CVEN9611

Urban Hydrology and Stormwater Management

Term One // 2021

School of Civil and Environmental Engineering // UNSW Engineering

Course Overview

Staff Contact Details

Convenors

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

Lecturers

Name	Email	Availability	Location	Phone
Stefan Felder	s.felder@unsw.edu.au		CE303 and Manly Vale Water Research Laboratory	9385 5898
Kefeng Zhang	kefeng.zhang@unsw.edu.au		Vallentine Annex, Building H22	9385 5227
Veljko Prodanovic	v.prodanovic@unsw.edu.au		Vallentine Annexe (H22) Level 1, Room VA 139	9385 4368
Behzad Jamali	b.jamali@unsw.edu.au		Vallentine Annex (H22) Level 1, Room VA 139	9385 4376

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

Credit Points 6

Summary of the Course

Human impacts on the hydrological cycle; impacts of urban development on stormwater quantity and quality; management of urban stormwater including re-use and groundwater interaction; design of stormwater quantity and quality management structures including detention basins, retention basins, infiltration basins, gross pollutant traps, pollution booms, sedimentation basins and artificial wetlands.

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. No paper copies will be supplied in class. 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 the 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 Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Urban hydrologic modelling assignment - Part 1	5%	12/03/2021 05:00 PM	1, 2, 3
Urban hydraulic structures	15%	19/03/2021 05:00 PM	1, 2, 3, 5, 6, 7
Water sensitive urban design	10%	01/04/2021 05:00 PM	2, 3, 4, 7
Urban hydrologic modelling assignment - Part 2	10%	16/04/2021 05:00 PM	1, 2, 3, 4, 5
Final exam	60%	Not Applicable	1, 2, 3, 4, 5, 6, 7

Assessment Details

Assessment 1: Urban hydrologic modelling assignment - Part 1

Details:

This online pre-task will help you to review the concepts required to complete Assignment 3. The assignment is based on the demo WBNM model Natural2012.wbn provided with WBNM. You may choose to run the model yourself or use the provided runfile and Natural2012_meta.out file (the output after running the model). The assignment is to be completed through the Moodle online quiz tool

Turnitin setting: This is not a Turnitin assignment

Assessment 2: Urban hydraulic structures

Details: Students are expected to demonstrate their understanding of engineering design and functionality of hydraulic structures in the context of urban hydrology and their understanding of water sensitive urban design. Students are also expected to demonstrate their ability to critically assess urban stormwater systems. Assignment will be marked upon the standard of report, the accuracy of work and its critical assessment. The assignment will in part be based on the Centennial Park field trip or an urban catchment of your own choice.

Assessment 3: Water sensitive urban design

Details: Students are expected to demonstrate understanding of engineering design of a biofiltration system used for stormwater pollution and/or flow reduction. Students will be asked to perform calculations in order to size different elements of a biofiltration system, with additional understanding and description of the choice of plants for such system. The marking of the assignment will be based upon the standard of the report, the accuracy of calculation and their critical assessment of the overall system.

Turnitin setting: This assignment is submitted through Turnitin and students can see Turnitin similarity

reports.

Assessment 4: Urban hydrologic modelling assignment - Part 2

Details:

Students are expected to demonstrate their understanding of hydrologic modelling and impacts of urbanisation by performing calculations, designing a detention basin, running suitable models and explaining basic concepts. The marking of the assignment will be based upon the standard of the report, practical design strategy and the accuracy of the simulations and calculations.

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

Assessment 5: Final exam

Start date: Not Applicable

Details: Students are expected to demonstrate their understanding of hydrological modelling, urbanisation and the design of basic hydraulic structures and water quality improvement structures by performing calculations, drawings and explaining basic concepts.

Turnitin setting: This is not a Turnitin assignment

Attendance Requirements

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

Course Schedule

View class timetable

Timetable

Date	Type	Content
Wednesday 24th February 09:00 - 12:30	Lecture	Content: Urbanisation, hydrology revision, design philosophies Lecturer: Fiona Johnson
Wednesday 24th February 13:30 - 17:00	Lecture	Content: Design events, continuous simulation and monte carlo approaches Lecturer: Fiona Johnson
Thursday 25th February 09:00 - 12:30	Lecture	Content: Stormwater management principles, introduction to Water Sensitive Urban Design, stormwater quality Lecturer: Kefeng Zhang
Thursday 25th February 13:30 - 17:00	Lecture	Content: Flow routing methods Lecturer: Fiona Johnson
Friday 26th February 09:00 - 12:30	Lecture	Content: Stormwater hydraulics Lecturer: Stefan Felder
Friday 26th February 13:30 - 17:00	Lecture	Content: Stormwater treatment systems Part 1 Lecturer: Veljko Prodanovic
Monday 1st March 09:00 - 12:30	Lecture	Content: Culvert hydraulics Lecturer: Stefan Felder
	Tut-Lab	Content: Culvert hydraulics demonstration Lecturer: Stefan Felder Details: wear closed shoes to be allowed in the laboratory
Monday 1st March 13:30 - 17:00	Lecture	Content: Stormwater treatment systems part 2 Lecturer: Veljko Prodanovic
Tuesday 2nd March 09:00 - 10:00	Lecture	Content: Briefing for Centennial Park fieldtrip Lecturer: Stefan Felder
Tuesday 2nd March	Fieldwork	Content: Centennial park field trip

10:00 - 14:00		Lecturer: Stefan Felder Details: walk from campus and back. Wear clothing approapriate for the weather. Bring your lunch or buy something on campus prior to 9am lecture.
Tuesday 2nd March 14:00 - 16:00	Lecture	Content: Vehicle stability and 2D modelling guest lecture Lecturer: Stefan Felder
Wednesday 3rd March 09:00 - 12:30	Lecture	Content: WSUD benefits for flood mitigation, computer modelling in urban hydrology Lecturer: Behzad Jamali and Fiona Johnson
Wednesday 3rd March 13:30 - 17:00	Lecture	Content: computer modelling in urban hydrology, course revision Lecturer: Fiona Johnson

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
- Stephenson, D, (1981), Stormwater Hydrology and Drainage, Elsevier, Amsterdam, Holland
- Sturm, TW, (2001) Open Channel Hydraulics, McGraw-Hill
- 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 better integration between the different topics

- they would like more guidance on the computer software for the assignment

- better organisation of the Moodle resources

- less duplication with undergraduate hydraulics content

We have responded to this feedback by:

- improving the presentation of materials on moodle and substantially consolidating the hydraulic lecture material

- providing new resources for the use of WBNM

- reviewing the hydraulic computation assignment content

Submission of Assessment Tasks

Please refer to the Moodle page of the course for further guidance on assessment submission.

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

Key UNSW Dates - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.

Final Examinations:

Final exams in Term 1 will be held online between 30th April - 13th May inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

Supplementary Examinations:

Supplementary Examinations for Term 1 2021 will be held on 24th - 28th May inclusive should you be required to sit one. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

ACADEMIC ADVICE

For information about:

- Notes on assessments and plagiarism;
- Special Considerations: student.unsw.edu.au/special-consideration;
- General and Program-specific questions: The Nucleus: Student Hub
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC/SURVSOC/CEPCA

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

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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	