ENVENG 701 – URBAN STORMWATER MANAGEMENT
(15 Points)

COURSE CO-ORDINATOR: Matthew Davis
matthew.davis@auckland.ac.nz
Room 402 1.1208 in front of the lifts on level 12
Phone Ext. 84540 or 021 493 487
Office hours: 2 – 3 pm, Fridays

COURSE ASSESSMENT: 3 Assignments 40%
1 project 60%

PHILOSOPHY
The objective is for students to gain an understanding of the interdisciplinary nature of stormwater management to minimize or prevent adverse impacts from flooding and runoff-borne contamination, with an emphasis on engineering solutions.

ASSESSMENT
Three assignments and a project will be completed. Assignments will focus on analysis and design of stormwater management solutions for actual catchments in the Auckland region. A portion of each assessment is allocated to the quality of the information presentation, including coherent written analysis of the design and results. The project will entail a detailed stormwater design for an Auckland Council proposed Special Housing Area development using a low impact design (LID) / water sensitive design (WSD) approach.

LEARNING OBJECTIVES
• To understand the effects of urban development on the hydrologic cycle.
• To understand urban stormwater contaminants and sources.
• To understand the interdisciplinary nature of managing stormwater runoff.
• To understand approaches to design of stormwater management “devices” (i.e., stormwater control measures (SCMs) / best management practices (BMPs)
• To be familiar with and use computer modeling techniques used in stormwater management, including HEC-HMS (a hydrologic model) and the Auckland Council Contaminant Load Model (CLM) (stormwater quality model).
• To understand the principles and application of low impact design/development (LID) / water sensitive design (WSD)).
• To present results in a professional and self-explanatory style.
• To work and learn from one’s peers, and learn to work as a team.

COURSE OUTLINE
See attached planner.

TEXT BOOK/REFERENCE MATERIAL
Access to text books and reference material (including book chapters, manuals of practice, journal articles, conference papers and other references) will be available via Cecil and in hard copy via short loan from the Engineering Library. No hard copies will be distributed in class of either reference material or lecture notes. The lecture notes have been prepared in a manner such that they can be used as course notes. See attached planner and lecture notes for readings.
POLICY ON OUT-OF-LECTURE SUPPORT
This policy is how out-of-lecture contact is conducted for EnvEng 701, which is not necessarily applicable to other courses in the Department or Faculty of Engineering.

Office Hours
I will be available Fridays from 2-3 pm in room 402 1.1208 (my shared office). Students who turn up outside these hours will be directed to come during this time window. Additional time will be allocated in the last two weeks before the project is due.

Email
All emails should be written in a professional manner correctly formatted with a subject, greeting, body text and signature sent from your University of Auckland email address. Replies will not be sent to messages improperly composed. Please take care to remember attachments and any other relevant information.

Queries sent to me by email on coursework/lecture material will not be answered. These questions should be either asked in class or posted on the Cecil discussion board.

Queries on other matters will be acknowledged within 48 hours, Monday-Friday, unless I am overseas.

Phone
Available during office hours or in the case to note an emergency. First priority will be given to individuals who turn up at my office in person (i.e., you may be asked to call back when/if someone is present.)

Peer review
A Cecil discussion board will exist for the course to allow for discussion amongst students and to serve as peer-to-peer interaction to discuss and resolve issues. I will check the board on a regular basis.

ATTENDANCE POLICY
Students are expected to attend all lectures, laboratories and field visits. If an absence is unavoidable, the student should contact the instructor before the class meeting. Absences may result in grade reductions.

HOMEWORK AND PROJECT POLICY
Homework and project assignments will be due on the dates announced in class. Homework turned in up to two (2) days late will be assessed an automatic penalty of 20 percent. Homework or projects submitted more than two (2) days late will not be accepted. If you are unable to submit an assignment on time for legitimate reasons, prior notification and arrangements are required. Missed assignments will not be able to be made up unless prior arrangements have been made with the instructor, or in the case of a documented emergency.

Homework and projects will be graded on technical accuracy and on presentation. Grades will be reduced for poor organization, incoherent grammar/English and inappropriate use of significant figures.

Submission requirements (computer use requirements)
Assignments are to be submitted in hard copy (delivered to the Civil and Environmental Engineering office, Level 11) and electronically via the Web Drop Off Box (https://webdropoff.auckland.ac.nz/). Details for each submission will be made clear at the time of each assignment.

Engineering and stormwater management are fields in which solutions to problems are often multi-valued rather than singly-valued. For example, solutions can consist of an entire vector or matrix of values, or they can be x-y graphs showing the relationship between two variables. Computer software, and particularly spreadsheets such as Microsoft Excel, is well suited to developing tabular and graphical solutions to problems of the types encountered in this course. Students are required to employ software in the completion of homework assignments and the project. Failure to do so on any particular
assignment will result in an automatic 20 percent grade reduction for that assignment. Failure to use computers on a recurring basis will result in a non-passing grade for the course.

The project and assignments are required to be typed using a word processor, including the use of the “equation editor” and computer generated tables and graphs. Do not mix and match Excel and Word (or any other computer program) for a response to a single question on any homework assignment. It is okay, for example, for question 1 to be answered using Excel, while question 2 is presented in Word. However, all worksheets should be submitted in a single spreadsheet file, using the tabs to indicate which sheet(s) pertains to which question number. Excel spreadsheets or other calculations must include adequate annotation to explain methodology and include at least one sample calculation for each step. I will check embedded formulas in spreadsheets. The final answer should be clearly apparent. Use page breaks in Word for different questions.

Please ensure spelling and grammar are correct. Students should keep in mind the automatic spelling corrections in Word, as many terms presented in this class often are not considered common language. For example, a common spelling error is “contaminate” instead of “contaminant”.

Photographs from digital cameras, or scanned prints, may be required for some assignments. Scanned photos should be saved as reduced size jpgs (200 dpi is suitable) to reduce the total file size of the resulting document.

Please use the following naming convention for all files:
Surname_ID#_Assign#_Question#.extension (.doc, .docx, .xls, .xlsx, etc)

**Prerequisite:** ENVENG244 or equivalent; ENVENG 333 or equivalent

**Restriction:** undergraduate enrolment restricted to those that have completed part 3.
## COURSE PLANNER 2015
*(subject to change)*

<table>
<thead>
<tr>
<th>Week</th>
<th>Class Dates</th>
<th>Thursdays, 4 – 5 pm (403-407)</th>
<th>Fridays, 3 – 5 pm (403-401)</th>
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<tbody>
<tr>
<td>1</td>
<td>5,6 Mar</td>
<td>Introduction and course overview; impacts of urbanization, water quantity and quality; stormwater regulatory context in Auckland; catchment characteristics (delineation, time of concentration &amp; calculation methods). Readings: ARC (2003) Ch1, 2; Gibbs et al (2004); Kelly et al (2014); USDA (1986) Ch 2; WEF/ASCE (2012) Ch 1, 2.</td>
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<tr>
<td>2</td>
<td>12,13 Mar</td>
<td>Rainfall-runoff; urban hydrology; design storms; detention volume; hydrologic routing; hydrologic modeling. <strong>Fri 13 Mar, HEC-HMS workshop in Computer Lab 1.311 or 1.312 (to be confirmed).</strong> <strong>Assignment 1 distributed.</strong> Readings: Bedient et al (2013) Ch 2.1-2.4*; HEC (2010a, b, 2008, 2000) and laboratory handouts; USDA (1986) Ch 3.</td>
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<td>3</td>
<td>19,20 Mar 21 Mar</td>
<td>Basins/ponds; stormwater quality; contaminant sources; water quality volume; water quality treatment; introduction to stormwater control measures(SCM)/best management practice (BMP); unit processes; performance monitoring and reporting. Reading(s): AC (2014c); ARC (2003) Ch 5; Buchanan et al (2013); Davis et al. (2011); WEF/ASCE (2012) Ch3, 4, 6.1-2, 6.6, 6.7. <strong>Sat, 21Mar: Field trip to Wesley College Special Housing Area departing UoA 8 am, returning by 1 pm (to be confirmed).</strong></td>
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<td>4</td>
<td>26,27 Mar</td>
<td>Stormwater quality models; contaminant load model (CLM); bioretention cells (rain gardens). <strong>Assignment 1 due by Fri 27 Mar 12 pm.</strong> <strong>Assignment 2 distributed.</strong> Reading(s): AC (2014a, 2010a,b); WEF/ASCE (2012) Ch 8.1-2, 8.5.</td>
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<td>5</td>
<td>2 Apr</td>
<td>Wynyard Quarter site visit. <strong>Meet north entrance to fish market (Jellico Street) at regular class time.</strong> Reading(s): WEF/ASCE (2012) Ch 8.1-2, 8.5; Wynyard quarter tour handout (2015).</td>
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<td>3 - 19 Apr</td>
<td>Mid Semester break</td>
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<td>Date</td>
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<td>Topic</td>
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<td>6</td>
<td>23,24 Apr</td>
<td>Wetlands; vegetated buffer strips (swales); stream function &amp; health; riparian margins; stream restoration &amp; protection. Reading(s): AC (2014b, d, 2013b); ARC (2003), WEF/ASCE (2012) Ch 6.1-2, 6.8-9, 7.</td>
<td>Assignment 2 due by Fri 24 Apr 12 pm.</td>
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<td>8</td>
<td>7,8 May</td>
<td>Water sensitive design, stormwater control measures/best management practices and stormwater control measure; Long Bay and other low impact design developments. Reading(s): AC (2013c), Heijs et al. (2009); Hinman (2012); WEF/ASCE (2012), Ch 5. Washington state; WSD project team registrations due by Fri, 22 May 12 pm</td>
<td>Unitary Plan versus Air, Land and Water stormwater rules; On-site quantity management; course project specifications. Reading(s): AC (2013a); ARC (2003); Washington state. Project distributed. Assignment 3 due by Fri 14 May 12 pm.</td>
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<td>11</td>
<td>28,29 May</td>
<td>Soils; stormwater control measures/best management practices/design considerations recap II. Readings(s): AC (2013a); Lewis et al 2009; WEF/ASCE (2012) Ch 4, 5, 12, 13 (recap).</td>
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<td>12</td>
<td>4,5 June</td>
<td>Project submissions due by Wed, 17 June 12 pm.</td>
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* Earlier editions of the text can be used. Read sections on rainfall-runoff analysis (i.e., relationships, hydrograph analysis, unit hydrograph, synthetic unit hydrograph (SCS method). Other hydrology texts can be used as well).
Assignments

Assignment 1. Urban stormwater, catchments, hydrology, pond design.

Assignment 2. Stormwater quality, bioretention design.

Assignment 3. Wetland design, water sensitive design, cost and benefits.

Project:

Water sensitive design semester project and student competition:

Greenfield subdivision using low impact design (LID) / water sensitive design (WSD) stormwater management in the Wesley College Special Housing Area (near Pukekohe).
References/Readings


Auckland Council (2013). *Stormwater Unit Strategic Direction.* Draft. Stormwater Unit. [Cecil].


