Department of
GEOTECHNICAL ENGINEERING
School of Civil Engineering - NTUA

Menu

Search

Search

Announcements

More Announcements...

You are here -> **UNDERGRADUATE STUDIES**

UNDERGRADUATE STUDIES

The Geotechnical Department offers fourteen courses, thirteen at Engineering and one at the School of Mining and Metallurgical E the thirteen courses are required Civil Engineering courses: Geo (1st sem.), Soil Mechanics I (5th sem.) and II (6th sem.), Engine sem.) and Foundations (7th sem.). The remaining eight cours Experimental Soil Mechanics (7th and 9th sem.), Selected Topics in Foundation Engineering (8th sem.), Soil-Structure Interaction (8th sem.), Rock Mechanics (9th sem.), Soil Dynamics (9th sem.), Selected Geotechnical Projects (9th sem.), Environmental Geotechnics (9th sem.) and Computational Geotechnics (9th sem.). Students who elect the Geotechnical Engineer Specialization need to enrol in at least four of these eight courses, which are also open to the students who elect the other three Specializations (Hydraulics, Structural and Transportation Engineer).

The Geotechnical Engineer Specialization was approved by NTUA's Senate in June 2004 and started for the 7th and 8th semesters in the 2004-2005 academic year.

Department of
GEOTECHNICAL ENGINEERING
School of Civil Engineering - NTUA

Menu

Search

Search

Announcements

More Announcements...

You are here -> THE DEPARTMENT

THE GEOTECHNICAL GROUP

The goal of the Geotechnical Department is to advance educat n the topics of Soil Mechanics, Rock Mechanics, Founc , Engineering Geology and Geoenvironmental Engineering. M e subject areas covered by the Geotechnical Department include:

1. Subsurface investigations, laboratory studies of the mechan s and rocks under static and dynamic loading, in situ measurements of soil and rock parameters.

2. Ground water flow.

3. Modelling of the mechanical behavior of soils and rocks.

4. Engineering behavior of rock formations and geological strata.

5. Slope stability analysis. Stability and deformation analysis of retaining structures.

6. Design, analysis and construction of foundations of buildings, dams, roads, etc.

7. Dynamic behavior of soils, foundations and other geotechnical structures.

8. Soil-structure interaction under static and seismic loading conditions.

9. Seismic behavior of underground structures, quay walls, bridge piers.

10. Analytical and numerical methods for the solution of problems in soil mechanics, foundation engineering and soil dynamics.

11. Analysis of geotechnical failures, with emphasis on earthquake-induced failures.

12. Protection and restoration of the geoenvironment.

13. Engineering geology and hydrogeology in karst environments.

14. Geotechnical description and behavior of unstable masses as applied to tunneling and dam construction.

Due to the multidisciplinarity of the subject matter, education and research in the Geotechnical Department is closely related to the other Departments in the Civil Engineering School.

The Department includes 10 faculty members, 8 instructors and 5 staff members providing administrative and laboratory support. The Department houses two Laboratories, the Soil Mechanics Laboratory and the Foundation Engineering Laboratory. The Department is administered through the General Assembly of its faculty members and the Department Head who is elected yearly.

In brief, the activities of the department can be described as educational (instruction, supervising of diploma theses, Master's theses and doctoral

dissertations), research-related (management of funded research projects) and scientific-professional (organizing seminars and conferences, collaborating with universities and research institutes from abroad) with the purpose of further advancing instruction and research in the broader area of Geotechnical Engineering.

Department of
GEOTECHNICAL ENGINEERING
School of Civil Engineering - NTUA

Menu

Search

Search

Announcements

More Announcements...

You are here -> COURSES:UNDERGRADUATE

Geology for Engineers (1st semester – School of Civ

Geology and civil engineering, geodynamics and structural geol mineralogy and petrography, geomorphology, principles of engir geological formations, geological hazards. Earthquakes, landslic subsidence, geological aspects of construction materials, princi hydrogeology.

Instructors: P. Marinos, G. Tsiambaos

Soil Mechanics I (5th semester– School of Civil Engineering)

Introduction, applications of soil mechanics in civil engineering. The nature of soil, types of soil, density, water content, Atterberg limits, subsurface soil investigation. Stresses and strains in soil elements, description of the stress state at a point with the Mohr circle, total and effective stresses, the "effective stress principle", geostatic stresses and stress changes due to externally applied loads (under plane strain and axisymmetric conditions). Phenomenological and microscopic description of soil deformation mechanisms. The triple role of the fluid phase. Stress-strain relationships under different loading conditions: one-dimensional compression, cylindrical (tri-axial) compression, simple shear, torsion. Shear strength of a soil element, Mohr-Coulomb failure criterion. Undrained loading: excess pore pressure, stress-strain relations under various loading conditions, undrained shear strength of soils.
Laboratory: Demonstration of common soil mechanics tests used to determine physical and mechanical properties.

Instructors: G. Bouckovalas, M. Kavvadas, V.N. Georgiannou,N. Gerolymos

---

Soil Mechanics II (6th semester– School of Civil Engineering)

Application of elastic continuum theory: stresses and strains in soil masses under external loading. Plane-strain and axis-symmetric loading. The St. Venant principle. Horizontal earth pressures under different loading conditions. Rankine and Coulomb methods. Gravity retaining walls. The role of elastic deformations. Retaining structures of the Athens metro stations. Limit equilibrium methods in soil mechanics. Slope stability under drained and undrained conditions. Ultimate load of foundation (bearing capacity). Ground water flow in one dimension. Evolution in time of excess pore water pressures and consolidation of a clay layer due to vertical external loading . Seismic Liquefaction.

Instructors: G. Gazetas, I. Protonotarios, V.N. Georgiannou,N. Gerolymos

---

Engineering Geology (6th semester– School of Civil Engineering)

Engineering geology in the field of geotechnical engineering. Engineering behaviour of rock and rock masses, rock mass description. Site investigation, presentation of data and geological information processing. Geology and engineering structures, rock excavations and slopes, foundation on rocks, dams, tunnels and underground construction. Selected subjects of ground-water hydrology. Engineering description and case histories from Greek geology. Selected topics in environmental geology.

Instructors: **P. Marinos, G. Tsiambaos**

Foundations (7th semester– School of Civil Engineering)

Factors affecting foundation design. Bearing capacity of shallow foundations. Principles of settlement design. Settlement of shallow foundations on cohesive and cohesionless soils. Allowable settlements of structures. In-situ tests for the design of shallow foundations. Contact pressures. Design of shallow foundations, spread footings, combined footings, beams on elastic foundations, raft foundations. Piled foundations, construction methods. Bearing capacity of piles into cohesive and cohesionless soils. Settlement of piles. Design of piles with the help of in-situ tests. Group of piles. Piles under horizontal loads. Selection of foundation type.

Instructors: **V. Papadopoulos, M. Kavvadas**

Experimental Soil Mechanics (7th and 9th semesters – School of Civil Engineering)

The course covers laboratory methods commonly used to determine the soil parameters that govern its engineering behaviour. The major soil mechanics tests are carried out by the students themselves in the laboratory. Tests include: classification of soils based on their grain-size distribution and characteristics (e, w%, γ_s, γ_d, LL, PL). Measurement of hydraulic conductivity using constant head and falling head permeameters. Measurement of the parameters needed for consolidation settlement calculations (E_s, c_c, c_s, c_v) using the oedometer.

Determining shear strength parameters of cohensionless soils using the direct shear strength apparatus. Drained and undrained triaxial tests and data interpretation.

Instructor: **V.N. Georgiannou**

Soil-Structure Interaction (8th semester– School of Civil Engineering)

Concepts and modelling methods. Surface foundation under static and seismic loading: soil-foundation-structure interaction. Transverse loading of piles and pile groups: analysis of deformations and ultimate capacity. Flexible ground retaining systems: analysis of stress and deformations using Winkler-type spring models or continuum mechanics models. Analysis of underground structures (tunnels, cut & covers, shafts) due to ground-induced loads. Note: Some of the above cases will be studied each year.

Instructors: G. Gazetas, M. Kavvadas

Elements of Soil Mechanics and Foundations (8th semester – School of Mining and Metallurgical Engineering)

Soil origin, soil characteristics: structure, grain-size distribution, Atterberg limits, soil classification, the concept of effective stress, elements of groundwater flow, soil stress distribution under hydrostatic conditions and groundwater flow, consolidation-settlements. Shear strength: failure criteria, determining shear strength parameters in the lab. Slope stability.

Instructor: V. Papadopoulos

Selected Topics in Foundation Engineering (8th semester– School of Civil Engineering)

Flexible retaining walls and anchors. General overview. Review of theories for earth pressures for cohesive and cohesionless soil. Self-supported walls (without anchors). Flexible walls with single or multiple anchors. Construction and design methods for anchors. In-situ testing in Geotechnical Engineering. General review of available testing methods. Performance. Interpretation and application of three basic in-situ tests: Standard Penetration (SPT), Cone Penetration (CPT) and Pressuremeter Test (PT). Soil improvement and reinforcement. General review of available methods. Soil improvement by preloading. Use of drains to accelerate excess pore pressure dissipation and reduce preloading time. Soil reinforcement using gravel piles.

Instructor: G. Bouckovalas

Rock Mechanics (9th semester– School of Civil Engineering)

Elements of Rock Mechanics: Discontinuity properties and their effect on rock mass behaviour, rock mass classification, in-situ stresses, models of mechanical behaviour, physical properties and mechanical parameters, strength criteria in-situ tests, stability of rock slopes. Elements of the tunnelling theory: Elastic stress distribution (deep and shallow openings), zone of influence of excavations, vertical and lateral pressures on linings. Design of rigid and flexible linings, rock mass reinforcement and support during excavation.

Instructor: V. Papadopoulos

Soil Dynamics (9th semester– School of Civil Engineering)

Introduction : problems and significance of soil dynamics. Dynamics of simple elastic structures. Concept and applications of response spectrum. Seismic sliding of rigid block supported on frictional surface. Seismic Overturning of rigid body. Soil behaviour under dynamic and cyclic loading. Liquefaction of saturated granular soils. Measurements of soil parameters in the laboratory and in situ.

One-dimensional wave propagation, reflection and refraction, propagating and stationary waves. The viscous-damping analogue. Resonance. Seismic wave propagation through soil deposits (“soil amplification” of seismic motion). Analysis of case studies on the role of soil conditions (Mexico, Kalamata, Pyrgos, Northridge, Kobe, Aegion). Two–dimensional wave propagation, surface waves. Vibrations of surface and embedded foundations. Seismic response of piles. Applications of soil dynamics in recent projects in Greece.

Instructors: **G. Gazetas, G. Bouckovalas, I. Protonotarios,N. Gerolymos**

Environmental Geotechnics (9th semester– School of Civil Engineering)

The overarching goal of the course is to develop environmental thinking related to (1) assessing the severity of a contaminant release in the subsurface, (2) recognizing the physical-chemical-biological mechanisms that affect the fate and transport of the released contaminant and, (3) selecting appropriate remedial measures and/or technologies. Course objectives are met if at the end of the semester students (a) can locate reliable data on the effects of contaminants on human health, (b) are confident in applying principles of mass transfer, groundwater flow and contaminant transport to problems of contamination and restoration of the subsurface, (c) are able to address the geoenvironmental aspects of landfill and clay barrier design, (d) are familiar with a wide range of remediation technologies, (e) are able to take initiatives related to modeling (i.e., related to the formulation of a simplified problem that admits solution) and, (f) are aware of some social or public policy dimensions of subsurface contamination and restoration problems.
Course contents include the following. Cases of restoration of contaminated sites. Legislation. Sources and characteristics of contaminants. Risk assessment. Groundwater flow. Soil-contaminant interaction. Mechanisms affecting the fate of contaminants, contaminant transport, applications (practice in the use of an educational software in the School’s PC lab). Landfill liner design and materials. Remediation technologies for contaminated sites.

Instructor: **M. Pantazidou**

Selected Geotechnical Projects (9th semester– School of Civil Engineering)

Geotechnics of embankment and gravity dams: engineering geology, design and construction issues. Use of explosives in civil engineering construction. Tunnels: development of wall convergence during excavation, principles of the New Austrian Tunnelling Method (NATM), design of temporary support and final lining. Deep cuts and slopes in rock: mechanisms of instability, methods for improving stability, analysis and construction issues.

Instructors: **P. Marinos, M. Kavvadas, V. Papadopoulos**

Computational Geotechnics (9th semester– School of Civil Engineering)

Continuum Mechanics in Computational Geotechnics (theory of elasticity, failure criteria). Common constitutive models for non-linear soil behaviour. Simple numerical methods: slope stability analysis with the method of slices. Introduction to the Finite Difference and the Finite Element methods for the solution of boundary value problems in geotechnics. Application of the Finite Element method in

engineering practice: simulation of laboratory tests, bearing capacity and settlement of foundations, groundwater flow, deep excavations and retaining structures, static soil-structure interaction. Case studies.

Instructor: **N. Gerolymos**
