Geotechnical Engineering

Geotechnical Engineering Certificate

The Geotechnical Engineering certificate provides a strong foundation and detailed technical program in the design and construction of geotechnical structures such as foundations, retaining walls, and dams as well as design of environmental remediations. This is a 12-credit certificate. Students may pursue classes from geotechnical or a geo-environmental focus areas.

Who would be suited to take this program?

Students and professionals interested in the areas of Geotechnical and Geo-environmental Engineering. Graduates of the program will be well positioned to understand and design a variety of geotechnical structures and environmental remediations.

What are the prerequisites?

Applicants should have a bachelor's degree from an accredited institution
in either Civil Engineering, Civil Technology, Mechanical Engineering or bachelor's degree in Mathematics, Physics with
relevant experience and appropriate prerequisites. NJIT's standard admission requirements apply to this graduate certificate.

What will I learn?

This program prepares individuals to apply geotechnical engineering principles , which deal with the analysis, design, inspection, and construction of earth and earth supported structures, to the application of environmental problems, such as waste containment, waste disposal, construction of landfills, soil permeation, soil analysis, and soil improvement. Includes instruction in soil mechanics, soil dynamics, soil behavior, waste management and containment systems, geosynthetics, geochemistry, earth structures, geo-environmental engineering, geotechnical engineering, earthquake engineering, foundation engineering and tunneling.

Why Study Geotechnical Engineering at NJIT?

NJIT is situated in Newark, minutes from Newark Penn Station. Jersey City and New York City are also a short train ride away, providing easy access to these commercial areas with many companies that employ Geotechnical and Environmental Engineers. NJIT is a top 100 university, classified as R1 very high research activity, with faculty performing cutting-edge research and publishing in top venues. NJIT also consistently ranks highly on added-value and diversity.

Into what industries might holders of this program find employment?

Modern industries need the kind of information that comes from trained individuals who can analyze, design, manage and/or inspect the construction of geotechnical infrastructure. Positions in the industry include:

- Geotechnical Engineer
- Environmental Engineer
- Forensic Engineer
- Project Engineer
- Project Manager
- Construction Manager

Related Degree Programs

Credits from this graduate certificate can be applied toward the NJIT MS in Civil Engineering (Geotechnical or Geo-Environmental Concentration) degree.

COURSE DESCRIPTIONS

CE 638. Nondestructive Testing Methods in Civil Engineering, 3 credits.

Familiarizes the civil engineering student with nondestructive testing (NDT) techniques currently employed for evaluation and condition monitoring of civil structures and construction materials. Major emphasis in the application of NDT methodologies to steel, concrete, and timber as the construction material. Covers theories, principles, and testing methodologies associated with individual technologies from specific material point of view. Discusses advantages and limitations pertaining to the application of individual NDT technologies to construction materials.

CE 641. Engineering Properties of Soils, 3 credits.

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.

CE 642. Foundation Engineering, 3 credits.

Prerequisites: approved undergraduate courses in soil mechanics and foundation engineering. The salient aspects of shallow foundation design such as bearing capacity and settlement analyses. Topics are relevant to the deep foundation, selection of the type and the determination of load bearing capacity from soil properties, load tests, and driving characteristics utilizing wave equation analyses. Earth pressure theory and retaining wall design.

CE 643. Advanced Foundation Engineering, 3 credits.

Prerequisites: Approved undergraduate or graduate course in foundation designs within the last five years is required. Lateral and earth pressure computations for the design of retaining walls, bulkheads, cellular cofferdams, and sheet piles. Also considers the design of internal bracing systems and anchors, soil nailing and reinforced earth. Slope stability of embankments and dams.

CE 646. Geosynthetics & Soil Imp, 3 credits.

Prerequisite: CE 341 (see undergraduate catalog for description). Includes engineering properties of geosynthetics and their application in civil engineering, such as filtration, seepage, and erosion control; subgrade and slope stabilization. Soil improvement topics include preloading, electrokinetic stabilization, soil modification, admixtures and grouting.

CE 647. Geotechnical Aspects of Solid Waste, 3 credits.

Prerequisites: CE 341, CE 341A or equivalents (see undergraduate catalog for descriptions). Geotechnical aspects of solid waste such as municipal landfill, dredged materials, coal and incinerator ashes, identification and classification of waste materials, geological criteria for siting, laboratory and field testing, design for impoundment and isolation of waste, methods of stability analyses of landfill sites, techniques for stabilizing waste sites, leachate and gas collection and venting systems. Primary emphasis is on municipal wastes.

CE 648. Flow Through Soils, 3 credits.

Prerequisites: Approved undergraduate or graduate course in soil mechanics within the last five years is required. Explains the fundamentals of fluid flow through saturated and unsaturated soils and the use of computer programs for the solution of boundary value fluid flow problems in soils. The first two-thirds of the course are devoted to flow through saturated soils. The topics are mathematical description of flow through soils, solutions for steady state and transient state fluid flow and geotechnical applications. The last one-third is devoted to flow through unsaturated soils. Topics include steady state of transient state fluid flow and a presentation of how these concepts are applied to geo-environmental problems.

CE 742. Geotechnology of Earthquake Engineering, 3 credits.

Prerequisite: CE 641 (http://catalog.njit.edufile://search/%3fP=CE%20641/). Explains the fundamentals of propagation of the earthquakes through soils to supporting structures and the use of computer programs in the solution of boundary value problems in soils. The first half is devoted to synthesis of earthquakes, mathematical formulation of the problem, measurement of applicable soil parameters, use of computer programs to solve 1-D wave propagation problems in soils with structures. The second half is devoted to soil liquefaction, soil-structure interaction, and design of machine foundations.

ENE 660. Introduction to Solid and Hazardous Waste Problems, 3 credits.

Prerequisite: ENE 663. (May be taken concurrently.) Introduction to solid waste disposal. Industrial and urban sources of solid waste and conventional methods of waste disposal. Application of engineering principles related to these topics.

ENE 662. Site Remediation, 3 credits.

Prerequisite: EM 631. Can be taken concurrently with EM 631. Examines site remediation from start to finish. Includes regulations, cleanup standards, remedial investigations, feasibility studies, risk assessment, and safety. Examines established and innovative cleanup technologies such as incineration, containment, bioremediation, vapor extraction and ground water recovery.

ENE 671. Environmental Impact Analysis, 3 credits.

Prerequisite or corequisite: ENE 663. A graduate course dealing with physical aspects of the environment. Overview of environmental problems, federal and state standards, methodology for developing impact statements, case studies based on recent experience, basis for assessment and decision making.

What are the Required Courses?

Code	Title	Credits
Geotechnical Core - Select one from the following:		3
CE 641	Engineering Properties of Soils	

CE 644	Geology in Engineering
CE 645	Rock Mechanics

Students select one of the following two options.

Code	Title	Credits
Option 1: Geotechnical Option- Select three from the following:		9
CE 642	Foundation Engineering	
CE 643	Advanced Foundation Engineering	
CE 646	Geosynthetics & Soil Imp	
CE 648	Flow Through Soils	
CE 742	Geotechnology of Earthquake Engineering	
CE 638	Nondestructive Testing Methods in Civil Engineering	

Code	Title	Credits
Option 2: Geo-environmental Option- Select three from the following:		9
CE 646	Geosynthetics & Soil Imp	
CE 648	Flow Through Soils	
CE 647	Geotechnical Aspects of Solid Waste	
ENE 662	Site Remediation	
ENE 671	Environmental Impact Analysis	
ENE 660	Introduction to Solid and Hazardous Waste Problems	