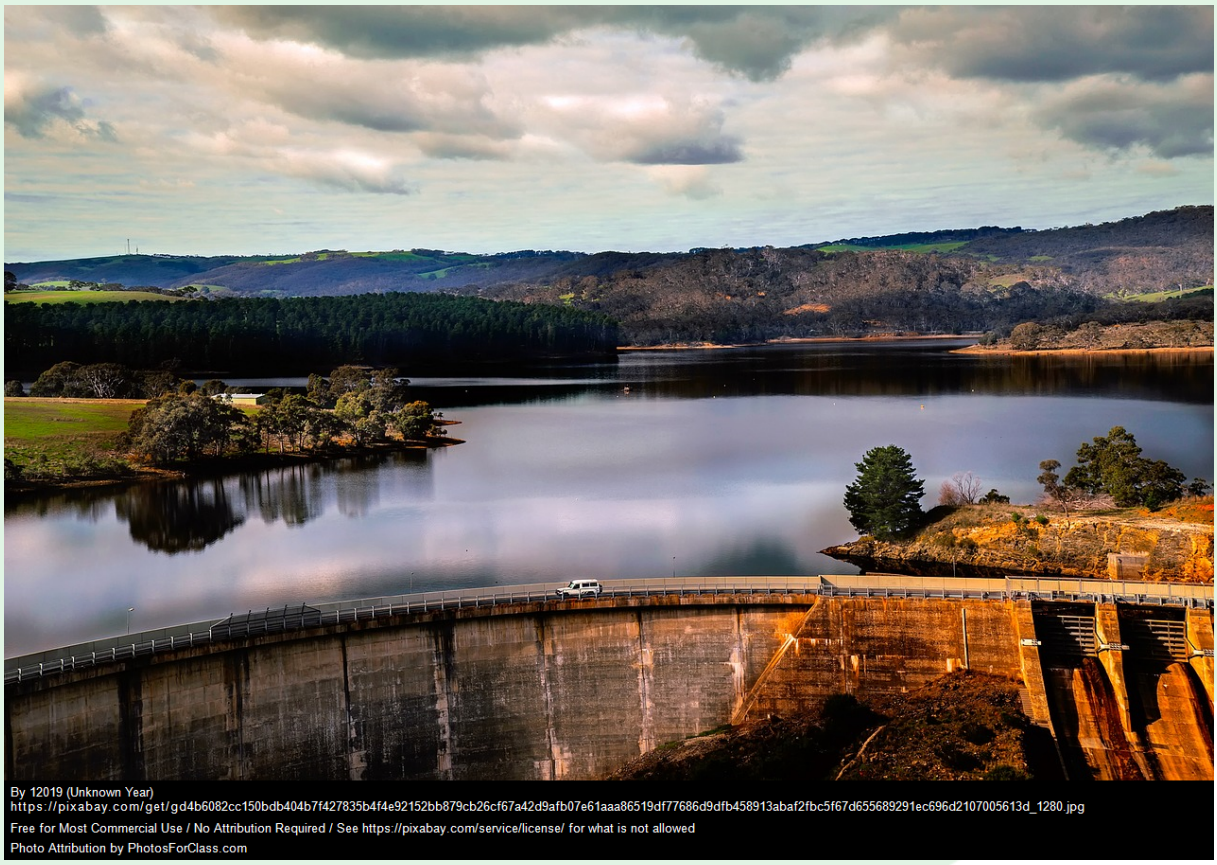
# CVEN4507

## Advanced Water Engineering

Term 2, 2023



# Course Overview

## Staff Contact Details

### Convenors

| Name | Email | Availability | Location | Phone |
|---|---|---|---|---|
| Fiona Johnson | f.johnson@unsw.edu.au | Tuesday 2-3pm and other time by prior arrangement | H22, Room 132 | 02 9385 9769 |

### Lecturers

| Name | Email | Availability | Location | Phone |
|---|---|---|---|---|
| Stefan Felder | s.felder@unsw.edu.au | Arrange via email | Water Research Laboratory (Manly Vale) | 02 8071 9861 |

## 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

Introduction to hydraulic structures engineering and design of weirs, spillways, energy dissipators and fishways, sedimentation engineering, reservoir behaviour and design, advanced topics in hydrological design.

## Course Aims

- To build up your technical understanding of water engineering
- To understand large-scale water supply and flood engineering assessments.
- To be able to apply acquired theory to develop realistic mathematical models of water engineering systems
- To develop the critical abilities required to apply commercial software packages to large-scale water engineering problems.
- Be able to design hydraulic structures

## Course Learning Outcomes

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

| Learning Outcome | EA Stage 1 Competencies |
|---|---|
| 1. Apply hydrologic models appropriately to a design problem. | PE1.1, PE3.2, PE3.4 |
| 2. Design and analyse reservoir sizing, with consideration of uncertainties and risks. | PE1.1, PE1.5, PE2.3 |
| 3. Describe the sources of uncertainty in hydrologic calculations, including the effects of climate change. | PE1.4, PE1.5, PE1.6 |
| 4. Describe the important characteristics of basic hydraulic structures and sediment transport processes in open channel flows. | PE1.3, PE1.6, PE2.1 |
| 5. Design basic hydraulic structures in open channel flows by performing relevant calculations. | PE2.3 |
| 6. Solve calculations of basic sediment transport processes in open channel flows. | PE1.3, PE2.1 |

## Teaching Strategies

This subject consists of a mixture of lectures, tutorials and hands-on computer sessions.

Lectures will cover advanced engineering hydrological and hydraulic analyses and their application to water engineering. Commercial software packages used in industry will be described and discussed. This information will form the foundations for your assignment which will require development of a

working, practical engineering numerical model. Application of the theories to formulate guidelines in the analysis of practical engineering problems will be emphasized.

The tutorials provide you with the opportunity to discuss the lecture material with your tutors and to solve the set tutorial problems. In order to understand the subject matter well, it is essential to attend the tutorial classes and solve the tutorial problems by yourself.

For each hour of contact it is expected that a student will put in at least 1.5 hours of private study. You are recommended to review the lecture and tutorial material weekly.

The teaching/learning activities are summarized in the following table:

Lectures

- Cover material to be learned for assessment tasks
- Follow worked examples
- Hear announcements on course changes

Tutorials

- Practice solving set problems
- Be guided by tutors
- Ask questions

Computer Sessions

- Hand on exercises using commercial software
- Familiarise with pre- and post-processors
- Reflect and discuss on practical issues in numerical simulation

Private Study

- Review lecture material and textbook
- Preparation for the tutorial and do set problems
- Reflect on class problems
- Study relevant references

Assessments (hand-in, assignments, examinations)

- Demonstrate your knowledge and skills
- Demonstrate higher understanding and problem solving

## Assessment

| Assessment task | Weight | Due Date | Course Learning Outcomes Assessed |
|---|---|---|---|
| 1. Quiz | 5% | 09/06/2023 06:00 PM | 4 |
| 2. Assignment 1 | 15% | 03/07/2023 09:00 AM | 4, 5, 6 |
| 3. Assignment 2 | 20% | 04/08/2023 05:00 PM | 1, 2, 3 |
| 4. Final Exam | 60% | Not Applicable | 1, 2, 3, 4, 5, 6 |

### Assessment 1: Quiz

**Submission notes:** You will have 2 hours within a 24 hour time frame to complete the quiz (between 6 pm 8/6 and 6 pm 9/6).
**Due date:** 09/06/2023 06:00 PM

The quiz will be a multiple choice quiz and students will be assessed on their knowledge of basic hydraulic engineering concepts and interpretation of results.

This is not a Turnitin assignment

### Assessment 2: Assignment 1

**Due date:** 03/07/2023 09:00 AM

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.

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

### Assessment 3: Assignment 2

**Due date:** 04/08/2023 05:00 PM

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.

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

### Assessment 4: Final Exam

**Assessment length:** 2 hours

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

## Attendance Requirements

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

## Course Schedule

View class timetable

### Timetable

| Date | Type | Content |
|---|---|---|
| O-Week: 22 May - 26 May | | |
| Week 1: 29 May - 2 June | Lecture | Course introduction<br><br>Tuesday: Hydraulic structures: Introduction<br><br>Wednesday: Hydraulic structures: Weirs |
| Week 2: 5 June - 9 June | Lecture | Tuesday: Hydraulic structures:Spillways<br><br>Wednesday: Hydraulic structures: Energy dissipators |
| | Assessment | Quiz: You will have 2 hours within a 24 hour time frame to complete the quiz (between 6 pm 8/6 and 6 pm 9/6). |
| Week 3: 12 June - 16 June | Lecture | Tuesday: Hydraulic structures: Stilling basin<br><br>Wednesay: Hydraulic structures: Field trip to WRL for Practice lecture on hydraulic structures and fishways |
| | Fieldwork | Field trip to WRL Manly Vale (Wednesday 14 June) |
| Week 4: 19 June - 23 June | Lecture | Tuesday: Sediment transport: sediment motion<br><br>Wednesday: Sediment transport: Tractive force theory |
| Week 5: 26 June - 30 June | Lecture | Tuesday (SF): Sediment transport: Bedforms and sediment transport rate<br><br>Wednesday (FJ): Catchment processes |
| Week 6: 3 July - 7 July | Homework | Flexibility week - no classes |
| | Assessment | Assignment 1 |
| | | |

| | | |
|---|---|---|
| Week 7: 10 July - 14 July | Lecture | Catchment modelling and machine learning |
| Week 8: 17 July - 21 July | Lecture | Reservoir analysis |
| Week 9: 24 July - 28 July | Lecture | Uncertainty analysis and remote sensing |
| Week 10: 31 July - 4 August | Lecture | Climate change impact assessment |
| | Assessment | Assignment 2 |
| Stuvac: 7 August - 11 August | | |

# Resources

## Recommended 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

## Course Evaluation and Development

We welcome all feedback from students during class, off line and via MyExperience. For example, past students asked for more worked examples throughout the lectures rather than a separate tutorial period at the end and these are now implemented through all the topics. Your feedback helps us to improve the

course for you and for future students.

## 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.*

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## 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 | |