CVEN9625

Fundamentals of Water Engineering

Term 1, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Ashish Sharma	a.sharma@unsw.edu.au	Teaching Consultation Tuesday 4-5	CVEN307	+61425332304
William Glamore	w.glamore@unsw.edu.au	Teaching Consultation Tuesday 4-5	UNSW Water Research Laboratory Manly Vale Campus	+61404822080

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 practice of water engineering, including the properties of fluids, hydrostatics, mass conservation, energy and momentum in flowing fluids, pipes, open channel flow, the hydrological cycle, precipitation, storm runoff and loss rates, rainfall estimation - IFD diagrams and design hyetographs, deterministic rational method, water supply and drainage systems, pumping stations and rising mains.

Course Aims

This is a fundamentals of water engineering course to equip qualified environmental scientists and other professionals who wish to work in professional water engineering, hydraulics, engineering hydrology, and environmental engineering.

The objective of this course is to provide an postgraduate level introduction to the practice of water engineering, including the properties of fluids, hydrostatics, mass conservation, energy and momentum in flowing fluids, pipes, open channel flow, the hydrological cycle, precipitation, storm runoff and loss rates, rainfall estimation - IFD diagrams and design hyetographs, deterministic rational method, water supply and drainage systems, pumping stations and rising mains.

Course Learning Outcomes

1. Conduct a hydrological assessment of a catchment
2. Quantify the size of design floods
3. Understand energy fluxes and calculate evaporation
4. Explain the basic fluid properties of fluids and how these relate to fluid flow
5. Explain the fundamental principles of fluid flow in pipes and free surface flows viz continuity, energy and momentum, and to know when they can be applied to different flow scenarios
6. Assess and carry out calculations on the flows through pipes and channels

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown in the table below.

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

Learning Outcome		**EA Stage 1 Competencies**
1.	*Conduct a hydrological assessment of a catchment.*	*PE1.1, PE1.5, PE2.2,PE2.3*
2.	*Quantify the size of design floods.*	*PE1.2, PE2.2, PE2.3*
3.	*Understand energy fluxes and calculate evaporation.*	*PE1.2, PE2.2, PE2.3*
4.	*Explain the basic properties of fluids and how these relate to fluid flow.*	*PE1.1, PE2.2, PE2.3, PE3.3*
5.	*Explain the fundamental principles of fluid flow in pipes and free surface flows via continuity, energy and momentum equations, and to know when they can be applied to different flow scenarios.*	*PE1.1, PE2.2, PE2.3, PE3.3*
6.	*Assess and carry out calculations on the flows through pipes and channels.*	*PE1.2, PE2.2, PE2.3*
7.	*By the conclusion of this course the student will be familiar with the*	*PE2.2, PE2.3, PE3.3*

	engineering techniques used to analyse and design the basic components of water engineering.	

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

Teaching Strategies

Private Study

- Review lecture material and research literature
- Do set problems and assignments
- Reflect on class problems, assignments & literature review
- Do internet and library searches on topics related to the course
- Participate in class discussions
- Utilize material taught in class and learnt from literature review, to develop innovative solutions for the class project

Lectures

- Find out what you must learn
- Follow worked theory and examples
- Hear announcements on course changes

Tutorials

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

Assessments (tests, examinations, assignments)

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

Additional Course Information

If a flood happens, how many people could lose their lives and how much damage could happen to infrastructure? Is it possible to predict a flood? How does climate change affect floods? How can water be guided/transferred from one location to another? The answer to these questions and the way to approach them lies within the Water Engineering discipline. This course will introduce the basic principles of Water Engineering with a focus on hydrology and hydraulics. You will learn about the movement of water on earth (hydrological cycle), what makes water flow, how water is transferred to desired locations through engineering (hydraulics) and how water behaves in natural and human made environments. This course will introduce you the basic principles of water engineering and enable you to apply your understandings to develop solutions to water engineering problems.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Online Quiz (weeks 1-5)	10%	17/03/2022 11:00 PM	1, 2, 3
2. Assignment 1	15%	25/03/2022 11:00 PM	1, 2, 3
3. Assignment 2	15%	26/04/2022 09:00 AM	4, 5, 6
4. Final Exam	60%	See Exam timetable	1, 2, 3, 4, 5, 6

Assessment 1: Online Quiz (weeks 1-5)

Start date: 17/02/2022 03:00 PM
Submission notes: Online submission via Moodle
Due date: 17/03/2022 11:00 PM
Marks returned: Marks returned each week after submission

Weekly online quiz after lecture to review the material covered in the week.

NOTE - ONLINE QUIZ MUST BE COMPLETED BY 11PM OF THE DAY IT IS RELEASED.

Assessment criteria

Correct answers recieve full marks. Incorrect attempts prompt a comment and one additional attempt provide to correct the answer.

Additional details

See Moodle

Assessment 2: Assignment 1

Start date: 17/02/2022 12:00 PM
Submission notes: See Moodle for submission details
Due date: 25/03/2022 11:00 PM

This assessment is designed to assess your knowledge of applied hydrology to estimate design rainfall, rainfall losses and design floods

Assessment criteria

Correct answers are awarded full marks.

Presentation marks associated with parts requiring discussion.

Blind inclusion of calculations without adequate description or discussion is not preferred, and if needed,

should be placed in an appendix with relevant results extracted and reported in the main body of the submission with discussion and comments.

Additional details

Students are expected to provide brief and to the point answers to the questions. A brief discussion on the distribution fitting and the selection of appropriate distribution is expected. If, some information is missing or not clear, it should be stated clearly in the assignment. The assessment will broadly be based on your understanding of the subject and answers to the questions.

Assessment 3: Assignment 2

Start date: 14/04/2022 12:00 PM
Submission notes: Submissions will be via Moodle
Due date: 26/04/2022 09:00 AM
Marks returned: End of Term

This assignment consists of a series of questions from the hydraulic lectures to assess your knowledge and techniques to quantify energy losses and flows through pipes and channels.

This is not a Turnitin assignment

Assessment criteria

Questions will be assessed against their understanding of the theory of fluid flow and the associated assumptions in the applying the theory. The assignment will consist of a series of calculations and students are expected to provide brief and to the point answers to the questions asked. The assessment will be broadly based on their understanding of the subject and answers to the questions asked.

Additional details

Students are expected to provide brief and to the point answers to the questions asked. The assessment will broadly be based on their understanding of the subject and answers to the questions asked.
Students will be assessed against their understanding of the theory of fluid flow and the associated assumptions in applying the theory.

Assessment 4: Final Exam

Start date: See Exam timetable
Submission notes: See Moodle for details including exam date
Due date: See Exam timetable

Examination of the entire material covered in the course

Hurdle requirement

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

Attendance Requirements

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

Course Schedule

A table of lectures and workshops or practical class topics for each week is provided below. This table indicates the name of lecturer involved (where multiple lecturers teaching in course), online activities, such as discussion forums, and relevant readings from textbook and other reference material identified for the course. Class will be held on Thursday from 12-3 with workshops running for an hour immediately thereafter.

Term 1 2022

Date **(week commencing)**	**Lecture Content**	**Lecturer**	**Assignment**
17/02/2022 (Week 1)	Introduction to Australian hydrology and catchment processes, rainfall and streamflow measurement technique; Introduction to Evaporation	AS	Online quiz 1 Assignment 1 issued
24/02/2022 (Week 2)	Evaporation (continued); Energy balance, climate variability and anthropogenic climate change	AS	Online quiz 2
03/03/2022 (Week 3)	Design storms, losses, temporal patterns	AS	Online quiz 3
10/03/2022 (Week 4)	Flood frequency analysis, rational method, time area method	AS	Online quiz 4
17/03/2022 (Week 5)	Rainfall-runoff modelling (1.5 hr)	AS/WG	Online quiz 5
24/03/2022 (Week 6)	***Non□teaching week for all courses***		Assignment 1 due 25/03/22 (11pm)
31/03/2022 (Week 7)	Properties of fluids Hydrostatics Hydrodynamics (Continuity – 1 and 2)	WG	
07/04/2022 (Week 8)	Hydrodynamics (Energy) Hydrodynamics (Momentum)	WG	

14/04/2022 (Week 9)	Hydrodynamics (Momentum) Drag force Pipe flow	WG	Assignment 2 issued
21/04/2022 (Week 10)	Uniform flow critical flow hydraulic jump	WG	

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

- Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors) Australian Rainfall and Runoff: A Guide to Flood Estimation, © Commonwealth of Australia (Geoscience Australia), 2016.(available from http://arr.ga.gov.au/arr-guideline)
- Pilgrim, D.H (Editor) (1998). Australian Rainfall & Runoff – A Guide to Flood Estimation. Institution of Engineers, Australia, Barton, ACT. ISBN: 1858256878 (Vol 1) and ISBN: 0858254352 (Vol 2)
- 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. (1999). The Hydraulics of Open Channel Flow, Arnold, ISBN 0 340 74067 1
- Akan, A.O. (2006). Open Channel Hydraulics, Butterworth-Heinemann, ISBN 978 0 7506 6857 6.

Laboratory Workshop Information

See Moodle for details of the weekly workshops

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 T1 2022 will be held online between 29th April - 12th May inclusive, and supplementary exams between 23rd - 27th May 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
- Refer to Academic Advice on the School website available at: https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

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Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.