



**UNIVERSITI TEKNOLOGI MARA**

**CMT666: AIR POLLUTION AND SOLID WASTE MANAGEMENT**

<b>Course Name (English)</b>	AIR POLLUTION AND SOLID WASTE MANAGEMENT <b>APPROVED</b>
<b>Course Code</b>	CMT666
<b>MQF Credit</b>	3
<b>Course Description</b>	The course deals with the identification of sources of air pollution, environmental impacts and the available treatment technologies. In solid waste management, the topics include types of solid wastes, their collection and transfer and the methods of disposal. The lectures also cover the definition of hazardous wastes, their generation, waste minimization and treatment technologies. The students will also have first-hand information via field visits and talks by professionals.
<b>Transferable Skills</b>	<ol style="list-style-type: none"> <li>1. Identify:the sources, effects of air pollution and methods of air quality control.</li> <li>2. Differentiate the composition of different types of municipal solid wastes, their environmental impacts and the technology of solid waste management.</li> <li>3. Characterize and classify hazardous wastes and to manage their disposal and treatment technology.</li> </ol>
<b>Teaching Methodologies</b>	Lectures, Field Trip, Directed Self-learning
<b>CLO</b>	<p>CLO1 Identify the sources, effects of air pollution and methods of air quality control</p> <p>CLO2 Identify the sources, effects of air pollution and methods of air quality control</p> <p>CLO3 Identify and characterise solid and hazardous wastes</p> <p>CLO4 Identify and describe the technology adopted for solid and hazardous waste management.</p> <p>CLO5 Describe the environmental impacts of hazardous wastes.</p>
<b>Pre-Requisite Courses</b>	No course recommendations
<b>Topics</b>	
<p><b>1. Air Pollution</b></p> <p>1.1) Natural and anthropogenic air pollutants and their sources. Some serious incidents of air pollution in history. Composition of atmosphere: temperature inversion</p> <p>1.2) Primary, secondary and criteria pollutants; mobile and stationary sources and the environmental effects of major air pollutants on human health, plants and materials.</p> <p>1.3) Concentration of air pollutants: ppm and ug/l: conversion</p> <p>1.4) Major air pollution problems: petrochemical smog; acid rain; greenhouse effect and global warming, ozone depletion.</p> <p>1.5) Indoor air pollution: pollutants, sources and health effects. Sick buildings and symptoms of indoor air pollution. Radon gas and reduction of its entry to buildings.</p>	
<p><b>2. Air Sampling</b></p> <p>2.1) Types of sampling: source, ambient and indoor.</p> <p>2.2) PMs samplers.</p> <p>2.3) Samplers of gases.</p>	
<p><b>3. Air Pollution Control</b></p> <p>3.1) Air quality standards.</p> <p>3.2) Emission controls for stationary sources.</p> <p>3.3) Particulates: gravity settlers, cyclones, wet scrubbers, electrostatic precipitators and fabric filters_</p> <p>3.4) gases: absorption, adsorption, incineration.</p> <p>3.5) Emission controls for mobile sources; catalytic converters and changes in fuels for internal combustion engines, zero emission vehicles</p>	

**4. Solid Waste**

- 4.1) Types of: refuse and trash; municipal and industrial.
- 4.2) Sources, quantities and composition of solid wastes
- 4.3) Impacts of solid wastes on public health and water resources.
- 4.4) Collection and transportation strategies: types of vehicles used, transfer Stations

**5. Solid waste processing before final disposal**

- 5.1) The advantages of solid waste processing before final disposal.
- 5.2) Methods of processing: incineration, shredding, pulverizing, baling, composting.
- 5.3) Differences between combustion, gasification and pyrolysis
- 5.4) Recycling of paper, glass, plastics and metals.
- 5.5) Refuse -derived fuel, calorific value and manufacturing process
- 5.6) Composting system; shredding and pulverising; digestion in open windrows. uses of compost and demand

**6. Ultimate disposal of solid waste**

- 6.1) Sanitary landfills: design, construction and operation.
- 6.2) Site selection and limitations.
- 6.3) leachate management

**7. Hazardous waste**

- 7.1) EPA definition of hazardous wastes and classification.
- 7.2) Potential risks and problems of hazardous wastes to humans and environment.
- 7.3) Waste sources and quantities.
- 7.4) Transportation of hazardous waste: various regulations to comply with, preparation of waste; collection and transfer station.
- 7.5) Definition of hazardous waste; types of wastes and their environmental effects
- 7.6) Sources and quantity worldwide in Malaysia
- 7.7) Thermal treatment: incinerators, wet-air oxidation, and fluidized bed Combustion.
- 7.8) Chemical treatment: neutralization, detoxification, precipitation and ion exchange.
- 7.9) Physical treatment: filtration, flocculation, sedimentation and centrifugation.
- 7.10) Biological treatment; in-situ treatment, offsite remediation, land farming, lagoon and bioreactor
- 7.11) Final disposal: secure landfill deep well injection
- 7.12) Waste minimization: EPA waste minimization assessment, waste minimisation audit.
- 7.13) Radioactive waste; types of environmental effects and management techniques. Reduction of internal and external radiation hazards.
- 7.14) E-waste; sources and environmental effects. Basel convention. Current management option. Consequences on developing countries

Assessment Breakdown	%
Continuous Assessment	50.00%
Final Assessment	50.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Assignment 1: Essay type questions involving topics covering CLO 1 .	4%	CLO1
	Assignment	Assignment 2: Essay type questions involving topics covering CLO 3.	4%	CLO3
	Assignment	Assignment 1: Essay type questions involving topics covering CLO 2.	4%	CLO2
	Assignment	Assignment 2: Essay type questions involving topics covering CLO 4.	4%	CLO4
	Assignment	Assignment 2: Essay type questions involving topics covering CLO 5.	4%	CLO5
	Test	Test 1: covering on topics involving CLO 1	5%	CLO1
	Test	Test 2: covering topics involving CLO 3	5%	CLO3
	Test	Test 1: covering topics involving CLO 2	5%	CLO2
	Test	Test 2: covering topics involving CLO 4	5%	CLO4
	Test	Test 3; covering topics involving CLO 5.	10%	CLO5

Reading List	Reference Book Resources	<ul style="list-style-type: none"> <li>Howard D. Peavy, Donald R. Rowe and 'George Tcfrobanoglous/ Environmental Engineering 1985, <i>Environmental Engineering</i>, MacGraw-Hill International Edltions,</li> <li>Mackenzie L. Davis and Davld A Cornwel , 1983, <i>Introduction to Environrnental Engineeing</i>, 3rd Ed., Mcgraw - Hill</li> <li>Jeny A. Nathanson,n P. E. 1997, <i>Basic Environmental Technology</i>, 2nd Ed., Prentice Hall</li> </ul>
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	