

Department of Civil and Environmental Engineering

Course Description and Tentative Outline

Spring 2018

CE: 644 – Geology in Engineering

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***Format for Emails** – Always put “CE-644-102” in the subject line of the email.*

Office Hours: By appointment

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

Course Texts:

A. Gonzalles de Vallejo, Ferrer, and de Freitas, **Geological Engineering**, 1st Edition, ISBN 978-0415413527

B. Waltham, T., **Foundations of Engineering Geology**, 3rd Edition, Spon Press, New York, 2002
ISBN 0-415-25449-3

Optional Text for General Geology Background:

Hamblin, W.K. and Christiansen, E.H., **Dynamic Earth**, 1st Edition, Jones and Bartlett, 2014, ISBN-13: 9781449659844

In addition, hand-outs will be distributed.

Course Description: 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. Each student is required to assemble a personal rock collection as a capstone project. A self-guided field trip is required.

Course Format: Weekly lectures will be followed by “laboratory” exercises. The exercises will require analysis both during class time and for homework. Laboratory and homework assignments must be handed in at the beginning of the class. Assignments must be typed, however, hand sketches (as necessary) and calculations on engineering computation paper are encouraged/required. **Late assignments are not accepted.**

Term Assignment: All students are required to assemble their own collection of 10 rocks and minerals. In addition, a reconnaissance Necessary background information and knowledge for this assignment will be provided throughout the semester.

Course Grading Basis: Class Assignments = 20%; Midterm Quiz = 20%; Final Exam = 20%; Rock Collection = 15%; Reconnaissance Investigation = 15%; Class Participation & Attendance = 10%.

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.

Additional Policies:

- All work must be submitted in a professional manner. This means it should be in a neat, organized and orderly.
- Assignments must be typed and, if required, completed on an 8 1/2" x 11" engineering calculation paper, in a manner consistent with professional practice.
- Electronic versions of homework or projects will not be accepted.
- Please keep a copy of all your work until you have received a final grade (make a copy of your entire assignment, and file accordingly). Please save a copy of your homework BEFORE you submit to the instructor, since it may not be possible for the instructor to return the corrected homework back in time for you to study for quizzes/examinations.
- **ABSOLUTELY NO LATE SUBMISSIONS. All late assignments will incur a 50% reduction if handed same day, and 100% deduction thereafter.**
- No make-up examination will be administered.
- Switch off laptops/cellphones during quizzes/exams. Please bring a watch to keep time during examinations.
- No recording devices shall be used during class or examinations.

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

**CE 644 – Geology in Engineering
[Lecture Topic Schedule]**

Date	Lecture Topic	Assigned Reading Text (A)	Assigned Reading Text (B)	Assignment	Assignment Due Date
Jan. 18	Role of Geology in Engineering; Historical Notes; Environmental Dimension; Earth Structure & Processes	Chapter 1 (All)	Section 01	Assignment #1 - Rock Collection Assignment #5– Reconnaissance Investigation	
Jan. 25	Minerals: Building Blocks of Soil & Rock; Mineral properties and identification, formation, and industrial/engineering properties.	Chapter 2.7			
Feb. 1	Igneous Rocks: Intrusive/Extrusive, Processes & Structure; Volcanoes and Flows; Foundations on Rock		Section 02		
Feb. 8	Foundations on Rock (cont.) Sedimentary Rocks: Formation and processes; Clastic vs. Non Clastic	Chapter 8.4	Section 03, 04	Assignment #2 - Rock Engineering	
Feb. 15	Metamorphic Rocks: Formation, processes, veins, and the Rock cycle; Ores and Mining; Geologic Time Scale; Relative/Absolute Dating;		Section 05		
Feb. 22	Rock Identification and Rock ID Chart; Rock as Construction Material; Rock Quarrying; Stratigraphy; Site Investigations (rock coring, equipment, techniques);	Chapter 5.3-5.6	Section 21, 22	Assignment #3 - Stratigraphy & Relative Dating	
Mar. 1	MIDTERM EXAM				Assignment #2 – Rock Engineering
Mar. 8	ROCK FIELD TRIP – NO FORMAL CLASS				
Mar. 15	Spring Break – NO CLASS				
Mar. 22	Seismicity and Earthquakes; Seismic Hazards; Seismic Building Codes; Liquefaction and Quick Clays	Chapter 14 (All)	Section 09, 10		Assignment #3 – Stratigraphy & Rel. Dating
Mar. 29	Geologic Time Scale; Geologic History of the NY Metro Area; Reconnaissance Investigations; Geobotanical Indicators	Chapter 5.1, 5.2	Section 19, 20		
Apr.5	Topographic Map Interpretation; Geologic Maps; Engineering Geomorphology; Physiographic Provinces; Residual vs. Transported Deposits; Saprolite	Chapter 7 (All)	Section 07,08 Section 13	Assignment #4 - Engineering Physiography and Geomorphology	Assignment #1 – Rock Collection
Apr. 12	River Systems & Forms; Flood Zoning & Protection; Alluvial deposits and fans		Section 14		
Apr. 19	Continental & Alpine Glaciation; Glacial Deposits incl. Ground Moraines, Glacial Till, Glaciofluvial, and Glaciolacustrine Deposits; Global Climate Change; Sea Level Rise		Section 15		
Apr. 26	Groundwater and Wells; Engineering Geomorphology of Carbonate Formations and Karst Areas; Sinkhole Hazards; Depth to Groundwater	Chapter 4 (All)	Section 18		
May 3	Structural Geology; Rock Masses and Rock Slope Evaluation; Slope Stability and Landslides; Problematic Shales	Chapter 6, 9 (All)			Assignment #5 – Reconnaissance Investigation
May 10	FINAL EXAM				

