



## UNSW Course Outline

# CVEN3502 Water and Wastewater Engineering - 2024

Published on the 13 May 2024

## General Course Information

**Course Code :** CVEN3502

**Year :** 2024

**Term :** Term 2

**Teaching Period :** T2

**Is a multi-term course? :** No

**Faculty :** Faculty of Engineering

**Academic Unit :** School of Civil and Environmental Engineering

**Delivery Mode :** In Person

**Delivery Format :** Standard

**Delivery Location :** Kensington

**Campus :** Sydney

**Study Level :** Undergraduate

**Units of Credit :** 6

### Useful Links

[Handbook Class Timetable](#)

## Course Details & Outcomes

### Course Description

The course introduces students to the principles of water and wastewater engineering, including water supply and wastewater disposal systems, water and wastewater treatment, water quality and indicators, open channel flow, pump selection and placement and pipe networks. Open

channel flow topics include uniform flows, rapidly varied flows in channel transitions and hydraulic jumps as well as gradually varied flows and flow control. Topics covered in water and wastewater treatment include water quality parameters, unit operations in treatment of water and wastewater, sewage collection systems, pumping stations and rising mains, sludge treatment and management, and water management concepts and effluent reuse.

## Course Aims

The learning objectives for this course are for you to understand:

- water and wastewater distribution and collection systems and their roles in the water cycle;
- basic water quality issues associated with water and wastewater treatment;
- design and operation of sewerage collection systems and water distribution;
- environmental implications and assessment of wastewater discharge;
- treatment options and principles of conventional treatment systems;
- fundamental design issues for open channel flows including uniform, rapidly and gradually varied flows;
- specific energy concept and its application to flow transitions;
- pipes, pipe networks and pumping systems.

Thus, this course provides an introduction to water and sewerage system structures/design principles, water

quality guidelines and objectives, water treatment and wastewater treatment and the environmental issues

related to treatment. This course introduces students further to the basic principles of open channel

hydraulics enabling students to determine flow profiles, flow regimes and energy dissipation along open channel systems.

## Course Learning Outcomes

| Course Learning Outcomes   |
|--|
| CLO1 : Describe the important characteristics of commonly applied water and wastewater treatment processes.                                |
| CLO2 : Solve calculations around water quality and water treatment process design characteristics.   |
| CLO3 : Describe the important characteristics of open channel flow hydraulics, and the application of pumps and turbines in pipe networks. |
| CLO4 : Solve basic calculations around open channel flow hydraulics, and pumps and turbines in pipe networks.                              |

| Course Learning Outcomes   | Assessment Item   |
|--|---|
| CLO1 : Describe the important characteristics of commonly applied water and wastewater treatment processes.                                | <ul style="list-style-type: none"> <li>• Water Quality laboratory online assessment</li> <li>• Research Assignment</li> <li>• Final Examination</li> </ul>    |
| CLO2 : Solve calculations around water quality and water treatment process design characteristics.   | <ul style="list-style-type: none"> <li>• Water Quality laboratory online assessment</li> <li>• Research Assignment</li> <li>• Final Examination</li> </ul>    |
| CLO3 : Describe the important characteristics of open channel flow hydraulics, and the application of pumps and turbines in pipe networks. | <ul style="list-style-type: none"> <li>• Hydraulics Online Quizzes</li> <li>• Hydraulics laboratory online assessment</li> <li>• Final Examination</li> </ul> |
| CLO4 : Solve basic calculations around open channel flow hydraulics, and pumps and turbines in pipe networks.                              | <ul style="list-style-type: none"> <li>• Hydraulics Online Quizzes</li> <li>• Hydraulics laboratory online assessment</li> <li>• Final Examination</li> </ul> |

## Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

## Assessments

### Assessment Structure

| Assessment Item   | Weight | Relevant Dates   |
|---|--------|--|
| Water Quality laboratory online assessment<br>Assessment Format: Individual | 5%     | Start Date: 10/06/2024 09:00 AM<br>Due Date: 19/06/2024 06:00 PM   |
| Research Assignment<br>Assessment Format: Individual                        | 15%    | Start Date: 15/06/2024 12:00 PM<br>Due Date: 25/06/2024 06:00 PM<br>Post Date: 07/07/2024 06:00 PM   |
| Hydraulics Online Quizzes<br>Assessment Format: Individual                  | 10%    | Start Date: Two online quizzes (each 5% marks) will take place in Weeks 8 & 10 on the Moodle course page. For the respective week, t<br>Due Date: End of Quiz 1: 6 pm Friday 19 July; End of Quiz 2: 6 pm Friday 2 August. |
| Hydraulics laboratory online assessment<br>Assessment Format: Individual    | 10%    | Start Date: 22/07/2022 09:00 AM<br>Due Date: 31/07/2024 06:00 PM   |
| Final Examination<br>Assessment Format: Individual                          | 60%    |  |

# Assessment Details

## Water Quality laboratory online assessment

### Assessment Overview

Students are expected to demonstrate their ability to describe the important characteristics of commonly applied water and wastewater treatment processes. Furthermore, students will demonstrate ability to perform basic calculations around water quality and water treatment process design characteristics.

### Course Learning Outcomes

- CL01 : Describe the important characteristics of commonly applied water and wastewater treatment processes.
- CL02 : Solve calculations around water quality and water treatment process design characteristics.

### Detailed Assessment Description

Water quality laboratory online assessment on the Moodle course page is an individual assessment of the water and wastewater treatment course content. You are required to complete a laboratory lesson which includes a face-to-face laboratory class in Week 3 for an important water treatment process. After you have completed the lab lesson, an online assessment (Online Quiz) will become available on the Moodle course page.

Students are expected to demonstrate their ability to describe the important characteristics of commonly applied water and wastewater treatment processes. Furthermore, students will demonstrate ability to perform basic calculations around water quality and water treatment process design characteristics.

### Assessment Length

4 hrs within provided time frame

### Submission notes

The Quiz will become available when an face-to-face lab lesson has been completed. Quiz to be completed online in Moodle.

### Assessment information

Answers to the Quiz questions will be assessed automatically against the correct answer within Moodle. Feedback will be provided at the end of the Quiz, via Moodle.

### Assignment submission Turnitin type

Not Applicable

# Research Assignment

## Assessment Overview

Students are expected to demonstrate an ability to undertake independent research to explore new (to them)

information about a topic related to water and wastewater treatment.

## Course Learning Outcomes

- CL01 : Describe the important characteristics of commonly applied water and wastewater treatment processes.
- CL02 : Solve calculations around water quality and water treatment process design characteristics.

## Detailed Assessment Description

Students are required to undertake independent research on one of a selection of topics to be provided. These topics will relate to various aspects of water and/or wastewater treatment.

Assignments will be uploaded and marked via Moodle.

Students are expected to demonstrate an ability to undertake independent research to explore new (to them) information about a topic related to water and wastewater treatment.

## Assessment Length

1 page

## Assessment information

Deadline for absolute fail: 1 week after the due date.(2nd July).

## Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

# Hydraulics Online Quizzes

## Assessment Overview

Students are expected to demonstrate their understanding of basic open channel flow and pump concepts. Students will demonstrate ability to perform basic calculations of open channel flow and pipe/pump problems applying the open channel and closed conduit flow concepts from the course lectures and workshops.

### **Course Learning Outcomes**

- CLO3 : Describe the important characteristics of open channel flow hydraulics, and the application of pumps and turbines in pipe networks.
- CLO4 : Solve basic calculations around open channel flow hydraulics, and pumps and turbines in pipe networks.

### **Detailed Assessment Description**

A time limit of 4 hours has been set for the Quiz from the time you start your attempt. You are allowed 1 attempt with a 4-hour time limit for this attempt within the given time frame (i.e. if you start your attempt at 4.30 pm on Friday, your attempt will automatically end at 6 pm with the end of the Quiz time frame). You can review and change your answers before submitting your attempt. Each Quiz will comprise 5 randomly allocated numerical questions testing your understanding of the course theory. You will need a calculator. Your answers to the Quiz questions will be assessed automatically against the correct answer within Moodle. Feedback will be provided at the end of the Quiz, after 6 pm on Friday of the respective week, via Moodle.

Students are expected to demonstrate their understanding of basic open channel flow and pump concepts. Students will demonstrate ability to perform basic calculations of open channel flow and pipe/pump problems applying the open channel and closed conduit flow concepts from the course lectures and workshops.

### **Assessment Length**

4 hrs within 24-hr time frame

### **Assessment information**

Answers to the Quiz questions will be assessed automatically against the correct answer within Moodle.

Feedback will be provided at the end of the Quiz, via Moodle.

### **Assignment submission Turnitin type**

Not Applicable

## **Hydraulics laboratory online assessment**

### **Assessment Overview**

4 hrs within provided time frame. The Quiz will become available when a lab lesson has been completed. Answers to the Quiz questions will be assessed automatically against the correct answer within Moodle. Feedback will be provided at the end of the Quiz, via Moodle.

### **Course Learning Outcomes**

- CLO3 : Describe the important characteristics of open channel flow hydraulics, and the application of pumps and turbines in pipe networks.
- CLO4 : Solve basic calculations around open channel flow hydraulics, and pumps and turbines in pipe networks.

### **Detailed Assessment Description**

Hydraulics laboratory online assessment on the Moodle course page is an individual assessment of the hydraulics course content. The assessment complements the face-to-face laboratory class in Week 9). All students must complete a lab lesson on Moodle and once completed an online assessment (Hydraulics Laboratory Quiz) will become available on the Moodle course page. You have 4 hours to complete this Online Quiz within the available time frame.

Students are expected to demonstrate their understanding of basic open channel flow and pump concepts. Students will demonstrate ability to perform basic calculations of open channel flow and pipe/pump problems applying the open channel and closed conduit flow concepts from the course lectures and workshops.

### **Assessment Length**

4 hrs within provided time frame

### **Assessment information**

The Quiz will become available when a lab lesson has been completed. Answers to the Quiz questions will be assessed automatically against the correct answer within Moodle. Feedback will be provided at the end of the Quiz, via Moodle.

### **Assignment submission Turnitin type**

Not Applicable

## **Final Examination**

### **Assessment Overview**

Students are expected to demonstrate their ability to describe the important characteristics of commonly applied water and wastewater treatment processes. Furthermore, students will demonstrate ability to perform basic calculations around water quality and water treatment process design characteristics. Students are expected to demonstrate their understanding of open channel flow hydraulics and pump and turbines in pipe networks by performing calculations and explaining basic concepts.

### **Course Learning Outcomes**

- CL01 : Describe the important characteristics of commonly applied water and wastewater treatment processes.
- CL02 : Solve calculations around water quality and water treatment process design characteristics.
- CL03 : Describe the important characteristics of open channel flow hydraulics, and the application of pumps and turbines in pipe networks.
- CL04 : Solve basic calculations around open channel flow hydraulics, and pumps and turbines in pipe networks.

### **Detailed Assessment Description**

Students are expected to demonstrate their ability to describe the important characteristics of commonly applied water and wastewater treatment processes. Furthermore, students will demonstrate ability to perform basic calculations around water quality and water treatment process design characteristics. Students are expected to demonstrate their understanding of open channel flow hydraulics and pump and turbines in pipe networks by performing calculations and explaining basic concepts.

### **Hurdle rules**

A mark of at least 40% in the final examination is required before the class work is included in the final mark.

## **General Assessment Information**

The final course mark will be based on you completing the coursework and final examination: your coursework mark accounts for 40% of the course, and your final examination mark accounts for 60% of the course.

Provided a mark of 40% or more has been achieved in your final exam and a mark of 40% or more has been achieved in your coursework component, your final aggregated mark for this course will normally be based on the sum of the scores from each of the assessment tasks with your final examination being worth 60% of the final mark and your class work being 40% of the final mark.

### **Grading Basis**

Standard

# Course Schedule

| Teaching Week/Module         | Activity Type | Content  |
|------------------------------|---------------|--|
| Week 0 : 20 May - 26 May     | Other         |  |
| Week 1 : 27 May - 2 June     | Lecture       | Tuesday: Water & wastewater characterisation Thursday: Screening, grit removal and sedimentation   |
|                              | Workshop      | Week 1 Workshop questions  |
| Week 2 : 3 June - 9 June     | Lecture       | Tuesday: Coagulation and flocculation Thursday: Biological processes 1   |
|                              | Workshop      | Week 2 Workshop questions  |
| Week 3 : 10 June - 16 June   | Lecture       | Tuesday: Biological processes 2 Thursday: Filtration and adsorption  |
|                              | Workshop      | Week 3 Workshop questions  |
|                              | Laboratory    | Water quality laboratory class. Attend the class that you enrolled in on the Moodle course page.   |
|                              | Assessment    | Water Quality laboratory online assessment : The Quiz will become available when an online lab lesson has been completed. Quiz to be completed online in Moodle. |
| Week 4 : 17 June - 23 June   | Lecture       | Tuesday: Disinfection Thursday: Sludge management  |
|                              | Workshop      | Week 4 Workshop questions  |
| Week 5 : 24 June - 30 June   | Lecture       | Tuesday: Membrane Treatment Thursday: Uniform Flow   |
|                              | Workshop      | Week 5 Workshop questions  |
|                              | Assessment    | 1-Page research assignment : All assignments must be submitted by uploading on Moodle. No other submission method will be accepted.                              |
| Week 6 : 1 July - 7 July     | Other         | No classes or workshops.   |
| Week 7 : 8 July - 14 July    | Lecture       | Tuesday: Optimal Sections Thursday: Specific Energy  |
|                              | Workshop      | Week 7 Workshop questions  |
| Week 8 : 15 July - 21 July   | Lecture       | Tuesday: Channel Transitions Thursday: Hydraulic Jump  |
|                              | Workshop      | Week 8 Workshop questions  |
|                              | Assessment    | Hydraulics Online Quiz 1   |
| Week 9 : 22 July - 28 July   | Lecture       | Tuesday: Gradually Varied Flows Thursday: Pumps and pump selection   |
|                              | Workshop      | Week 9 Workshop questions  |
|                              | Laboratory    | Hydraulics laboratory class. Attend the class that you enrolled in on the Moodle course page.  |
|                              | Assessment    | Hydraulics laboratory online assessment : The Quiz will become available when an online lab lesson has been completed. Quiz to be completed online in Moodle.    |
| Week 10 : 29 July - 4 August | Lecture       | Tuesday: Pumps and pipes Thursday: Pipes and pipe networks   |
|                              | Workshop      | Week 10 Workshop questions   |
|                              | Assessment    | Hydraulics Online Quiz 2   |

## Attendance Requirements

For courses with Workshops and/or Labs, attendance for those classes is a necessary part of the course. You must attend at least 80% of the workshop/lab in which you are enrolled in for the duration of the session.

## Course Resources

### Recommended Resources

- The following text is strongly recommended for the Water & Wastewater Treatment components: Environmental Engineering: Principles and Practice. Richard O. Mines, Jr. ISBN:

978-1-118-80145-1. Wiley-Blackwell, 2014. Available from UNSW Bookshop in hardcopy or online as an e-book: <http://au.wiley.com/WileyCDA/WileyTitle/productCd-1118801458.html>

- Lecture notes for Open channel flows, pumps and pipes also available at the UNSW Bookshop for purchase (students can purchase them if they like working with a hardcopy; however electronic versions of the lecture notes will be provided on Moodle).

Additional reading:

- Water and Wastewater Technology (by Hammer MJ & Hammer MJ), Pearson Education Limited, 7th Edition, 2014.
- Water Quality and Treatment: A Handbook on Drinking Water. (Ed. Edzwald JK). American Water Works Association. 6th Edition, 2011.
- Water Treatment: Principles and Design. 3rd Edition, MWH, Wiley, 2012.
- Wastewater Engineering: Treatment and Resource Recovery, Metcalf & Eddy, 5th Edition, McGraw-Hill, 2013.
- Applied Fluid Mechanics, R. L. Mott, Pearson Prentice-Hall, 6th Edition, 2006.
- Fundamentals of Hydraulic Engineering Systems, Houghtalen RJ, Akan AO & Hwang NHC, Prentice-Hall, 4th Edition, 2010.

## Staff Details

| Position | Name          | Email | Location                               | Phone        | Availability          | Equitable Learning Services Contact | Primary Contact |
|----------|---------------|-------|--|--------------|-----------------------|-------------------------------------|-----------------|
| Lecturer | Bing-Jie Ni   |       | Water Research Centre Room 104         | 02 9065 2306 | Appointments by email | No                                  | No              |
| Convenor | Stefan Felder |       | Water Research Laboratory (Manly Vale) | 02 8071 9861 | Appointments by email | Yes                                 | Yes             |

## Other Useful Information

### Academic Information

#### I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's [Special Consideration page](#).

## II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and policies. In particular, students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)
- [Equitable Learning Services](#)

## III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

## IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: <https://www.unsw.edu.au/engineering/student-life/student-resources/program-design>.

*Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.*

## Academic Honesty and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at*

*UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: [student.unsw.edu.au/plagiarism](https://student.unsw.edu.au/plagiarism). The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

[www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf](https://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)

## **Submission of Assessment Tasks**

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

## Faculty-specific 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)

## School-specific Information

### Final Examinations

Final Exams in T2 2024 will be held on campus between the 9th - 22nd August, and Supplementary Exams between the 2nd - 6th September 2024. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

## School Contact Information

For assistance with enrolment, class registration, progression checks and other administrative matters, please see [the Nucleus: Student Hub](#). They are located inside the Library – first right as

you enter the main library entrance. You can also contact them via <http://unsw.to/webforms> or reserve a place in the face-to-face queue using the UniVerse app.

For course administration matters, please contact the Course Coordinator.

Questions about the this course should normally be asked during the scheduled class so that everyone can benefit from the answer and discussion.