Department of Civil and Environmental Engineering
Course Description and Outline

CE 644 - Geology in Engineering **Spring 2017**
Dr. John Schuring

Prerequisites: Undergraduate courses in soil mechanics and geology or permission of instructor.

Course Objective:
Geology has a significant influence on how we plan, design, and construct engineering works. This course examines how the geologic formations underlying a locale will ultimately determine land use, control structure design, and affect construction material availability. Included is a study of the various rock-forming processes and geologic agents that have shaped Earth's surface. The course also explores the engineering impacts of natural geologic hazards including landslides, sinkholes, earthquakes, and subsiding soils. In addition, classic land forms will be analyzed on topographic maps to determine the engineering and environmental consequences. Case study applications and field trips are included.

Course Texts:
A: The principal text will consist of chapter sections of a draft book written by the instructor, which will be distributed periodically. In addition, the reference texts listed below are recommended for further study.
Reference Text:
B: Waltham, T., Foundations of Engineering Geology, 3rd Edition, Spon Press, New York, 2002 ISBN 0-415-25449-3.
Also, for general background on physical geology, consult any introductory text, such as: (1) Hamblin, W.K. & Christiansen, E.H., The Earth's Dynamic Systems, 10th Edition, Prentice Hall, 2001; (2) Hamblin and Howard, Exercises in Physical Geology , 12th Edition.

Course Format: Interpretative exercises will be given throughout the course requiring analysis both during class time and for homework. Students are to maintain a course notebook containing the completed exercises, as well as lecture notes and handouts.

***Honor Code:** Students are advised that the NJIT Honor Code will be upheld in this course, and any violations will be brought to the immediate attention of the Dean of Students.

Course Grading Basis: Assignments (A2, A3, A4, A6) = 30%; Midterm Quiz = 25%; Rock Collection (A1) = 15%; Reconn. Investigation (A5) = 20%; Class Participation = 10%.

Instructor Contact: Colton Hall, Room 225; Ph: 973-596-5849; Fax: 973-596-5790; schuring@njit.edu. Office hours: Mon. 4-5; Wed. 11-1; other hours by appointment.

Course Syllabus: *Please see next page.* Students will be consulted on any substantial changes to the course syllabus. Changes will be discussed and announced in advance.

Course Outline: CE 644

Date	*Lecture Topic*	*Assigned Reading*	*Studio Exercises*	*Assignments*	*Due*
Jan. 23	Role of Geology in Engineering; Historical Notes; The Environmental Dimension; Earth Structure and Processes; Geo Quiz	A: 1.1-1.4, 2.1 B: 1, 9	Geo Quiz	A1 - Rock Collection	
Jan 30	Minerals, the Building Blocks of Rock and Soil; Mineral Properties and Identification; Minerals with Engineering and Industrial Importance	A: 2.2-2.4 B: 2-5	S1 - Mineral Lab		
Feb. 6	Igneous Rocks and Processes; Volcanoes and Flows; Foundations on Rock	A: 3.1, 7.1, 9.3 B: 2, 6, 24, 25	S2 - Igneous Lab	A2 - Rock Engineering	
Feb. 13	Sedimentary Rocks and Processes; Foundations on Rock (*finish*); GW Bridge Case Analysis	A: 3.2, 9.3 B: 3, 4, 6, 40	S3 – Sedimentary Lab & Disp. Test		
Feb. 20	Metamorphic Rocks; Veins; Rock Cycle; Ores and Mining; Geologic Time and Dating	A: 3.3-3.5, 4.1-4.2 B: 5, 9	S4 - Metamorphic Lab	A3 – Stratigraphy and Relative Dating	A2
Feb. 27	Rock Identification; Rock as Construction Material; Rock Quarrying; Stratigraphy; Borehole Logging	A: 3.6, 4.4-4.5, 8.6, 9.4 B: 7, 8, 19, 21, 39	S5 - Borehole Correlation		
Mar. 6	**Midterm Geo Quiz**		Rock Cores		
Mar. 13	**No Class** (*Spring Break*)				

Mar. 20	Geologic Time Scale; Geologic History of New York Metro Area; Reconnaissance Investigations; Geobotanical Indicators; Depth to Groundwater	A: 4.3, 8.1-8.3, 8.8 B: 12, 18, 19, 20		A5 – Reconn. Investigation	A3
Mar 28	Seismicity and Earthquakes; Seismic Hazards; Seismic Building Codes; Liquefaction and Quick Clays	A: 10.2 B: 9, 10	S6 - Seismic Class Simulations	A4 - Seismicity	
Apr. 3	Topographic Map Interpretation; Engineering Geomorphology; Physiographic Provinces; Global Climate Change; Sea Level Rise; Residual vs. Transported Deposits; Saprolite	A: 5.1-5.6, 17 B: 13, 15, 16	S7 – Hackettstown Map Analysis	A6 – Engineering Physiography and Geomorphology	A5 (1 pg. sum-mary)
Apr. 10	Continental Glaciation; Glacial Deposits incl. Ground Moraine, Glaciofluvial, Glaciolacustrine; Special Foundations;	A: 18, 19, 20 B: 15, 16			A4
Apr. 17	Groundwater Occurrence and Movement; Carbonate Formations and Karst Areas; Sinkhole Hazards and Ordinances; Other Subsidence, incl. Loess, Mining, GW Withdrawal; Well Siting Case Study	A: 11.1, 11.7, 27 B: 23, 27-31			
Apr. 24	Structural Geology; Rock Masses and Rock Slope Evaluation; Slope Stability and Landslides; Problem Shales	A: 7.1-7.6; 28; 10.1 B: 6, 24, 25, 32-37	S8 - Geo. Compass; Strike and Dip		A6
May 1	**NO CLASS:** (Payback for Field Trip) Rock Collection Due (A1); Pickup graded homework.				A1
May 8	**Final Exam;** Reconnaissance Investigation (A5) Due				A5