CA4682: ADVANCED GEOTECHNICAL AND FOUNDATION ENGINEERING

Effective Term
Semester B 2025/26

Part I Course Overview

Course Title
Advanced Geotechnical and Foundation Engineering

Subject Code
CA - Civil and Architectural Engineering
Course Number
4682

Academic Unit
Architecture and Civil Engineering (CA)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
CA3687 Soil Mechanics

Students must have attempted (including class attendance, coursework submission, and examination) the precursor course(s) so identified.

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The course introduces advanced concepts and theories in geotechnical and foundation engineering. Analytical methods will also be introduced to solve geotechnical design problems.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Discuss the importance of advanced concepts and theories in soil mechanics and geotechnical engineering;		x		
2	Solve soil mechanics and foundation engineering problems using computational and analytical techniques;				x
3	Design deep foundation systems subjected to various types of loads against bearing capacity and serviceability criteria;			x	
4	Describe specialized theories relevant to foundation engineering and soil mechanics practice.		x		x

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage in formal lectures to gain knowledge on key concepts, principles and theories in advanced soil mechanics and foundation engineering	1, 2, 3, 4	
2	Tutorial	Students will participate in tutorial activities to apply the knowledge gained from the lectures in practical problems in soil mechanics and foundation engineering	1, 3, 4	

3	Assignments	Students will actively develop solutions to various soil mechanics and geotechnical engineering problems through individual assignments covering a range of geotechnical systems	2	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Coursework	1, 2, 3, 4	30		Yes
2	Mid-term Test	2, 4	20		No

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

To pass a course, a student must obtain minimum marks of 30% in both coursework and examination components, and an overall mark of at least 40%

Assessment Rubrics (AR)

Assessment Task

Coursework

Criterion

CAPACITY to ANALYZE t practical geotechnical engineering problems based on computational, analytical and empirical methods;

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Mid-term Test

Criterion
CAPACITY to describe concepts and theories of foundation engineering and ANALYZE geo-systems;

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Examination

Criterion
CAPACITY to describe concepts and theories of advanced soil mechanics and foundation engineering and ANALYZE geo-systems and geomechanics problems

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Design of driven piles and drilled shafts; Pile groups; Axial and lateral capacity of piles; Limit equilibrium theory; Shallow Foundations; Geomechanics modelling; Critical State Soil Mechanics.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Bolton, M.D (1998). 'A Guide to Soil Mechanics'. London : Macmillan. (TA710.B657)
2	Craig, R.F. (2004). 'Craig's Soil Mechanics'. 7th ed. Spon Press.
3	Muir Wood, D. (1990). 'Soil Behaviour and Critical State Soil Mechanics'. Cambridge University Press.
4	Powrie, W. (2004). 'Soil Mechanics: Concepts and Applications'. 2nd ed. Spon Press.
5	Coduto, Donald P. (2001). 'Foundation Design : Principles and Practices'.
6	Atkinson (2007). An Introduction to the Mechanics of Soils and Foundations. Mc-Graw-Hill.