

School of Civil and Environmental
Term 3, 2020
**CVEN9856 WATER
TREATMENT**

COURSE DETAILS

Units of Credit	6	
Contact hours	4 hours per week	
Class	Mon 10:00AM - 12:00PM	Online
	Thu 12:00PM - 2:00PM	Online
Course Coordinator and Lecturer	Dr Richard Collins	
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	Office: Room 103 (H22 – Vallentine Annexe)	
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Course Coordinator Lecturer	Dr. A. Ninh Pham	
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	Office: Room 108 (H22 – Vallentine Annexe)	
	Phone: 9385 5102	

INFORMATION ABOUT THE COURSE

The course discusses the concepts involved in design of facilities for the treatment of various types of raw water to meet specified water quality including chemical selection, intake and screening, coagulation, flocculation, clarification, filtration, and disinfection technology. Advanced treatment processes such as membrane processes, adsorption and ion exchange are also introduced.

HANDBOOK DESCRIPTION

See link to virtual handbook -

<https://www.handbook.unsw.edu.au/postgraduate/courses/2020/CVEN9856>

OBJECTIVES

To provide a sound understanding of the concepts and design principles in both conventional and developing methods of water treatment.

TEACHING STRATEGIES

The teaching strategies that will be used in this course are traditional lecture teaching combined with online workshop and discussion, and independent study.

The approaches to learning are:

Private Study	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Find out what you must learn • See methods that are not in the textbook • Follow worked examples • Hear announcements on course changes
Workshops	<ul style="list-style-type: none"> • Be guided by Demonstrators • Practice solving set problems • Ask questions
Assessments	<ul style="list-style-type: none"> • 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.

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

Learning Outcome		EA Stage 1 Competencies
1.	<i>Identify important water quality parameters and various constituents that affect water quality</i>	PE1.3, PE1.5, PE3.1, PE3.4
2.	<i>Analyse the concepts involved in the design of a conventional water treatment plant</i>	PE1.1, PE1.2, PE1.5, PE2.1, PE2.2, PE2.3, PE3.3
3.	<i>Apply the various advanced treatment methods to produce water of high-quality standards</i>	PE1.1, PE1.3, PE1.5, PE2.1, PE2.2, PE3.3
4.	<i>Design major unit treatment processes in a water treatment plant including intake and screening, coagulation, flocculation, clarification, filtration, disinfection, and residuals management</i>	PE2.1, PE2.2, PE2.3, PE3.1, PE3.3
5.	<i>Develop interpersonal and process management skills in team-work environments and the ability to evaluate and disseminate knowledge and technologies from published literature effectively in a written report</i>	PE1.1, PE1.3, PE1.4, PE3.2, PE3.3, PE3.5, PE3.6

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

COURSE PROGRAM

TERM 3 2020

Date	Topic	Lecture Content	Lecturer
14/09/2020 (Week 1)	Introduction to Water Quality & Treatment Processes Intake and Screening	<ul style="list-style-type: none"> Australian Drinking Water Guidelines and water quality parameters Common & less common undesirable constituents Unit operations in a conventional WTP and advanced treatment processes Intake and Screen 	Collins/ Pham
21/09/2020 (Week 2)	Coagulation	<ul style="list-style-type: none"> Surface charge of particles in suspension Coagulants and mechanisms of coagulation Coagulation practices 	Collins/ Pham
28/09/2020 (Week 3)	Flocculation	<ul style="list-style-type: none"> Flocculation modelling Flocculation practices 	Collins/ Pham
05/10/2020 (Week 4)*	Clarification	<ul style="list-style-type: none"> Particle settling theory Conventional sedimentation basin design Alternative sedimentation processes 	Collins/ Pham
12/10/2020 (Week 5)	Granular Filtration	<ul style="list-style-type: none"> Types of granular filtration Rapid filtration classification and filter media Models for rapid filter behaviour Rapid filter design 	Collins/ Pham
19/10/2020 (Week 6)	<i>Non-teaching week for all courses</i>		
26/10/2020 (Week 7)	Disinfection	<ul style="list-style-type: none"> Disinfection kinetics Design of disinfection contactors Disinfection with free and combined chlorine, chlorine dioxide, ozone and UV 	Collins/ Pham
02/11/2020 (Week 8)	Residuals Management	<ul style="list-style-type: none"> Sources and characterization of residuals Residuals management and process modification 	Collins/ Pham
09/11/2020 (Week 9)	Membrane Processes	<ul style="list-style-type: none"> Membrane classification, properties & configuration Filtration mechanism, permeate flux and fouling Process design of membrane filtration 	Collins/ Pham
16/11/2020 (Week 10)	Adsorption and Ion Exchange	<ul style="list-style-type: none"> Fundamentals of adsorption & adsorption isotherms Powdered and granular activated carbon Fundamental of ion exchange and mechanisms Classification & properties of ion exchange media Ion exchange process configuration 	Collins/ Pham

*Monday 5th Oct (week 4) is a public holiday. A pre-recorded lecture will be provided.

ASSESSMENT

The Final Examination is worth 50% of the Final Mark if class work is included and 100% if class work is not included. The class work is worth 50% of the Final Mark if included. The formal exam scripts will not be returned but you are permitted to view the marked script. Students who perform poorly in the quizzes and assignment are strongly recommended to discuss progress with the lecturers during the term.

Note: The Coordinator 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 and the dates of submission are set out below.

Supplementary Examinations:

Supplementary Examinations for Term 3 2020 will be held on Monday 11th to Friday 15th January 2021 (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 work will be penalised at the rate of 10% per day after the due time and date have expired.

Short Course/Distance Courses:

All Distance/Short course mode students are expected to sit their final examination on Kensington campus (Sydney). If you reside further than 40 km from the Kensington campus, and you wish to sit your exam externally (by distance), you must register for an external exam by the UNIVERSITY CENSUS DATE (Term 3: 11th October) more information found [here](#)

ASSESSMENT OVERVIEW

Item	Length	Weighting	Learning outcomes assessed	Assessment Criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
<i>1. Quizzes – All quizzes are individual assessments</i>							
Quiz 1	45 min (10 questions)	5%	LO1, LO2	Materials presented in weeks 1 to 3 to be assessed	07 th Oct 2020 (online by 11 pm)	Same day with the due date	09 th Oct 2020
Quiz 2	45 min (10 questions)	7.5%	LO1, LO2, LO4	Materials presented in weeks 4, 5 and 7 to be assessed.	08 th Nov 2020 (online by 11 pm)		One week after the due date
Quiz 3	45 min (10 questions)	7.5%	LO1, LO3, LO4	Materials presented in weeks 8 to 10 to be assessed	22 nd Nov 2020 (online by 11 pm)		One week after the due date
<i>2. Assessments – Group work assessments (two students per group)</i>							
Design of a conventional WTP	30 page long in total (typed, 12-point, 1.5 line spacing)	30%	LO1, LO2, LO3, LO4, LO5	All materials from weeks 1-10 to be assessed. Details given on a separate assignment sheet.	15 th Nov 2020 (via Turnitin by 11 pm)	One week after the due date	Two weeks after the due date
<i>3. Final Exam</i>	2 hr online open book exam	50%	LO1, LO2, LO3, LO4	All lecture materials presented from weeks 1 to 10	During the exam period	N/A	TBA

**Quizzes will be uploaded on UNSW Moodle one week prior to the due dates mentioned above. They will be available for one week and students can attempt the quizzes in their own time within that one-week period once. Quizzes are individual assessments which will be based on the concepts discussed during lectures and will have short-answer, multiple choice, true-false and/or calculation questions. Please ensure that your computer is UNSW Moodle compatible before attempting the quizzes. Please check the following link for system requirement for UNSW Moodle and other information on UNSW Moodle.*

<https://student.unsw.edu.au/moodle-support>

Please inform the course coordinator in advance if you are not able to take the quiz in the allotted week or regarding any computing problems.

RELEVANT RESOURCES

No textbook recommended but material will be drawn from a variety of texts (see additional readings) and lecture handouts.

Additional material will be provided on UNSW - Moodle

Additional Reading:

1. Water Treatment: Principles and Design, 3rd Edition, MWH, Wiley, 2012.
2. Water Quality Engineering: Physical/Chemical Treatment Processes, Benjamin & Lawler, Wiley 2013.

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:

<http://www.lc.unsw.edu.au/onlib/plag.html>

ACADEMIC ADVICE

(Formerly known as Common School Information)

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations: <https://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