

Introduction

This comprehensive **Environmental Soil and Water Chemistry Course** provides participants with an in-depth understanding of how soils are formed and the intricate interactions between soil chemistry and agricultural productivity. The course covers fundamental principles in both **soil chemistry** and **environmental water chemistry**, highlighting their significance in crop fertility, environmental management, and human health protection.

Through detailed discussions and practical applications, this course equips participants with the knowledge to effectively integrate soil and water chemistry principles into their professional practices, whether in agriculture, environmental science, or related fields.

Target Audience

This course is suitable for:

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

Course Objectives

By the end of this course, participants will be able to:

- Understand chemical reactions in soil and the fundamentals of environmental soil chemistry.
- Explore various soil testing methods and classifications, in line with soil chemistry principles.
- Learn techniques for enhancing soil fertility to optimize crop production.
- Understand the influence of the hydrological cycle on human health and agriculture.

Targeted Competencies

By the completion of the course, participants will develop the following competencies:

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

Course Content Breakdown

Unit 1: Principles of Soil Chemistry

- Overview of chemistry fundamentals: chemical terms, elements, compounds, and bonds.
- Study of **soil redox reactions** and their significance.
- Introduction to **biogeochemistry** and **soil structure**.
- Examination of **biogeochemical cycles** and their role in soil processes.
- Understanding **mineralization** and **immobilization processes**.
- Ammonium fixation dynamics and the **urea cycle**.
- Study of **soil adsorption and desorption mechanisms**.

Unit 2: Soil Chemical Processes

- Detailed exploration of the **factors influencing soil formation**.
- Understanding **weathering processes** in soil formation.
- Overview of **soil profiles** and their classification.
- Study of **British soil classifications** and various **soil types** and their relationship to **plant growth**.
- Investigation of **physical and chemical properties of soil** and their impact on plant growth.

Unit 3: Soil-Chemical Testing

- Overview of **standard soil tests**.
- Exploration of various **soil cations** and their role in soil chemistry.
- Understanding **Cation Exchange Capacity (CEC)** in soils and its importance in nutrient availability.

Unit 4: Soil Chemistry - Applications in Agriculture

- Exploration of the **components of soil fertility**.
- Examination of the **factors affecting crop growth** in different farming environments.
- Strategies to **enhance soil fertility** for optimal agricultural productivity.

Unit 5: Soil Chemistry - Applications in Environmental Management

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

Unit 6: Environmental Water Chemistry

- Investigating the **chemical and physical properties of water**.

- Analysis of the **hydrological cycle** and its impact on water resources.
- Evaluation of water resources and their environmental implications.
- Study of the **water footprint** and its significance in resource management.
- Impact of **drought** on water resources and agriculture.

Unit 7: Chemistry of Water Sources and Drinking Water

- Chemical composition of different **water sources** including **seawater, groundwater, and surface water**.
- Principles and applications of **potable water chemistry**, including the processes involved in making water safe for consumption.

Unit 8: Water – Chemical Testing

- Techniques for **testing and interpreting water pH levels**.
- Measurement of electrical conductivity in water to determine its purity.
- Determining **total alkalinity** and **total hardness** in water sources.

Conclusion

This **Environmental Soil and Water Chemistry** course provides participants with a robust understanding of the chemical processes that govern both soil and water environments. It equips professionals with the skills to manage soil fertility, environmental contamination, and water resources effectively, ensuring that they can apply their knowledge in agricultural, industrial, and environmental management contexts.