School of Civil and Environmental Engineering

Term 2, 2020

CVEN3502 WATER & WASTEWATER ENGINEERING

COURSE DETAILS

Units of Credit	6	
Contact hours	6 hours per week	
Class	Wednesday, 14:00 – 16:00	Online
	Friday, 12:00 – 14:00	Online
Workshop	Friday, 14:00 – 16:00	Online
	Friday, 16:00 – 18:00	Online
Course Coordinator and Lecturer	Dr Stuart Khan Email: s.khan@unsw.edu.au Office: Room 311, School of Civil & Environmental Engineering (Bld H20) Phone: 02 9385 5070	
Lecturer	Dr Stefan Felder Email: s.felder@unsw.edu.au Office: Room 303, School of Civil & Environmental Engineering (Bld H20) Phone: 02 9381 9861 (Water Research Laboratory)	
Course Assistant	Dr Chris Chen Email: s.chen@wrl.unsw.edu.au	

INFORMATION ABOUT THE COURSE

The course introduces students to the principles of water and wastewater engineering, including water supply and wastewater disposal systems, water and wastewater treatment, water quality and indicators, open channel flow, pump selection and placement and pipe networks. Topics include water quality parameters, guidelines and water quality frameworks; unit operations in treatment of water and wastewater; sewage collection systems; pumping stations and rising mains, sludge treatment and management, and water management concepts and effluent reuse.

HANDBOOK DESCRIPTION

See link to virtual handbook -

https://www.handbook.unsw.edu.au/undergraduate/courses/2020/CVEN3502

OBJECTIVES

The learning objectives for this course are for you to understand:

- water and wastewater distribution and collection systems and their roles in the water cycle;
- basic water quality issues associated with water and wastewater treatment;
- design and operation of sewerage collection systems and water distribution;
- environmental implications and assessment of wastewater discharge;

- treatment options and principles of conventional treatment systems;
- fundamental design issues for open channel flows including uniform, rapidly and gradually varied flows;
- Specific energy concept and its application to flow transitions;
- Pipes, pipe networks and pumping systems.

Thus, this course provides an introduction to water and sewerage system structures/design principles, water quality guidelines and objectives, water treatment and wastewater treatment and the environmental issues related to treatment. This course introduces students further to the basic principles of open channel hydraulics enabling students to determine flow profiles, flow regimes and energy dissipation along open channel systems.

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
Laboratory illustration	• Visual demonstration, to set studies in context

EXPECTED LEARNING OUTCOMES

Expected learning outcomes, their association with the teaching strategies and with the suggested approaches to learning. Include an alignment of the assessment tasks to the course and program learning outcomes. Student-centred and self-directed learning (expectations of the students, where relevant)

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 achieve the following learning outcomes:

Learning Outcome		**EA Stage 1 Competencies**
1.	*The students will describe the important characteristics of commonly applied water and wastewater treatment processes.*	*PE1.1, PE1.3, PE1.5, PE1.6*
2.	*The students will be able to perform basic calculations around water quality and water treatment process design characteristics.*	*PE1.2, PE1.5*
3.	*The students will understand the important characteristics of open channel flow hydraulics, as well as the application of pumps and turbines*	*PE1.1, PE1.3, PE1.5, PE1.6*

	in pipe networks.	
4.	*The students will be able to perform basic calculations around open channel flow hydraulics, and pumps and turbines in pipe networks.*	*PE1.2, PE1.5*

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	Wednesday	Friday	Demonstration Content
01/06/2020 (Week 1)	Uniform Flow	Optimal Sections	Week 1 Workshop questions
8/06/2020 (Week 2)	Specific Energy	Channel Transitions	Week 2 Workshop questions
15/06/2020 (Week 3)	Hydraulic Jump	Gradually Varied Flows	Week 3 Workshop questions
22/06/2020 (Week 4)	Pumps and pump selection	Pumps and pipes	Week 4 Workshop questions
29/06/2020 (Week 5)	Pipes and pipe networks	Water & wastewater characterisation	Week 5 Workshop questions
06/07/2020 (Week 6)	***Non-teaching week for all courses***		
13/07/2020 (Week 7)	Screening, grit removal and sedimentation	Coagulation and flocculation	Week 7 Workshop questions
20/07/2020 (Week 8)	Biological processes 1	Biological processes 2	Week 8 Workshop questions
27/07/2020 (Week 9)	Filtration and adsorption	Disinfection	Week 9 Workshop questions
03/08/2020 (Week 10)	Sludge management	Membrane treatment processes	Week 10 Workshop questions
10/08/2020 (Week 11)	***No classes or labs in Week 11***		

***Workshops**

Your participation at workshops is compulsory for this course. Workshops and lectures will take place in Blackboard Collaborate providing a detailed digital log of your attendance.

****Laboratory visual demonstrations**

The laboratory visual demonstrations will include water quality (jar test) and hydraulics (open channel flow and pumps). The course content covered in these Laboratory visual demonstrations is examinable in the final exam.

ASSESSMENT

The assessment tasks for this course have been developed to achieve the following outcomes:

- Assess each student's achievements in terms of each of the four learning outcomes listed above;

- Provide an incentive for students to keep up with the work presented in this course;
- Provide indications to students of how well they are achieving the learning outcomes prior to the final exam;
- Provide an opportunity for experimental results observation and interpretation;
- Manage the possible occurrence of unauthorized student collaboration on individual assessment tasks.

Hydraulics Online Quizzes on the Moodle course page. Two online quizzes (each 5% marks) will take place in Weeks 3 & 5 on the Moodle course page. For the respective week, the Quizzes will be available for 24 hours between 6 pm Wednesday and 6 pm Thursday. A time limit of 4 hours has been set for the Quiz from the time you start your attempt. You are allowed 1 attempt with a 4-hour time limit for this attempt within the given time frame (i.e. if you start your attempt at 4.30 pm on Thursday, your attempt will automatically end at 6 pm with the end of the Quiz time frame). You can review and change your answers before submitting your attempt. Each Quiz will comprise 5 randomly allocated numerical questions testing your understanding of the course theory. You will need a calculator. Your answers to the Quiz questions will be assessed automatically against the correct answer within Moodle. Feedback will be provided at the end of the Quiz, after 6 pm on Thursday of the respective week, via Moodle.

Hydraulics laboratory online assessment on the Moodle course page is an individual assessment of the hydraulics course content. You are required to complete a laboratory lesson which includes a laboratory demonstration video of open channel flows and various pump types. After you have completed the lab lesson, an online assessment (Online Quiz) will become available on the Moodle course page. You have 4 hours to complete the Online Quiz within the available time frame (2 pm Wednesday 1 July and 12 pm (noon) Wednesday 15 July).

Water quality laboratory online assessment on the Moodle course page is an individual assessment of the water and wastewater treatment course content. You are required to complete a laboratory lesson which includes a laboratory demonstration video of an important water treatment process. After you have completed the lab lesson, an online assessment (Online Quiz) will become available on the Moodle course page.

1-Page research assignment: Students are required to undertake independent research on one of a selection of topics to be provided. These topics will relate to various aspects of water and/or wastewater treatment. Assignments will be uploaded and marked via Moodle.

The final course mark will be based on you completing the coursework and final examination:

(i) your coursework mark accounts for 40% of the course, **and**
(ii) your final examination mark accounts for 60% of the course.

Provided a mark of 40% or more has been achieved in your final exam **and** a mark of 40% or more has been achieved in your coursework component, your final aggregated mark for this course will normally be based on the sum of the scores from each of the assessment tasks with your final examination being worth **60%** of the final mark and your class work being **40%** of the final mark.

Assessment Task	**Assessment Details**	**Due Date**
2 Hydraulics online quizzes (combined 10%)	Each online quiz will have 4 hour duration and will be provided on the Moodle course page.	Weeks 3 & 5 Available between 6 pm Wednesday and 6 pm Thursdays of the respective week
Hydraulics laboratory online assessment (10%)	Complete an online lab lesson (no time limit) and a lab quiz (4 hours) on the Moodle course page.	Available between 2 pm Wednesday 1 July and 12 pm (noon) Wednesday 15 July
Water Quality laboratory online assessment (5%)	Complete an online lab lesson (no time limit) and a lab quiz (4 hours) on the Moodle course page.	6pm Friday 24 July
1-Page research	Students are required to	6pm Friday 31 July

assignment (15%)	undertake independent research on one of a selection of topics to be provided.	
Exam (60%)	Exam content comprises: - 50% Open channel flows, pumps and pipes (Weeks 1-5) - 50% Water and Wastewater treatment (Weeks 5-10)	During UNSW Term 2 examinations period.

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

Penalties for late submission: *late work will be penalised at the rate of 10% per day after the due time and date have expired. Work submitted late during or after a weekend will count as 2 days.*

SPECIAL CONSIDERATION

Students who miss assessment tasks (including the quizzes and lab class) will be required to formally apply for special consideration (with appropriate documentation) before alternative arrangements will be considered. Details for UNSW special consideration applications are available at:
https://student.unsw.edu.au/special-consideration

ASSESSMENT OVERVIEW

Item	Length	Weighting	Learning outcomes assessed	Assessment Criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
2x Hydraulics Online Quizzes	4 hrs within 24-hr time frame	10% of final marks	3,4	Students are expected to demonstrate their understanding of basic open channel flow and pump concepts. Students will demonstrate ability to perform basic calculations of open channel flow and pipe/pump problems applying the open channel and closed conduit flow concepts from the course lectures and workshops.	End of Quiz 1: 6 pm Thursday 18 June End of Quiz 2: 6 pm Thursday 2 July Answers to the Quiz questions will be assessed automatically against the correct answer within Moodle. Feedback will be provided at the end of the Quiz, via Moodle.		
Hydraulics laboratory online assessment	4 hrs within provided time frame	10% of final marks	3,4	Students are expected to demonstrate their understanding of basic open channel flow and pump concepts. Students will demonstrate ability to perform basic calculations of open channel flow and pipe/pump problems applying the open channel and closed conduit flow concepts from the course lectures and workshops.	End of Quiz: 12 pm Wednesday 15 July The Quiz will become available when a lab lesson has been completed. Answers to the Quiz questions will be assessed automatically against the correct answer within Moodle. Feedback will be provided at the end of the Quiz, via Moodle.		
Water Quality laboratory online assessment	4 hrs within provided time frame	5% of final marks	1,2	Students are expected to demonstrate their ability to describe the important characteristics of commonly applied water and wastewater treatment processes. Furthermore, students will demonstrate ability to perform basic calculations around water quality and water treatment process design characteristics.	End of Quiz: 6 pm Friday 24 July The Quiz will become available when a lab lesson has been completed. Answers to the Quiz questions will be assessed automatically against the correct answer within Moodle. Feedback will be provided at the end of the Quiz, via Moodle.		
1-Page	1 page	15% of	1,2	Students are expected to demonstrate	Submit on	1 week	Monday 10 August.

research assignment		final marks		an ability to undertake independent research to explore new (to them) information about a topic related to water and wastewater treatment.	Moodle by 6pm Friday 31 July.	after due date.	
Final exam	2 hours	60% of final marks	1,2, 3,4	Students are expected to demonstrate their ability to describe the important characteristics of commonly applied water and wastewater treatment processes. Furthermore, students will demonstrate ability to perform basic calculations around water quality and water treatment process design characteristics. Students are expected to demonstrate their understanding of open channel flow hydraulics and pump and turbines in pipe networks by performing calculations and explaining basic concepts.	During UNSW Term 2 examinations period.	N/A.	During formal notification of final results as determined by UNSW Faculty of Engineering.

RELEVANT RESOURCES

- All required lecture material will be provided on Moodle.
- The following text is strongly recommended for the Water & Wastewater Treatment components: Environmental Engineering: Principles and Practice. Richard O. Mines, Jr. ISBN: 978-1-118-80145-1. Wiley-Blackwell, 2014. Available from UNSW Bookshop in hardcopy or online as an e-book: http://au.wiley.com/WileyCDA/WileyTitle/productCd-1118801458.html
- Lecture notes for Open channel flows, pumps and pipes also available at the UNSW Bookshop for purchase (students can purchase them if they like working with a hardcopy; however electronic versions of the lecture notes will be provided on Moodle).

Additional reading:

- Water and Wastewater Technology (by Hammer MJ & Hammer MJ), Pearson Education Limited, 7th Edition, 2014.
- Water Quality and Treatment: A Handbook on Drinking Water. (Ed. Edzwald JK). American Water Works Association. 6th Edition, 2011.
- Water Treatment: Principles and Design. 3rd Edition, MWH, Wiley, 2012.
- Wastewater Engineering: Treatment and Resource Recovery, Metcalf & Eddy, 5th Edition, McGraw-Hill, 2013.
- Applied Fluid Mechanics, R. L. Mott, Pearson Prentice-Hall, 6th Edition, 2006.
- Fundamentals of Hydraulic Engineering Systems, Houghtalen RJ, Akan AO & Hwang NHC, Prentice-Hall, 4th Edition, 2010.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

https://my.unsw.edu.au/student/resources/KeyDates.html

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,
- School policy on Supplementary exams,
- Special Considerations: student.unsw.edu.au/special-consideration
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.

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