CVEN9824

Advanced Materials Technology

Term 2, 2023

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Taehwan Kim	taehwan.kim@unsw.edu.au		Room 718 H20 (Civil Engineering Building)	Teams call

Lecturers

Name	Email	Availability	Location	Phone
Taehwan Kim	taehwan.kim@unsw.edu.au		Room 718 H20 (Civil Engineering Building)	Teams call

School Contact Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students).

Course Details

Units of Credit 6

Summary of the Course

In Advanced Materials Technology, details of concrete components including cement, aggregate, and admixtures will be covered. Hydration reactions in cement and structures of cement pasts will be discussed and then the properties of fresh and hardened concrete will be introduced. In addition, this course includes details of mix design of concrete. Durability issues and chemical deterioration of concrete materials (corrosion, alkali silica reaction, and sulphate attack) will be introduced and their mitigation methods will be discussed. This course also includes several topics for the sustainability: new sustainable alternative binders, low carbon concrete and high-performance concrete materials.

Course Aims

The objectives of this course are to:

- Introduce concrete components and their roles and effects on concrete properties (both chemical and mechanical). This objective contributes to achievement of learning outcomes 1, 2 and 3.
- Provide details of fluid transportation in concrete and various concrete deteriorations. Identify effective measure that promotes durability. This objective contributes to achievement of learning outcomes 4 and 5.
- Introduce recent advancements in cement and concrete technologies including high performance concrete, and low carbon concrete. This objective contributes to achievement of learning outcome 5.

The course achieves these objectives through a combination of lecture presentations, workshops, and assessment exercises that are designed to introduce students to in-depth understanding of concrete materials and most recent advancements in cement and concrete materials. This course will also provide students with opportunities to develop the following graduate attributes:

- the capacity for analytical and independent critical thinking; and
- skills related to lifelong learning, such as self-reflection (ability to apply theory to practice in familiar and unfamiliar situations);

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Describe the properties and behaviour of concrete materials by understanding materials' fundamentals.	PE1.1, PE1.3, PE1.5, PE2.2
2. Apply the fundamentals of cementitious materials to real world engineering problems.	PE1.2, PE2.2, PE2.3
3. Design the concrete mixtures to meet the structure requirement.	PE1.5, PE1.6, PE2.1, PE2.3

Learning Outcome	EA Stage 1 Competencies
4. Describe the mechanisms of deterioration of concrete and use the preventive methods to promote durability.	PE1.1, PE1.3, PE2.1, PE3.3
5. Explain the use of recent alternative cement and concrete materials to improve durability and sustainability.	PE1.1, PE1.3, PE1.4

Teaching Strategies

Private Study

- Review lecture material
- Do workshop problems
- Reflect on class and workshop problems

Lectures

- Listen carefully and ask questions
- Try and understand the principles
- Follow worked examples

Workshops

- Preparing for assignments
- Ask questions
- Hand-in or Quiz

Assessments (quiz/exam)

- Demonstrate your understanding of material properties
- Demonstrate your understanding of design Consideration for new materials
- Demonstrate problem solving

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Quiz 1	15%	Not Applicable	1, 2, 3, 4, 5
2. Quiz 2	15%	Not Applicable	1, 2, 3, 4, 5
3. Assignment	10%	02/08/2023 06:00 PM	1, 2, 3, 4, 5
4. Final Exam	60%	Not Applicable	1, 2, 3, 4, 5

Assessment 1: Quiz 1

Start date: 22/06/2023 06:00 PM

The mid-session quizzes (Quiz 1 and Quiz 2) will assess the basic knowledge covered in the main topics of the course.

The details of Quizzes will be announced and provided in Moodle and Lectures.

Assessment 2: Quiz 2

Start date: 27/07/2023 06:00 PM

The mid-session quizzes (Quiz 1 and Quiz 2) will assess the basic knowledge covered in the main topics of the course.

The details of Quizzes will be announced and provided in Moodle and Lectures.

Assessment 3: Assignment

Start date: 19/07/2023 06:00 PM
Due date: 02/08/2023 06:00 PM
Deadline for absolute fail: UNSW has a standard late submission penalty of: 5% per day, for all assessments where a penalty applies, capped at five days (120 hours), after which a student cannot submit an assessment, and no permitted variation.

The assignment will assess the basic knowledge covered in the main topics of the course.

The details of the assighment will be annoucned and provided in Moodle and Lectures

Assessment 4: Final Exam

The final exam provides an opportunity to assess higher capabilities in understanding and applying the knowledge learned throughout the term.

Final examination will assess students on all aspects of the course.

Hurdle requirement

A mark of at least 40% in the final examination is required before the class work is included in the final mark.

Attendance Requirements

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

Course Schedule

Lectures: Wednesday 18:00 - 20:00 (K-E19-G04, E-19 Patricia O'Shane G04, previously CLB 3)

Thursday 18:00 - 19:00 (K-E19-G04, E-19 Patricia O'Shane G04, previously CLB 3)

Demonstration Workshops: Thursday 19:00 - 20:00 (K-E19-G04, E-19 Patricia O'Shane G04, previously CLB 3)

View class timetable

Timetable

Date	Type	Content
Week 1: 29 May - 2 June	Lecture	**Cement and Concrete** • Cement and Concrete Basics • Porltand Cement Hydration
	Workshop	**Cement and Concrete** • Cement and Concrete Basics
Week 2: 5 June - 9 June	Lecture	**Cement and Concrete** • Structure of Hydration Products
	Workshop	**Cement and Concrete** • Porltand Cement Hydration • Structure of Hydration Products
Week 3: 12 June - 16 June	Lecture	**Cement and Concrete** • Water, Aggregate, Chemical Admixtures
	Workshop	**Cement and Concrete** • Water, Aggregate, Chemical Admixtures
Week 4: 19 June - 23 June	Lecture	**QUIZ 1**
	Lecture	**Cement and Concrete**

		• Fresh and Hardened Concrete I
Week 5: 26 June - 30 June	Lecture	**Cement and Concrete** • Fresh and Hardened Concrete II • Shrinkage
	Workshop	**Cement and Concrete** • Fresh and Hardened Concrete II • Shrinkage
Week 6: 3 July - 7 July	Lecture	**Flexibility Week (Non-teaching)**
Week 7: 10 July - 14 July	Lecture	**Concrete Mix Design** • Concrete Mix Design
	Workshop	**Concrete Mix Design** • Concrete Mix Design
Week 8: 17 July - 21 July	Lecture	**Durability and Sustainability of Concrete** • Transport Properties of Concrete
	Workshop	**Durability and Sustainability of Concrete** • Transport Properties of Concrete
Week 9: 24 July - 28 July	Lecture	**Quiz 2**
	Lecture	**Durability and Sustainability of Concrete** • Chemical Attacks (Corrosion, Alkali-Silica Reaction, and Sulphate Attack)
Week 10: 31 July - 4 August	Lecture	**Durability and Sustainability of Concrete** • Sustainability and Alternaitive binders
	Workshop	**Durability and Sustainability of Concrete**

		• Sustainability and Alternaitive binders
	Assessment	Assignment

Resources

Prescribed Resources

Moodle

The Moodle LMS, https://moodle.telt.unsw.edu.au/ will also be used for this course for activities and gradebook management. You will need to regularly check Moodle.

Required Textbook

No texbook is required.

Recommended Resources

Recoommeded Books

- There is no prescribed textbook for this course.
- S. Midness, J. F. Young, D. Darwin, “Concrete”, 2nd Edition, Prentice Hall, 2002.
- A.M. Neville, “Properties of Concrete”, 5th Edition, Prentice Hall, 2011
- P. K. Mehta, P.J.M. Monteiro, “Concrete Microstructure Properties and Materials”, 4th Edition, McGraw-Hill Education, 2013

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School’s Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

Submission of Assessment Tasks

Please refer to the Moodle page of the course for further guidance on assessment submission.

UNSW has a standard late submission penalty of:

- 5% per day, for all assessments where a penalty applies, capped at five days (120 hours), after which a student cannot submit an assessment, and no permitted variation.

Academic Honesty and Plagiarism

Beware! An assignment that includes plagiarised material will receive a 0 fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

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

Academic Information

Final Examinations:

Final Exams in T2 2023 will be held on campus between Friday 11th and Thursday 24th August (inclusive), and Supplementary Exams between Monday 4th and Friday 8th September (inclusive). You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

For students enrolled in the distance offering of a postgraduate course, and who reside further than 100km from UNSW Kensington campus, will be contacted regarding sitting an external exam. The school's External Exam Policy can be found on the Intranet.

ACADEMIC ADVICE

- Key Staff to Contact for Academic Advice (log in with your zID and password): https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw
- Key UNSW Dates - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.
- CVEN Student Intranet (log in with your zID and password): https://intranet.civeng.unsw.edu.au/student-intranet
- Student Life at CVEN, including Student Societies: https://www.unsw.edu.au/engineering/civil-and-environmental-engineering/student-life
- Special Consideration: https://student.unsw.edu.au/special-consideration
- General and Program-Specific Questions: The Nucleus: Student Hub
- Book an Academic Advising session: https://unswengacademicadvising.as.me/schedule.php

Disclaimer

This course outline sets out description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Mike Gal.

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	✓
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in professional and lay domains	
PE3.3 Creative, innovative and pro-active demeanour	✓
PE3.4 Professional use and management of information	
PE3.5 Orderly management of self, and professional conduct	
PE3.6 Effective team membership and team leadership	