

# CA2169: ENVIRONMENTAL ENGINEERING

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## Effective Term

Semester A 2024/25

## Part I Course Overview

### Course Title

Environmental Engineering

### Subject Code

CA - Civil and Architectural Engineering

### Course Number

2169

### Academic Unit

Architecture and Civil Engineering (CA)

### College/School

College of Engineering (EG)

### Course Duration

One Semester

### Credit Units

3

### Level

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

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

The course provides the student with entry level knowledge on environmental engineering, with a focus on the basic concepts of material and energy balances, reactions and reactors, process and flow analysis, environmental risk analyses, water quality, air quality, fate and transport of contaminants, and basic chemical and biological aspects of pollution.

#### Course Intended Learning Outcomes (CILOs)

| CILOs |                                                                                                            | Weighting (if DEC-A1 app.) |  | DEC-A2 | DEC-A3 |
|-------|------------------------------------------------------------------------------------------------------------|----------------------------|--|--------|--------|
| 1     | Design simple unit for physical, chemical and biological treatment processes                               |                            |  | x      |        |
| 2     | Design simple solid waste management system                                                                |                            |  | x      |        |
| 3     | Explain the basic concepts of water quality and air quality                                                |                            |  | x      |        |
| 4     | Explain the fate and transport of contaminants, and the basic chemical and biological aspects of pollution |                            |  | 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    | Lecture   | <p>Students will gain an overview of environmental engineering, with examples relating to material and energy balances, reactions and reactors, process and flow analysis, environmental risk analyses, water quality, air quality, fate and transport of contaminants, and basic chemical and biological aspects of pollution.</p> <p>Students will learn to design simple unit for physical, chemical and biological treatment processes, and simple solid waste management system through in-class demonstrations on solving related environmental engineering problem examples.</p> <p>Students will engage in in-class exercises to practice what they learned, and receive immediate feedback from the lecturer to reinforce their learning.</p> | 1, 2, 3, 4 | 3                          |
| 2    | Readings  | Students will develop an in-depth understanding of the concepts and topics discussed through the readings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1, 2, 3, 4 |                            |
| 3    | Tutorials | Students will expand and consolidate their knowledge on topics by engaging with the lecture notes and readings to complete the tutorials                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1, 2, 3, 4 |                            |

**Assessment Tasks / Activities (ATs)**

| ATs |            | CILO No.   | Weighting (%) | Remarks (e.g. Parameter for GenAI use)                                                                                                                 |
|-----|------------|------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Quiz       | 1, 2, 3, 4 | 30            | Students will sit for one quiz to demonstrate their basic understanding and mastery of the subject matter                                              |
| 2   | Assignment | 1, 2, 3, 4 | 20            | Students will complete one assignment to demonstrate their more in-depth understanding and mastery of the subject matter with more difficult exercises |

**Continuous Assessment (%)**

50

**Examination (%)**

50

**Examination Duration (Hours)**

2

**Additional Information for ATs**

To pass a course, a student must obtain minimum marks of 30% in both coursework and examination components, and an overall mark of at least 40%

**Assessment Rubrics (AR)****Assessment Task**

Quiz

**Criterion**

ABILITY to SOLVE environmental engineering problems and CAPACITY to EXPLAIN key concepts and knowledge of the subject

**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**

Assignment

**Criterion**

ABILITY to INVESTIGATE and APPLY acquired skills for problems or topics related to environmental engineering

**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

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**Assessment Task**

Examination

**Criterion**

ABILITY to SOLVE environmental engineering problems and CAPACITY to EXPLAIN key concepts and knowledge of the subject

**Excellent (A+, A, A-)**

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## Part III Other Information

**Keyword Syllabus**

Material balance, energy balance, reaction kinetics, reactor design, process and flow analysis, environmental risk analyses, diffusion, dispersion, fate and transport of contaminants, aquatic chemistry, atmospheric chemistry.

**Reading List****Compulsory Readings**

| Title |     |
|-------|-----|
| 1     | Nil |

**Additional Readings**

| Title |                                                                                                             |
|-------|-------------------------------------------------------------------------------------------------------------|
| 1     | Masters and Ela, "Introduction to Environmental Engineering and Science", 3rd edition, Prentice Hall, 2008. |
| 2     | Riffat, “Fundamentals of Wastewater Treatment and Engineering” , 1st edition, CRC Press, 2012               |
| 3     | Davis, “Principles of Environmental Engineering and Science” , 3rd Edition, McGraw Hill, 2013               |