School of Civil and Environmental Engineering

Term 2, 2021

CVEN4703 ADVANCED WATER QUALITY PRINCIPLES AND

COURSE DETAILS

Units of Credit	6	
Contact hours	4 hours per week	
Class	Tue 3:00PM - 5:00PM	Online
	Thu 4:00PM - 6:00PM	Online
Workshop	Online	Via Q & A Moodle Forum

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INFORMATION ABOUT THE COURSE

Prerequisites: CVEN3502

Fundamental aspects of the chemistry and biology of aquatic environments are reviewed and extended enabling analysis and interpretation of processes occurring in surface and ground waters as well as water and wastewater treatment systems. Consideration is given to recent developments in water and wastewater treatment technologies.

HANDBOOK DESCRIPTION

See link to virtual handbook:

https://www.handbook.unsw.edu.au/undergraduate/courses/2021/CVEN4703/

OBJECTIVES

To familiarise the students with the fundamental principles of water chemistry and to apply these principles to the understanding of, and development of solutions to, water quality problems typical of those encountered by Environmental Engineers and Public Health and Waste Management specialists.

TEACHING STRATEGIES

The teaching strategies that will be used in this course are traditional lecture teaching combined with problem -based learning, group project, online workshop and independent study.

The approaches to learning are:

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.

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

Learning Outcome		**EA Stage 1 Competencies**
1.	Identify key biogeochemical processes that operate within natural and engineered aquatic systems and how these processes influence water quality.	PE1.1, PE1.3, PE1.5
2.	Recognize the challenges that exist in maintaining acceptable water quality and the knowledge gaps that remain with regard to understanding and mitigating particular water quality problems.	PE1.3, PE1.4, PE1.5
3.	Apply your knowledge of both conventional and advanced methods of treating waters and wastewaters such that desired water quality is achieved.	PE1.3, PE1.4, PE1.5, PE2.1, PE2.2, PE2.3, PE3.1
4.	Develop interpersonal and process management skills in real-world dynamic team-work environments.	PE3.1, PE3.2, PE3.4, PE3.5, PE3.6
5.	Evaluate knowledge and technologies from published literature and disseminate findings effectively in a written report and as a seminar presentation.	PE1.3, PE1.4, PE3.2, PE3.3, PE3.4

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 2021

Date	Topic	Lecture Content	Lecturer Guest speaker
31/05/2021 (Week 1)	Physical, chemical and biological quality of water	• Concentration units • Physical aggregate characteristics of water • Inorganic and organic chemical constituents • Taste and odours • Gases and organisms in water	Waite/Pham (No guest lecture)
07/06/2021 (Week 2)	Principles of chemical reactions	• Chemical reactions and thermodynamics of chemical reactions • Reaction kinetics and rate laws • Reactions used in water treatment	Waite/Pham (No guest lecture)
14/06/2021 (Week 3)	Arsenic: Toxicity, mobility and treatment options	• Arsenic as a worldwide problem • Arsenic speciation & mobility in natural systems • Removal of Arsenic from drinking water • A case study	Waite/Pham Dr Andrew Kinsela (guest lecturer)
21/06/2021 (Week 4)	Salinity: Market failure and management	• Introduction to salinity, thresholds and types of salinity • Inadequate knowledge & causes of market failure • Salinity management	Waite/Pham Clare Bales (guest lecturer)
28/06/2021 (Week 5)	Acid sulfate soils and associated water quality implications	• Introduction to acid sulfate soils: formation, generation of acid and location • Environmental impacts of ASS • Management of ASS	Waite/Pham Dr Richard Collins (guest lecturer)
05/07/2021 (Week 6)	***Non-teaching week for all courses***		
12/07/2021 (Week 7)	Blue green algae: Water quality issues & management	• Occurrence of BGA & associated water quality issues • Basic properties of BGA, growth dynamic and toxin production • Algal management strategies	Waite/Pham TBA
19/07/2021 (Week 8)	N and P contaminants: Occurrence and removal	• Overview of N and P cycles • N and P removal from wastewaters • N and P removal from dinking waters	Waite/Pham Dr Changyong Zhang
26/07/2021 (Week 9)	Radionuclides: Extraction and management	• Radiation basis, radioactivity and sources • Uranium mining in Australia • Biogeochemistry of Uranium • Removal of radionuclides in water treatment	Waite/Pham Dr Tim Payne (guest lecturer)
02/08/2021 (Week 10)	Emerging organic contaminants	• Issues with and classification of emerging contaminants • Removal of emerging contaminants in drinking water: conventional, adsorption, RO and AOPs	Waite/Pham Prof Stuart Khan (guest lecturer)

ASSESSMENT

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 50% of the Final Mark and the class work is worth 50% of 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 online quiz and workshops are recommended to discuss progress with the lecturers during the semester.

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 2021 will be held on Monday 6th – Friday 10th September 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.

Special consideration can be applied 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
1. Quizzes – All quizzes are individual, online assessments							
Quiz 1 (Census quiz)	45 min (10 questions)	5%	LO1	Lecture materials presented in weeks 1 and 2 to be assessed.	Sun 20/06/2021 at 11pm (online)	Same day with the due date	One week after the due date
Quiz 2	45 min (10 questions)	10%	LO1, LO2, LO3	Lecture materials presented in weeks 3 to 10 to be assessed.	Sun 08/08/2021 at 11pm (online)	Same day with the due date	One week after the due date
Quiz 3 (consists of 7 weekly quizzes)	20 min (5 questions) for each quiz	10.5% (1.5% x 7)	LO1, LO2, LO3	Materials presented weekly by groups to be assessed.	One week after the corresponding group presentation(s) (online)	Same day with the due date	One week after the due date
2. Assessments – Group work assessments							
Literature review	10 pages (typing)	10%	LO1, LO2, LO3, LO4	Details given on a separate assignment guideline (Literature review writing format)	Two weeks after the research topic is assigned to the group (both hard and soft copies)	One week after the due date	One week after the due date
Presentation	20 min talk + 10 min Q&A	11%	LO1, LO2, LO3, LO4	Details given on a separate assignment guideline	Two weeks after the research topic is assigned to the group	Same day with the due date	One week after the due date.
Participation		3.5% (0.5% x 7)	LO1, LO2, LO3, LO4	Attendance of and participation to the group presentations	Same day with the group presentations	Same day with the presentations	Same day with the presentations
3. Final Exam	2 hr	50%	LO1, LO2, LO3	All lecture materials given by Waite/Pham to be assessed	During the exam period Online, open book exam	N/A	TBA

The online quizzes will be uploaded on UNSW Moodle one week prior to the due dates mentioned above. Students can attempt the quizzes in their own time within that one-week period once. The online quizzes may have short-answer, multiple choice, true-false and/or calculation-based 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://moodle.telt.unsw.edu.au/

Please inform the course coordinator/lecturer in advance if you are not able to take the quizzes in the allotted weeks or regarding any computing problems.

RELEVANT RESOURCES

- MWH (2012) Water Treatment: Principles and Design, 3rd edition, John Wiley and Sons, Inc.
- 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

(Formerly known as Common School Information)

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 Key Contacts on the Faculty website available at:

https://www.unsw.edu.au/engineering/student-life/student-resources/key-contacts

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