SEE4202: ATMOSPHERIC CHEMISTRY

Effective Term
Semester A 2024/25

Part I Course Overview

Course Title
Atmospheric Chemistry

Subject Code
SEE - School of Energy and Environment
Course Number
4202

Academic Unit
School of Energy and Environment (E2)

College/School
School of Energy and Environment (E2)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
SEE2002 Chemical Sciences for Energy and Environmental Engineers

Precursors
BCH2004 OR CHEM2004 Principles of Analytical Chemistry; AND
SEE3203 Air Pollution

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The course is designed for the students who want to learn the atmospheric chemistry processes of inorganic and organic chemical species in the tropospheric atmosphere. After this course, the students should have a working knowledge of chemistry and some knowledge on some areas of current interest in environmental science.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Understand the structure and composition of stratosphere and troposphere and sources of trace components	20	x		
2	Understand the photochemical reactions of organic and inorganic compounds and discover the relation with atmospheric processes	30		x	
3	Understand the ozone formation and discover the impact on the environment	20	x	x	
4	Understand the acid deposition and aerosol chemistry and discover their impact on the environment	30		x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Student will go through the PowerPoint slides that are backed by reading/ references.	1, 2, 3, 4	2.15
2	Tutorials	Students will participate in in-class exercises and problem-solving activities to deepen their understanding and enhance their learning of the classroom topics.	1, 2, 3, 4	0.85

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	In-class test or quizzes	1, 2, 3	20	
2	Assignments	1, 2, 3	20	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Additional Information for ATs

Examination duration: 2 hrs
Percentage of continuous assessment, examination, etc.: 40% by continuous assessment; 60% by exam

To pass a course, a student must do ALL of the following:
1) obtain at least 30% of the total marks allocated towards continuous assessment (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 Assessment Rubrics.

Assessment Rubrics (AR)

Assessment Task

1. In-class test or quizzes

Criterion

Ability to analyse and solve problems related to atmospheric chemistry and its interface with air pollution

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

2. Assignments

Criterion

Assessing the ability to solving problems, but especially in imaginative ways of and expands on class materials.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
3. Examination

Criterion
Showing a depth of understanding of the chemistry, but also able to integrate the answer across the material from lectures and reading. Seeing the socio-political context of air pollution chemistry and understands the relevance of scientific discoveries about atmospheric chemistry to key scientific questions.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

a. The structure and composition of atmosphere, the stratosphere and troposphere;
b. Natural and anthropogenic sources of atmospheric gases;
c. The origin of air pollution problems and their control;
d. Atmospheric oxidants and radicals, their formation and relevant reactions;
e. Atmospheric fate of organic air pollutants compounds, sources, reactions and sinks;
f. Photochemistry of atmospheric inorganic compounds, NOx chemistry, secondary air pollutants;
g. Ozone formation in the stratosphere and troposphere;
h. Acid deposition and cloud formation
i. Aerosol chemistry and physics

Reading List

Compulsory Readings

	Title
1	Elements of this book will be mounted on CANVAS: Finlayson-Pitts, B.J. and Pitts, Jr. J.N. 2000, Chemistry of the Upper and Lower Atmosphere, Academic Press, San Diego, CA.
2	Elements of this book will be mounted on CANVAS: Brimblecombe, P. 1996 Air composition & chemistry, Cambridge University Press.

Additional Readings

	Title
1	Powerpoint listing of references to journal literature given in class if students need this
2	Mounted on CANVAS: ELECTIVE READINGS these are optional, but give the social, historical and literary context to the course