School of Civil and Environmental Engineering

Term 3, 2021

CVEN9620 RIVERS, ESTUARIES & WETLANDS

COURSE DETAILS

Units of Credit	**6**
Contact hours	4 hours per week
Lecture/Seminar/Workshops	Thursday,10:00 – 14:00 Online – see Moodle for details *Workshops run interspersed with the lectures during the 4-hr period. This provides breaks as well as opportunity to work on problems as they are learned.
Course Coordinator and Lecturer	Dr. Kristen Splinter email:k.splinter@unsw.edu.au Kensington office: CE 313 *note that during COVID I am not working on campus Main office is at Water Research Laboratory (Manly Vale Campus) Phone: 80719845 (Water Research Laboratory)
Lecturer	A/Prof Will Glamore email: w.glamore@unsw.edu.au Kensington office: CE 313. *note that during COVID I am not working on campus Main office is at Water Research Laboratory (Manly Vale Campus) phone: 8071 9868 (Water Research Laboratory)

INFORMATION ABOUT THE COURSE

The assumed knowledge for this course is undergraduate Civil and Environmental Engineering fluid mechanics (ENGG2500/CVEN2501, CVEN 3501, CVEN 3502).

Those enrolled in the Master of Engineering Science (CVENZS8338) or the Master of Engineering (CVENYS8621) programs are expected to have completed Fundamentals of Water Engineering (CVEN9625) prior to commencing this course or show relevant undergraduate courses equivalent to UNSW. Students currently enrolled or who have taken Advanced Water Engineering (CVEN4507) will further benefit.

HANDBOOK DESCRIPTION

https://www.handbook.unsw.edu.au/postgraduate/courses/2021/CVEN9620/

OBJECTIVES

Rivers, Estuaries and Wetlands (CVEN 9620) aims to develop an appreciation of the theory of hydrodynamics, hydraulics, hydrology and sediment transport related to our natural and manmade waterways.

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 relationship between rivers and estuaries, including tidal dynamics, stratification, estuarine classification, salinity, turbidity, and inlet stability. Also included is a discussion of water quality and pollution dynamics 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 the physical and biochemical processes that occur in estuaries and how to measure, model and predict those processes.

In the Wetland's section of this course, theory learned within the Rivers and Estuaries sections are applied and discussed to highlight nature-based solutions, the emerging field of blue carbon, as well as the engineer's role in developing wetland design and implementation. Students will gain an understanding into the selection of numerical models for routing flows along the channels and rivers in a catchment drainage network.

Throughout the course we discuss the role of climate change in our natural systems and how current management strategies are being applied using real-world examples.

Workshops provide opportunity for discussion on challenges, both technical and ethical, faced by engineers when dealing with complex natural systems and include practice questions and case studies.

The field work component of this course (TBC, COVID Pending) aims to give students real-world experience, analytic skills, as well as collaborative and effective communication skills.

The individual self-learning topic of an estuary/river aims to link what has been learned in class to the broader world and for students to develop clear and effective written communication.

List of programme attributes:

- An in-depth engagement with the relevant disciplinary knowledge in its inter-disciplinary context
- Capacity for analytical and critical thinking and for creative problem solving
- Ability to engage independent and reflective learning
- Information literacy
- Skills for collaborative and multi-disciplinary work
- A respect for ethical practice and social responsibility
- Skills for effective communication

TEACHING STRATEGIES

Teaching in this course is centred on the Lectures/Seminars 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.

PLEASE NOTE THAT ALL LECTURE AND OTHER MATERIALS FOR THIS COURSE ARE DISTRIBUTED VIA MOODLE. NO PAPER COPIES ARE PROVIDED IN CLASS. IT IS ESSENTIAL THAT ALL STUDENTS DOWNLOAD AND BRING TO CLASS EACH WEEK THE RELEVANT MATERIAL.

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 tutorial solutions.
Lectures/Seminars	• 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.
Workshops	• 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 tutorial or conceptual problems – even if your question relates to matters from previous weeks. • Ask questions.
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.
Field Trip/ Work	• Hands-on work, field data collection, to set studies in context
Online (Moodle)	• Access/download all relevant material for weekly lectures/workshops • Use discussion forums to work with fellow students and discuss problems/topics • Review lectures • All quizzes and assignments will be administered in Moodle.

EXPECTED LEARNING OUTCOMES

At the end of this course, students should be familiar with the engineering approach to channel design, river management, sediment transport, estuarine processes and contaminant fate. Students should be competent in performing analytical practices, collecting field data, numerical modelling methods, sampling techniques, and communicating effectively. The course combines both lectures, workshops, field work and self-directed learning.

For each contact hour, it is expected that students put in at least 1.5hrs of private study.

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.	*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.	*Demonstrate an ability to investigate a large river and estuary system, synthesize and interpret available data, and compose engineering reports of high quality.*	*PE1.2, PE2.3, PE3.2, PE3.4*
4.	*Design idealized channels and river systems using both standard engineering design practice and building with nature concepts.*	*PE1.6, PE2.2,*
5.	*Solve simple water quality and dispersion problems through the use of numerical models and empirical equations related to pollutant dispersion and river flow.*	*PE1.5, PE2.3, PE3.1*

OBLIGATION OF AN ENGINEER

I am an Engineer. In my profession, I take deep pride. To it, I owe solemn obligations.

As an engineer, I pledge to practice integrity and fair dealing, tolerance and respect, and to uphold devotion to the standards and dignity of my profession. I will always be conscious that my skill carries with it the obligation to serve humanity by making the best use of the Earth's precious wealth.

As an engineer, I shall participate in none but honest enterprises. When needed, my skill and knowledge shall be given, without reservation, for the public good. In the performance of duty, and in fidelity to my profession, I shall give my utmost.

— "Obligation of an Engineer"

COURSE PROGRAM

Date	Topic	Lecture/Workshop Content	Lecturer
13/09/2021 (Week 1)	Course introduction Introduction to hydraulics, hydrology, 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** **WORKSHOP: Students will be asked to describe a River/Estuary of their choice during the interactive portion of the lecture.**	WG
20/09/2021 (Week 2)	Sediment Transport Theory	Thresholds of sediment motion, Bed load, Suspended load **WORKSHOP**: **live-streaming of sediment transport lab at end of lecture/workshop via MS Teams** ***Theory Calculations to prep for Quiz1**	KS
27/09/2021 (Week 3)	Rivers	River geomorphology, Floodplain modelling **WORKSHOP: live-streaming of river lab at end of lecture/workshop via MS Teams** **Case Studies: Ok Tedi Mine/River PNG, Kosi River India**	KS
04/10/2021 (Week 4)	**Rivers** ***Quiz 1 is this week**	River engineering structures, River management Natural channel design **WORKSHOP: live-streaming of river lab at end of lecture/workshop via MS Teams and Theory calcs to prep for Quiz** **Case Studies: Mississippi River, GBR, Calgary, Murray Darling**	KS
11/10/2021 (Week 5)	Inlets and estuaries	Tides, Tidal inlet and stability Estuarine classification and processes **WORKSHOP: Calc based questions and ASSIGNMENT WALKTHROUGH** ***MAJOR Assignment released** **Case studies: Lake Illawarra, Shoalhaven**	KS
18/10/2021 (Week 6)		***Flexibility week for all courses (non-teaching)***	
25/10/2021 (Week 7)	Inlets and estuaries	Introduction to Estuarine Hydrodynamics and Hydraulic Modelling 1hr – Guest lecture on Analytical Modelling of Estuaries **WORKSHOP:** Building a model case studies ***Assignment 1 released**	WG

01/11/2021 (Week 8)	Water quality/ Contaminant fate	Estuarine and Riverine Water Quality 1hr – Guest Lecture on Water Quality Models **WORKSHOP:** Water quality case studies for rivers: acid sulfate soils, PFAS and outfalls	WG
08/11/2021 (Week 9)	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. ***Assignment 1 is due**	Guest Lecture
15/11/2021 (Week 10)	Tidal wetlands and estuaries	Climate change in estuaries Advances in river and wetland restoration The Blue Economy **WORKSHOP:** Discussion on major assignment	WG
22/11/2021 (Week 11)		**MAJOR ASSIGMENT DUE**	

ASSESSMENT

Overall rationale for assessment components and their association with course objectives.

The final grade for this course will be based on the sum of the scores from each of the assessment tasks. There is no FORMAL EXAM FOR CVEN9620 IN 2021.

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 3 2021 will be held on Monday 10 January – Friday 14 January 2022 (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. Online quizzes must be done during the time allocated. There is no makeup for online Quizzes unless Special Consideration is given.

ASSESSMENT OVERVIEW

Item	**Length**	**Weighting**	**Learning outcomes assessed**	**Assessment Criteria** *(this needs to explicitly describe what students are expected to demonstrate in the task)*	**Due date and submission requirements**	**Deadline for absolute fail**	**Marks returned**
1.Quizzes							
Quiz 1	2-hr quiz in a 6-hr period	25	1,2,4	Knowledge weeks 1-4 See Moodle for full details	Quiz will occur in WEEK 4. 6 hr period runs from Thursday Oct. 7 @ 4pm to Thursday Oct. 7 @ 10pm	Thursday Oct. 7 @ 10pm (local Sydney Time)	Friday 8/10/2021
2. Assessments							
Assignment 1 Understanding and modelling estuarine processes	10 pages	25	3,5	Ability to apply knowledge/theory learned in the classroom to a real-world problem Ability to concisely write an engineering report See Moodle and assignment handout for full details	Monday 08/11/2021 @ 11:59 pm (week 9) Submitted online via Moodle	Saturday 13/11/2021 @ 11:59pm	Friday 26/11/2021
MAJOR ASSIGNMENT A- REPORT B – INDIVIDUAL VIDEO SUMMARY	30 pages (max) 5 min	40 10	3,5 3	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 See Moodle and assignment handout for full details	BOTH tasks are due: Monday 22/11/2021 @ 11:59 pm (week 11) Submitted online via Moodle	Saturday 27/11/2021 @ 11:59pm	Friday 10/12/2021

RELEVANT 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/

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

For information about:

- Notes on assessments and plagiarism;
- Special Considerations: student.unsw.edu.au/special-consideration;
- General and Program-specific questions: The Nucleus: Student Hub
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC/SURVSOC/CEPCA

Refer to Academic Advice on the School website available at:

https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw

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