

Construction & Building Engineering Courses (CB)

Geotechnical Engineering Courses Group

CB 564 – Special Topics in Geotechnical Engineering

COURSE INFORMATION

Course Title: Special Topics in Geotechnical Engineering

Code: CB 564

Hours: Lecture – 2 Hrs. Tutorial – 2 Hrs. Credit –3.

Prerequisite: CB 463

GRADING

Class Performance/Attendance: 10%

Midterm # 1/Assignments – (7th Week): 30%

Midterm # 2/Assignments – (12th Week): 20%

Final Exam: 40%

COURSE DESCRIPTION

Foundations on problematic soils. Ground modification. Soil Improvement. Mat foundation. Unsaturated soil; stress, shear strength, water flow. Geoenvironmental fundamentals. Fate and transport of contaminants in the subsurface. Treatment and disposal methods of waste. Land disposal. Site remediation and subsurface characterization. Containment.

TEXT BOOK

Foundation Design & Construction by Tomlinson, M. Publisher Pearson Education, Inc., Pearson Prentice Hall, Upper Saddle River, NJ USA.

REFERENCE BOOKS

Foundation Design and Construction by TOMLINSON, M. J. and Boorman R., Publisher: Longman, London, 6th Ed 1995.

Geotechnical Engineering: Foundation Design by CERNICA, John N. Publisher: Wiley, 1995.

Piling Engineering by FLEMING, Weltman, Randolph and Elson, Publisher: Blackie, London, 1992.

Hazardous Waste Management by LaGREGA, M. D., Buckingham, P. L., and Evans, J. C Publisher: McGraw-Hill, New York, 1994.

Geotechnical Practice for Waste Disposal by DANIEL, D. E. ed., Publisher: Chapman and Hall, New York, NY, 1993.

Design, Construction and Monitoring of Sanitary Landfill by BAGCHI, A. Publisher: John Wiley, New York, NY, 1990.

Soil Mechanics for Unsaturated Soils by FREDLUND, D.G., and Rahardjo, H. Publisher: John Wiley, New York, NY, 1993.

COURSE AIM

The course aims at introducing the student to advanced practical topics in geotechnical engineering as well as to the fundamentals of geo-environmental engineering.

SPECIFIC OUTCOMES OF INSTRUCTION

- The student should be aware with geotechnical engineering related to design and construction problems.
- The student should be aware with the basics of geo-environmental engineering pertaining to hazardous waste treatment and disposal in the subsurface are also introduced to the student.

COURSE OUTLINE

- Week Number 1:* Soil reinforcement:
- Reinforced soil properties, elements of a reinforced earth system, design criteria, construction considerations, foundation with soil reinforcement
- Week Number 2:* Ground modification:
- Ground modification concept, need for improvement.
 - Mechanical and chemical techniques of soil stabilization
- Week Number 3:* Soil improvement:
- Vibro-floatation, sand drain, pre-compression.
 - Foundations on problematic subsurface soil conditions, foundation design precautions
- Week Number 4:* Mat foundations:
- Types and usage of mat foundations.
 - Classical design methods.
 - Numerical design method
- Week Number 5:* State of unsaturated soil:

- Suction and potential of soil water, suction regimes and soil-water characteristic curve, material variables
- Week Number 6:* State of stress in unsaturated soil:
 - Effective stress, hysteresis in soil-water characteristic curve, representation of stress tensor
- Week Number 7:* Shear strength of unsaturated soil:
 - Extended Mohr-Coulomb criterion, shear strength parameters.
 - Capillary cohesion in unsaturated soils, validity of effective stress as a state variable.
 - Effect of suction on lateral earth pressure
- Week Number 8:* Water flow in unsaturated soils:
 - Hydraulic conductivity function, steady infiltration and evaporation, measurement of hydraulic conductivity.
 - Suction and hydraulic conductivity models
- Week Number 9:* Transport of contaminants in the subsurface:
 - Contaminant release, contaminant transport, fate of contaminants in the subsurface
- Week Number 10-11:* Waste treatment methods:
 - Stabilization, solidification, mechanisms, technology, testing, field implementation, design.
 - Case studies.
- Week Number 12-13:* Land disposal of waste:
 - Landfill operations, site selection, liner collection systems, cover systems.
 - Contaminant transport through landfill barriers, landfill stability, closure and post-closure care
- Week Number 14:* Site remediation:
 - Site and subsurface characterization, methodology, planning.
 - Site characterization, geophysics, boring and sampling, monitoring wells.
 - Geographic information system
- Week Number 15:* Containment:
 - Passive contaminant control systems.
 - Ground water control technologies, active systems
- Week Number 16:* Final Exam.

COURSE COORDINATOR AND DEMAND

Course Coordinator: Dr.sameh Abu El Soud.

Course Demand: *Elective*