CVEN9872

Solid Waste Management

Term 3, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Ailar Hajimohammadi	ailar.hm@unsw.edu.au	Please send an email and ask for a meeting time	H20, level 7 room 707	

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

Units of Credit 6

Summary of the Course

Characterisation of municipal solid waste; collection; transfer stations; waste minimisation and recycling; waste treatment, including size reduction, composing, incineration, emerging technologies; landfill disposal, including preparation of landfill management plans and operational aspects; introduction to planning of waste management systems.

Course Aims

The objectives of this course are to:

- Provide an appreciation of the management of solid waste in a systems context; i.e. to understand the nature of the various functional elements in waste management systems and the relationships among them, so that optimal systems can be designed;
- Provide an understanding of the characteristics of urban solid waste, and be able to predict the composition and quantities for a city / town / region;
- Be able to understand the data requirements for, and then be able to prepare concept designs of common functional elements e.g. transfer stations, recycling and resource recovery facilities, composting facilities, waste to energy plants, and landfills; and
- Provide an understanding of waste management policy and how to prepare a waste management strategy or plan.

Students will be provided with the basic tools by way of audio/video streaming/podcasts of this year's lectures, electronic copies of the lectures, and course notes and then will be expected to prepare workable solutions to assignment problems that have been drawn from a composite of real world problems.

The course objectives, content and assessment concentrate on encouraging the development of the following attributes in students, with particular application to Waste Management, as below:

- *An in-depth engagement with the relevant disciplinary knowledge in its inter-disciplinary context: the influence of socio-economic circumstances on waste generation will need to be included in waste generation predictions, and in the commentary on the implementation stages of waste facility establishment*, in the design of one of the facilities in a region.
- *The capacity for analytical and critical thinking and for creative problem solving*: Data will be incomplete, and an analysis of the fundamental influences on waste generation will need to be made to arrive at reasonable projections; then creative designs for facilities to suit the circumstances of the hypothetical region will need to be produced in the second assignment.
- *The ability to engage in independent and reflective learning:* lectures will give standard procedures for the design of waste facilities such as landfills and waste sorting facilities; you will then need to independently develop appropriate solutions for the hypothetical region and draw on the Principal Engineer (lecturer) for reactive advice after you have developed and reflected on their own designs – the Principal Engineer will not do creative design work for you.
- *Information literacy*: you will need to find appropriate websites and use suggested texts and journals to find supplementary information to enable them to go into sufficient detail to produce workable concept designs for facilities – all details will not be given in lectures. **You must not directly contact by any means, private or public organisations. This can only be done by**

the Lecturer.

- *The skills for collaborative and multi-disciplinary work*: you will work in groups of up to 3 (for Assignment) and will need to collaboratively manage time and inputs to meet deadlines; the inputs of other disciplines that would need to be included in real-world situations will need to be recognized and commented upon. All students in each group get the same assignment marks.

In general, the course aims to facilitate:

- *A respect for ethical practice and social responsibility:* you will need to conduct the preparation and submission of your assignment projects in accordance with UNSW policies on academic conduct as described at: http://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

and in accordance with the IEAust's code of ethics as at (search code of ethics here):

http://www.engineersaustralia.org.au

- *The skills of effective communication:* in this course, memo's and technical reports need to be appropriate for a technical audience i.e. for another engineer that works for a Council or a consulting engineer. They are not novels. They are technical reports, typically using an introductory sentence and point form, and provided with at least 2 levels of numbered headings. Appropriate referencing must be used.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Describe a regional urban solid waste management system, showing the flow of materials within the system.	PE1.1, PE1.6, PE2.4
2. Explain waste management policy and how to prepare a waste management strategy or plan.	PE1.6
3. Characterise waste generation in a town/city/region and make forecasts about future waste quantities and composition.	PE1.2, PE1.6, PE2.2
4. Explain design, construction and operational aspects of some waste management facilities including transfer station, material recovery facility, composting facility, waste to energy plant, and a landfill waste disposal site.	PE1.1, PE1.6
5. Prepare concept designs of some of the following waste facilities including transfer station, material recovery facility, composting facility, waste to energy plant, and a landfill waste disposal site.	PE1.3, PE1.5, PE2.1, PE3.2, PE3.6

Teaching Strategies

Lectures will provide an explanation of procedures to follow to quantify waste generation in a town / city / region and then to prepare conceptual designs of waste management facilities.

Examples will be given in these lectures. You then need to learn these procedures by characterizing waste generation in a town / city / region and preparing conceptual designs for selected waste facilities to a standard typical in a consulting office.

All material will be provided on Moodle. Printed and photocopied notes, overheads etc. will not be provided.

The approaches to learning are:

Private Study	• Review lecture material and textbook • 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	• Take notes – the slides do not contain all information • Refer to specified reference material for additional information • Participate in activities and example problems in class. • Check for announcements
Workshops	• Be guided by Demonstrators • Practice solving set problems • Ask questions
Assessments	• Formative and summative assessment of knowledge and skills in assignments, with students encouraged to seek formative informal assessment via consultation with the Principal Engineer/lecturer during preparation of assignments. • Demonstrate higher understanding and problem solving on real world problems in a hypothetical region/context. • Exams are summative assessments on knowledge gained in the course, particularly as indicated by the ability to quickly undertake exercises set in the Exercise problems
Emails	• You are strongly advised to check your UNSW emails daily for course related messages that are sent via News forum in Moodle. Use Q&A in Moodle to ask questions, as this builds an archive for all students in the course.
Moodle	• The Waste Management lectures can be found on MOODLE. From time to time, other information will be placed on MOODLE.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Assignment 1 (section 1 and section 2)	15%	02/10/2022 11:59 PM	1, 2, 3, 4, 5
2. Exam	55%	Not Applicable	3, 4
3. Video presentation	30%	13/11/2022 11:59 PM	1, 2, 4

Assessment 1: Assignment 1 (section 1 and section 2) (Group)

Due date: 02/10/2022 11:59 PM
Marks returned: Sunday 16th of October

Assess the understanding of the concepts, data collection, calculations and reporting.

Section 1 is the data gathering and calculations

Will be explained in detail during demonstration

Assessment 2: Exam

The exam is a 2-hour closed book exam during the normal exam period. The exam will test the students' ability to synthesise the overall course. All material presented during the session will be examinable in the exam unless otherwise noted.

Assessment 3: Video presentation

Start date: 13/11/2022 11:59 PM
Due date: 13/11/2022 11:59 PM
Deadline for absolute fail: 18/11/2022 11:59 PM
Marks returned: 4th Dec

Summarise the content and highlight and analyse the underlying connections, contrast and topics related to the assignment 1. Critically analyse waste management approaches and mention limitations. make conclusions and suggest strategies

Attendance Requirements

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

Course Schedule

Term 3 2022

Date	**Topic** **Lecture Content**	**Demonstration Content**	**Other**
14/09/2022 (Week 1)	Introduction and course overview. Background, waste management policy and planning	**DEMO:** Introduction, demo structures (and assignments)	
21/09/2022 (Week 2)	Waste generation & characterisation	**DEMO:** Waste generation and characterization	
28/09/2022 (Week 3)	Waste minimisation, recycling, and materials recovery	**DEMO:** Waste minimization	**Assignment 1 Section 1** Due: Sunday 2nd Oct (11:59pm)
05/10/2022 (Week 4)	Waste collection and transfer	**DEMO:** waste transfer	
12/10/2022 (Week 5)	Composting	**DEMO:** composting	
19/10/2022 (Week 6)	***Flexibility week for all courses (non□teaching)***		
26/10/2022 (Week 7)	Landfill gas	**DEMO:** Landfill gas	**Assignment 1 section 2** Due: Sunday 23rd Oct (11:59pm)
02/11/2022 (Week 8)	Landfill waste disposal (Stuart Dever)	Landfill leachate (Stuart Dever)	
09/11/2022 (Week 9)	Waste to Energy	**DEMO:** Waste to energy	**Video presentation** Due: Sunday 13th Nov (11:59pm)
16/11/2022 (Week 10)	MBT and course overview	**DEMO:** MBT and Landfill leachate	

Resources

Prescribed Resources

There is NO textbook for this Course.

Most of the reference material required will be provided on MOODLE or students will be directed to relevant resources.

The following references may be useful for assignments and to practitioners. They are available from the Library:

- Christensen, T., (Ed.), 2010. Solid Waste Technology & Management. Wiley.
- Kreith & Tchobanoglous, 2002. The McGraw-Hill Handbook of solid waste management. 2nd Edition,(UNSW Library)
- Christensen, T.H., Cossu, R., Stegmann, R., Sanitary Landfilling: Process, Technology and Environmental Impact, Academic Press, London, 1989.
- Baccini, P. (Ed.), The Landfill, Reactor and Final Storage, Springer-Verlag, Berlin, 1989. Another useful reference, which is quite old but still a very good reference, but will be difficult to find:
- Tchobanoglous, G et al, 1993; Integrated Solid Waste Management, McGraw - Hill

Other reading material that students will be referred to includes that listed below:

Solid waste management policy, strategy, planning, legislation, regulation:

- Australian Environment Protection and Heritage Council (EPHC) National Waste Policy: Less waste, more resources, 2009

(http://www.environment.gov.au/protection/national-waste-policy)

    - Australian Environment Protection and Heritage Council (EPHC), Waste Overview, 2009 (http://www.environment.gov.au/protection/national-waste-policy/publications)
    - Waste Avoidance and Resource Recovery Act, 2001
    - Protection of the Environment Operations (Waste) Regulation
    - NSW Waste Avoidance and Resource Recovery Strategy 2014–21, 2014 (http://www.epa.nsw.gov.au/wastestrategy/warr.htm)
- NSW Government: Waste Less Recycle More Initiative (http://www.epa.nsw.gov.au/wastestrategy/waste-less-recycle-more.htm)
- NSW Waste Less, Recycle More, Initiative, Community benchmark study, 2015 (see http://www.epa.nsw.gov.au/wastestrategy/waste-less-recycle-more.htm)
- NSW Draft Waste Less Recycle More Education Strategy, 2015 (http://www.epa.nsw.gov.au/wastestrategy/education.htm)
- NSW Waste Education Programs (http://www.epa.nsw.gov.au/wastestrategy/education-prog.htm)
- NSW Product Stewardship Schemes (http://www.epa.nsw.gov.au/wastestrategy/stewardship-schemes.htm)
- NSW Container Deposit scheme (http://www.epa.nsw.gov.au/waste/container-deposit-scheme.htm)
    - NSW Energy from Waste Policy Statement, 2014

(http://www.epa.nsw.gov.au/wastestrategy/energy-from-waste.htm)

Waste generation: - Blue Environment, 2016. Australian National Waste Report. Report prepared for the Department of Environment & Energy. - Australian Environment Protection and Heritage Council (EPHC), Waste Overview, 2009 • Australian Dept of Env & Energy Waste generation and resource recovery in Australia 2010-11 (http://www.environment.gov.au/protection/national-waste-policy/publications/waste-generation- and-resource-recovery-australia-report-and-data-workbooks) • NSW Waste data surveys (http://www.epa.nsw.gov.au/wastetools/surveys.htm) • NSW Local Government Waste and Resource Recovery Data Reports (https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/warr-strategy/policy-makers/surveys)
Waste minimisation and recycling: Nil
Waste storage, collection and transfer: Nil
Waste processing, resource and energy recovery: - NSW EPA Environmental Guidelines: Composting and Related Organics Processing Facilities (http://www.epa.nsw.gov.au/waste/organics-guidelines.htm
Landfill waste disposal: • NSW EPA Environmental Guidelines: Solid Waste Landfills, 2016 (http://www.epa.nsw.gov.au/waste/landfill-sites.htm) • EPA Victoria, Siting, design, operation and rehabilitation of landfills, 2015 (http://www.epa.vic.gov.au/business-and-industry/guidelines/landfills-guidance) • Townsend, Powell, Jain, Xu, Tolaymat, Reinhart. Sustainable Practices for Landfill Design and Operation, 2015

Submission of Assessment Tasks

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

UNSW has a standard late submission penalty of:

- 5% per day, for all assessments where a penalty applies, capped at five days (120 hours), after which a student cannot submit an assessment, and no permitted variation.

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

Final Examinations:

Final exams in T3 2022 will be held online between 25th November - 8th December 2022 inclusive, and supplementary exams between 9th - 13th January 2023 inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

ACADEMIC ADVICE

- Key Staff to Contact for Academic Advice (log in with your zID and password): https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw
- Key UNSW Dates - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.
- CVEN Student Intranet (log in with your zID and password): https://intranet.civeng.unsw.edu.au/student-intranet
- Student Life at CVEN, including Student Societies: https://www.unsw.edu.au/engineering/civil-and-environmental-engineering/student-life
- Special Consideration: https://student.unsw.edu.au/special-consideration
- General and Program-Specific Questions: The Nucleus: Student Hub
- Book an Academic Advising session: https://app.acuityscheduling.com/schedule.php?owner=19024765

Disclaimer

This course outline sets out 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 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 (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Mike Gal.

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	✓