

# CA4682: ADVANCED GEOTECHNICAL AND FOUNDATION ENGINEERING

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## Effective Term

Semester B 2022/23

## 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, and CA4665 Geotechnical Analysis and Design

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. Numerical methods will also be introduced to solve geotechnical design problems.

### Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 DEC-A2 DEC-A3 app.)			
1	Explain the importance of advanced concepts and theories in soil mechanics and geotechnical engineering;		x		
2	Solve soil mechanics and foundation engineering problems using commercial computer software;				x
3	Apply theoretical and empirical methods for design of deep foundation problems;			x	
4	Select and apply appropriate theories to analyze various foundation engineering problems.		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.

### Teaching and Learning Activities (TLAs)

TLAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Explain key concepts, principles and theories in experimental and computational soil mechanics	1, 2, 3, 4	
2	Tutorial	Require the students to solve foundation engineering problems using theoretical, analytical and numerical methods	1, 3, 4	
3	Numerical Assignment	Require the students to solve classical soil mechanics problems using commercial software	2	

**Assessment Tasks / Activities (ATs)**

	<b>ATs</b>	<b>CILO No.</b>	<b>Weighting (%)</b>	<b>Remarks (e.g. Parameter for GenAI use)</b>
1	Coursework	1, 2, 3, 4	30	
2	Mid-term Test	2, 4	20	

**Continuous Assessment (%)**

50

**Examination (%)**

50

**Examination Duration (Hours)**

3

**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**

ABILITY to apply numerical methods to the practical geotechnical engineering problems; ABILITY to apply the theoretical and empirical methods to the foundation engineering 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

**Assessment Task**

Mid-term Test

**Criterion**

UNDERSTANDING the concepts and theories of advanced soil mechanics problems; ABILITY to evaluate the theoretical methods and apply them to the solving of foundation engineering 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

**Assessment Task**

Examination

**Criterion**

UNDERSTANDING the concepts and theories of advanced soil mechanics problems; ABILITY to evaluate the theoretical methods and apply them to the solving of practical foundation engineering 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 and bored piles; Pile groups; Axial and lateral capacity of piles; Upper and lower bound theory; Limit analysis; Finite Element Analysis; Finite Difference Analysis.

**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'.