COURSE DETAILS

Units of Credit 6
Contact hours 5 hours per week
Lecture Wednesday, 10:00 – 12:00 online
Thursday, 10:00 – 12:00 online
Workshop Thursday, 13:00 – 14:00 online

Course Coordinator and Lecturer
Dr Lucy Marshall
email: lucy.marshall@unsw.edu.au
office: Room 132, Water Research Centre (Building H22)

Lecturer
Dr Stefan Felder
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office: CE303 and Water Research Laboratory

INFORMATION ABOUT THE COURSE

This course is one of the professional electives in water engineering. The following topics are discussed in this course: Design and performance of hydraulic structures including weirs, spillways and stilling basins, sediment modes of transport, threshold of sediment transport and prediction of sediment transport rates, reservoir behaviour and design, rainfall runoff modelling, climate change analyses and advanced topics in hydrological design.

Pre requisites for this course are ENGG2500 (CVEN2501), CVEN3501 and CVEN3502; or CVEN9625.

HANDBOOK DESCRIPTION

See link to virtual handbook:

OBJECTIVES

The objectives of this course are:
- to provide an understanding of the rationale behind the development of hydrological models.
- to give you an understanding of the principles of reservoir design and operation.
- to introduce you to climate change assessments for water resources
- to expose you to methods of considering uncertainties in data and models.
- to introduce you to the design of some common hydraulic structures based upon fundamental
concepts of fluid mechanics and open channel flows.

- to provide you with an understanding of cohesionless sediment transport and how to make predictions of sediment transport rates in alluvial channels or beds.

These objectives link to the following program outcomes:

- An in-depth engagement with the relevant disciplinary knowledge in its inter-disciplinary context
- Capacity for analytical and critical thinking and for creative problem solving
- Ability to engage independent and reflective learning
- Information literacy
- Skills for effective communication

**TEACHING STRATEGIES**

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 | • Be guided by Demonstrators  
| --- | ---  
|  | • Practice solving set problems  
|  | • Ask questions  

| Assessments | • Demonstrate your knowledge and skills  
| --- | ---  
|  | • Demonstrate higher understanding and problem solving  

**EXPECTED LEARNING OUTCOMES**

*This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.*

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

| Learning Outcome | EA Stage 1 Competencies |
| --- | ---  
| 1. Select and use hydrologic models appropriate to a design problem | PE1.1, PE2.2  
| 2. Design and analyse reservoir sizing, with consideration of uncertainty and risk | PE1.2, PE1.3, PE1.5, PE1.6  
| 3. Understand the sources of uncertainty in hydrologic calculations, including the effects of climate change | PE1.1, PE1.6  
| 4. Understand the important characteristics of basic hydraulic structures and sediment transport processes in open channel flows. | PE1.2, PE1.3, PE1.5  

5. Perform calculations around and design of basic hydraulic structures and sediment transport processes in open channel flows. PE2.1, PE2.2, PE2.3

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

### COURSE PROGRAM

#### Term 2 2021

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Lecture Content</th>
<th>Demonstration Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>31/05/2021 (Week 1)</td>
<td>Catchment hydrology and modelling</td>
<td>LM</td>
<td></td>
</tr>
<tr>
<td>07/06/2021 (Week 2)</td>
<td>Catchment modelling continued</td>
<td>LM</td>
<td>Online Quiz</td>
</tr>
<tr>
<td>14/06/2021 (Week 3)</td>
<td>Reservoir design</td>
<td>LM</td>
<td></td>
</tr>
<tr>
<td>21/06/2021 (Week 4)</td>
<td>Climate change</td>
<td>LM</td>
<td></td>
</tr>
<tr>
<td>28/06/2021 (Week 5)</td>
<td>Uncertainty Analysis and Hydraulic structures</td>
<td>LM/SF</td>
<td>Assignment 1 due</td>
</tr>
<tr>
<td>05/07/2021 (Week 6)</td>
<td>Flexibility week for all courses (non-teaching)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/07/2021 (Week 7)</td>
<td>Hydraulic structures</td>
<td>SF</td>
<td></td>
</tr>
<tr>
<td>19/07/2021 (Week 8)</td>
<td>Hydraulic structures</td>
<td>SF</td>
<td></td>
</tr>
<tr>
<td>26/07/2021 (Week 9)</td>
<td>Sediment transport</td>
<td>SF</td>
<td></td>
</tr>
<tr>
<td>02/08/2021 (Week 10)</td>
<td>Sediment transport</td>
<td>SF</td>
<td>Assignment 2 due</td>
</tr>
</tbody>
</table>

#### ASSESSMENT

The assessment tasks for this course have been developed to assess each student’s achievements in terms of each of the five learning outcomes listed above.

Assignments are individual assessments testing the students’ understanding of the hydrological and hydraulic concepts in agreement with the learning objectives. Each student will receive an individual data set of parameters which will lead to individual results. The individual data will be emailed to your UNSW student email address. The assignment will be marked against detailed assessment criteria and will be based upon completeness, neatness and logical working.

The final course mark will be based on you completing the coursework and final examination:

(i) your coursework mark accounts for 50% of the course, and

(ii) your final examination mark accounts for 50% of the course.
The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. The Final Exam is worth 50% of your Final Mark if class work (Online quiz, Assignment 1 and Assignment 2) is included and 100% if your class work is not included. The class work is worth 50% of the Final Mark if included. A mark of at least 40% in the final examination is required before the class work is included in the final mark.

Students who perform poorly in the assignments are recommended to discuss progress with the lecturer during the term. Note: The lecturer reserves the right to adjust the final scores by scaling if agreed by the Head of School.

Supplementary Examinations for Term 2 2021 will be held on Monday 06th September – Friday 10th September 2021 (inclusive) should you be required to sit one. You are required to be available during these dates. Please do not make any personal or travel arrangements during this period.

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Assessment Details</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online quiz (5%)</td>
<td>Topic: Modelling fundamentals and result interpretation</td>
<td>11.59pm 11th June</td>
</tr>
<tr>
<td>Assignment 1 (20%)</td>
<td>Topic: Water supply design (issued Week 3)</td>
<td>2 pm, 9th July</td>
</tr>
<tr>
<td>Assignment 2 (25%)</td>
<td>Topic: Hydraulic structures and sediment transport (issued in Week 7)</td>
<td>2 pm, 3rd August</td>
</tr>
</tbody>
</table>
| Exam (50%) | Exam content comprises:  
- 50% Hydrology (Lucy Marshall’s part)  
- 50% Hydraulics (Stefan Felder’s part) | During UNSW Session 2 examinations period. |

PENALTIES

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Length</th>
<th>Weighting</th>
<th>Learning outcomes assessed</th>
<th>Assessment Criteria</th>
<th>Due date and submission requirements</th>
<th>Deadline for absolute fail</th>
<th>Marks returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Online Quiz Modelling fundamentals</td>
<td>1 hour</td>
<td>5%</td>
<td>1</td>
<td>The quiz will be a multiple choice quiz and students will be assessed on their knowledge of basic modelling concepts and interpretation of model results.</td>
<td>Friday 11th June Week 2</td>
<td>Friday 11th June Week 2</td>
<td>Wednesday 16th June Week 3</td>
</tr>
<tr>
<td>2. Assignment 1 (Hydrology)</td>
<td>20%</td>
<td>1,2,3</td>
<td></td>
<td>Students are expected to demonstrate their understanding of hydrologic modelling and reservoir design by performing calculations, running suitable models and explaining basic concepts. The marking of the assignment will be based upon the standard of the report, discussion and justification of modelling strategy and the accuracy of the simulations and calculations.</td>
<td>Friday 9th July Week 6</td>
<td>Friday 16th July Week 7</td>
<td>Wednesday 21st July Week 8</td>
</tr>
<tr>
<td>3. Assignment 2 (Hydraulics)</td>
<td>25%</td>
<td>4,5</td>
<td></td>
<td>Students are expected to demonstrate their understanding of the design of basic hydraulic structures and sediment transport processes by performing calculations, drawings and explaining basic concepts. The marking of the assignment will be based upon completeness, neatness and logical working. Please explain your working and indicate your calculation steps. Marks will be deducted if you only provide a final value as answer. If you used a computer program for your working, you must provide details about your working step as well as the formulas and code created.</td>
<td>Tuesday 3rd August Week 10</td>
<td>Tuesday 10th August Week 11 / Study Period</td>
<td>Wednesday 11th August Week 11 / Study Period</td>
</tr>
<tr>
<td>4. Final exam</td>
<td>2 hours</td>
<td>50% of final marks</td>
<td>1,2,3,4,5</td>
<td>Students are expected to demonstrate their understanding of hydrological modelling, reservoir design and climate change and the design of basic hydraulic structures and sediment transport processes by performing calculations, drawings and explaining basic concepts.</td>
<td>During UNSW Term 2 examinations period.</td>
<td>N/A</td>
<td>During formal notification of final results determined by UNSW Faculty of Engineering.</td>
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</tbody>
</table>
RELEVANT 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


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

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 Key Contacts on the Faculty website available at:
https://www.unsw.edu.au/engineering/student-life/student-resources/key-contacts
## Appendix A: Engineers Australia (EA) Competencies

### Stage 1 Competencies for Professional Engineers

<table>
<thead>
<tr>
<th>PE1: Knowledge and Skill Base</th>
<th>Program Intended Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE1.1</td>
<td>Comprehensive, theory-based understanding of underpinning fundamentals</td>
</tr>
<tr>
<td>PE1.2</td>
<td>Conceptual understanding of underpinning maths, analysis, statistics, computing</td>
</tr>
<tr>
<td>PE1.3</td>
<td>In-depth understanding of specialist bodies of knowledge</td>
</tr>
<tr>
<td>PE1.4</td>
<td>Discernment of knowledge development and research directions</td>
</tr>
<tr>
<td>PE1.5</td>
<td>Knowledge of engineering design practice</td>
</tr>
<tr>
<td>PE1.6</td>
<td>Understanding of scope, principles, norms, accountabilities of sustainable engineering practice</td>
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<table>
<thead>
<tr>
<th>PE2: Engineering Application Ability</th>
<th>Program Intended Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE2.1</td>
<td>Application of established engineering methods to complex problem solving</td>
</tr>
<tr>
<td>PE2.2</td>
<td>Fluent application of engineering techniques, tools and resources</td>
</tr>
<tr>
<td>PE2.3</td>
<td>Application of systematic engineering synthesis and design processes</td>
</tr>
<tr>
<td>PE2.4</td>
<td>Application of systematic approaches to the conduct and management of engineering projects</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>PE3: Professional and Personal Attributes</th>
<th>Program Intended Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE3.1</td>
<td>Ethical conduct and professional accountability</td>
</tr>
<tr>
<td>PE3.2</td>
<td>Effective oral and written communication (professional and lay domains)</td>
</tr>
<tr>
<td>PE3.3</td>
<td>Creative, innovative and pro-active demeanour</td>
</tr>
<tr>
<td>PE3.4</td>
<td>Professional use and management of information</td>
</tr>
<tr>
<td>PE3.5</td>
<td>Orderly management of self, and professional conduct</td>
</tr>
<tr>
<td>PE3.6</td>
<td>Effective team membership and team leadership</td>
</tr>
</tbody>
</table>