CVEN9620

Rivers, Estuaries and Wetlands

Term 3, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Kristen Splinter	k.splinter@unsw.edu.au	by appointment	Manly Vale Campus Main Admin Bldg	0280719845

Lecturers

Name	Email	Availability	Location	Phone
William Glamore	w.glamore@unsw.edu.au	by appointment	Manly Vale Campus Main Admin Building	

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

This course introduces the student to engineering concepts related to Rivers, Estuaries, and Wetlands. Topics covered include Sediment Transport theory; River Geomorphology; River Engineering and Management; Inlets and Estuaries; Water Quality Modelling; and Wetlands. Models for routing of flows along channels and rivers will be presented including model theory, selection, calibration, validation, and reliability. Concepts including estuarine classification and density structure; tides, water level response, mixing processes and flushing of estuaries; estuarine difference models including hydrodynamic stratification and algal dynamics; random walk and box models; biochemical processes in estuaries are also presented.

Course Aims

This course introduces the student to engineering concepts related to Rivers, Estuaries, and Wetlands.

In the Rivers section of the course, students will gain a professional understanding of sediment transport theory, river geomorphology, methods of measuring and calculating flow and river dimensions, and river engineering/management including the design of river control structures.

In the Estuaries section of this course, students will gain a professional understanding of the complex environment that are estuaries, including tidal dynamics, density, estuarine classification, salinity, turbidity, and inlet stability. Also included is a discussion of water quality models for motion of pollutant constituents in channels and rivers. These models will include plug-flow methods, and advection-dispersion models in both a coupled and uncoupled situation. The course includes detailed description of those physical and biochemical processes which occur in estuaries and how to measure, model and predict those processes. Mixing processes and random walk and box models.

In the Wetlands section of this course, theory learned within the Rivers and Estuaries sections are applied and discussed within the context of wetland design, restoration and rehabilitation. Students will gain an understanding into the selection of numerical models for routing flows along the channels and rivers in a catchment drainage network.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Calculate unidirectional sediment transport and differentiate between the various modes of sediment transport expected in Rivers, Estuaries, and Wetland systems (including channels)	PE1.1, PE2.1
2. Describe the key physical attributes associated with Rivers, Estuaries, and Wetland systems.	PE1.2, PE2.2
3. Synthesise and interpret available data for a large river and estuary system to compose a high quality engineering report	PE1.2, PE2.3, PE3.2, PE3.4

Learning Outcome	EA Stage 1 Competencies
4. Design idealized channels and river systems using both standard engineering design practice and building with nature concepts.	PE1.6
5. Solve water quality and dispersion problems using numerical models and empirical equations for pollutant dispersion and river flow	PE1.5, PE2.3, PE3.1

Teaching Strategies

Teaching in this course is centered on the Lectures which are technical in content. You will develop your analysis skills by applying the theory to problems that you undertake in the Workshops and in your major assignment. The workshops are meant to be hands-on and interactive and include the use of a mobile sediment transport bed model on occasion to enhance the student learning experience as well as real-world case studies to discuss.

Detailed lecture slides with examples will be supplied in this course. The purpose is to free up your time to think and comprehend during the lectures. Students should consider and actively answer any questions posed during the course of the lecture and in the lecture slides – if not aloud, then in your head. Follow worked examples or clarifications made on the whiteboard or blackboard during classes. Be alert to any course announcements.

Much of your learning can take place during the course workshops. If you work actively in this time, it will free you up for other activities outside of class. Make sure you understand the solution strategies of any Worked Problems. Use your time to ask your demonstrators about any unresolved workshop or conceptual problems – even if your question relates to matters from previous weeks. Ask questions.

Private Study: Students are expected to review lecture material and reference literature provided. Reflect and work on the set of workshop problems (when given) at the end of each lecture. Reflect on and complete any assignments issued. Reflect on class problems. Check your email regularly for messages and workshop solutions.

Assessments demonstrate your knowledge and skills. These include technical content (quizzes and final exams) as well as design problems (assignments) where you as an engineer must use your best judgment to provide advice to your client. The assessments demonstrate higher understanding and problem solving in this design-led course.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Midterm Quiz	25%	06/10/2022 03:00 PM	1, 2, 4
2. River and Estuary Investigation	25%	11/11/2022 05:00 PM	3, 5
3. Major Assignement	50%	24/11/2022 05:00 PM	3, 5

Assessment 1: Midterm Quiz

Start date: 06/10/2022 01:00 PM
Assessment length: 2 HRS
Due date: 06/10/2022 03:00 PM

2-hr quiz covering weeks 1-4 (approximately) up to the census date. The quiz is a combination of fill in the blank, calculated answers, matching, multiple choice, etc.

Assessment criteria

See Moodle for full details.

Assessment 2: River and Estuary Investigation

Due date: 11/11/2022 05:00 PM
Deadline for absolute fail: as per UNSW policy
Marks returned: see Moodle

Students will perform a Water Quality assessment for a proposed new effluent dispersion into the river.

This is not a Turnitin assignment

Assessment criteria

See Moodle

Assessment 3: Major Assignement

Assessment length: see Moodle
Due date: 24/11/2022 05:00 PM
Deadline for absolute fail: as per UNSW policy.

Ability to do a literature review of relevant research.
Ability to succinctly analyse data from various sources.
Ability to present your work clearly to a prospective client.
Ability to link engineering applications to broader issues, including social, economic, industry.

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

Assessment criteria

Please see Moodle.

Attendance Requirements

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

Course Schedule

Please see Moodle for week-to-week information on the course, labs, and any field trips.

View class timetable

Timetable

Date	Type	Content
O-Week: 5 September - 9 September		
Week 1: 12 September - 16 September	Seminar	**Lecturer:** Will Glamore. **Topics Covered:** Course Introduction and basics into hydraulics, hydrology and hydrodynamics. We provide a general overview of the course and a big picture of river and estuaries. Specific topics covered include open channel flow and channel design. An example river is described to highlight various issues covered in the course. **Case Studies: Hunter River Estuary** **Students will be asked to describe a River/Estuary of their choice during the interactive portion of the seminar.**
Week 2: 19 September - 23 September	Seminar	**Lecturer:** A/Prof Kristen Splinter **Topic**: Sediment Transport Theory in Rivers and Estuaries Thresholds of sediment motion, Bed load, and Suspended load. Time to go over theory questions from today's lecture portion is given. An opportunity to visit the Sediment transport lab in Vallentine Annexe may also be given.

Week 3: 26 September - 30 September	Seminar	**Lecturer:** A/Prof Kristen Splinter **Topic**: Rivers River geomorphology, Floodplain modeling Time to go over theory questions from today's lecture portion is given. **Case Studies: Ok Tedi Mine/River PNG, Kosi River India** An opportunity to visit the Sediment transport lab in Vallentine Annexe may also be given.
Week 4: 3 October - 7 October	Online Activity	*Content for this week will be pre-recorded for students and available end of Week 3 to allow for ample study time for the Quiz in Week 4. **Lecturer:** A/Prof Kristen Splinter **Topic**: Rivers River engineering structures, River management Natural channel design **Case Studies: Mississippi River, GBR, Calgary, Murray Darling**
	Assessment	Midterm Quiz
Week 5: 10 October - 14 October	Seminar	**Lecturer:** A/Prof Kristen Splinter **Topic**: Inlets and Estuaries Tides, Tidal inlet and stability Estuarine classification and processes **In class time will be given for calc based questions and ASSIGNMENT WALKTHROUGH** ***MAJOR Assignment released** **Case studies: Lake Illawarra, Shoalhaven**
Week 6: 17 October - 21 October	Fieldwork	Week 6 is a flexible week and may be used for a field trip to explore various aspects of the course within the Greater Sydney region. See Moodle for

		details.
Week 7: 24 October - 28 October	Seminar	**Lecturer**: A/Prof Will Glamore **Topic:** Inlets and estuaries Introduction to Estuarine Hydrodynamics and Hydraulic Modelling 1hr – Guest lecture on Analytical Modelling of Estuaries Students will look at building a model case studies as part of the seminar/workshop ***Water Quality Assignment released**
Week 8: 31 October - 4 November	Seminar	**Lecturer**: A/Prof Will Glamore **Topic:** Water quality and Contaminant fate Estuarine and Riverine Water Quality 1hr – Guest Lecture on Water Quality Models Water quality case studies for rivers: acid sulfate soils, PFAS and outfalls
Week 9: 7 November - 11 November	Seminar	**Lecturer:** A/Prof Kristen Splinter and TBD **Topic**: Geospatial methods for river and estuarine management Remote sensing in estuaries and rivers. Approaches for quantifying floodplain dynamics, river width, bathymetry, river flow, water quality (e.g. algal blooms) and estuarine geomorphology. Data-driven modelling and analysis techniques for integrated river and estuary management.
	Assessment	River and Estuary Investigation
Week 10: 14 November - 18 November	Seminar	**Lecturer**: A/Prof Will Glamore **Topic:** Tidal wetlands and estuaries Climate change in estuaries Advances in river and wetland restoration

		The Blue Economy
Study Week: 21 November - 24 November		
	Assessment	Major Assignement

Resources

Prescribed Resources

- There is no required textbook for this course.
- Students are encouraged to review documents and textbooks suggested in moodle.
- Please see the Moodle page for details on relevant textbooks, notes, materials and internet sources
- Students are encouraged to review the following web page regarding Estuaries and climate change: http://estuaries.wrl.unsw.edu.au/index.php/climate-change/

Course Evaluation and Development

Student feedback is welcome and encouraged throughout the term.

Based on past years feedback we have included more opportunities for worked examples in the seminar and more guidance on the major assignment will be provided. Marking guidelines for the assignments will be provided in Moodle to assist students.

Laboratory Workshop Information

Opportunities to visit field sites around Sydney will be given for students. There will be opportunity to visit the sediment lab in Vallentine Annexe during some weeks.

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 T3 2022 will be held online between 25th November - 8th December 2022 inclusive, and supplementary exams between 9th - 13th January 2023 inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

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://app.acuityscheduling.com/schedule.php?owner=19024765

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.

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	