CVEN3502

Water and Wastewater Engineering

Term 2, 2023

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Stuart Khan	s.khan@unsw.edu.au	Appointments by email		0293855070
Stefan Felder	s.felder@unsw.edu.au	Appointments by email	Water Research Laboratory (Manly Vale)	02 8071 9861

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

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.

Course Aims

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.

Course Learning Outcomes

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

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 in pipe networks.	PE1.1, PE1.3, PE1.5, PE1.6
4. The students will be able to perform basic calculations around open channel flow hydraulics, and pumps and turbines in pipe	PE1.2, PE1.5

Learning Outcome	EA Stage 1 Competencies
networks.	

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

Assessment

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

1. your coursework mark accounts for 40% of the course, **and**
2. 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	Weight	Due Date	Course Learning Outcomes Assessed
1. 2x Hydraulics Online Quizzes	10%	End of Quiz 1: 6 pm Thursday 15 June; End of Quiz 2: 6 pm Thursday 29 June.	3, 4
2. Hydraulics laboratory online assessment	10%	28/06/2023 06:00 PM	3, 4
3. Water Quality laboratory online assessment	5%	21/07/2023 06:00 PM	1, 2
4. 1-Page research assignment	15%	28/07/2023 06:00 PM	1, 2
5. Final Examination	60%	Not Applicable	1, 2, 3, 4

Assessment 1: 2x Hydraulics Online Quizzes

Start date: 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.
Assessment length: 4 hrs within 24-hr time frame
Due date: End of Quiz 1: 6 pm Thursday 15 June; End of Quiz 2: 6 pm Thursday 29 June.

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.

Assessment criteria

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.

Additional details

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.

Assessment 2: Hydraulics laboratory online assessment

Start date: 23/06/2023 06:00 PM
Assessment length: 4 hrs within provided time frame
Due date: 28/06/2023 06:00 PM

Hydraulics laboratory online assessment on the Moodle course page is an individual assessment of the hydraulics course content. Each students will enrol into a laboratory demonstration in the Kensington Hydraulics Laboratory H22 (Valentine Annex). These lab classes will take place in Week 4. All students are expected to attend a lab class and attendance will be taken.
After the lab class has finished, all students must complete a lab lesson on Moodle (including laboratory demonstration videos of open channel flows and various pump types) and once completed an online assessment (Hydraulics Laboratory Quiz) will become available on the Moodle course page.
You have 4 hours to complete this Online Quiz within the available time frame. Quiz questions can only be navigated sequentially (i.e. you must progress through the quiz in order, and may not return to previous pages nor skip ahead).

Assessment criteria

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.

Additional details

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.

Assessment 3: Water Quality laboratory online assessment

Start date: 17/07/2023 04:00 PM
Assessment length: 4 hrs within provided time frame
Submission notes: The Quiz will become available when an online lab lesson has been completed. Quiz to be completed online in Moodle.
Due date: 21/07/2023 06:00 PM
Marks returned: 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 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.

Assessment criteria

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.

Assessment 4: 1-Page research assignment

Start date: 18/07/2023 12:00 PM
Assessment length: 1 page
Due date: 28/07/2023 06:00 PM
Deadline for absolute fail: 1 week after the due date (Friday 4 August, 6:00pm).
Marks returned: Monday 7 August

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.

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Assessment criteria

Students are expected to demonstrate an ability to undertake independent research to explore new (to them) information about a topic related to water and wastewater treatment.

Assessment 5: Final Examination

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.

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

For courses with Workshops and/or Labs, attendance for those classes is a necessary part of the course. You must attend **at least 80% of the workshop/lab** in which you are enrolled in for the duration of the session.

Course Schedule

View class timetable

Timetable

Date	Type	Content
O-Week: 22 May - 26 May		
Week 1: 29 May - 2 June	Lecture	Monday: Uniform flow Tuesday: Optimal Sections
	Workshop	Week 1 Workshop questions
	Online Activity	Enroll into your lab classes (Hydraulics lab in Week 4 & Water quality lab in Week 9)
Week 2: 5 June - 9 June	Lecture	Monday: Specific Energy Tuesday: Channel Transitions
	Workshop	Week 2 Workshop questions
Week 3: 12 June - 16 June	Lecture	Monday: (public holiday, no class) Tuesday: Hydraulic Jump
	Workshop	Week 3 Workshop questions
	Assessment	Online Quiz 1
Week 4: 19 June - 23 June	Lecture	Monday: Gradually Varied Flows Tuesday: Pumps and pump selection
	Workshop	Week 4 Workshop questions
	Laboratory	Hydraulics laboratory class with subsequent lab lesson and online assessment
Week 5: 26 June - 30 June	Lecture	Monday: Pumps and pipes Tuesday: Pipes and pipe networks
	Workshop	Week 5 Workshop questions
	Assessment	Online Quiz 2
	Assessment	Hydraulics laboratory online assessment
Week 6: 3 July - 7 July		No classes or labs.

Week 7: 10 July - 14 July	Lecture	Monday: Water & wastewater characterisation Tuesday: Screening, grit removal and sedimentation
	Workshop	Week 7 Workshop questions
Week 8: 17 July - 21 July	Lecture	Monday: Coagulation and flocculation Tuesday: Biological processes 1
	Workshop	Week 8 Workshop questions
	Assessment	Water Quality laboratory online assessment: The Quiz will become available when an online lab lesson has been completed. Quiz to be completed online in Moodle.
Week 9: 24 July - 28 July	Lecture	Monday: Biological processes 2 Tuesday: Filtration and adsorption
	Workshop	Week 9 Workshop questions
	Assessment	1-Page research assignment
Week 10: 31 July - 4 August	Lecture	Monday: Disinfection Tuesday: Sludge management
	Workshop	Week 10 Workshop questions
Stuvac: 7 August - 11 August		No classes or labs.

Resources

Recommended Resources

- 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.

Laboratory Workshop Information

Workshops

Your participation at workshops is compulsory for this course. Workshops will take place in face-to-face mode on campus (attendance will be taken during the workshop).

Laboratory visual demonstrations

The attendance of the laboratory classes is compulsory for this course. face-to-face laboratory visual demonstrations will include hydraulics (open channel flow and pumps) and water quality (jar test). The course content covered in these Laboratory visual demonstrations is assessed in lab assessments as well as in the final exam.

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	