School of Civil and Environmental Engineering

Trimester 1, 2021

CVEN3501 WATER RESOURCES ENGINEERING

COURSE DETAILS

Units of Credit	6		
Contact hours	6 hours per week		
Class	Wed	11:00-13:00	Online
	Fri	11:00-13:00	Online
Workshop	Fri	14:00-16:00	Online + face to face

Course Coordinators

Ashish Sharma (AS)
email: a.sharma@unsw.edu.au
office: School of Civil and Environmental Engineering, Kensington CE307

Lecturers

Ashish Sharma (AS)
email: a.sharma@unsw.edu.au
office: School of Civil and Environmental Engineering, Kensington CE307

Lucy Marshall (LM)
email: lucy.marshall@unsw.edu.au
office: Water Research Centre. School of Civil and Environmental Engineering,

Martin Andersen (MA)
email: m.andersen@unsw.edu.au
office: School of Civil and Environmental Engineering, Kensington CE303

INFORMATION ABOUT THE COURSE

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:

- Principles of Water Engineering (CVEN2501): The object of CVEN2501 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

HANDBOOK DESCRIPTION

See link to virtual handbook

http://www.handbook.unsw.edu.au/undergraduate/courses/2021/CVEN3501.html

OBJECTIVES

The objectives of this course are to:

- Introduce you to the practice of water resources engineering
- To instruct you in basic hydrological measurement techniques
- To teach you how to estimate design rainfall and rainfall losses
- To teach you how to quantify flow peaks and volumes required for engineering design
- To develop an awareness of the energy and water fluxes in the environment
- To introduce you to groundwater and the techniques used to estimate groundwater resources

TEACHING STRATEGIES

Teaching in this course is centred on the Lectures which are technical in content. You will develop your analysis skills in water resources engineering by applying the theory to problems which you undertake in the Workshops

Detailed lecture notes with examples are available on Moodle. The purpose is to free up your time to think and comprehend during the lectures.

Private Study	• Review lecture material and textbook • 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 more details on the methods and theory that are not covered in the notes • Follow worked examples • Hear announcements on course changes
Workshops	• Be guided by demonstrators • Practice solving set problems • Ask questions
eLearning	• Lecture notes will be made available to you in Moodle. Worked workshop solutions to selected problems will also be made available.
Email	• You should check your email regularly (daily is the recommended frequency) to ensure that you are aware of any course announcements.
Assessments (examinations, quiz, assignments)	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving

EXPECTED LEARNING OUTCOMES

At the end of this course, you will be familiar with the engineering techniques used to analyse and design the basic components of water resources engineering. Upon successful completion of Water Resources Engineering (CVEN3501) you will 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.	*Undertake a basic assessment of groundwater resources.*	*PE2.2, PE2.3, PE3.3*

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

COURSE PROGRAM

The course schedule tabulated below shows the main topics and approximately how long will be spent on each topic in lectures. Please note that the lecture durations and sequence of topics is a guide only; there may be some variations. However, details on the associated assessment tasks should not be affected; if they are you will be informed.

TRIMESTER 1 2021

Week	Date	Lecturer	Topic	Assessments	Workshop
Week 1	17/02/2021 19/02/2021	AS	Water and Energy Cycles, Climate change, meteorological variables and evaporation	Online quiz 1 Ass#1 issued	Workshop 1
Week 2	24/02/2021 26/02/2021	AS	Rainfall and streamflow measurements, Rainfall estimation, catchment delineation and water balance	Online quiz 2	Workshop 2
Week 3	03/03/2021 04/03/2021	AS	Losses, rainfall-runoff modelling basics	Online quiz 3	Workshop 3

Week 4	10/03/2021 12/03/2021	LM	Flood Frequency Analysis	Online quiz 4	Workshop 4
Week 5	17/03/2021 19/03/2021	LM	IFD relationships, temporal patterns, design Floods	Online quiz 5	Workshop 5
Week 6	**24/03/2021** **26/03/2021**		***No lectures or workshops***	**-**	**-**
Week 7	31/03/2021	LM	· Regional frequency analysis and rational method	-	-
	02/04/2021	**-**	***No lecture/workshop (Easter Friday)***		
Week 8	07/04/2021	LM	· Unit Hydrograph for flood estimation	Online quiz 6 + Online quiz 7	Workshop 6
	09/04/2021	MA	· Introduction to Groundwater Resources and Darcy's Law · Groundwater in Australia		
Week 9	14/04/2021	MA	· Groundwater flow equations · Introduction to assignment 2	Ass#2 issued	Workshop 7
	16/04/2021	MA	· Aquifer storage properties·		
Week 10	21/04/2021 23/04/2021	MA	· Borehole types & construction · Pumping test analysis & groundwater in Australia	-	Workshop 8
Week 11	28/04/2021	MA	· Groundwater surface water interactions	-	-

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 2021 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.

PENALTIES

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

ASSESSMENT OVERVIEW

Generally, the final exam, the mid-semester quiz and the assignments are designed to assess your understanding of the engineering problems and their solutions. These will require you to apply your professional skills to solve the practical problems. More specifically you will be asked to conduct a hydrological assessment of a catchment; quantify the size of design floods; calculate evaporation; and conduct a basic assessment of groundwater resources. The course objectives, content and assessment focus on encouraging the following attributes in you, with particular application to water resources engineering:

- Your understanding of the principles of Water Resources Engineering.
- Capacity for analytical and critical thinking and for creative problem solving. You will be exposed to, and be required to solve, numerous hydrologic problems in the Lectures, the Workshops and the assignments --- "the learning is in the doing". All these problems will cover a variety of scenarios, and where possible, will be drawn from engineering practice.
- Skills for effective communication: Throughout this course, the skills to be developed are in written communication. In your assignments and exams, it is important that you clearly communicate your knowledge.
- Ability to engage independent and reflective learning: By revising the material from the lectures and the workshops you will gain improved skills in independent learning.

Details of each assessment component, the marks assigned to it and the dates of submission are set out below (**Note:** It generally takes 3 weeks after the due/exam dates for marking results to be released)

Item	Weight (%)	Learning outcomes assessed	Assessment Criteria	Issue date	Due date
1	**Assignments (40%)**				
Ass#1: • Water cycle • Engineering hydrology	25%	• Fundamental understanding on hydrology and various components of hydrologic cycle including evaporation • Knowledge of applied hydrology to estimate design rainfall, rainfall losses and design floods	• Students are expected to provide brief and to the point answers to the questions asked. • If some information is missing or not clear, it should be stated clearly in the assignment. • The assessment will broadly be based on their understanding of the subject and answers to the questions asked. • They are expected to justify the reason for going for a particular evaporation model.	17 Feb 2021	11:00PM, 01 April 2021 (to be submitted via Moodle)
Ass#2: • Groundwater	15%	• Assessing your knowledge on the fundamentals of groundwater and the techniques used to estimate groundwater	• Students are expected to provide brief and to the point answers to the questions asked. • The assessment will broadly be based on their	14 April 2021	11:00PM, 29 April 2021 (to be

		resources	understanding of the subject and answers to the questions asked. • Students will be assessed against their understanding of the groundwater and the associated assumptions in applying the theory.		submitted via Moodle)
2	**Online Quizzes (15%)**				
Online Quizzes (Moodle)	15%	• The online quizzes will each collectively contribute to 15% of your mark for the subject (equal weight for each quiz) • These quizzes will give you the opportunity to review your progress in the course as you go • You will be given select questions for each online quiz taken from a database of questions • You will be able to have 2 attempts at each quiz with your higher mark taken	• 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 the subject and the associated assumptions in applying the theory	Weeks 1-9	Each quiz will remain open for a week or as otherwise indicated
3	**Final Exam (45%)**				
Final Exam	45%	• Final examination constitutes a core part of the course and will be closed book of 2 hours duration • It will test your learning and knowledge gained during the semester • Exam will be online in 2021 with instructions provided during the course	• Students are expected to provide brief and to the point answers to the questions asked • 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 their understanding of the subject and answers to the questions asked	Formal exam period	Immediately after exam

RELEVANT RESOURCES

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

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

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

(Formerly known as Common School Information)

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations: student.unsw.edu.au/special-consideration
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.

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

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