

CVEN9824

Advanced Materials Technology

Term 2, 2022



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

Following are our suggested approaches to learning in the course.

Private Study

- Review lecture material and read textbook
- Do set problems and assignments
- Reflect on class problems and assignments

Lectures

- Find out what you must learn and read ahead.
- See methods that are not in the textbook
- Follow worked examples
- Listen for announcements on course changes

Tutorials

- Be guided by tutors
- Practice solving set problems
- Ask questions

Assessments (multiple choice, tests, examinations, assignments, hand-in tutorials, laboratory reports etc.)

- Demonstrate your knowledge and skills
- Demonstrate higher understanding and 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%	04/08/2022 12:00 PM	1, 2, 3, 4, 5
4. Final Exam	60%	Not Applicable	1, 2, 3, 4, 5

Assessment 1: Quiz 1

Start date: 23/06/2022 06:00 PM (tentative)

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

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

Assessment 2: Quiz 2

Start date: 28/07/2022 06:00 PM (tentative)

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

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

Assessment 3: Assignment

Start date: 21/07/2022 12:00 PM

Assessment length: 2 weeks

Due date: 04/08/2022 12:00 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 mid-session quizzes (Quiz 1 and Quiz 2) and one assignment will assess the basic knowledge covered in the main topics of the course.

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

Assessment 4: Final Exam

Start date: Exam Period

Assessment length: 2 hours

The final exam provides an opportunity to assess higher capabilities in understanding and applying the

knowledge learned throughout the term.

Final examination which 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: Tuesday 18:00 - 20:00 (K-E10-104, Central Lecture Block 7 and Online)

Thursday 18:00 - 19:00 (K-E10-104, Central Lecture Block 7 and Online)

Demonstration Workshops: Thursday 19:00 - 20:00 (K-E10-104, Central Lecture Block 7 and Online)

[View class timetable](#)

Timetable

Date	Type	Content
Week 1: 30 May - 3 June	Lecture	Cement and Concrete • Cement and Concrete Basics • Portland Cement Hydration
	Workshop	Cement and Concrete • Cement and Concrete Basics
Week 2: 6 June - 10 June	Lecture	Cement and Concrete • Structure of Hydration Products
	Workshop	Cement and Concrete • Portland Cement Hydration • Structure of Hydration Products
Week 3: 13 June - 17 June	Lecture	Cement and Concrete • Water, Aggregate, Chemical Admixtures
	Workshop	Cement and Concrete • Water, Aggregate, Chemical Admixtures
Week 4: 20 June - 24 June	Lecture	QUIZ 1
	Lecture	Cement and Concrete

		• Fresh and Hardened Concrete I
Week 5: 27 June - 1 July	Lecture	Cement and Concrete • Fresh and Hardened Concrete II • Shrinkage
	Workshop	Cement and Concrete • Fresh and Hardened Concrete II • Shrinkage
Week 6: 4 July - 8 July	Lecture	Flexibility Week (Non-teaching)
Week 7: 11 July - 15 July	Lecture	Concrete Mix Design • Concrete Mix Design
	Workshop	Concrete Mix Design • Concrete Mix Design
Week 8: 18 July - 22 July	Lecture	Durability and Sustainability of Concrete • Transport Properties of Concrete
	Workshop	Durability and Sustainability of Concrete • Transport Properties of Concrete
Week 9: 25 July - 29 July	Lecture	Quiz 2
	Lecture	Durability and Sustainability of Concrete • Chemical Attacks (Corrosion, Alkali-Silica Reaction, and Sulphate Attack)
Week 10: 1 August - 5 August	Lecture	Durability and Sustainability of Concrete • Sustainability and Alternative binders
	Workshop	Durability and Sustainability of Concrete

		• Sustainability and Alternative binders
	Assessment	Assignment

Resources

Prescribed Resources

Microsoft Teams

Microsoft's communication platform, [Microsoft Teams](#), will be used extensively in this course. It has native apps for Windows, Android, iOS and more.

myAccess and Matlab

UNSW [myAccess](#) provides access to your engineering software from many different devices. This course will use Matlab extensively, which is available through myAccess and the computer labs.

Moodle

The Moodle LMS, <https://moodle.telt.unsw.edu.au/> will also be used for this course for activities and gradebook management. You will not need to regularly check Moodle.

Required Textbook

No textbook is required.

Recommended Resources

Recommmeded 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 2022 will be held online between 12th - 25th August 2022 inclusive, and supplementary exams between 5th - 9th September 2022 inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

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://app.acuityscheduling.com/schedule.php?owner=19024765>

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	