This core course exposes engineering, computer science, and cyber security students to the different aspects of artificial intelligence, including knowledge representation, reasoning, planning, natural

language processing, and search techniques. The course is designed specifically to prepare 4th Yr students to do a thesis in Artificial Intelligence by giving them the required foundations in the field.

So, are you ready to unlock the power of AI and discover how it can solve real-world problems? Join us for an exciting journey into the fundamentals of AI. This course is designed to provide students with a comprehensive understanding of various concepts and techniques used in AI. You will learn how to formulate real-life problems into well-defined AI problems, design AI solutions, perform knowledge acquisition, encoding, reasoning, and evaluation, utilize programming paradigms to solve AI problems, and communicate AI challenges, solutions, and ethics to non-technical audiences.

Throughout the course, students will learn through a combination of lectures, discussions, and hands-on projects. By the end of the course, students will have a solid understanding of the fundamental concepts and techniques in AI and will be able to apply this knowledge to solve a variety of real-world problems. Furthermore, they will be ready to dive in more advanced concepts in AI if they wish to. The course is suitable for students who are interested in exploring the field of AI and want to gain a comprehensive understanding of the different AI topics.

Course Aims

The aim of this course is to expose students to different sub-fields in Artificial Intelligence and provide them with a hands-on experience with basic Artificial Intelligence algorithms, including the analysis, design, implementation, and validation of Artificial Intelligence algorithms.

Relationship to Other Courses

This course is recommended to be completed before

- ZEIT4151 Machine Learning
- ZEIT4154 Deep Learning

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Formulate real-life problems into well-defined AI problems.
CLO2 : Design AI solutions, including performing knowledge acquisition, encoding, reasoning, and evaluation.
CLO3 : Utilise programming paradigms to solve AI problems.
CLO4 : Communicate AI challenges, solutions, and ethics to non-technical audiences.

Course Learning Outcomes	Assessment Item
CLO1 : Formulate real-life problems into well-defined AI problems.	• Problem-solving on State Space Search • Problem-solving and programming task on Adversarial State Space Search • Knowledge Acquisition Report
CLO2 : Design AI solutions, including performing knowledge acquisition, encoding, reasoning, and evaluation.	• System Project Presentation • Expert System Project implemented in PROLOG accompanied by a written report • Problem-solving and programming task on Adversarial State Space Search • Knowledge Acquisition Report
CLO3 : Utilise programming paradigms to solve AI problems.	• Expert System Project implemented in PROLOG accompanied by a written report • Problem-solving and programming task on Adversarial State Space Search
CLO4 : Communicate AI challenges, solutions, and ethics to non-technical audiences.	• System Project Presentation • Knowledge Acquisition Report • Expert System Project implemented in PROLOG accompanied by a written report

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

Moodle Site:

The primary source for course materials (lecture notes, assignments, solutions, and latest news, among others) is the Moodle site for this course. Moodle is accessible at

https://moodle.telt.unsw.edu.au/

Other Professional Outcomes

Program Learning Outcomes

This course contributes to:

The following Program Learning Outcomes of the Bachelor of Engineering (Hons) (Aeronautical Engineering):

- PLO5: Students will define, conduct experiments on and analyse complex, open-ended problems and apply appropriate methods for their solution.
- PLO6: Students will demonstrate proficiency in applying systematic engineering synthesis and design processes, and critically evaluating and effectively communicating the results and implications to all audiences.
- PLO8: Students will demonstrate independence, creativity and ethical conduct, and explain the importance of user-focused and sustainable solutions.

The following Program Learning Outcomes of the Bachelor of Engineering (Hons) (Civil Engineering)

- PLO4: Students will define, conduct experiments on and analyse complex, open-ended problems and apply appropriate methods for their solution.
- PLO5: Students will demonstrate proficiency in applying systematic engineering synthesis and design processes, and critically evaluating and effectively communicating the results and implications to all audiences.
- PLO7: Students will demonstrate independence, creativity and ethical conduct, and explain the importance of user-focused and sustainable solutions.

The following Program Learning Outcomes of the Bachelor of Engineering (Hons) (Electrical Engineering)

- PLO5: Students will define, conduct experiments on and analyse complex, open-ended problems and apply appropriate methods for their solution.
- PLO6: Students will demonstrate proficiency in applying systematic engineering synthesis and design processes, and critically evaluating and effectively communicating the results and implications to all audiences.
- PLO8: Students will demonstrate independence, creativity and ethical conduct, and explain the importance of user-focused and sustainable solutions.

The following Program Learning Outcomes of the Bachelor of Engineering (Hons) (Mechanical Engineering)

- PLO5: Students will define, conduct experiments on and analyse complex, open-ended problems and apply appropriate methods for their solution.
- PLO6: Students will demonstrate proficiency in applying systematic engineering synthesis and design processes and critically evaluating and effectively communicating the results and implications to all audiences.
- PLO8: Students will demonstrate independence, creativity and ethical conduct and explain the importance of user-focused and sustainable solutions.

The following Program Learning Outcomes of the Bachelor of Engineering (Hons) (Naval Architecture)

- PLO5: Define, conduct experiments on and apply problem-solving, design and decision-

making methodologies to identify complex problems in both the ship design and construction industries and the wider maritime sector whilst concurrently considering the implications of the solution in a global and sustainable context using appropriate engineering methods and tools
- PLO6: Demonstrate proficiency in applying systematic engineering synthesis and design processes and critically evaluating and effectively communicating the results and implications to all audiences
- PLO8: Review personal performance, demonstrate independent initiatives and leadership as a means of managing continuing professional development and lifelong learning.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Problem-solving on State Space Search Assessment Format: Individual	10%	Start Date: 08/03/2024 09:00 AM Due Date: Week 3: 11 March - 15 March
Problem-solving and programming task on Adversarial State Space Search Assessment Format: Individual	20%	Start Date: 18/03/2024 09:00 AM Due Date: 02/04/2024 11:55 PM
Knowledge Acquisition Report Assessment Format: Individual	10%	Start Date: 02/04/2024 09:00 AM Due Date: Week 7: 22 April - 26 April
System Project Presentation Assessment Format: Individual	10%	Start Date: 29/04/2024 09:00 AM Due Date: Week 9: 06 May - 10 May
Expert System Project implemented in PROLOG accompanied by a written report Assessment Format: Individual	25%	Start Date: 29/04/2024 09:00 AM Due Date: Week 11: 20 May - 24 May
Final Exam Assessment Format: Individual	25%	Start Date: Exam week Due Date: Exam week

Assessment Details

Problem-solving on State Space Search

Assessment Overview

n/a

Course Learning Outcomes

- CLO1 : Formulate real-life problems into well-defined AI problems.

Assessment information

The feedback for this assessment will be provided before the census date.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Problem-solving and programming task on Adversarial State Space Search

Assessment Overview

n/a

Course Learning Outcomes

- CLO1 : Formulate real-life problems into well-defined AI problems.
- CLO2 : Design AI solutions, including performing knowledge acquisition, encoding, reasoning, and evaluation.
- CLO3 : Utilise programming paradigms to solve AI problems.

Knowledge Acquisition Report

Assessment Overview

n/a

Course Learning Outcomes

- CLO1 : Formulate real-life problems into well-defined AI problems.
- CLO2 : Design AI solutions, including performing knowledge acquisition, encoding, reasoning, and evaluation.
- CLO4 : Communicate AI challenges, solutions, and ethics to non-technical audiences.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

System Project Presentation

Assessment Overview

n/a

Course Learning Outcomes

- CLO2 : Design AI solutions, including performing knowledge acquisition, encoding, reasoning, and evaluation.
- CLO4 : Communicate AI challenges, solutions, and ethics to non-technical audiences.

Expert System Project implemented in PROLOG accompanied by a written report

Assessment Overview

n/a

Course Learning Outcomes

- CLO2 : Design AI solutions, including performing knowledge acquisition, encoding, reasoning, and evaluation.
- CLO3 : Utilise programming paradigms to solve AI problems.
- CLO4 : Communicate AI challenges, solutions, and ethics to non-technical audiences.

Final Exam

Assessment Overview

n/a

Detailed Assessment Description

This assessment assess all the course learning outcomes:

- CLO1: Formulate real-life problems into well-defined AI problems.
- CLO2: Design AI solutions, including performing knowledge acquisition, encoding, reasoning, and evaluation.
- CLO3: Utilise programming paradigms to solve AI problems.
- CLO4: Communicate AI challenges, solutions, and ethics to non-technical audiences.

General Assessment Information

All marks obtained for assessment items during the session are provisional. The final mark as published by the university following the assessment review group meeting is **the only official mark.**

Assessment 1 is due in week 3; grades and feedback will be given to students before the end of week 4.

Grading Basis

Standard

Requirements to pass course

Assessment Criteria: Compulsory components or minimum performance standards

To pass the course, you must get a final mark of 50% or greater and must obtain a mark of 40% or greater in the final exam. Please note that final marks in this course may be moderated. For details about mark expectations and interpreting results, see the UNSW Guide to Grades on MyUNSW at: https://my.unsw.edu.au/student/academiclife/assess ment/GuideToUNSWGrades.html

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 26 February - 1 March	Lecture	• Introduction to AI • Introduction to AI Cont' • Perception, Reasoning and Actions
	Tutorial	• Introduction to Python
	Laboratory	• Tuesday Lab: No Lab • Friday Lab: Introduction to Python
Week 2 : 4 March - 8 March	Lecture	• Environments • Agents • Uninformed State Space Search
	Tutorial	• Uninformed State Space Search
	Laboratory	• Tuesday Lab: Introduction to Python (Repeat from week 1). • Friday Lab: Environments and Agents (New)
Week 3 : 11 March - 15 March	Lecture	• Informed State Space Search • Beyond State Space Search • Beyond State Space Search (cont'd)
	Tutorial	• Informed State Space Search
	Laboratory	• Tuesday Lab: Environments and Agents (Repeat from week 2). • Friday Lab: State Space Search in Python (New)
	Assessment	• Assessment 1 "Problem-solving on State Space Search (10%)" is due by the end of week 3.
Week 4 : 18 March - 22 March	Lecture	• Adversarial Search and Games • Adversarial Search and Games (cont'd) • Monte-Carlo Tree Search
	Tutorial	• Adversarial search and Games
	Laboratory	• Tuesday Lab: State Space Search in Python (Repeat from week 2). • Friday Lab: Adversarial search and Games (New): Assignment 2 draft submission is due by the end of the lab for Friday's lab students.
Week 5 : 25 March - 29 March	Lecture	• Knowledge Representation • Expert Systems • No Lecture on Friday - Good Friday Public Holiday
	Tutorial	• No Tutorial- Good Friday Public Holiday
	Laboratory	• Tuesday Lab: Adversarial search and Games (Repeat from week 2). Assignment 2 draft submission is due by the end of the lab for Tuesday's lab students. • Friday Lab: No Lab- Good Friday Public Holiday
	Assessment	• Assessment 2 "Problem-solving and programming task on Adversarial State Space Search (20%)" is due by the end of week 5. Note: As the last day of week 5 is a public holiday, the assessment can be delivered by the end of the next working day, which is Tuesday the 2nd of April.
Week 6 : 1 April - 5 April	Lecture	• Reinforcement Learning • Reinforcement Learning Cont' • Natural Computation
	Tutorial	• Knowledge Acquisition
	Laboratory	• Tuesday Lab: Reinforcement Learning (New) • Friday Lab: Reinforcement Learning (Repeat from Tuesday)
Week 7 : 22 April - 26 April	Lecture	• Constraint Satisfaction Problems (CSP) • Logical Agents • Logical Agents (Cont'd)
	Tutorial	• T7: CSP
	Laboratory	• Tuesday Lab: Functional Programming with Python (New) • Friday Lab: Functional Programming with Python (Repeat from Tuesday)
	Assessment	• Assessment 3 "Knowledge Acquisition Report (10%)" is due by the end of week 7 Note: Assessment 3 is the first part of a scaffolded assessment (the main course project).
Week 8 : 29 April - 3 May	Lecture	• First-Order Predicate Logic • Inference in First-Order Logic • Quantifying Uncertainty
	Tutorial	• First-Order Predicate Logic

		• Unification and Pattern Matching
	Laboratory	• Tuesday Lab: Logic Programming with PROLOG (New) • Friday Lab: Logic Programming with PROLOG (Repeat from Tuesday)
Week 9 : 6 May - 10 May	Lecture	• Probabilistic Reasoning • Probabilistic Reasoning Cont' • No Lecture on Friday - Military Training Day
	Laboratory	• Tuesday Lab: Expert Systems with PROLOG (New) • Friday Lab: No Lab- Military Training Day
	Assessment	• Assessment 4 "System Project Presentation (10%)" is due by the end of week 9. Note: Assessment 4 is the second part of a scaffolded assessment (the main course project).
Week 10 : 13 May - 17 May	Lecture	• Machine Learning: Supervised Learning • Machine Learning: Unsupervised Learning
	Tutorial	• Probabilistic Reasoning
	Laboratory	• Tuesday Lab: Expert Systems with PROLOG Cont' (New) • Friday Lab: Expert Systems with PROLOG (Repeat from Week 9)
	Group Activity	• Projects Progress Review/Feedback Session (Friday Lecture Timeslot)
Week 11 : 20 May - 24 May	Lecture	• Natural Language Processing
	Tutorial	• Natural Language Processing
	Laboratory	• Tuesday Lab: Natural Language Processing (New) • Friday Lab: Expert Systems with PROLOG Cont' (Repeat from Week 10)
	Assessment	• Assessment 5 "Expert System Project implemented in PROLOG accompanied by a written report (25%)" is due by the end of week 11 Note: Assessment 5 is the third and last part of a scaffolded assessment (the main course project).
Week 12 : 27 May - 31 May	Lecture	• No lecture on Tuesday • Friday Lecture: Hot Topic Series (Large Language Models)
	Tutorial	• Tutorial on Machine Learning
	Laboratory	• Tuesday Lab: Compensation Day – Monday Timetable • Friday Lab: Natural Language Processing (Repeat from week 11)
Week 13 : 3 June - 7 June	Lecture	• Hot Topic Series (Philosophy and Ethics of AI) • Hot Topic Series (AI in Practice and the Future of AI) • Hot Topic Series (Swarm Intelligence)
	Tutorial	• Discussion on Ethics of AI
	Laboratory	• Tuesday Lab: AI in Practice (New) • Friday Lab: AI in Practice (Repeat from Tuesday)

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Resources

Prescribed Resources

Artificial Intelligence: A Modern Approach, 4th Edition, 2021, Global Edition, Stuart Russell, Peter Norvig, Pearson· ISBN 9781292401133

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Heba El-Fiqi		Building 15 Room 204	02 5114 5332	Monday 1600 - 1700	No	Yes
Lecturer	Mo Hossny		Building 36 Room 103	02 5114 5363	Friday 1300-1400	No	No

Other Useful Information

Academic Information

Course Evaluation and Development

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by listening to our own students. Students will be asked to complete the myExperience survey towards the end of each course.

Students can also provide feedback during the semester via: direct contact with the lecturer, the “On-going Student Feedback” link in Moodle, Student-Staff Liaison Committee meetings in schools, informal feedback conducted by staff, and focus groups (where applicable). Student opinions really do make a difference. Refer to the Moodle site for your course to see how the feedback from previous students has contributed to the course development.

Important note: Students are reminded that any feedback provided should be constructive and professional and that they are bound by the Student Code of Conduct.

https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Equitable Learning Services (ELS)

Students living with neurodivergent, physical and/or mental health conditions or caring for someone with these conditions may be eligible for support through the Equitible Learning Services team. Equitable Learning Services is a free and confidential service that provides practical support to ensure your mental or physical health conditions do not adversely affect your studies.

Our team of dedicated **Equitable Learning Facilitators** (ELFs) are here to assist you through this process. We offer a number of services to make your education at UNSW easier and more equitable.

Further information about ELS for currently enrolled students can be found at: https://www.student.unsw.edu.au/equitable-learning

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. All students are expected to adhere to UNSW's Student Code of Conduct. Find relevant information at: Student Code of Conduct (unsw.edu.au)

Plagiarism undermines academic integrity and is not tolerated at UNSW. It is defined as using the words or ideas of others and passing them off as your own, and can take many forms, from deliberate cheating to accidental copying from a source without acknowledgement.

For more information, please refer to the following:

https://student.unsw.edu.au/plagiarism

Submission of Assessment Tasks

Special Consideration

Special Consideration is the process for assessing and addressing the impact on students of short-term events, that are beyond the control of the student, and that affect performance in a specific assessment task or tasks.

Applications for Special Consideration will be accepted in the following circumstances only:

- Where academic work has been hampered to a substantial degree by illness or other cause;
- The circumstances are unexpected and beyond the student's control;
- The circumstances could not have reasonably been anticipated, avoided or guarded against by the student; and either:

(i) they occurred during a critical study period and was 3 consecutive days or more duration, or a total of 5 days within the critical study period; or

(ii) they prevented the ability to complete, attend or submit an assessment task for a specific date (e.g. final exam, in class test/quiz, in class presentation)

Applications for Special Consideration must be made as soon as practicable after the problem occurs and at the latest within three working days of the assessment or the period covered by the supporting documentation.

By sitting or submitting the assessment task the student is declaring that they are fit to do so and cannot later apply for Special Consideration (UNSW 'fit to sit or submit' requirement).

Sitting, accessing or submitting an assessment task on the scheduled assessment date, after applying for special consideration, renders the special consideration application void.

Find more information about special consideration at: https://www.student.unsw.edu.au/special/consideration/guide

Or apply for special consideration through your MyUNSW portal.

Late Submission of assessment tasks (other than examinations)

UNSW has a standard late submission penalty of:

- 5% per day,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Electronic submission of assessment

Except where the nature of an assessment task precludes its electronic submission, all assessments must be submitted to an electronic repository, approved by UNSW or the Faculty, for archiving and subsequent marking and analysis.

Release of final mark

All marks obtained for assessment items during the session are provisional. The final mark as published by the university following the assessment review group meeting is the only official

mark.

School-specific Information

The Leaning Management System

Moodle is the Learning Management System used at UNSW Canberra. All courses have a Moodle site which will become available to students at least one week before the start of semester. Please find all help and documentation (including Blackboard Collaborate) at the Moodle Support page.

UNSW Moodle supports the following web browsers:
• Google Chrome 50+
• Safari 10+
Internet Explorer is not recommended. Addons and Toolbars can affect any browser's performance.

Operating systems recommended are:
• Windows 10,
• Mac OSX Sierra,
• iPad IOS10

Further details:
Moodle System Requirements
Moodle Log In

If you need further assistance with Moodle:

For enrolment and login issues please contact:
IT Service Centre
Email: itservicecentre@unsw.edu.au
Phone: (02) 9385-1333
International: +61 2 9385 1333

For all other Moodle issues please contact:
External TELT Support
Email: externalteltsupport@unsw.edu.au
Phone: (02) 9385-3331

International: +61 2 938 53331

Opening hours:

Monday – Friday 7:30am – 9:30 pm

Saturday & Sunday 8:30 am – 4:30pm

Study at UNSW Canberra

Study at UNSW Canberra has lots of useful information regarding:

- Where to get help
- Administrative matters
- Getting your passwords set up
- How to log on to Moodle
- Accessing the Library and other areas.

UNSW Canberra Student Hub

For News and Notices, Student Services and Support, Campus Comminity, Quick Links, Important Dates and Upcoming Events

School Contact Information

Deputy Head of School (Education): Dr Erandi Hene Kankanamge

E: e.henekankanamge@adfa.edu.au

T: 02 5114 5157

Syscom Admin Support: syscom@unsw.edu.au

T: 02 5114 5284

Syscom Admin Office: Building 15, Level 1, Room 101 (open 10am to 3pm, Mon to Fri)