



UNSW

UNSW Course Outline

ZEIT3606 Foundation and Pavement Engineering - 2024

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General Course Information

Course Code : ZEIT3606

Year : 2024

Term : Semester 2

Teaching Period : Z2

Is a multi-term course? : No

Faculty : UNSW Canberra

Academic Unit : School of Engineering and Technology

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

This course consists of two modules. Students have to pass in both modules.

Module 1: Foundation Engineering.

Subjects for Module 1:

- Stress-strain-strength relationships
- Unsaturated soil mechanics and related strength
- Shallow foundations (theories and design)
- Deep foundations (theories and design)
- Foundations on problematic soils.

Module 2: Pavement Engineering.

Subjects for Module 1:

- Natural materials for road and airfield pavement construction
- Investigation and field testing for pavements
- Bituminous materials
- Rigid and flexible roads and introduction to airfield pavements
- Structural design of unsealed and sealed pavements
- Pavement evaluation and maintenance
- Introduction to pavement management.

Course Aims

This course consisting of two modules, foundation engineering and pavement engineering, both being related to geotechnical engineering. This course will develop the basic principles into design methodologies. Pavement Engineering builds on what you have learnt in geotechnical and materials engineering courses concerning pavement materials and integrates pavement design. Foundation engineering will be built on soil mechanics and geotechnical engineering courses

Relationship to Other Courses

Prerequisites: ZEIT2601, and ZEIT3602.

Course Learning Outcomes

Course Learning Outcomes	Engineers Australia - Professional Engineer (Stage 1)
CLO1 : Have a preliminary understanding of stress-strain (including non-linearity) and unsaturated behaviours of soils	<ul style="list-style-type: none"> • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline
CLO2 : Understanding the paradigm of geotechnical engineering design for foundations	<ul style="list-style-type: none"> • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE3.2 : Effective oral and written communication in professional and lay domains • PEE3.6 : Effective team membership and team leadership
CLO3 : Apply geotechnical engineering theory and design simple shallow and deep foundations using a first principle approach	<ul style="list-style-type: none"> • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE1.6 : Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE3.1 : Ethical conduct and professional accountability • PEE3.5 : Orderly management of self, and professional conduct
CLO4 : Have a good understanding of the characteristics of pavement materials, the behaviour of pavements under traffic wheel loads and the principles involved in flexible pavement design	<ul style="list-style-type: none"> • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline

	<ul style="list-style-type: none"> • PEE2.2 : Fluent application of engineering techniques, tools and resources • PEE3.1 : Ethical conduct and professional accountability • PEE3.6 : Effective team membership and team leadership
CLO5 : Apply pavement analysis methods and design simple unsealed roads and sealed flexible road pavements	<ul style="list-style-type: none"> • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.2 : Fluent application of engineering techniques, tools and resources • PEE3.2 : Effective oral and written communication in professional and lay domains
CLO6 : Have a preliminary understanding on the construction, evaluation, maintenance and management of pavements	<ul style="list-style-type: none"> • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.3 : Application of systematic engineering synthesis and design processes

Course Learning Outcomes	Assessment Item
CLO1 : Have a preliminary understanding of stress-strain (including non-linearity) and unsaturated behaviours of soils	<ul style="list-style-type: none"> Assignment 1 Assignment 2 Quiz
CLO2 : Understanding the paradigm of geotechnical engineering design for foundations	<ul style="list-style-type: none"> Assignment 1 Assignment 2 Quiz
CLO3 : Apply geotechnical engineering theory and design simple shallow and deep foundations using a first principle approach	<ul style="list-style-type: none"> Quiz
CLO4 : Have a good understanding of the characteristics of pavement materials, the behaviour of pavements under traffic wheel loads and the principles involved in flexible pavement design	<ul style="list-style-type: none"> Assignment 3 Final Exam
CLO5 : Apply pavement analysis methods and design simple unsealed roads and sealed flexible road pavements	<ul style="list-style-type: none"> Assignment 3 Final Exam
CLO6 : Have a preliminary understanding on the construction, evaluation, maintenance and management of pavements	<ul style="list-style-type: none"> Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

The Learning 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 7, 10, Mac OSX Sierra, iPad IOS10

For further details about system requirements click [here](#).

Log in to Moodle [here](#).

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

Other Professional Outcomes

NA

Additional Course Information

Academic Integrity and Plagiarism

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

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

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>

Referencing

In line with UNSW Canberra policy, undergraduate students must be instructed to use either the APA 7 or Chicago NB (notes and bibliography) referencing conventions.

In this course, students are required to reference following the APA 7 / Chicago NB referencing style. Information about referencing styles is available at: <https://guides.lib.unsw.adfa.edu.au/c.php?g=472948&p=3246720>

Study at UNSW Canberra

<https://www.unsw.adfa.edu.au/study>

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.

Additional Information as required

CRICOS Provider no. 00098G

The University of New South Wales Canberra.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates	Australian Institute of Project Management (AIPM), Engineers Australia - Engineering Technologist (Stage 1), Engineers Australia - Professional Engineer (Stage 1)
Assignment 1 Assessment Format: Individual	5%	Start Date: 26/07/2024 05:00 PM Due Date: 02/08/2024 05:00 PM Post Date: 26/07/2024 05:00 PM	<ul style="list-style-type: none">• PM1 : The program aims, and program-level learning outcomes are to be aligned to the PMBOK® Guide 7th Edition (2021) OR relevant alternative standard or professional reference• ET1.1 : Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain• ET1.3 : In-depth understanding of specialist bodies of knowledge within the technology domain• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline
Assignment 2 Assessment Format: Individual Short Extension: Yes (2 days)	10%	Start Date: 07/08/2024 05:00 PM Due Date: 21/08/2024 05:00 PM Post Date: 07/08/2024 05:00 PM	<ul style="list-style-type: none">• PM1 : The program aims, and program-level learning outcomes are to be aligned to the PMBOK® Guide 7th Edition (2021) OR relevant alternative standard or professional reference• ET1.1 : Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain

			<ul style="list-style-type: none"> • ET1.3 : In-depth understanding of specialist bodies of knowledge within the technology domain • ET2.2 : Application of engineering techniques, tools and resources within the technology domain • ET2.3 : Application of systematic synthesis and design processes within the technology domain • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving
Assignment 3 Assessment Format: Individual	15%	Start Date: 04/10/2024 05:00 PM Due Date: 18/10/2024 05:00 PM Post Date: 04/10/2024 12:00 AM	<ul style="list-style-type: none"> • PM1 : The program aims, and program-level learning outcomes are to be aligned to the PMBOK® Guide 7th Edition (2021) OR relevant alternative standard or professional reference • ET1.1 : Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain • ET1.3 : In-depth understanding of specialist bodies of knowledge within the technology domain • ET1.5 : Knowledge of engineering design practice and contextual factors impacting the technology domain • ET2.2 : Application of

			<p>engineering techniques, tools and resources within the technology domain</p> <ul style="list-style-type: none"> • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.3 : Application of systematic engineering synthesis and design processes
Quiz Assessment Format: Individual	35%	<p>Start Date: 13/09/2024 03:00 PM</p> <p>Due Date: 13/09/2024 05:00 PM</p> <p>Post Date: 13/09/2024 03:00 PM</p>	<ul style="list-style-type: none"> • PM1 : The program aims, and program-level learning outcomes are to be aligned to the PMBOK® Guide 7th Edition (2021) OR relevant alternative standard or professional reference • ET1.1 : Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain • ET1.3 : In-depth understanding of specialist bodies of knowledge within the technology domain • ET1.5 : Knowledge of engineering design practice and contextual factors impacting the technology domain • ET2.1 : Application of established engineering methods to broadly-defined problem solving within the technology

			<p>domain</p> <ul style="list-style-type: none"> • ET2.2 : Application of engineering techniques, tools and resources within the technology domain • ET3.2 : Effective oral and written communication in professional and lay domains • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.2 : Fluent application of engineering techniques, tools and resources
Final Exam Assessment Format: Individual	35%	Start Date: Not Applicable Due Date: Exam week	<ul style="list-style-type: none"> • PM1 : The program aims, and program-level learning outcomes are to be aligned to the PMBOK® Guide 7th Edition (2021) OR relevant alternative standard or professional reference • ET1.1 : Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain • ET1.3 : In-depth understanding of specialist bodies of knowledge within the technology domain • ET1.5 : Knowledge of engineering design practice and contextual factors impacting the technology domain

		<ul style="list-style-type: none"> • ET2.1 : Application of established engineering methods to broadly-defined problem solving within the technology domain • ET2.2 : Application of engineering techniques, tools and resources within the technology domain • ET3.2 : Effective oral and written communication in professional and lay domains • ET3.4 : Professional use and management of information • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.2 : Fluent application of engineering techniques, tools and resources
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Assessment Details

Assignment 1

Course Learning Outcomes

- CLO1 : Have a preliminary understanding of stress-strain (including non-linearity) and unsaturated behaviours of soils
- CLO2 : Understanding the paradigm of geotechnical engineering design for foundations

Detailed Assessment Description

NA

Assessment Length

Calculation based questions

Submission notes

via Moodle

Assessment information

NA

Assignment submission Turnitin type

This is not a Turnitin assignment

Assignment 2

Course Learning Outcomes

- CLO1 : Have a preliminary understanding of stress-strain (including non-linearity) and unsaturated behaviours of soils
- CLO2 : Understanding the paradigm of geotechnical engineering design for foundations

Detailed Assessment Description

NA

Assessment Length

Calculation based questions

Submission notes

via Moodle

Assessment information

NA

Assignment submission Turnitin type

This is not a Turnitin assignment

Assignment 3

Course Learning Outcomes

- CLO4 : Have a good understanding of the characteristics of pavement materials, the behaviour of pavements under traffic wheel loads and the principles involved in flexible

pavement design

- CLO5 : Apply pavement analysis methods and design simple unsealed roads and sealed flexible road pavements

Detailed Assessment Description

NA

Assessment Length

Calculation based questions

Submission notes

via Moodle

Assessment information

NA

Assignment submission Turnitin type

This is not a Turnitin assignment

Quiz

Assessment Overview

The quiz will be in an on-site/closed book form during the teaching period, where students will be allowed to bring in a sheet of A4 paper with anything written on both sides for the test.

Course Learning Outcomes

- CLO1 : Have a preliminary understanding of stress-strain (including non-linearity) and unsaturated behaviours of soils
- CLO2 : Understanding the paradigm of geotechnical engineering design for foundations
- CLO3 : Apply geotechnical engineering theory and design simple shallow and deep foundations using a first principle approach

Detailed Assessment Description

NA

Assessment Length

Calculation based questions

Submission notes

via Moodle

Assessment information

NA

Assignment submission Turnitin type

This is not a Turnitin assignment

Final Exam

Assessment Overview

The Final exam will be an on-site/closed book form (during University Exam period), where students will be allowed to bring in a sheet of A4 paper with anything written on both sides for the exam/test of each module. In addition, relevant parts of Austroads (2017) or a collection of equations, charts and tables will be provided during the exam/test. Details will be discussed during the semester. However, the Final Exam can turn to an online/take-home form if COVID-19 restrictions are still effective.

Course Learning Outcomes

- CLO4 : Have a good understanding of the characteristics of pavement materials, the behaviour of pavements under traffic wheel loads and the principles involved in flexible pavement design
- CLO5 : Apply pavement analysis methods and design simple unsealed roads and sealed flexible road pavements
- CLO6 : Have a preliminary understanding on the construction, evaluation, maintenance and management of pavements

Detailed Assessment Description

NA

Assessment Length

Calculation based questions

Submission notes

via Moodle

Assessment information

NA

Assignment submission Turnitin type

This is not a Turnitin assignment

General Assessment Information

Assignment 1 will be due in week 3, feedback, grades and worked solutions will be given to students during week 4.

Late Submission of Assessment

- Unless prior arrangement is made with the lecturer or a formal application for special consideration is submitted, a penalty of 5% of the total available mark for the assessment will apply for each day that an assessment item is late up to a maximum of 5 days (120 hours) after which an assessment can no longer be submitted and a grade of 0 will be applied.

Use of Generative AI in Assessments

FULL ASSISTANCE WITH ATTRIBUTION

You can use generative AI software in this assessment to the extent specified in the assessment instructions. Any output of generative software within your assessment must be attributed with full referencing.

If the outputs of generative AI such as ChatGPT form part of your submission and is not appropriately attributed, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

* To cite: OpenAI (Year Accessed). ChatGPT. OpenAI. <https://openai.com/models/chatgpt/>

* Please note that the outputs from these tools are not always accurate, appropriate, nor properly referenced. You should ensure that you have moderated and critically evaluated the outputs from generative AI tools such as ChatGPT before submission.

Grading Basis

Standard

Requirements to pass course

The overall passing mark is set at 50% by the University and this must not be varied.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Lecture	Review: Strength and constitutive model of soils + Tutorial
Week 2 : 22 July - 26 July	Lecture	Introduction to unsaturated soil mechanics + Tutorial
	Assessment	Assignment 1 release
Week 3 : 29 July - 2 August	Lecture	Shallow foundation: Bearing capacity + Tutorial
	Assessment	Assignment 1 due
Week 4 : 5 August - 9 August	Lecture	Shallow foundation: Settlement + Tutorial
	Assessment	Assignment 2 release
Week 5 : 12 August - 16 August	Lecture	Deep foundation: Piles and Drilled-shaft
Week 6 : 19 August - 23 August	Lecture	Deep foundation: Principles and design
	Assessment	Assignment 2 due
Week 7 : 9 September - 13 September	Lecture	Introduction to pavement design and construction + Unsealed pavement
	Assessment	Quiz
Week 8 : 16 September - 20 September	Lecture	Unsealed pavement
Week 9 : 23 September - 27 September	Lecture	Sealed flexible pavement
Week 10 : 30 September - 4 October	Lecture	Sealed flexible pavements
Week 11 : 7 October - 11 October	Lecture	Rigid pavements
	Assessment	Assignment 3 release
Week 12 : 14 October - 18 October	Lecture	Introduction to pavement drainage; airfield pavements; pavement maintenance and management
	Assessment	Assignment 3 due
Week 13 : 21 October - 25 October	Lecture	Revision

Attendance Requirements

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

General Schedule Information

Wed 18 Sep lost - Military training day

Course Resources

Prescribed Resources

NA

Recommended Resources

Braja M. Das. Principles of Foundation Engineering. 9th Edition.

AUSTROADS (2017). Guide to Pavement Technology – Part 2: Pavement Structural Design.

AUSTROADS, Sydney, Australia. ISBN: 978-1- 925671-11-7. AUSTROADS Publication No:

AGPT02-17

Additional Costs

No additional costs

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 this 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. Student opinions really do make a difference. Refer to the Moodle site for this 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 Policy

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

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Yue Chen		Room 364 Building 21	0251145195	Usually available at any time during normal working hours. An appointment is usually not necessary Consultation Modes: Face to face, online via Teams, e-mail and phone Drop-in consultation: Friday 16:00 to 17:00	Yes	Yes