CVEN9611

Urban Hydrology and Stormwater Management

Term 1, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Fiona Johnson	f.johnson@unsw.edu.au	By appointment	CE309	9385 9769

Lecturers

Name	Email	Availability	Location	Phone
Stefan Felder	s.felder@unsw.edu.au	By appointment	CE303 and Manly Vale Water Research Laboratory	8071 9861
Kefeng Zhang	kefeng.zhang@unsw.edu.au	By appointment	Vallentine Annex, Building H22, Level 1, Room VA 139	9385 5227
Veljko Prodanovic	v.prodanovic@unsw.edu.au	By appointment	Vallentine Annexe (H22), Level 1, Room VA 139	9385 4368

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 considers human impacts on the hydrological cycle and how these can be quantified, designed for and mitigated. The course covers the impacts of urban development on stormwater quantity and quality, hydraulic calculations, management of urban stormwater including re-use and the design of stormwater quantity and quality management structures, including Water Sensitive Urban Design philosophies.

Course Aims

The objectives of this course are:

1. To provide an overview of urban hydrology and stormwater management. Included in the course are an introduction to human impacts on the hydrological cycle, anthropogenic influences on the quantity and quality of stormwater runoff from urban catchments, development of stormwater management plans, and case studies in urban stormwater management. Application of the continuity, energy and momentum principles to the analysis of flows in different scenarios.

2. To characterise the most important types of stormwater structures used in urban drainage systems. Methods for their design as well as current issues in stormwater management are presented and discussed.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Gain an overview of urban hydrology and stormwater management	PE1.1, PE1.3, PE1.4
2. Understand the anthropogenic influences on the quantity and quality of stormwater runoff from urban catchments	PE1.1, PE1.3, PE1.4
3. Be able to quantify flows from urban catchments	PE2.2, PE2.1
4. Be able to develop stormwater management plans	PE1.5, PE1.6
5. Be able to conduct case studies in urban stormwater management	PE3.1, PE3.2
6. Apply continuity, energy and momentum principles to the analysis of flows in stormwater scenarios.	PE1.2, PE1.3, PE1.5
7. Be able to characterise and design the most important types of stormwater structures used in urban drainage systems	PE1.5, PE2.3

Teaching Strategies

Detailed lecture notes with examples will be supplied via Moodle for this course. The purpose is to free up your time to think and understand during lectures. Please note that all lecture and workshop materials for this course will be distributed electronically via Moodle. It is essential that students download and bring to class printed and/or electronic copies of all the materials. Students will also require a calculator for all classes.

The following teaching strategies will be used in this 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	• Practice solving set problems • Ask questions
Assessments	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving
Field trip	• Practical demonstration of course theory, to set studies in context • Centennial Park – practical application of stormwater management
Laboratory	• Demonstration of culvert hydraulics

Additional Course Information

The assumed knowledge for this course is undergraduate Civil and Environmental hydrology, fluid mechanics and hydraulics. Students who do not have this assumed knowledge should have completed CVEN9625 Fundamentals of Water Engineering. If you have concerns about your background knowledge, please contact the course coordinator.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Assignment 1 - hydrological modelling	15%	10/03/2022 05:00 PM	1, 2, 3, 4, 5
2. Assignment 2 - Hydraulic structures	15%	01/04/2022 05:00 PM	1, 2, 3, 5, 6, 7
3. Assignment 3 - water sensitive urban design	10%	24/04/2022 05:00 PM	1, 3, 4, 5, 6, 7
4. Final exam	60%	Not Applicable	1, 2, 3, 4, 5, 6, 7

Assessment 1: Assignment 1 - hydrological modelling

Due date: 10/03/2022 05:00 PM

This assessment is designed to help you understand the basics of rainfall runoff modelling to assess the impacts of urban development. You will set up a hydrologic model for a catchment, then increase the urbanisation to assess the changes in the flood hydrograph. Finally you will design an approrpriate detention structure to mitigate the impacts of urbanisation. The assignment is provided in two parts. The first part involves setting up a simple demonstration catchment model and answering some questions about the results. The second part of the assignment will involve setting up the full catchment model, with urbanisation and mitigation scenarios.

This is not a Turnitin assignment

Assessment 2: Assignment 2 - Hydraulic structures

Due date: 01/04/2022 05:00 PM

The hydraulic structures assignment will assess your ability to perform calculations of culvert hydraulics and will test your general understanding of hydraulic structures within the urban environment. This assignment involves hydraulic calculations, but will also require you to undertake your own research and investigations on urban hydraulic structures.

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

Assessment 3: Assignment 3 - water sensitive urban design

Due date: 24/04/2022 05:00 PM

This assignment aims to test your understanding of stormwater pollution in the urban environments, and of the components for stormwater management and treatment. You will be asked to create a detailed report (similar to what WSUD practitioners are doing in the industry) that follows stormwater treatment train in the real catchment, assess opportunities and constraints and design WSUD system accordingly (with all appropriate design calculations).

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

Assessment 4: Final exam

Online 2 hour exam during the official UNSW examination period. Details of format and platform will be provided closer to the exam date.

This is not a Turnitin assignment

Attendance Requirements

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

Course Schedule

The course is being delivered in hybrid mode and students are warmly invited to attend in person where possible. Students can also attend virtually and/or access lecture recordings. The platform being used for the virtual delivery is Microsoft Teams. Live lectures will be accessed from Teams and the recordings will also be available from Teams.

UNSW resources for COVID-19 are available here. If COVID-19 affects the ability of the lecturers to deliver any class you will be updated as soon as possible via Moodle, Teams and if possible via an in person message in Room CE701. It may also be necessary to teach some weeks fully virtually but we hope not!

View class timetable

Timetable

Date	Type	Content
Week 1: 14 February - 18 February	Lecture	Lecturer: FJ (Monday) Introduction to the hydrologic cycle, urbansiation impacts
	Lecture	Lecturer: FJ (Tuesday) Design rainfall
Week 2: 21 February - 25 February	Lecture	Lecturer: FJ (Monday) Flow routing
	Lecture	Lecturer: FJ (Tuesday) Hydrologic modelling
	Assessment	Assignment 1 (Part 1) due
Week 3: 28 February - 4 March	Lecture	Lecturer: FJ (Monday) Detention storage
	Lecture	Lecturer: SF (Tuesday) Stormwater hydraulics
Week 4: 7 March - 11 March	Lecture	Lecturer: SF (Monday) Stormwater hydraulics

	Lecture	Lecturer: SF (Tuesday) Culverts include a laboratory demonstration
	Assessment	Assignment 1 (Part 2) due
Week 5: 14 March - 18 March	Lecture	Lecturer: SF (Monday) Culverts
	Lecture	(Tuesday) - no class due to field trip on Friday
	Fieldwork	Lecturer: SF Meet in CE701 (Briefing Lecture) at 12pm followed by field trip to Centennial Park (Friday Week 5, 12-4pm)
Week 6: 21 March - 25 March	Online Activity	Flexibility week - no lectures.
Week 7: 28 March - 1 April	Lecture	Lecturer: FJ (Monday) Climate change and design implications
	Lecture	Lecturer: KZ (Tuesday) Stormwater quality
	Assessment	Assignment 2 due
Week 8: 4 April - 8 April	Lecture	Lecturer: KZ (Monday) Stormwater monitoring and introduction to Water Sensitive Urban Design
	Lecture	Lecturer: VP (Tuesday) Stormwater treatment systems - non-vegetated
Week 9: 11 April - 15 April	Lecture	Lecturer: VP Stormwater treatment systems - vegetated
Week 10: 18 April - 22 April	Lecture	(Monday) Public holiday no class
	Lecture	Lecturer: VP (Tuesday) WSUD design practice
	Assessment	Assignment 3 due

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

- Akan, AO, (2006) Open Channel Hydraulics, Butterworth-Heineman
- 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)
- Chow, VT, (1959) Open Channel Hydraulics, McGraw-Hill Book Co, Tokyo, Japan
- French, RH, (1986) Open Channel Hydraulics, McGraw-Hill Book Co, Singapore
- Henderson, FM, (1966) Open Channel Flow, Macmillan Publishing Co, Inc, New York, NY, USA
- Jain, SC, (2001) Open-Channel Flow, John Wiley
- Ladson, T, (2005) Hydrology - An Australian Introduction. Oxford University Press, South Melbourne
- Melbourne Water (2005) WSUD Engineering Procedures: Stormwater, CSIRO Publishing
- Payne, et al. (2015) Adoption Guidelines for Stormwater Biofiltration Systems, CRC for Water Sensitive Cities
- Stephenson, D, (1981), Stormwater Hydrology and Drainage, Elsevier, Amsterdam, Holland
- Sturm, TW, (2001) Open Channel Hydraulics, McGraw-Hill
- Trowsdale et al. (2011) Urban stormwater treatment using bioretention, Journal of Hydrology 397, 167-174
- Urbonas, B and Stahre, P, (1993), Stormwater – Best management practices and detention for water quality, drainage, and CSO management, PRT Prentice Hall, Englewood Cliffs, NJ, USA:

Course Evaluation and Development

Previous students told us:

- they would like more ongoing support for learning online during COVID

- improved sound in recordings

- support in forming study groups for students studying virtually

We have responded to this feedback by:

- changing the course to 10 week delivery instead of a short course

- using newly installed audio-visual equipment for hybrid teaching

- spending time in Week 1 to allow students to get to know each other and form study support networks

Laboratory Workshop Information

Workshops will be integrated into course lectures. There are no formal "workshop" classes.

Students attending the course in person will visit the H20 Civil and Environmental Engineering water laboratory for the culvert hydraulics demonstration in Week 4**.** Students will need to wear closed shoes to enter the laboratories. Further details will be provided prior to the laboratory visit.

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

Image Credit

Mike Gal.

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	