

Subject Description Form

Subject Code	ABCT4757
Subject Title	POLLUTION CONTROL AND ENVIRONMENTAL ANALYSIS
Credit Value	3
Level	4
Pre-requisite	Introduction to Chemical and Bioprocess Technology
Objectives	This subject is to enable students to be aware of the pollution problems associated with industrial pollution, and to understand the fundamental concepts and technologies of industrial pollution control and waste treatment.
Intended Learning Outcomes	<p>Upon the completion of this subject, students will be able to</p> <ol style="list-style-type: none"> a. recognize the sources and causes of pollution and assess the impact of the pollutants on deterioration of environmental quality; b. explain and analyze the functions of control devices for air pollutants and various unit operations for treating water as well as wastewater; c. deploy and apply the physical, chemical, biological principles and concepts of various unit processes for water and wastewater treatment; d. formulate and integrate processes to control air pollutants and to treat water and wastewater in order to meet the effluent discharge requirements; e. develop further the ability to work in a team on an environment-related project, to critically analyze information collected from the literature and the internet and draw appropriate conclusions, and to prepare and give oral presentations.
Subject Synopsis/ Indicative Syllabus	<p><u>Industrial Pollution and Society</u> Definition and classification of pollution and pollutants; impact of industrial pollution on deterioration of environmental quality; toxicity of chemical pollutants; environmental awareness and government regulations with emphasis on the Hong Kong situation.</p> <p><u>Air Pollution and Control</u> Air quality requirements, particulate and gaseous contaminants, sources and effects of air pollutants, air pollution problems. Control devices for particulate contaminants: gravitational settling chamber, cyclones, wet scrubber, fabric filters, and electrostatic precipitator. Control processes for gaseous contaminants: absorption, adsorption, condensation, and combustion.</p> <p><u>Water and Wastewater Analysis</u> Water quality requirements, sources of industrial water pollution, municipal wastewater, organic and inorganic pollutants. Analytical methods for the examination of water and wastewater. Physical, chemical and biological characterization of natural water and</p>

wastewater.

Water Pollution and Control
 Water and wastewater control processes. Primary, secondary and tertiary sewage treatment processes. Wastewater reclamation and reuse.
 Physical treatment processes: screening, sedimentation, filtration, membrane filtration, gas stripping.
 Chemical treatment processes: coagulation and flocculation, ion exchange, oxidation, precipitation, disinfection.
 Biological treatment processes: principles, activated sludge, removal of nitrogen and phosphorus, biofilm systems, sludge processing.

Teaching/Learning Methodology

Lectures will provide students with fundamental principle and concepts of pollution control and environmental analysis as well as guidance on further reading. Real-life examples and case studies will be used to illustrate the impact of industrial pollution and the application of technologies for protecting the environment.

Tutorials are designed to provide the forum for group discussion and problem-based learning on the subject materials. Problems and case studies will be provided to cultivate the skill of students to apply concepts and knowledge learned in class to control air pollutants and to treat water and wastewater in order to meet the effluent discharge requirements

Students will also be required to form teams to actively work together on a environment-related project, to critically analyze information collected from the literature and the internet and draw appropriate conclusions, and to prepare and present the project work and case studies.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	
1. Assignments/In-class problems/Class participation	10	√	√	√	√		
2. Group project	10	√	√	√	√	√	
3. Tests	20	√	√	√	√		
4. Examination	60	√	√	√	√		
Total	100 %						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:
 Since the comprehensive examination and tests will cover material from

	lectures, reading in the text, assignments, most of the intended subject learning outcomes will be assessed. Group project will be used to assess especially the last intended subject learning outcome.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	39 Hrs.
	▪ Tutorial and presentation	9 Hrs.
	Other student study effort:	
	▪ Reading, studying, preparing for class etc.	37 Hrs.
	▪ Assignments, project	32 Hrs.
	Total student study effort	117 Hrs.
Reading List and References	<ol style="list-style-type: none"> 1. Hammer, M. J. and Hammer J. R. <i>Water and Wastewater Technology</i>, 7th ed. Pearson/Prentice Hall, 2012. 2. Nevers, N. D. <i>Air Pollution Control Engineering</i>, 2nd ed. McGraw Hill, 2000. 3. <i>Standard Methods for the Examination of Water and Wastewater</i>, 22nd ed. American Public Health Assoc., American Water Works Assoc. and Water Pollution Control Fed., Washington, D.C., 2010. 4. Eckenfelder, Jr. W. W. <i>Industrial Water Pollution Control</i>, 3rd ed. McGraw Hill, 2000. 5. Manahan, S. E. <i>Environmental Chemistry</i>, 9th ed. CRC Press, 2010. 6. Environmental Protection Department. <i>Environment Hong Kong</i> (Current Editions). Hong Kong Government Publication. 	