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:
- Introduction to Environmental Geotechnology. Y. Fang, 1997, CRC press
- 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
- Waste Containment Facilities, Daniel & Koerner, 1995, ASCE
- International Congress on Environmental Geotechnics (Proceedings)