CVEN3501

Water Resources Engineering

Term 1, 2023

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Ashish Sharma	a.sharma@unsw.edu.au	Teaching Consultation Tuesday 4-5	CVEN307	+61293855768

Lecturers

Name	Email	Availability	Location	Phone
Martin Anderson	m.anderson@unsw.edu.au			

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

The object of CVEN3501 is to introduce engineering hydrology and its application in water resources management and flood estimation. Topics discussed include hydrological cycle, climatology, atmospheric circulation, meteorological measurements, precipitation, interpretation of data, streamflow measurement, runoff components, hydrograph analysis, storm runoff and loss rates, rainfall estimation - IFD diagrams and design hyetographs, concepts of flood estimation, deterministic rational method, probabilistic rational method, time-area methods, unit hydrographs concepts, development of hydrographs using non-linear reservoir and kinematic techniques, groundwater, hydraulic conductivity, Darcy's law, intrinsic permeability, water potential, hydraulic head, unsaturated zone, aquifers, aquicludes, aquitards, steady state flow, transient flow, effective stress, transmissitivity, storativity, pump test interpretation.

Course Aims

The objectives of this course are to:

- Introduce you to the practice of water resources engineering.
- To instruct you in the basic hydrological measurement techniques required
- To teach you how to estimate rainfall occurrence
- To teach you how to estimate the height and extent of possible flooding so that efficient engineering design can be carried out
- To develop an awareness of the energy and water fluxes in the environment
- To introduce you to groundwater and the techniques used to estimate quantity of available groundwater resource.

Course Learning Outcomes

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 and risk of exceedance	PE1.2, PE2.2, PE2.3
3. Describe the hydrologic cycle and energy fluxes to calculate evaporation	PE1.2, PE2.2, PE2.3
4. Assess groundwater resources, including estimating flows, storage and surface water interactions	PE1.2, PE2.2, PE3.3

Teaching Strategies

Please refer to the information in Moodle

Additional Course Information

Water Resources Engineering will provide the basic information describing the hydrological cycle and those components of it that are essential to engineering design and process understanding. The main course taken before Water Resources Engineering (CVEN3501) which supports its content is:

- Fluid Mechanics for Engineers (ENGG2500)/Principles of Water Engineering (CVEN2501): The objective of this course is to introduce students to the practice of water engineering. Topics discussed include properties of fluids, manometry, hydrostatics, the principles of mass conservation, energy conservation, the forces and momentum in flowing fluids, flow in pipes, boundary layers, dimensional analysis, physical models, flow in open channels inclusive of specific energy, Manning and Chezy equations, uniform flow, subcritical and supercritical flow, hydraulic jumps, and gradually varied flow profiles.

Courses to be taken after Water Resources Engineering (CVEN3501) which are supported by its content are:

- Water and Wastewater Engineering (CVEN3502): the design and operation of (i) water treatment plants, (ii) wastewater treatment plants, (iii) stormwater systems, (iv) water distribution systems and (v) sewage distribution systems require knowledge of free surface computations, head losses due to friction in pipes, local head losses due to pipe fittings and shear stresses at flow boundaries which maintain pipes and channels which are scoured clean.

- Solid Wastes and Contaminant Transport (CVEN3702): quantifying the rate of pollutant transport and dispersion in pipes, streams, rivers and estuaries requires knowledge of flow regimes (laminar and turbulent) and the velocity profiles in boundary layers.

- Groundwater resource Investigation (CVEN4503): this course aims to develop the understanding of groundwater processes and provide students with techniques to investigate its occurrence and quality

Assessment

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. If you apply for and receive special consideration for any of the assignments, a scaling of your final exam marks will be carried out. It is recommended that students who perform poorly in the assignments and workshops discuss progress with the lecturer during the semester. A mark of at least 40% in the final examination is required before the class work is included in the final mark. The formal exam scripts will not be returned. The lecturer reserves the right to adjust the final scores by scaling if agreed by the Head of School.

Supplementary Examinations for Trimester 1 2023 will be held on dates in late-May as advised by the school 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	Weight	Due Date	Course Learning Outcomes Assessed
1. Weekly Online Quiz	15%	See Moodle	1, 2, 3, 4
2. Assignment 1	25%	See Moodle	1, 2, 3
3. Assignment 2	15%	See Moodle	1, 4
4. Final examination	45%	See exam timetable	1, 2, 3, 4

Assessment 1: Weekly Online Quiz

Start date: Week 1-9 (See Moodle)
Due date: See Moodle

Weekly quizzes (15%). These quizzes are designed to assess student learning of the lectures completed in that week. They provide a self assessment of the understanding each student has of the material. More information on these is available on Moodle.

Assessment criteria

Assessment criteria explained on Moodle.

Assessment 2: Assignment 1

Start date: See Moodle
Due date: See Moodle

Assignment on Hydrology. This assignment focusses on water balance and design flood estimation, the two main topics the surface water hydrology component of the course focusses on. More details are available on Moodle.

Assessment criteria

Assessment criteria explained on Moodle.

Assessment 3: Assignment 2

Start date: See Moodle
Due date: See Moodle

Assignment on Groundwater investigations. More details on this are available on Moodle.

Assessment criteria

Assessment criteria explained on Moodle.

Assessment 4: Final examination

Start date: See exam timetable
Due date: See exam timetable

Assesses student understanding of all material covered in the course. More information on this will be made available on Moodle closer to the date of the exam.

Assessment criteria

Assessment criteria explained on Moodle.

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

For courses with Workshops or Laboratories, attendance for those classes is a necessary part of the course and workshop/laboratory content that is examinable. **Minimal attendance of at least 80% of the workshop/laboratory** in which you are enrolled for the duration of the term**, is required to Satisfactory complete the course assessment.**

Course Schedule

Week	Date	Lecturer	Topic	Assessments	Workshop
Week 1	13/02/2023 15/02/2023	AS	Water and Energy Cycles, Climate change, meteorological variables and evaporation	Online quiz 1 Ass#1 issued	Workshop 1
Week 2	20/02/2023 22/02/2023	AS	Rainfall and streamflow measurements, Rainfall estimation, catchment delineation and water balance	Online quiz 2	Workshop 2
Week 3	27/02/2023 01/03/2023	AS	Losses, rainfall-runoff modelling basics	Online quiz 3	Workshop 3
Week 4	06/03/2023 08/03/2023	AS	Flood Frequency Analysis	Online quiz 4	Workshop 4
Week 5	13/03/2023 15/03/2023	AS	IFD relationships, temporal patterns, design Floods	Online quiz 5	Workshop 5
Week 6	**20/03/2023** **22/03/2023**		***No lectures or workshops (UNSW Flexibility Week)***	**-**	**-**
Week 7	27/03/2023	AS	• Regional frequency analysis and rational method	Online quiz 6	Workshop 6
	29/03/2023	AS	• Unit Hydrograph for flood estimation		
Week 8	03/04/2023	MA	• Introduction to Groundwater Resources and Darcy's Law • Groundwater in Australia	Online quiz 7 Ass#2 issued	Workshop 7
	05/04/2023	MA	• Groundwater flow equations • Introduction to assignment 2		
Week 9	10/04/2023	MA	***No lecture (Easter Monday)***	Online quiz 8	
	12/04/2023	MA	• Aquifer storage properties•		
Week 10	17/04/2023 19/04/2023	MA	• Borehole types & construction • Pumping test analysis & groundwater in Australia	Online quiz 9	Workshop 8

Week 11	24/04/2023	MA	• Groundwater surface water interactions	-	-

Resources

Prescribed Resources

There is no textbook for this course. Electronic copies of the notes are available from Moodle.

Recommended Resources

Flood Hydrology

- 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

Groundwater

- Fetter, C.W. (2001) Applied Hydrogeology. Prentice Hall, ISBN: 0131226878

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 2023 will be held on campus between the 28th of April and the11th of May, and Supplementary Exams between the 22nd of May and the 26th of May. 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://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.

Image Credit

Shutterstock Image, Gordon dam, Tasmania

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	