School of Civil and Environmental Engineering

Term 2, 2021

CVEN4507 ADVANCED WATER ENGINEERING

COURSE DETAILS

Units of Credit	6	
Contact hours	5 hours per week	
Lecture	Wednesday, 10:00 – 12:00	online
	Thursday, 10:00 – 12:00	online
Workshop	Thursday, 13:00 – 14:00	online

Course Coordinator and Lecturer Dr Lucy Marshall
email: lucy.marshall@unsw.edu.au
office: Room 132, Water Research Centre (Building H22)

Lecturer Dr Stefan Felder
email: s.felder@unsw.edu.au
office: CE303 and Water Research Laboratory

INFORMATION ABOUT THE COURSE

This course is one of the professional electives in water engineering.

The following topics are discussed in this course: Design and performance of hydraulic structures including weirs, spillways and stilling basins, sediment modes of transport, threshold of sediment transport and prediction of sediment transport rates, reservoir behaviour and design, rainfall runoff modelling, climate change analyses and advanced topics in hydrological design.

Pre requisites for this course are ENGG2500 (CVEN2501), CVEN3501 and CVEN3502; or CVEN9625.

HANDBOOK DESCRIPTION

See link to virtual handbook:

https://www.handbook.unsw.edu.au/undergraduate/courses/2021/CVEN4507/

OBJECTIVES

The objectives of this course are:

- to provide an understanding of the rationale behind the development of hydrological models.
- to give you an understanding of the principles of reservoir design and operation.
- to introduce you to climate change assessments for water resources
- to expose you to methods of considering uncertainties in data and models.
- to introduce you to the design of some common hydraulic structures based upon fundamental

concepts of fluid mechanic and open channel flows.
- to provide you with an understanding of cohesionless sediment transport and how to make predictions of sediment transport rates in alluvial channels or beds.

These objectives link to the following program outcomes:

- 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 effective communication

TEACHING STRATEGIES

The following teaching strategies will be used in the course

Private Study	• Review lecture material • 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 • Learn and discuss course content • 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.	*Select and use hydrologic models appropriate to a design problem*	*PE1.1, PE2.2*
2.	*Design and analyse reservoir sizing, with consideration of uncertainty and risk*	*PE1.2, PE1.3, PE1.5, PE1.6*
3.	*Understand the sources of uncertainty in hydrologic calculations, including the effects of climate change*	*PE1.1, PE1.6*
4.	*Understand the important characteristics of basic hydraulic structures and sediment transport processes in open channel flows.*	*PE1.2, PE1.3, PE1.5*

5.	*Perform calculations around and design of basic hydraulic structures and sediment transport processes in open channel flows.*	*PE2.1, PE2.2, PE2.3*

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	Demonstration Content
31/05/2021 (Week 1)	Catchment hydrology and modelling	LM	
07/06/2021 (Week 2)	Catchment modelling continued	LM	Online Quiz
14/06/2021 (Week 3)	Reservoir design	LM	
21/06/2021 (Week 4)	Climate change	LM	
28/06/2021 (Week 5)	Uncertainty Analysis and Hydraulic structures	LM/SF	Assignment 1 due
05/07/2021 (Week 6)		***Flexibility week for all courses (non-teaching)***	
12/07/2021 (Week 7)	Hydraulic structures	SF	
19/07/2021 (Week 8)	Hydraulic structures	SF	
26/07/2021 (Week 9)	Sediment transport	SF	
02/08/2021 (Week 10)	Sediment transport	SF	Assignment 2 due

ASSESSMENT

The assessment tasks for this course have been developed to assess each student's achievements in terms of each of the five learning outcomes listed above.

Assignments are individual assessments testing the students' understanding of the hydrological and hydraulic concepts in agreement with the learning objectives. Each student will receive an individual data set of parameters which will lead to individual results. The individual data will be emailed to your UNSW student email address. The assignment will be marked against detailed assessment criteria and will be based upon completeness, neatness and logical working.

The final course mark will be based on you completing the coursework and final examination:

(i) your coursework mark accounts for 50% of the course, **and**
(ii) your final examination mark accounts for 50% of the course.

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. The Final Exam is worth 50% of your Final Mark if class work (Online quiz, Assignment 1 and Assignment 2) is included and 100% if your class work is not included. The class work is worth 50% of the Final Mark if included. A mark of at least 40% in the final examination is required before the class work is included in the final mark.

Students who perform poorly in the assignments are recommended to discuss progress with the lecturer during the term. Note: The lecturer reserves the right to adjust the final scores by scaling if agreed by the Head of School.

Supplementary Examinations for Term 2 2021 will be held on Monday 06th September – 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.

Assessment Task	**Assessment Details**	**Due Date**
Online quiz (5%)	Topic: Modelling fundamentals and result interpretation	11.59pm 11th June
Assignment 1 (20%)	Topic: Water supply design (issued Week 3)	2 pm, 9th July
Assignment 2 (25%)	Topic: Hydraulic structures and sediment transport (issued in Week 7)	2 pm, 3rd August
Exam (50%)	Exam content comprises: - 50% Hydrology (Lucy Marshall's part) - 50% Hydraulics (Stefan Felder's part)	During UNSW Session 2 examinations period.

PENALTIES

Late work will be penalised at the rate of 10% per day after the due time and date have expired.

ASSESSMENT OVERVIEW

Item	Length	Weighting	Learning outcomes assessed	Assessment Criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
1. Online Quiz Modelling fundamentals	*1 hour*	5%	1	The quiz will be a multiple choice quiz and students will be assessed on their knowledge of basic modelling concepts and interpretation of model results.	Friday 11th June Week 2	Friday 11th June Week 2	Wednesday 16th June Week 3
2. Assignment 1 (Hydrology)		20%	1,2,3	Students are expected to demonstrate their understanding of hydrologic modelling and reservoir design by performing calculations, running suitable models and explaining basic concepts. The marking of the assignment will be based upon the standard of the report, discussion and justification of modelling strategy and the accuracy of the simulations and calculations.	Friday 9th July Week 6	Friday 16th July Week 7	Wednesday 21st July Week 8
3. Assignment 2 (Hydraulics)		25%	4,5	Students are expected to demonstrate their understanding of the design of basic hydraulic structures and sediment transport processes by performing calculations, drawings and explaining basic concepts. The marking of the assignment will be based upon completeness, neatness and logical working. Please explain your working and indicate your calculation steps. Marks will be deducted if you only provide a final value as answer. If you used a computer program for your working, you must provide details about your working step as well as the formulas and code created.	Tuesday 3rd August Week 10	Tuesday 10th August Week 11 / Study Period	Wednesday 11th August Week 11 / Study Period
4. Final exam	2 hours	50% of final marks	1,2, 3,4,5	Students are expected to demonstrate their understanding of hydrological modelling, reservoir design and climate change and the design of basic hydraulic structures and sediment transport processes by performing calculations, drawings and explaining basic concepts.	During UNSW Term 2 examinations period.	N/A.	During formal notification of final results determined by UNSW Faculty of Engineering.

RELEVANT RESOURCES

There is no textbook for this course but a number of recommended reference books for this course are indicated below - there will be further recommended reading indicated within the lecture notes and course delivery

- Ladson, A. (2008). Hydrology - An Australian Introduction. Oxford University Press, South Melbourne, ISBN: 978019555358
- Maidment, D.R (1993). Handbook of Hydrology. McGraw-Hill. ISBN: 9780070397323
- White, F.M. (2011). Fluid Mechanics, 7th edition, McGraw-Hill, ISBN 978 07 1286 459.
- Chanson, H. (2004). "The Hydraulics of open channel flow: an introduction", Butterworth-Heinemann, Oxford, UK, 2nd edition (ISBN 0 7506 5978 5).
- Akan, A.O. (2006). Open Channel Hydraulics, Butterworth-Heinemann, ISBN 978 0 7506 6857 6.
- Van Rijn, L.C. (1993). Principles of Sediment Transport in Rivers, Estuaries and Coastal Seas, AQUA Publications, Amsterdam, ISBN 90 800356 2 9
- Henderson, F.M. (1966). Open Channel Flow, Macmillan, New York.
- Bos, M.G. (1989). "Discharge measurement structures" – ILRI Publication 20, 3rd edition, Wageningen, The Netherlands, ISBN 9070754150

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 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