School of Civil and Environmental Engineering

Term 2, 2020

CVEN9824 ADVANCED MATERIALS TECHNOLOGY

COURSE DETAILS

Units of Credit	6	
Contact hours	4 hours per week	
Class	Monday, 18:00 – 20:00	Online
	Wednesday, 18:00 – 19:00	Online
Workshop	Wednesday, 19:00 – 20:00	Online

Course Coordinator and Lecturer	Dr Taehwan Kim (Coordinator and Lecturer) and Dr Iman Al-Damad (Coordinator) email: taehwan.kim@unsw.edu.au office: Rm 718
Lecturer	Dr Taehwan Kim

INFORMATION ABOUT 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.

HANDBOOK DESCRIPTION

See link to virtual handbook *:*

https://www.handbook.unsw.edu.au/undergraduate/courses/2020/CVEN9824

OBJECTIVES

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.

List of programme attributes:

- An in-depth engagement with the relevant disciplinary knowledge in its inter-disciplinary context
- Capacity for analytical and critical thinking and for creative problem solving
- Ability to engage independent and reflective learning
- Information literacy
- Skills for collaborative and multi-disciplinary work
- A respect for ethical practice and social responsibility
- Skills for effective communication

TEACHING STRATEGIES

Private Study	• Review lecture material and textbook • Do set problems and assignments • Join Moodle discussions of problems • Reflect on class problems and assignments • Download materials from Moodle • Keep up with notices and find out marks via Moodle
Lectures	• Find out what you must learn • See methods that are not in the textbook • Follow worked examples • Hear announcements on course changes
Workshops	• Be guided by Demonstrators • Practice solving set problems • Ask questions
Assessments	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving

EXPECTED LEARNING OUTCOMES

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

Example:

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, PE2.3, PE2.5*
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*

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

COURSE PROGRAM

Term 2 2020

Date	Topic	Lecture Content	Demonstration Content
01/06/2020 (Week 1) Dr Kim	Cement and Concrete	Cement and Concrete Basics Portland Cement Hydration	Cement and Concrete Basics
08/06/2020 (Week 2) Dr Kim		Structure of Hydration Products No lecture on 08/06. The pre-recorded lecture will be provided.	Portland Cement Hydration Structure of Hydration products
15/06/2020 (Week 3) Dr Kim		Water, Aggregate, Chemical Admixtures	Water, Aggregate, Chemical Admixtures
22/06/2020 (Week 4) Dr Kim		Fresh and Hardened Concrete I	Fresh and Hardened Concrete I **Quiz 1 (24/06/2020)**
29/06/2020 (Week 5) Dr Kim		Fresh and Hardened Concrete II Shrinkage	Fresh and Hardened Concrete II Shrinkage
06/07/20 (Week 6) Dr Kim		***Flexibility week for all courses (non-teaching)***	
13/07/2020 (Week 7) Dr Kim	Concrete Mix Design	Concrete Mix Design	Concrete Mix Design
20/07/2020 (Week 8) Dr Kim	Durability and Sustainability of Concrete	Transport Properties of Concrete	Transport Properties of Concrete
27/07/2020 (Week 9) Dr Kim		Chemical Attacks (Corrosion, ASR, and Sulphate Attack)	Chemical Attacks (Corrosion, ASR, and Sulphate Attack) **Quiz 2 (29/07/2020)**

03/08/2020 (Week 10) Dr Kim		Suitability and Alternative binders	Suitability and Alternative binders

ASSESSMENT

The assessment components are two online quizzes (30%), one assignment (10%), and the final exam (60%). The mid-session quizzes and the assignment are designed to assess the basic knowledge, conceptual and theoretical knowledges, the ability to solve the engineering problems using the knowledges covered in the course. The final exam will assess students all aspects of the course and the type of the final exam will be an open-book and take-home exam.

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. The Final Examination is worth 60% of the Final Mark and the class work is worth 40% of the Final Mark. *A mark of at least 40% in the final examination is required before the class work (hand-in quizzes and online tasks) is included in the final mark. The formal exam scripts will not be returned but you are permitted to view the marked script.*

Students who perform poorly in the quick quizzes and workshops are recommended to discuss progress with the lecturer during the term. There will be hand-in problems and quick quizzes. Note: The lecturer reserves the right to adjust the final scores by scaling if agreed by the Head of School.

Details of each assessment component, the marks assigned to it, the criteria by which marks will be assigned, and the dates of submission are set out below.

Supplementary Examinations for Term 2 2020 will be held on Monday 7th September – Friday 11th September (inclusive) should you be required to sit one. You are required to be available during these dates. Please do not to make any personal or travel arrangements during this period.

PENALTIES

Late Assignments will incur a penalty of 10% of the maximum mark per calendar day up regardless of the mark awarded. An extension will only be granted by the lecturer under exceptional circumstances.

ASSESSMENT OVERVIEW

Item	**Length**	**Weighting**	**Learning outcomes assessed**	**Assessment Criteria** *(this needs to explicitly describe what students are expected to demonstrate in the task)*	**Due date and submission requirements**	**Deadline for absolute fail**	**Marks returned**
1. Quiz 1	40 min	15%	1, 2	The mid-session quizzes and one assignment will assess the basic knowledge covered in the main topics of the course.	24/06/2020 (Week 4)	-	28/06/2020 (Week 4)
2. Quiz 2	40 min	15%	3. 4		29/07/2020 (Week 9)		04/08/2020 (Week 10)
3. Assignment	2 weeks	10%	1, 2, 3, 4, 5		20/07/2020 – 02/08/2020 (Week 8 – Week 9)		11/08/2019 (Week 11)
4. Final Exam	Take home exam	60%	1, 2, 3, 4, 5	The final exam provides an opportunity to assess higher capabilities in understanding and applying the knowledge learned throughout the semester.	Exam Period	-	-

RELEVANT RESOURCES

There is no prescribed textbook for this course

Recommended Books:

- 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
- Additional materials provided on Moodle.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

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

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 ADVICE

For information about:

- Notes on assessments and plagiarism;
- Special Considerations: student.unsw.edu.au/special-consideration;
- General and Program-specific questions: The Nucleus: Student Hub
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC/SURVSOC/CEPCA

Refer to Academic Advice on the School website available at:

https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex 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
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (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