

Module Code	CE7E04
Module Name	E4: Waste Management and Energy Recovery
ECTS Weighting¹	5 ECTS
Semester taught	Semester 1
Module Coordinator/s	Lecturer(s): Assoc. Prof. Liwen Xiao (Liwen.Xiao@tcd.ie)
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should have LO1. An understanding of the nature of solid waste and the conceptual approaches to solving the problems of its management. LO2. An understanding of the theories and technologies of energy recovery from solid waste. LO3. An understanding of the best available technologies for waste treatment. LO4. An understanding of legislations and regulations relevant to waste management. LO5. An understanding of the relationships between waste management, climate change, circular economy and sustainable development. LO6. The capacity to collect and analyse data for waste management. LO7. The capacity to develop sustainable waste treatment strategies for a region or city. Graduate Attributes: levels of attainment To act responsibly - Enhanced To think independently - Enhanced To develop continuously - Enhanced To communicate effectively - Enhanced
Module Content	This module will introduce (1) the definition of waste and approaches to the assessment, management and control of solid waste in its various forms, and (2) the theories and technologies of energy recovery from solid waste. • Solid waste: definitions and assessment, liquid, solid and gaseous. • Landfill/landspreading hydrology: processes and modelling.

- Thermal treatment: Incineration, pyrolysis, gasification.
- Contaminated land: investigation and remediation of contaminated soil and groundwater. Sampling and monitoring; legal issues; risk analysis.
- Energy recovery: heat, electricity and combustible gases recovery from organic waste.

Teaching and Learning Methods

Lectures, tutorials, coursework and field visit

Assessment Details²

Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Examination	3 hours written exam	LO1, LO2, LO3, LO4, LO5, LO6, LO7	70%	Week 16
Coursework 1	Tutorial	LO2, LO6	10%	Week 9
Coursework 2	Report and assignment	LO1, LO2, LO3, LO4, LO5, LO6, LO7	20%	Week 17

Reassessment Requirements

Contact Hours and Indicative Student Workload²

Contact hours:

27 hours of lectures (mixture of in-person and online), 3 hours of tutorials

Independent Study (preparation for course and review of materials):

30 hours; Researching journals; reading text books recommended in module booklist; reviewing lecture material and class notes

Independent Study (preparation for assessment, incl. completion of assessment):

	30 hours; literature review, research methods development, data collection and analysis, completion of end of semester essay;
Recommended Reading List	Text books include: Fetter, C.W. CONTAMINANT HYDROGEOLOGY, 1999, Prentice Hall La Grega, M.D., Buckingham, P.L., Evans, G.J., HAZARDOUS WASTE MANAGEMENT, 1994, McGraw-Hill Nathanail, C.P. and Bardos, R.P. RECLAMATION OF CONTAMINATED LAND, 2004, Wiley Tchobanoglous, G., Theisen, H., Vigil, S.A. INTEGRATED SOLID WASTE MANAGEMENT, 1993, McGraw-Hill Williams, P. WASTE TREATMENT AND DISPOSAL, 1997, Wiley
Module Pre-requisite	Chemistry and environmental engineering background
Module Co-requisite	
Module Website	
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No
Module Approval Date	
Approved by	
Academic Start Year	1 st September 2025
Academic Year of Date	2025/2026