

Fall 2019

# CE 641-101: Engineering Properties of Soil

Jay Meegoda

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# Course Outline

CE 641 - Engineering Properties of Soils  
Section: 101

Fall 2019

**Text:** Mitchell and Soga, *Fundamentals of Soil Behavior*, 3<sup>rd</sup> edition, Wiley ISBN: 9780471463027  
Holtz, Kovacs, and Sheahan, *Introduction to Geotechnical Engineering*, 2nd Edition, Pearson, ISBN: 9780132496346

**Instructor:** Dr. Jay N. Meegoda, Ph.D, PE, 221 Colton Hall, 973-596-2464, Fax: 973-596-5790, Email: meegoda@njit.edu, homepage: <http://web.njit.edu/~meegoda>, Office Hours: W: 4:00 to 6:00 PM and any other time when I am in my office.

Honor Code: The NJIT honor code will be upheld. Violations will be brought immediately to the attention of Dean of Students.

Prerequisite: approved undergraduate course in soil mechanics within last five years. An in-depth study of physical and mechanical properties of soils. Topics include clay mineralogy, shear behavior and compressibility of fine and coarse grained soil; and in-situ measuring techniques such as vane shear, core penetration and pressure meter. Laboratory work includes consolidation test and triaxial test, with emphasis on analysis, interpretation and application of data to design problems.

“Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at [dos@njit.edu](mailto:dos@njit.edu)

Week	Topic	Mitchell and Soga Book Chapter
1	Soil Formation and Soil Mineralogy	2 and 3
2	Soil Composition and Soil Fabric	4 and 5
3	Granular Interactions	7 and 8
4-6	Soil-Water-Chemical Interactions	6
7	Soil Compaction and Field Applications	Notes
8	Midterm Examination	
9-10	Conduction Phenomenon and Field Applications	9
11-12	Volume Change Behavior and Field Applications	10
13-14	Shear Strength/Deformation and Field Applications	11
15	Final Exam	

## Course Objective

By the end of the semester the following learning objectives will be accomplished: Select appropriate laboratory and field methods for determining mechanical properties of coarse grained and fine grained soils interacting with the environment. Estimation or measurement of such based on laboratory and field tests and use of such in geotechnical designs.

## Policy

- *I will be communicating with you via email, so please make sure that you have NJIT email account.*
- Based on participants some changes may be made to the syllabus; this will be discussed and agreed upon in class. You will be responsible for such changes.

## Grading

- Please, carefully review the notes and example problems in your text book.
- You are encouraged to ask questions about homework problems in class, and discuss with classmates outside of class, post to a FORUM or email for class mates to comment and my response, but homework problems should not be done together.
- Home work is due at the beginning of the class following the completion of the topic. Late homework carries 50% penalty.
- Grading: Homework = 25%, Term Paper = 25%, Mid-term = 25%, Final = 25%

## A list of Useful References

1. Gao, S., **Meegoda, J. N.** and Hu, L., Microscopic Investigation of Air Sparging - Dynamic Two-phase Flow," Transport in Porous Media, Volume 96, Issue 1 (2013), Page 173-192
2. Pasha, Y. A., Aflaki E., Hu L., and **Meegoda J. N.**, "Effect of Soil Fabric on Transport of a LNAPL through Unsaturated Fine Grained Soils: A Centrifugal Model Study," Soil and Sediment Contamination an International Journal, Vol. 22# 1, pp. 223-240, 2013
3. Gao, S., **Meegoda, J. N.** and Hu, L., "Two Methods for Pore-Network of Porous Media". International Journal for Numerical and Analytical Methods in Geomechanics, Volume 36, Issue 18, 25 December 2012, Pages 1954-1970
4. Gao, S., **Meegoda, J. N.** and Hu, L., "Microscopic Modeling of Air Migration during Air Sparging," Journal of Hazardous, Toxic, and Radioactive Waste Management, Vol. 15#2, pp. 70-79, 2011
5. **Meegoda, J. N.**, and Ratnaweera, P., "Prediction of Effective Porosity of Contaminated Soils using Electrical Properties," Geotechnical Testing Journal, Vol. 31 #4, pp. 344-357, 2008.
6. Kamolpornwijit, W., **Meegoda, J. N.**, and Hu, Z., "Characterization of Chromite Ore Processing Residue," Journal of Hazardous, Toxic, and Radioactive Waste Management, Vol. 11#4, pp 234-239, 2007
7. **Meegoda, J. N.**, and Tantemsapya, N., "Microscopic Modeling of Colloidal Silica Stabilized Granular Contaminated Soils," Journal of Materials in Civil Engineering, Vol. 19 #1, pp 91-98, 2007
8. Ratnaweera, P., and **Meegoda, J. N.**, "Shear Strength and Stress-Strain Behavior of Contaminated Soils," Geotechnical Testing Journal, Volume 29 #2, pp. 141-148, 2006.
9. **Meegoda, J. N.**, Chen, B., Gunasekera, S. D. and Pederson, P., "Compaction Characteristics of Contaminated Soils-Reuse as a Road Base Material" Recycled Materials in Geotechnical Applications, Geotechnical Special Publication # 79, pp. 195-209, 1998.
10. Ratnaweera, P., and **Meegoda, J. N.**, "Treatment of Oil Contaminated Soils for Identification and Classification", Geotechnical Testing Journal, Vol. 18#1 pp. 41-49, 1995.

11. Ratnaweera, P. and **Meegoda, J. N.**, "Compressibility of Contaminated Clay Soils", Geotechnical Testing Journal, Vol. 17#1, March pp. 101-112, 1994.
12. **Meegoda, N. J.**, and Rajapakse, R. A. "Long-term and Short-term Hydraulic Conductivities of Contaminated Clays", Environmental Engineering Journal, Vol. 119#4, pp. 725-743, 1993.
13. **Meegoda, N. J.**, and Gunasekera, S. D., "A Method to Measure the Effective Porosity of Clays", Geotechnical Testing Journal, Vol. 15#4, pp. 340-351, 1992.
14. **Meegoda, N. J.**, King, Ian P., and Arulanandan, K. "An Expression for Permeability of Anisotropic Granular Media," International Journal for Numerical and Analytical Methods in Geomechanics, Vol. 13#6, pp 575-598, 1989
15. **Meegoda, N. J.**, Arulanandan, K., "Electrical Method of Predicting In- situ Stress State of Normally Consolidated Soils," Use of In-situ Tests in Geotechnical Engineering, Geotech. Special Publication #6, pp. 794-808, 1986
16. Shan, H. Y., and **Meegoda J. N.**, "Construction Use of Abandoned Soils," Journal of Hazardous Materials, Vol. 56#1-3, pp. 133-145, 1998
17. **Meegoda, J. N.** and Martin, L., In-Situ Specific Surface Area of Clays, , Geotechnical and Geological Engineering, <https://doi.org/10.1007/s10706-018-0623-7>