Course Overview

This **Environmental Soil and Water Chemistry Fundamentals Course** is designed to provide participants with a comprehensive understanding of the chemical processes involved in soil formation, water chemistry, and their interconnections with environmental management and agriculture. The course focuses on how soil and water chemistry directly influence crop fertility, agricultural productivity, and environmental sustainability. Participants will gain valuable knowledge about the hydrological cycle, soil chemistry principles, and methods for improving both soil and water quality.

By engaging in this course, participants will be equipped with the skills to apply soil and water chemistry concepts in their professional practices, especially in fields like environmental management, agriculture, and related industries.

Targeted Groups

This course is aimed at:

- **Petrochemical Engineers**
- **Chemical Engineers**
- **Plant Engineers**
- **Process Control Engineers**

Course Objectives

By the end of this course, participants will:

- Gain a deep understanding of chemical reactions in soil and environmental soil chemistry.
- Learn various soil testing methods and classifications in line with principles of soil chemistry.
- Develop strategies to enhance soil fertility for optimal crop production.
- Understand the influence of the hydrological cycle on human health and agriculture.

Targeted Competencies

Upon completion of the course, participants will be able to:

- Grasp the basics of soil chemistry, including atoms, elements, compounds, and chemical reactions.
- Develop methods for soil remediation.
- Distinguish between different soil fractions based on nature, size, and chemical activity.
- Understand the components of the water cycle and the chemistry of potable water.

Course Content

Unit 1: Principles of Soil Chemistry

This unit provides foundational knowledge of soil chemistry:

- Basic **chemical terms**, **elements**, **compounds**, and **bonds**.
- **Soil redox reactions** and their significance.
- Overview of **biogeochemistry** and **soil structure**.
- Examination of key **biogeochemical cycles**.
- **Mineralization** and **immobilization processes**.
- **Ammonium fixation dynamics** and **urea cycle** exploration.
- Mechanisms of **soil adsorption/desorption**.

Unit 2: Soil Chemical Processes

In this unit, participants will explore soil formation and chemical processes:

- **Soil formation factors** and the influence of weathering.
- Descriptions of soil profiles and classification.
- Classification of **British soils** and their significance.
- Study of **soil types** and their impact on plant growth.
- Physical and chemical properties of soil and how they relate to plant growth.

Unit 3: Soil-Chemical Testing

This unit introduces soil testing methods:

- Overview of **standard soil tests**.
- Exploration of other **soil cations** and their roles.
- Understanding the **Cation Exchange Capacity (CEC)** in soils.

Unit 4: Soil Chemistry – Applications in Agriculture

Participants will learn how soil chemistry is applied in agricultural practices:

- **Components of soil fertility** and their importance.
- Factors affecting **crop growth** in various farming environments.
- Strategies to enhance soil fertility for sustainable agricultural practices.

Unit 5: Soil Chemistry – Applications in Environmental Management

This unit covers the application of soil chemistry in environmental management:

- Identification of **soil pollutants** and their sources.
- Techniques for **soil remediation**.
- Assessment of the impact of both **inorganic** and **organic soil pollutants** on health and the environment.

Unit 6: Environmental Water Chemistry

This unit examines the chemical properties of water and their environmental impacts:

- Overview of **water's chemical and physical properties**.
- Analysis of the **hydrological cycle**.
- Evaluation of **water resources** and their impact on the environment.
- Understanding the concept of a **water footprint**.
- Study of **drought** and its long-term consequences.

Unit 7: Chemistry of Water Sources and Drinking Water

Participants will explore the chemistry of different water sources:

- Chemical composition of **seawater**, **groundwater**, and **surface water**.
- Principles and applications of **potable water chemistry**.

Unit 8: Water – Chemical Testing

In this unit, participants will learn water testing methods:

- Testing and interpreting **water pH levels**.
- Measuring **electrical conductivity** of water.
- Determining **total alkalinity** and **total hardness** in water.

By the end of this course, participants will have a well-rounded understanding of both soil and water chemistry and will be able to apply this knowledge in agricultural productivity, environmental management, and other related fields.