



FOUNDATION SYSTEMS AND EARTH-RETAINING STRUCTURES

Enrollment year	2017/2018
Academic year	2021/2022
Regulations	DM270
Academic discipline	ICAR/09 (CONSTRUCTION TECHNIQUES)
Department	DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE
Course	
Curriculum	PERCORSO COMUNE
Year of study	5°
Period	1st semester (27/09/2021 - 21/01/2022)
ECTS	3
Lesson hours	25 lesson hours
Language	Italian
Activity type	WRITTEN TEST
Teacher	GIOFFRE' DOMENICO - 6 ECTS
Prerequisites	Fundamentals of the courses of Soil Mechanics, Structural Design and Hydraulics.
Learning outcomes	The aim of the course is the application of the principles of geotechnical and structural engineering to the design and analysis of foundations and earth-retaining structures. The course will comprise lecturing hours dedicated to the illustration of the theoretical topics and hours of tutoring dedicated to problem-solving of foundations engineering and/or deepening some of the themes treated during the lectures.
Course contents	<p>First didactic module</p> <p>Review of general concepts of soil mechanics. Principle of effective stress, geostatic stresses. Normally-consolidated and overconsolidated soils. Drained and undrained stress-paths. Shear strength of coarse and fine-grained soils. Seepage and steady state flow in porous media. Darcy law. Hydrodynamic pressure and critical hydraulic gradient.</p>

Siphoning and assessment of safety conditions of an excavation. Shear strength and deformability parameters under drained and undrained conditions. Geotechnical characterization by means of field and laboratory testing.

Second didactic module

Shallow foundations. Typologies and classification of shallow foundations (plinths, strip foundations, plates and foundation grids). General design criteria. Bearing capacity of shallow foundations for coarse and fine-grained soils. Italian building code (D.M. 17/01/2018). Computation of settlements of shallow foundations for coarse and fine-grained soils. Deformations induced by the superstructure and related effects. Allowable limits of distortions. Structural assessment. Soil-structure interaction under static conditions (Winkler method). Soil/foundation/structure interaction.

Third didactic module

Deep foundations. Typologies and classification of piled-foundations. Drilled and bored piles. Bearing capacity of single pile subjected to axial loading (tip and shaft resistances). Negative skin friction. Settlements of deep foundations. Interaction and group effects under static conditions. Piles subjected to horizontal loading. Italian building code (D.M. 17/01/2018). Experimental loading tests.

Fourth didactic module.

Earth-retaining structures. Classification of earth-retaining structures. Review on the calculation of active and passive earth pressures according to classical Coulomb and Rankine theories. Influence of displacement and friction on the earth pressure regimes. Effects of hydrostatic water pressures and live loads. Drainage systems. Stability analysis under drained and undrained conditions. Static assessment of gravity earth-retaining structures. Flexible walls. Anchored and cantilever diaphragm walls. Simplified methods of analysis using the notion of "Equivalent beam". Rowe's theory. Italian building code (D.M. 17/01/2018).

Teaching methods

Lectures (hours/year in lecture theatre):36
Practical class (hours/year in lecture theatre): 18
Practicals / Workshops (hours/year in lecture theatre): 0

Reccomended or required readings

Lecture notes, scientific articles and other didactic material will be distributed during classes. The following monographs are recommended:

Lancellotta, R. and Calavera, J. (1999). Fondazioni. McGraw-Hill, 611 pp.

Viggiani, C. (1999). Fondazioni. Hevelius, 568 pp.

Nova, R. (2008). Meccanica delle Costruzioni Geotecniche. Edizioni Città Studi, 224 pp. (in Italian).

Salgado, R. (2006). The Engineering of Foundations. McGraw-Hill, 928 pp.

Reese, L. C., Isenhower, W.M., Wang, S.T. (2005). Analysis and Design of Shallow and Deep Foundations. Wiley, 608 pp.

Fleming, K., Weltman, A.J., Randolph, M.F., Elson, K. (2008). Piling Engineering. Vol. 1. Third Edit. Taylor & Francis, 392 pp.

Bowles, J.E. (2001). Foundation Analysis and Design. McGraw-Hill, 1175 pp.

Reese L.C., Van Impe, W.F. (2001). Single Piles and Pile Groups under Lateral Loading, Vol 1. . Taylor & Francis, 463 pp.

Fang, H.-Y. (1990). Foundation Engineering Handbook. Springer-Verlag, New York, Second Edit., 923 pp.

Viggiani C., Mandolini A., Russo G. (2012). Piles and Pile Foundations. Spon Press.

Clayton, C.R.I., Woods, R.I., Bond, A.J., Milititsky J. (2014). Earth Pressure and Earth-Retaining Structures, Third Edition. CRC-Press Taylor & Francis Group.

Assessment methods

Three assignments will be given during the course. They will contribute for about 40% of the final course grade.

The final examination consists of a three hour written assessment. The test will include both theoretical questions and solution of practical problems.

Further information

Lecture notes, scientific articles and other material are posted at the KIRO web site:

<https://elearning2.unipv.it/ingegneria/>

Sustainable development goals - Agenda 2030

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