Course Number and Title: CET 236 Soils

Campus Location:
Georgetown, Stanton

Effective Date:
2022-52

Prerequisite:
ENG 102, (MAT 183 or higher), (CET 135 or ENV 190)

Co-Requisites:
none

Course Credits and Hours:
3.00 credits
2.00 lecture hours/week
2.00 lab hours/week

Course Description:
This course examines the principles of soils engineering, including the study of physical and mechanical properties of soils, design considerations, construction applications, and the transport of water and pollutants. Emphasis is placed on field conditions and problems that are encountered on the construction job sites and how they are resolved.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
None

Schedule Type:
Classroom Course
Video Conferencing
Web Conferencing
Hybrid Course
Online Course
Hyflex

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Explain the composition of soil and related terminology. (CCC 1, 2, 3, 4, 6; PGC: CET 1, 2, 5; SET 1, 6; EET 1, 5)
2. Classify the different types and how the soil is structured. (CCC 1, 2, 3, 4, 6; PGC: CET 1, 5; SET 1, 4, 6; EET 1, 4, 5)
3. List the properties of soils, and complete classification tests. (CCC 1, 2, 3, 4, 6; PGC: CET 1, 2, 5; SET 1, 2, 6; EET 1, 2, 6)
4. Explain the engineering properties and behavior of soil deposits through analysis and review of soil engineering property data. (CCC 1, 2, 3, 4, 6; PGC: CET 1, 4, 5; SET 1, 6; EET 1, 2, 4, 6)
5. Apply soil mechanics theories. (CCC 1, 2, 3, 4, 6; PGC: CET 1, 3, 5; SET 1, 6; EET 1)
6. Determine optimal construction practices in the field relative to soil and foundation construction. (CCC 1, 2, 3, 4, 6; PGC: CET 1, 3, 5; SET 1, 6; EET 1)
7. Explain the relationship between hydrology and soils. (CCC 1, 2, 3, 4, 6: PGC: CET 1, 5; SET 1, 6; EET 1, 5)
8. Demonstrate professional and ethical conduct, as expected in industry. (CCC 1, 2, 3, 4, 6; PGC: CET 1, 5; SET 1, 6; EET 3, 6)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Explain the composition of soil, and define the related terminology.
    1. Explain basic geology as it relates to soil and rock.
    2. Explain the relationships between geology and engineering
    3. List the branches of engineering that use geology in their practice.
    4. Explain soil forming factors and their effect on soil development
    5. Explain the biochemical processes involved in soil formation.
2. Classify the different types and how the soil is structured.
    1. List the major soil types.
    2. List and explain the properties of the major soil horizons.
    3. Explain the unsaturated zone, capillary zone, water table, and saturated zone.
    4. Interpret shapes and sizes of particles to help determine soil types.
    5. Explain the relationship of clay and water and the chemical composition of clays.
    6. Explain the basic soil structure, and explain how it relates to soil groupings and types.
3. List the properties of soils, and complete classification tests.
    1. Explain the indexing properties of soils and how they relate to type and condition of soil, strength, and the compressibility of the soil.
    2. Calculate the relative density of a soil.
    3. Interpret the different classification systems of soils, including the United Soil Classification System and the American Association of State Highway and Transportation Officials (AASHTO) System.
    4. Determine the plasticity index and the liquid limit of a soil sample.
4. Explain the engineering properties and behavior of soil deposits through analysis and review of soil engineering property data.
    1. List the various methods of obtaining soil samples from the field.
    2. Explain the effects of water on soils.
    3. Explain the common drainage and dewatering techniques used.
    4. Explain how drainage is applied in construction, including the use of foundation drains, blanket drains, interceptor drains, filters, synthetic fabrics, land drainage, and soil percolation.
    5. Explain *frost heave* in soils.
    6. Explain the effects of swelling, hydrocompaction, and liquefaction.
    7. Explain the types of subsidence and discuss their causes.
    8. Explain the identification of unstable or potentially unstable slopes.
5. Apply soil mechanics theories.
    1. Calculate stress analysis of soils.
    2. Explain the mechanical response of soils to load.
    3. Explain consolidation and calculate consolidation settlement.
    4. Explain pile foundations and design.
    5. Explain common field compaction procedures, including field considerations, methods, and techniques.
    6. Explain several of the methods used in the transportation of earth fill and why these methods vary.
    7. Determine the type of field equipment needed to achieve proper compaction of a site for specific soil types and applications.
    8. List and explain several methods used for the stabilization of soils.
    9. Explain some of the field procedures used to provide the proper field quality control, including the proper testing methods.
    10. Explain the design and construction of retaining structures.
6. Determine optimal construction practices in the field relative to soil and foundation construction.
    1. List the difficulties that arise in the field.
    2. Assess how engineering judgment is used in the field to overcome unanticipated difficulties.
7. Explain the relationship between hydrology and soils.
    1. Explain how groundwater fits into the hydrologic cycle.
    2. List aquifer types.
    3. Explain the hydraulic effects of pumping confined and unconfined aquifers.
    4. Explain natural substances in groundwater.
    5. Explain how groundwater quality can change from its recharge area to its discharge area.
    6. List construction problems associated with groundwater flow.
    7. Explain how contaminants move in the subsurface.
    8. Calculate groundwater flow using Darcy's law.
    9. Explain sedimentation.
8. Demonstrate professional and ethical conduct, as expected in industry.
    1. Identify the need for self-discipline and time management in technical industries.
    2. Communicate and function effectively as a member of a team.

Evaluation Criteria/Policies:
The grade will be determined using the Delaware Tech grading system:

90	–	100	=	A
80	–	89	=	B
70	–	79	=	C
0	–	69	=	F

Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:
Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Summative: Exams (3-4) (Equally weighted)	30%
Summative: Labs (4-6) (Equally weighted)	30%
Formative: Assessments (homework, in-class assignments, participation, etc.)	40%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):
CETAASCET

1. Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering activities, including but not limited to site development, hydraulics and hydrology, grading, and structural systems.
2. Conduct standardized field and laboratory testing on civil engineering project materials.
3. Select appropriate materials and estimate material quantities for technical projects.
4. Use graphic techniques and productivity software to produce engineering documents.
5. Demonstrate a commitment to quality, timeliness, professional development, and continuous improvement.

CETAASSET

1. Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities, including but not limited to site development, hydraulics and hydrology, grading, and structural systems.
2. Conduct standardized field and laboratory testing on civil engineering project materials.
3. Select appropriate materials and estimate material quantities for technical projects.
4. Use graphic techniques and productivity software to produce engineering documents.
5. Integrate appropriate surveying methods for land measurement and/or construction layout and the acquisition of spatial data in accordance with the laws and regulations pertaining to Professional Land Surveying.
6. Demonstrate a commitment to quality, timeliness, professional development, and continuous improvement.

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.