SEE8220 Environmental Pollution: Theories, Measurement and Mitigation

Course Title:	Environmental Pollution: Theories, Measurement and Mitigation
Course Code:	SEE8220
Course Duration:	One semester
Credit Units:	3
Level:	R8
Medium of Instruction:	English
Prerequisites:	Nil
Precursors:	Nil
Equivalent Courses:	SEE5212 Environmental Pollution: Theories, Measurement and Mitigation
Exclusive Courses:	Nil

Course Aims

The course aims to provide students the fundamental theories of environmental pollution, including key aspects of the pollution of air, water and soils, with a particular focus on both indoor and outdoor air. Additionally it will examine the application of measurement techniques and how underlying theory and monitoring creates a firm basis creating policy. Holistic training, which includes the cultural context of pollution, will equip the students with knowledge of theories and their application to solve complicated environmental pollution issues innovatively and independently.

Course Intended Learning Outcomes (CILOs)

(state what the student is expected to be able to do at the end of the course according to a given standard of performance)

Upon successful completion of this course, students should be able to:

No.	CILOs	Weighting
1	Explain the nature of pollution of air, water and soils;	20%
2	Explain the drivers, principles and methods of environmental analysis;	15%
3	Explain some key methods and techniques for pollution measurement;	15%
4	Relate the theories and measured pollution data to the development of environmental regulations;	30%
5	Apply the different pollution measurement techniques and create the methodologies to analyze the data to solve the environmental problems independently and innovatively.	20%

Teaching and Learning Activities (TLAs)

(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

TLAs	Lectures	Tutorial	Total hours
CILO 1	8	4	12
CILO 2	3	2	5
CILO 3	3	1	4
CILO 4	8	4	12
CILO 5	4	2	6
Total hours	26	13	39

Assessment Tasks/Activities

(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO No.	Type of Assessment Tasks/Activities	Weighting (if applicable)	Remarks
CILO 1	Examination (25%); Class project (10%);		
CILO 2	Examination (5%); Class project (3%);		
CILO 3	Examination (5%); Class project (4%);		
CILO 4	Examination (25%). Class project (3%);		
CILO 5	Examination (10%). Class project (10%)		

Examination duration: 2 hours
Class project: 30%
Examination: 70%

Standard of Passing a Course

To pass a course a student must do ALL of the following:

1) obtain at least 30% of the total marks allocated towards coursework (combination of assignments, pop quizzes, term paper, lab reports and/ or quiz, if applicable);

2) obtain at least 30% of the total marks allocated towards final examination (if applicable); and,

3) meet the criteria listed in the section on Grading of Student Achievement

Grading of Student Achievement: Refer to Grading of Courses in the Academic Regulations (Attachment) and to the Explanatory Notes.

Grade A

The student completes all assessment tasks/activities and the work demonstrates excellent understanding of the scientific principles and the working mechanisms. He/she can thoroughly identify and explain how the principles are applied to science and technology for solving physics and engineering problems. The student's work shows strong evidence of original thinking, supported by a variety of properly documented information sources other than taught materials. He/she is able to communicate ideas effectively and persuasively via written texts and/or oral presentation.

Grade B

The student completes all assessment tasks/activities and can describe and explain the scientific principles. He/she provides a detailed evaluation of how the principles are applied to science and technology for solving physics and engineering problems. He/she demonstrates an ability to integrate taught concepts, analytical techniques and applications via clear oral and/or written communication.

Grade C

The student completes all assessment tasks/activities and can describe and explain some scientific principles. He/she provides simple but accurate evaluations of how the principles are applied to science and technology for solving physics and engineering problems. He/she can communicate ideas clearly in written texts and/or in oral presentations.

Grade D

The student completes all assessment tasks/activities but can only briefly describe some scientific principles. Only some of the analysis is appropriate to show how the principles are applied to science and technology for solving physics and engineering problems. He/she can communicate simple ideas in writing and/or orally.

Grade F

The student fails to complete all assessment tasks/activities and/or cannot accurately describe and explain the scientific principles. He/she fails to identify and explain how the principles are applied to science and technology for solving physics and engineering problems objectively or systematically. He/she is weak in communicating ideas and/or the student's work shows evidence of plagiarism.

Part III

Key syllabus elements:

1. Introduction to course, especially a discussion of the *Class Project* Notion on why we need measurement; policy making; pollution in relation to monitoring; key pollutants, primary/secondary issues; evaluation of pollutant impact e.g. World Cup 2022 in PRD!
2. Sources of air pollutants and natural sources, physical and chemical changes in gas and particulate phases, semi volatiles.
3. Gas measurements: Beer–Lambert law, NDIR technique for CO, CO2, CH4 measurements, trend from existing measurements, climate change and its impacts, the ozone hole…
4. Water pollution: weathering and water chemistry, carbonate equilibrium, nitrogen and phosphorus, acid rain…
5. Pollution of the oceans: seawater chemistry (ion pairing, activity coefficients), residence time and spatial variability, air-sea transfer, microlayer, oil pollution…
6. Soil pollution: clays, humic acid, degradation of organic materials, leachates and QSAR .
7. Ozone measurements and policy implications of secondary pollutants and air quality management.
8. Health impacts of pollution with a special focus on gases and particulate matter and its measurement.
9. Indoor pollution: sources and infiltration, effects, social issues…
10. Indicative methodology -extraction methods and offline chemical methods
11. Presenting results and communication of pollution issues to the public. Converting measurements to policy
12. Student presentations of *Class Project*
13. Revision

Recommended Reading:

Reference Book(s):

Julian E Andrews et al *An Introduction to Environmental Chemistry*, 2^{nd} Edition, Blackwell 2004, along with some readings from journal papers and the web.