Course Outline

Code: ENG411
Title: Reservoir and Stormwater Engineering

School: Science & Engineering
Teaching Session: Semester 1
Year: 2020
Course Coordinator: Dr Helen Fairweather  Tel: 07 5456 5564  Email: hfairwea@usc.edu.au
Course Moderator: A/Prof Terry Lucke Tel:07 5456 5185  Email: tlucke@usc.edu.au

Please go to the USC website for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?

1.1 Description
This course prepares you to analyse hydrology data and design water storage and conveyance systems. Topics include the capacity-yield and behavioural characteristics of surface reservoirs, stormwater system design including detention and retention storage designs and the potential for small scale hydro power generation. Included in the course are the methods employed to design decentralised water management systems (Water Sensitive Urban Design), which is increasingly a requirement for new developments in SE Qld.

1.2 Field trips, WIL placements or activities required by professional accreditation

<table>
<thead>
<tr>
<th>Activity</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Trip</td>
<td>Field trip to WSUD site on the Sunshine Coast</td>
</tr>
</tbody>
</table>

1.3 Course topics
- Extent of natural water resources globally and in Australia
- River and Reservoir Yield
- Yield of unregulated streams
- Storage Behavioural analysis
- Water Sensitive Urban Design (WSUD)
- Stormwater Drainage Design
- Detention and Retention Storage
- Water storage for small scale hydro power generation

2. What level is this course?
400 level Graduate - Independent application of graduate knowledge and skills. Meets AQF and professional requirements. May require pre-requisites and developing level knowledge/skills. Normally taken in the 4th year of an undergraduate program

3. What is the unit value of this course?
12 units
4. **How does this course contribute to my learning?**

<table>
<thead>
<tr>
<th>Specific Learning Outcomes</th>
<th>Assessment tasks</th>
<th>Graduate Qualities or Professional Standards mapping</th>
</tr>
</thead>
</table>
| Assess, manage, and design water resources in the context of sustainable development | Task 1: Online Quizzes  
Task 3: Water storage analysis and design for hydro power generation | Sustainability-focussed. |
| Demonstrate understanding of engineering and technological processes by accessing information relevant to managing and utilising water resources. | Task 3: Water storage analysis and design for hydro power generation | Knowledgeable. |
| Use critical thinking to analyse the impact and implications of engineering issues in the context of sustainable and ethical management of water resources. | Task 1: Online Quizzes  
Task 2: River Reservoir Report and Analysis Tool | Sustainability-focussed.  
Ethical. |
| Identify how managing water resources may be influenced by socio-economic, cultural, organisational and political factors and requires critical engagement with the latest research and practice. | Task 2: Stormwater design exercise  
Task 3: Water storage analysis and design for hydro power generation | Sustainability-focussed.  
Ethical. |
| Identify current issues affecting managing water resources | Task 1: Online Quizzes  
Task 2: Stormwater design exercise | Sustainability-focussed. |
| Demonstrate understanding by explaining the processes used to manage surface water resources | Task 1: Online Quizzes | Knowledgeable. |

5. **Am I eligible to enrol in this course?**

Refer to the [USC Glossary of terms](https://www.usc.edu.au) for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1 **Enrolment restrictions**
Nil

5.2 **Pre-requisites**
(MTH202 or MTH104) and (ENS314 or ENG330 or CIV330)

5.3 **Co-requisites**
Nil

5.4 **Anti-requisites**
Nil
5.5 Specific assumed prior knowledge and skills (where applicable)
Nil

6. How am I going to be assessed?

6.1 Grading scale
Standard – High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL)

6.2 Details of early feedback on progress
In week 4 the first quiz will test your knowledge of the material covered in the first three weeks of the course. A practice quiz will be provided in week 3.

6.3 Assessment tasks

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Assessment Product</th>
<th>Individual or Group</th>
<th>Weighting</th>
<th>What is the duration / length?</th>
<th>When should I submit?</th>
<th>Where should I submit it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Quiz/zes</td>
<td>Individual</td>
<td>20%</td>
<td>Two x 60 minute quizzes</td>
<td>Weeks 4 and 7</td>
<td>Quiz (Online Test)</td>
</tr>
<tr>
<td>2</td>
<td>Written Piece</td>
<td>Individual</td>
<td>40%</td>
<td>6xA4 pages including graphs, tables and explanation.</td>
<td>Week 9 Monday 4pm</td>
<td>Online Assignment Submission with Plagiarism check</td>
</tr>
<tr>
<td>3</td>
<td>Oral, and Written Piece</td>
<td>Group</td>
<td>40%</td>
<td>6xA4 pages including design specification, calculations (30%) and explanation (group) and individual presentations (10%)</td>
<td>Week 12 Monday 4pm</td>
<td>Online Assignment Submission with Plagiarism check</td>
</tr>
</tbody>
</table>

100%
Assessment Task 1: Two on-line quizzes

<table>
<thead>
<tr>
<th><strong>Goal:</strong></th>
<th>Demonstrate your understanding of the material covered.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product:</strong></td>
<td>Quiz/zes</td>
</tr>
<tr>
<td><strong>Format:</strong></td>
<td>Multiple-choice quizzes completed at home for each of two quizzes, which will be open for a total of 60 minutes at an agreed time in Weeks 4 &amp; 7. Questions are paired to demonstrate your reason for the choice of the first question in the pair. Practice questions will be provided in Wk 3.</td>
</tr>
</tbody>
</table>
| **Criteria:** | Students will be assessed on:  
  - Demonstration of your depth of understanding of the material covered. |

**Generic skill assessed** | **Skill assessment level**
--- | ---
Problem solving | Graduate
Information literacy | Graduate

**Engineers Australia competencies assessed in this task**

1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline.

Assessment Task 2: Stormwater design exercise

<table>
<thead>
<tr>
<th><strong>Goal:</strong></th>
<th>The goal of this task is to analyse the impact and implications of engineering issues in the context of sustainable and ethical management of water resources.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product:</strong></td>
<td>Written Piece</td>
</tr>
<tr>
<td><strong>Format:</strong></td>
<td>In this assessment task you will design or analyse stormwater infrastructure in the context of sustainably and ethically managing water resources. A report and spreadsheet library of analyses methods (or appropriate software) and a professional engineering report with appropriate headings, graphs, tables and explanations, showing all the steps for the final design/analysis. The maximum length of the report is 6 x A4 pages.</td>
</tr>
</tbody>
</table>
| **Criteria:** | Students will be assessed on:  
  - Identification of how managing water resources may be influenced by socio-economic, cultural, organisational and political factors  
  - Identification of current issues affecting managing stormwater  
  - Data collection and quality assurance  
  - Analysis and interpretation  
  - Communication of concepts in a report format |

**Generic skill assessed** | **Skill assessment level**
--- | ---
Information literacy | Graduate
Problem solving | Graduate

**Engineers Australia competencies assessed in this task**

1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline.
Assessment Task 3: Water storage analysis and design for hydro power generation project

<table>
<thead>
<tr>
<th>Goal:</th>
<th>Calculate the hydro electricity generation potential from the stored water extracted from air-conditioning condensation at USC and design a system for its implementation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product:</td>
<td>Oral and Written Piece</td>
</tr>
<tr>
<td>Format:</td>
<td>An engineering design specification report to a standard expected in professional practice (group) and individual presentations on your input into the assignment</td>
</tr>
</tbody>
</table>
| Criteria: | Students will be assessed on:  
- The standard of the report  
- demonstrated understanding of engineering and technological processes for utilising a water resource for energy generation  
- application of the theoretical and practical components of the course materials  
- analysis of data and information  
- application of design methodologies and calculations to the specific scenario |

<table>
<thead>
<tr>
<th>Generic skill assessed</th>
<th>Skill assessment level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem solving</td>
<td>Graduate</td>
</tr>
<tr>
<td>Applying technologies</td>
<td>Graduate</td>
</tr>
</tbody>
</table>

**Engineers Australia competencies assessed in this task**

1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline.

7. Directed study hours

The directed study hours listed here are a portion of the workload for this course. A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Directed study hours may vary by location. Student workload is calculated at 12.5 learning hours per one unit.

<table>
<thead>
<tr>
<th>Location:</th>
<th>Directed study hours for location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>USC Sunshine Coast</td>
<td>One 1 hour lecture and a 2 hour tutorial per week</td>
</tr>
</tbody>
</table>

7.1 Course content

<table>
<thead>
<tr>
<th>Week #/ Module #</th>
<th>What key concepts/content will I learn?</th>
<th>What activities will I engage in to learn the concepts/content?</th>
</tr>
</thead>
</table>
| 1               | Nature of this course: aims, objectives and assessment. Water resources: constraints, risks, issues, Water storages, and urban water runoff management Dam design overview | LECTURES DIRECTED STUDY  
Develop work schedule for course, assignments etc  
Set up framework for spreadsheet and/or R library to be used as a portfolio of methods  
Attend library and IT skill tutorials if necessary  
ANCOLD (yr uk) (International Commission on Large Dams) Dams and the World’s Water.  
<table>
<thead>
<tr>
<th></th>
<th>Course Outline: ENG411  Reservoir and Stormwater Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chanson (yr uk) Historical Development of Arch Dams. From Cut-Stone Arches to Modern Concrete Designs. URL: <a href="http://staff.civil.uq.edu.au/h.chanson/arch_dam.html">http://staff.civil.uq.edu.au/h.chanson/arch_dam.html</a></td>
</tr>
</tbody>
</table>
| 2 | Catchment and Reservoir Yield  
Reservoir reliability concepts  
Hydropower generation.  
LEcTUREs  
TUTORIAL on  
Catchment and  
Reservoir Yield and  
water storage requirements for  
hydropower generation  
*Reservoir and Capacity and Yield*, Elsevier Science.  
U.S. Army Corps of Engineers (1997)  
*Hydrologic Engineering Requirements for Reservoirs*. U.S. Army Corps of Engineers. |
| 3 | Climate and Reservoir Yield  
LEcTUREs  
TUTORIAL on Reservoir Yield and Climate Change  
Formative feedback for task 1  
| 4 | Sizing Reservoirs: Behavioural Analysis techniques  
LEcTUREs  
TUTORIAL on Critical Period Methods  
| 5 | Sizing Reservoirs: Drought curves  
LEcTUREs  
TUTORIAL on Storage-Yield-Reliability Techniques and Gould-Dincer Method  
| Course Outline: ENG411  Reservoir and Stormwater Engineering |
|---|---|---|
| **6** | **6** | **Sizing Reservoirs: Matrix Probability Analysis** |
| **7** | **LECTURES** | Sizing Reservoirs: Matrix Probability Analysis |
| **8** | **Reservoir sedimentation** | Reservoir outlet works |
| **9** | **Stormwater Drainage Design** | Introduction to WSUD Design of Swales |
### Course Outline: ENG411 Reservoir and Stormwater Engineering

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Bioretention Detention and Retention Storages, Infiltration and Aquifer storage</td>
<td>LECTURES</td>
<td>TUTORIAL on Bioretention, Infiltration and Aquifer storage</td>
<td>Readings and resources detailed in Blackboard</td>
</tr>
<tr>
<td>11</td>
<td>Artificial wetland design</td>
<td>LECTURES</td>
<td>TUTORIAL on Artificial wetlands</td>
<td>Readings and resources detailed in Blackboard</td>
</tr>
<tr>
<td>12</td>
<td>Urban Run-off Models</td>
<td>LECTURES</td>
<td>TUTORIAL on Urban Run-off Modelling</td>
<td>Readings and resources detailed in Blackboard</td>
</tr>
<tr>
<td>13</td>
<td>Summary lecture</td>
<td>TUTORIAL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please note that the course activities may be subject to variation.

### 8. What resources do I need to undertake this course?

Please note that course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Blackboard site. Please log in as soon as possible.

#### 8.1 Prescribed text(s)

There is no need to buy a text book for this course. Key information will be available by download from the web, or through directed readings. Students are encouraged to read further and these readings and the names of recommended texts will also be placed on the Blackboard site. Some useful reference texts in the library are shown below:


#### 8.2 Specific requirements

N/A

### 9. Risk management

Health and safety risks for this course have been assessed as low.

It is your responsibility as a student to review course material, search online, discuss with lecturers and peers, and understand the health and safety risks associated with your specific course of study. It is also your responsibility to familiarise yourself with the University’s general health and safety principles by reviewing the [online Health Safety and Wellbeing training module for students](#), and following the instructions of the University staff.
10. What administrative information is relevant to this course?

10.1 Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

10.2 Assessment: Additional requirements

Eligibility for Supplementary Assessment

Your eligibility for supplementary assessment in a course is dependent on the following conditions applying:

a) The final mark is in the percentage range 47% to 49.4%

b) The course is graded using the Standard Grading scale

c) You have not failed an assessment task in the course due to academic misconduct

10.3 Assessment: Submission penalties

Late submission of assessment tasks will be penalised at the following maximum rate:

- 5% (of the assessment task’s identified value) per day for the first two days from the date identified as the due date for the assessment task.
- 10% (of the assessment task’s identified value) for the third day
- 20% (of the assessment task’s identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.
- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task.

Weekdays and weekends are included in the calculation of days late.

To request an extension, you must contact your Course Coordinator and supply the required documentation to negotiate an outcome.

10.4 Study help

In the first instance, you should contact your tutor, then the Course Coordinator. Additional assistance is provided to all students through Academic Skills Advisers. To book an appointment or find a drop-in session go to Student Hub.

Contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au
10.5 Wellbeing Services
Student Wellbeing Support Staff are available to assist on a wide range of personal, academic, social and psychological matters to foster positive mental health and wellbeing for your success. Student Wellbeing is comprised of professionally qualified staff in counselling, health and disability Services.

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, mental health issue, learning disorder, injury or illness, or you are a primary carer for someone with a disability, AccessAbility Services can provide assistance, advocacy and reasonable academic adjustments.

To book an appointment with either service go to Student Hub, email studentwellbeing@usc.edu.au or accessibility@usc.edu.au or call 07 5430 1226

10.6 Links to relevant University policy and procedures
For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website:  
http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching

10.7 General Enquiries
In person:

- **USC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **USC Moreton Bay** – Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **USC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **USC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **USC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **USC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890
Email: studentcentral@usc.edu.au