

Course Name:
Environmental Geotechnics

Course Number:
20442

Credit:
3

Course Content (outline):

1. General

- 1.1 Natural vs Man-Made Hazards
- 1.2 What is Environmental Geotechnics?
- 1.3 Differences between Environmental Geotechnics and Other Civil Engineering Projects

2. Geotechnical Aspects of Soils and Rocks

- 2.1 Strength in Saturated and Unsaturated Conditions
- 2.2 Volume Change in Saturated and Unsaturated Conditions
- 2.3 Transport in Saturated and Unsaturated Conditions

3. Soil Contamination

- 3.1 Organic and Inorganic Soil Contaminants
- 3.2 Identification of Contaminated Soils
- 3.3 Physical Methods for Treatment of Contaminated Soils
- 3.4 Chemical Methods for Treatment of Contaminated Soils
- 3.5 Biological Methods for Treatment of Contaminated Soils

4. Groundwater Contamination

- 4.1 Types of Groundwater
- 4.2 Origins of Groundwater Contamination
- 4.3 Mechanisms of Contaminant Transport
- 4.4 Governing Equations for Water and Contaminant Transport
- 4.5 Mechanisms of Non-Aqueous Phase Liquid (NAPL) Contaminant Transport
- 4.6 Governing Equations for NAPL Transport in Groundwater
- 4.7 Groundwater Decontamination Methods

5. Municipal Solid Waste Disposal

- 5.1 Municipal Solid Waste Management
- 5.2 Different Types of Landfills
- 5.3 Site Selection for Landfills
- 5.4 Design of Landfill Liners Systems
- 5.5 Design of Leachate and Gas Collection Systems
- 5.6 Landfills Geotechnical Design Aspects
- 5.7 Construction of Operation of Landfills
- 5.8 Geotechnical Characteristics of Municipal Solid Wastes

6. Land Disposal of Industrial Wastes

- 6.1 Landfilling of Non-Hazardous Wastes
- 6.2 Landfilling of Hazardous Wastes
- 6.3 Disposal of Industrial Liquid Wastes in Injection Wells

7. Disposal of Mine Wastes

- 7.1 Disposal of Slurry Wastes in Tailings Dams
- 7.2 Tailings Dams Construction Methods
- 7.3 Analysis and Design of Tailing Dams
- 7.4 Disposal of Dry Wastes in Waste Dumps
- 7.5 Design of Waste Dumps
- 7.6 Acid Mine Drainage (AMD)
- 7.7 Techniques for Solving AMD Problem

8. Nuclear Waste

- 8.1 Low, Medium, and High Level Nuclear Wastes
- 8.2 Land Disposal of Low Level Wastes
- 8.3 Land Disposal of Medium Level Wastes
- 8.4 Land Disposal of High Level Wastes
- 8.5 Coupled Thermo-Hydro-Mechanical Problems in High Level Waste Disposal
- 8.6 Design and Construction of Repositories

References:

- Environmental Science and Engineering, Henry/Heinke, 1996, Prentice Hall

- Introduction to Environmental Geotechnology. Y. Fang, 1997, CRC press
- Geoenvironmental Engineering: Site Remediation, Waste containment and Emerging Waste Management Technologies, Sharma and Reddy, 2004, John Wiley
- Soil Mechanics for Unsaturated Soils, Fredlund & Rahradjo, 1993
- Designing with Geosynthetics, R.M. Koerner, 1994, Prentice Hall
- Contaminant Hydrogeology, C.W. Fetter, 1993, Maxwell Macmillan
- Geotechnical Aspects of Waste Disposal, David Daniel Ed, 1995, Chapman & Hall
- Design, Construction, and Monitoring of Landfills. A. Bagchi, 1994, John Wiley Interscience
- Integrated Solid Waste Management, Tchobanoglous, 1994, McGraw Hill
- Planning, Design, and Construction of Tailing Dams, S. G. Vick, 1983, John Wiley interscience
- Waste Containment Facilities, Daniel & Koerner, 1995, ASCE
- International Congress on Environmental Geotechnics (Proceedings)