



UNSW

UNSW Course Outline

ZEIT2603 Civil Engineering Materials - 2024

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General Course Information

Course Code : ZEIT2603

Year : 2024

Term : Semester 1

Teaching Period : Z1

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 presents the basic topics of modern construction materials and their applications in civil engineering. Topics covered include: history and development of materials; interactions between processes, design, and implementation; basic material properties; manipulating

material properties; soils, rocks, aggregates, asphalt, cement and concrete, steel, composites, and other natural materials; materials in practical implementations; new materials for civil engineering; civil engineering materials and the environment.

Course Aims

This course aims to provide a comprehensive introduction to civil engineering materials. It covers basic topics on modern construction materials, their properties and their applications in civil engineering projects. Emphases will be given to factors that affect material selections in terms of strength, serviceability, durability and sustainability in practice.

Relationship to Other Courses

Prerequisites: ZPEM1102

Course Learning Outcomes

Course Learning Outcomes	Engineers Australia - Professional Engineer (Stage 1)
CLO1 : Understand, describe and characterise basic properties of materials and apply such knowledge to civil engineering.	<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 • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE3.6 : Effective team membership and team leadership
CLO2 : Understand, describe and characterise properties of naturally occurring materials with which civil engineers must deal; apply such knowledge in practical situations.	<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 • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE3.6 : Effective team membership and team leadership
CLO3 : Understand, describe and characterise properties of artificial materials and their relationship and impact on civil engineering.	<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 • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin 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 • PEE3.6 : Effective team membership and team leadership
CLO4 : Understand and describe and analyse relationships between materials properties and design needs; apply such knowledge.	<ul style="list-style-type: none"> • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering

	<p>fundamentals applicable to the engineering discipline</p> <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 • PEE1.5 : 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 • PEE3.6 : Effective team membership and team leadership
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Course Learning Outcomes	Assessment Item
CLO1 : Understand, describe and characterise basic properties of materials and apply such knowledge to civil engineering.	<ul style="list-style-type: none"> • Final Examination • Quiz • Laboratory and assignment
CLO2 : Understand, describe and characterise properties of naturally occurring materials with which civil engineers must deal; apply such knowledge in practical situations.	<ul style="list-style-type: none"> • Final Examination • Quiz • Laboratory and assignment
CLO3 : Understand, describe and characterise properties of artificial materials and their relationship and impact on civil engineering.	<ul style="list-style-type: none"> • Final Examination • Quiz
CLO4 : Understand and describe and analyse relationships between materials properties and design needs; apply such knowledge.	<ul style="list-style-type: none"> • Laboratory and assignment • Final Examination

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

Teaching Strategies

This course will be taught through different methods involving lectures and laboratory sessions. Active participation in classes and laboratory discussions on practical issues of the subject matter, solving assigned problems both individually and as a group are important aspects of

learning. Overall expectations are as follows:

- ☒ This course covers several different civil engineering materials in one semester. Active engagements in lectures and laboratory sessions are strongly encouraged.
- ☒ Lecture handouts are not meant to be complete. They may have 'errors', either due to inevitable typos or deliberately 'built-in' to address certain issues. Both types of 'error' will be clarified during lectures.

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: externaltelsupport@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

None

Additional Course Information

Referencing

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	Engineers Australia - Professional Engineer (Stage 1)
Final Examination Assessment Format: Individual	50%	Start Date: Not Applicable Due Date: Not Applicable	<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• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin 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• PEE3.6 : Effective team membership and team leadership
Quiz Assessment Format: Individual	15%	Start Date: Not Applicable Due Date: Week 8: 29 April - 03 May	<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• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline• PEE2.1 : Application of

			<p>established engineering methods to complex engineering problem solving</p> <ul style="list-style-type: none"> • PEE3.6 : Effective team membership and team leadership • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline
Laboratory and assignment Assessment Format: Individual	35%	Start Date: Not Applicable Due Date: Not Applicable	<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 • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin 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 • PEE3.6 : Effective team membership and team leadership

Assessment Details

Final Examination

Assessment Overview

The final examination will cover all topics given in the course.

Course Learning Outcomes

- CLO1 : Understand, describe and characterise basic properties of materials and apply such knowledge to civil engineering.
- CLO2 : Understand, describe and characterise properties of naturally occurring materials with which civil engineers must deal; apply such knowledge in practical situations.
- CLO3 : Understand, describe and characterise properties of artificial materials and their relationship and impact on civil engineering.
- CLO4 : Understand and describe and analyse relationships between materials properties and design needs; apply such knowledge.

Detailed Assessment Description

Conduct during examination week. %0% of total course mark.

Assessment Length

Students need to answer 4 questions in the examination

Submission notes

Students needs to capture their answers and submit online

Assessment information

Materials allowed or provided at exam:

Students are allowed to bring an A4 sheet with handwritten information on both sides

Students will be provided with a collection of equations and design charts (if needed).

Assignment submission Turnitin type

Not Applicable

Quiz

Assessment Overview

One quiz will be given after semester break to test the learning process of the students up to week 6. Feedback will be given to students 1-2 weeks after the quizzes.

Course Learning Outcomes

- CLO1 : Understand, describe and characterise basic properties of materials and apply such knowledge to civil engineering.
- CLO2 : Understand, describe and characterise properties of naturally occurring materials with which civil engineers must deal; apply such knowledge in practical situations.
- CLO3 : Understand, describe and characterise properties of artificial materials and their relationship and impact on civil engineering.

Detailed Assessment Description

To be conduct in Class during Week 8 on 29 April 2024 during class period. 15% of total course mark.

Submission notes

Students need to capture their answers and submit online to Moodle

Assessment information

Materials allowed or provided at quiz:

For details of the quiz date, please refer to the "Detailed Course Schedule" at the Course Moodle site

Students are allowed to bring an A4 sheet with handwritten information on both sides

Students will be provided with a collection of equations and design charts (if needed).

Assignment submission Turnitin type

Not Applicable

Laboratory and assignment

Assessment Overview

A series of laboratory sessions and assignments will be arranged from week 3 to 12. All students must completed all the sessions and submit reports.

Course Learning Outcomes

- CLO1 : Understand, describe and characterise basic properties of materials and apply such knowledge to civil engineering.
- CLO2 : Understand, describe and characterise properties of naturally occurring materials with which civil engineers must deal; apply such knowledge in practical situations.
- CLO4 : Understand and describe and analyse relationships between materials properties and design needs; apply such knowledge.

Detailed Assessment Description

There are two assignments and three labs for this assessment component. All assignment and labs. report are individual assessments. Their details are shown below.

(1) Assignment 1 (5%): On Soils, aggregates and rock materials. Issue date on 25 March and due date on 5 April.

(2) Assignment 2 (5%): On concrete mix design. Issue date on 1 May and due date on 20 May

(3) Lab 1 (5%): On Soil classification. Conduct on 15 March and report due on 20 March

(4) Lab 2 (15%): Concrete labs. Conduct on 3 May, (mix and slump), 17 May (heat of hydration), 24 May (21 day strength and rebound hammer tests). Report due on 7 June

(5) Lab 3 (5%): Steel tensile strength test. Conduct on 31 May and report due on 7 June

All labs. will be conducted in SET Civil Labs at Building 20.

Assessment Length

Details assignment and lab. instruction will be provided to student for completing their assessments

Submission notes

Students require to submit their assignments and lab. reports to Moodle

Assessment information

General Assessment Criteria

Marks for the Assignments will be given with consideration to:

- ☒ *Understanding of principles* – we are looking to see that you are able to apply basic concepts to the engineering questions.
- ☒ *Correctness* – look for ways to check your results with redundant calculations or checking back to original question.
- ☒ *Clarity* – all steps should be shown to check every calculation. This is very important from the point of view of effective communication.
- ☒ *Completeness* – all answers should include any relevant units, any assumptions, approximations or simplifications should be stated.

Marking Criteria for Lab reports

- ☒ Correct and detailed procedures
- ☒ In-depth investigation, data analysis, and discussion

☒ Technical writing of an Engineering Report

Assignment submission Turnitin type

Not Applicable

General Assessment Information

Students will get the feedback of Lab. 1 assessment (Soil Classification) by the census date (24 March 2024)

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

For all the class tests and final examination, it is prohibited to use any software or service to search for or generate information or answers. If its use is detected, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

Grading Basis

Standard

Requirements to pass course

Qualification Conditions

To pass this course, a student must achieve:

(1) 50% of overall mark, and

(2) 40% for the final examination, and

(3) 50% (aggregate) for the quiz, assignments and laboratory reports.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 26 February - 1 March	Lecture	L1 Fundamentals (Robert Niven) L2 Chemistry of Materials (Robert Niven)
Week 2 : 4 March - 8 March	Lecture	L3 Soils 1 (Robert Niven) L4 Soils 2 (Robert Niven)
Week 3 : 11 March - 15 March	Lecture	L5 Aggregates (Robert Niven)
	Laboratory	Lab 1: Soil Classification lab. (Robert Niven)
Week 4 : 18 March - 22 March	Lecture	L6 Rocks (Robert Niven) L7 Asphalt I (Robert Niven)
	Assessment	Lab 1 report due (Robert Niven)
Week 5 : 25 March - 29 March	Lecture	L8 Asphalt II (Robert Niven) L9 Introduction to Concrete (Damith Mohotti)
	Assessment	Assignment 1 issue: Soils, aggregates, and rock materials
Week 6 : 1 April - 5 April	Lecture	L10 Cement and hydration (Damith Mohotti)
	Assessment	Assignment 1 due (Robert Niven)
Week 7 : 22 April - 26 April	Lecture	L11 Producing quality concrete (Damith Mohotti)
Week 8 : 29 April - 3 May	Lecture	L12 Concrete mix design (Damith Mohotti)
	Assessment	Assignment 2 issue: Concrete mix design (Damith Mohotti) Quiz: for Soil part (Robert Niven)
	Laboratory	Lab. 2.1 Concrete Mix and Slump (Damith Mohotti)
Week 9 : 6 May - 10 May	Lecture	L13 Properties of fresh and hardened concrete and site practices I (Damith Mohotti) L14 Properties of fresh and hardened concrete and site practices II (Damith Mohotti)
Week 10 : 13 May - 17 May	Lecture	L15 Introduction to AS3600 (Damith Mohotti) L16 Recent developments in concrete technology (Damith Mohotti)
	Laboratory	Lab. 2.1 Heat of hydration (Kasun)
Week 11 : 20 May - 24 May	Lecture	L17 Metals and Alloys (Chi-King Lee) L18 Steel as construction materials (Chi-King Lee)
	Laboratory	Lab. 2.3 21 Day strength and rebound hammer test (Kasun)
	Assessment	Assignment 2 due (Damith Mohotti)
Week 12 : 27 May - 31 May	Lecture	L19 Structural steel and mechanical properties (Chi-King Lee) L20 Brief introduction to AN3678, 3679 and 4671 (Chi-King Lee)
	Laboratory	Lab 3: Steel coupon test (Kasun)
Week 13 : 3 June - 7 June	Lecture	L21 Revision (all) L22 Revision (all)
	Assessment	Lab 2 report due (Damith Mohotti) Lab 3 report due (Damith Mohotti)

Attendance Requirements

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

General Schedule Information

For full detailed course schedule information, please refer to the "Detailed Course Schedule" at the Moodle site.

Normal teaching schedule: Lecture on Monday 10:00 - 12:00 B20 R123 and Wed. 13:00 -15:00

Note the following change of normal class schedule due to public holidays (PH) and military days.

- (1) 11/3 Monday: Canberra Day PH (no lecture)
- (2) 1/4 Monday: Easter Day PH. (no lecture)
- (3) 24/4 Wed.: Military training day (no lecture)
- (4) 10/5 Friday: Non-teaching day (no lab)
- (5) 27/5 Monday: Reconciliation Day PH (no lecture)
- (6) 28/5 Tuesday: Monday time table L19

Course Resources

Prescribed Resources

None

Recommended Resources

The following two textbooks are recommended to the students to gain additional knowledge (Not Compulsory)

- Nagaratnam Sivakugan, Carthigesu T, Gnanendran, Rabin Tuladhar, M. Bobby Kannan, *Civil Engineering Materials*, Cengage Learning, 2016.
- Michael S. Mamlouk and John P. Zaniewski, *Materials for Civil and Construction Engineers*, (4th Edition in SI units), Pearson, 2017.

The standards given below are supplementary materials

- Australian/New Zealand Standard AS/NZS 3678:2016: **Structural Steel– Hot Rolled Plates, floorplates and slabs.**
- Australian/New Zealand Standard AS/NZS 3679.1:2016: **Structural Steel Part I – Hot-Rolled bars and Sections**
- Australian/New Zealand Standard AS/NZS 4671.2001: **Steel reinforcing materials.**
- Australian/New Zealand Standard AS/NZS 3600:2021: **Concrete Structural Design**

Please note that a large number of other excellent books on Civil and Construction Engineering Materials are available at the Academy Library.

Additional Costs

None

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
Lecturer	Robert Niven		Room 129, Building 20	02-5114-5188	by email and phone appointment	No	No
Convenor	Chi King Lee		Room 133, Building 20	02-5114-5173	Monday 2:00 PM to 3:00 PM or by email and phone appointment	Yes	Yes
Lecturer	Damith Mohotti		Room 106, Building 20	02 5114 5160	by email or phone appointment	No	No
Demonstrator	Kasun Wijesooriya		Room G04 Building 15	02 5114 1576	by email and phone appointment	No	No

Other Useful Information

Academic Information

Course Evaluation and Development

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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 Equitable 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 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.

Find relevant information at: [Student Code of Conduct \(unsw.edu.au\)](https://www.unsw.edu.au/students/student-code-conduct)

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.