CVEN4703

Advanced Water Quality Principles

Term 2, 2023

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
David Waite	d.waite@unsw.edu.au	By appointment only	Room 114 (H22 – Vallentine Annexe)	9385 5060

Lecturers

Name	Email	Availability	Location	Phone
An Ninh Pham	anninh.pham@unsw.edu.au	By appointment only	Room 108 (H22 – Vallentine Annexe)	9385 5102

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

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.

Course Aims

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.

Course Learning Outcomes

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. Describe 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. Use both conventional and advanced methods of treating water and wastewater to achieve desired water quality.	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

Teaching Strategies

The course will involve a mix of lectures by teaching staff and guest lecturers, individual research, class room presentation and discussion.

Assessment

*Online quizzes will be made available on UNSW Moodle one week before the aforementioned due date. Students can take this quiz at their convenience within that one-week period, with only one attempt allowed. The online quizzes may include 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 and/or immediately if you are not able to take the quizzes in the allotted weeks or regarding any computing problems.

**Students are expected to form their own groups (2 students per group unless otherwise specified) and select the available research topics on a first-come-first-served basis. Group members and research topics must be finalized prior to Friday 9th June 2023. Research articles will be distributed to the groups two weeks prior to the groups' presentation dates (e.g., the first set of papers will be distributed on Friday week 2 to groups that present on Friday week 4).

Both presentation and literature review should be based primarily on the assigned research article(s) with focus given to (if applicable): a) the core hypothesis/findings of the article(s), b) the key biogeochemical principles/processes and/or treatment technologies underpinning the work, c) environmental significance of the work, and d) current knowledge (by referring to previous publications), knowledge gaps and work required to fill these gaps. All students are expected to attend the group presentations and provide marks based on a given marking rubric. The final presentation mark is equally weighted from the average of the student mark and the average of the staff mark.

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Quizzes	25%	Not Applicable	1, 2, 3
2. Final Exam	50%	Not Applicable	1, 2, 3
3. Group work assessment	25%	Not Applicable	1, 2, 3, 4, 5

Assessment 1: Quizzes

Submission notes: All quizzes are online submission.
Marks returned: One week after the due date.

Three online Moodle quizzes

Quiz 1 (5%): This quiz assesses all the teaching material in week 1 (Physical, Chemical and Biological Quality of Water) and week 2 (Principles of Chemical Reactions).

Quiz 2 (12%): This quiz assesses the teaching material from week 3 (Salinity) to week 10 (Emerging organic contaminants).

Quiz 3 (8%): This quiz consists of three or four topic quizzes that acounts for a total of 8% of the course

grade.

Assessment 2: Final Exam

Assessment length: 2 hr
Submission notes: In-class, closed book exam

The final exam is an in-class, 2-hour closed-book examination that assesses the material taught from week 1 to week 10.

The exam will be scheduled during the designated exam period. The exact date and time are yet to be confirmed.

Hurdle requirement

A mark of at least 40% in the final examination is required before the class work is included in the final mark.

Assessment 3: Group work assessment

Literature Review (10%): 10 pages (typing) on the assigned research topic.

Presentation (11%): 30 min presentation + 15 min Q&A

Participation (4%): Attendance of and participation to the group presentations.

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

Units of Credit	6	
Contact hours	4 hours per week	
Class	Tue 2:00PM - 4:00PM	ElecEng G03
	Fri 4:00PM - 6:00PM	Mat 310
Workshop	Online	Via Q & A Moodle Forum

View class timetable

Timetable

Date	Type	Content
O-Week: 22 May - 26 May		
Week 1: 29 May - 2 June	Lecture	**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 No guest lecture in this week.
Week 2: 5 June - 9 June	Lecture	**Principles of chemical reactions:** • Chemical reactions and thermodynamics of chemical reactions • Reaction kinetics and rate laws • Reactions used in water treatment

		No guest lecture this week.
Week 3: 12 June - 16 June	Lecture	**Salinity: Market failure and management:** • Introduction to salinity, thresholds and types of salinity • Inadequate knowledge & causes of market failure • Salinity management Guest lecture presented by Dr. Chris Miller
Week 4: 19 June - 23 June	Lecture	**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 Guest lecture presented by Dr Bojan Tamburic (TBC)
Week 5: 26 June - 30 June	Lecture	**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 Guest lecture presented by Dr Andrew Kinsela
Week 6: 3 July - 7 July		
Week 7: 10 July - 14 July	Lecture	**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 Guest lecture presented by Dr Yuan Wang
Week 8: 17 July - 21 July	Lecture	**Radionuclides: Extraction and management:** • Radiation basis, radioactivity and sources • Uranium mining in Australia • Biogeochemistry of Uranium • Removal of radionuclides in water treatment

		Guest lecture presented Dr. Tim Payne.
Week 9: 24 July - 28 July	Lecture	**Air pollutants and Their Impacts on Human Health:** • Particles in the atmosphere • Gaseous inorganic pollutants • Organic air pollutants Guest lecture presented by Dr Yingying Sun
Week 10: 31 July - 4 August	Lecture	**Emerging organic contaminants:** • Issues with and classification of emerging contaminants • Removal of emerging contaminants in drinking water: conventional, adsorption, RO and AOPs No guest lecture this week.

Resources

Prescribed Resources

No prescribed texts.

Recommended Resources

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

Laboratory Workshop Information

Workshop is via Q&A Moodle Forum.

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	✓