ENSC-202: ENVIRONMENTAL CHEMISTRY (THEORY) (02 Credit hrs)

PRE-REQUISITE: ENSC-105

LEARNING OUTCOMES

Upon successful completion of the course the student will be able to:

- Demonstrate knowledge of chemical and biochemical principles of fundamental environmental processes in air, water, and soil.
- Recognize different types of toxic substances & responses and analyze toxicological information.
- Apply basic chemical concepts to analyze chemical processes involved in different environmental problems (air, water & soil)

CONTENTS:

Unit-1: Chemistry of Troposphere

1.1. Toxic gases
1.2. Oxides of Carbon their sources and effect
1.3. Oxides of sulfur their sources and effect
1.4. Oxides of Nitrogen their sources and effect
1.5. Tropospheric ozone
1.6. Smog and its types
1.7. Sulfurous smog
1.8. Photochemical smog
1.9. Acid Rain and its impact on different ecosystems
1.10. Particulate Matter

Unit-II: Stratospheric chemistry

2.1. Introduction to stratosphere
2.2. Ozone layer and its chemical depletion
2.3. Polar stratospheric clouds and Polar vortex.

Unit-III: Green House Effect and Global warming

1.1. The Greenhouse Effect and Global Warming
1.2. Greenhouse gases,
1.3. Earth energy emission and greenhouse effect.
1.4. Chemical reactions
1.5. Atmospheric residence time.

Unit-IV: Chemistry of water bodies

4.1. Dissolved Oxygen
4.2. Biological oxygen Demand
4.3. Chemical Oxygen demand

Unit-V: Indoor Pollutants

5.1. Radon Gas
5.2. Volatile organic compounds
5.3. Tabaco smoke
5.4. Pesticides
5.5. Biological indoor pollutants

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Overway, K.S. (2017)**.** *Environmental Chemistry*. An Analytical approach. John Wiley and Sons.
2. Sonwani, S. and Shukla, A. (2021). *Air borne Particulate Matter, Source, Chemistry and Health.* Springer Singapore
3. Colin B. and Michael C. (2012). *Environmental Chemistry,* Fifth edition. W. H. Freeman & Company.
4. Stanley M. (2017). *Environmental Chemistry.* CRC Press
5. Bhatti, N.H., and Noreen, S. (2017). *Principles of Environmental Chemistry*. The Carwan Book House, Lahore

Further Reading: As suggested by the Instructor.

ENSC-202: ENVIRONMENTAL CHEMISTRY (PRACTICAL) (01 Credit hrs)

PRE-REQUISITE: ENSC-105

LEARNING OUTCOMES

Upon successful completion of the course the student will be able to:

- Demonstrate knowledge of chemical and biochemical principles of fundamental environmental processes in air, water, and soil.
- Recognize different types of toxic substances & responses and analyze toxicological information.
- Apply basic chemical concepts to analyze chemical processes involved in different environmental problems (air, water & soil)

CONTENTS

Unit-I:

1.1. Dissolved Oxygen
1.2. Chemical Oxygen Demand
1.3. Biological Oxygen Demand

Unit-II:

2.1. Total Dissolved Solids
2.2. Total Suspended Solids

Unit-III:

3.1. Conductivity measurements
3.2. pH measurements

Unit-IV:

4.1. PM estimation in air

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

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Further Reading: As suggested by the Instructor.