

# CA4665: GEOTECHNICAL ANALYSIS AND DESIGN

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## Effective Term

Semester A 2024/25

## Part I Course Overview

### Course Title

Geotechnical Analysis and Design

### Subject Code

CA - Civil and Architectural Engineering

### Course Number

4665

### 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

BC4665/BC4665P Geotechnical Analysis and Design

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

The course aims to introduce analysis and design methods of geotechnical structures through integration and consolidation of students' knowledge in soil mechanics.

### Course Intended Learning Outcomes (CILOs)

| CILOs |                                                                                                  | Weighting (if app.) | DEC-A1 | DEC-A2 | DEC-A3 |
|-------|--------------------------------------------------------------------------------------------------|---------------------|--------|--------|--------|
| 1     | Carry out simple analysis to discover the critical mechanism that governs geotechnical design    |                     |        | x      |        |
| 2     | Justify the stability of different types of geotechnical structures                              |                     |        | x      |        |
| 3     | Quantify the deformation of a geotechnical structure under working loads                         |                     |        | x      |        |
| 4     | Propose schemes and measures to enhance stability of different types of geotechnical structures. |                     |        | 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  | Explain the key concept, fundamental theories and tools in geotechnical analysis and design                                                                       | 1, 2, 3, 4 | 2 hours/week               |
| 2    | Tutorial | Require the students to discuss the concepts and solve the problems in geotechnical engineering and design individually or in a group basis in the tutorial class | 1, 2, 3, 4 | 1 hour/week                |

### Assessment Tasks / Activities (ATs)

| ATs |               | CILO No.   | Weighting (%) | Remarks (e.g. Parameter for GenAI use) |
|-----|---------------|------------|---------------|----------------------------------------|
| 1   | Assignments   | 1, 2, 3, 4 | 30            |                                        |
| 2   | Mid-term quiz | 1, 2, 3, 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**

Assignments

**Criterion**

Ability to understand and apply analysis and design methods of geotechnical structures

**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 quiz

**Criterion**

Ability to understand and apply analysis and design methods of geotechnical structures

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

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### Assessment Task

Examination

### Criterion

Ability to understand and apply analysis and design methods of geotechnical structures

**Excellent (A+, A, A-)**

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**Failure (F)**

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## Part III Other Information

### Keyword Syllabus

Theories of elasticity and plasticity in geotechnical engineering, bearing capacity and foundation design, limit equilibrium methods, earth pressure and retaining wall design, design of deep excavations with lateral support system, slope stability analysis and stabilization measures.

### Reading List

#### Compulsory Readings

| Title |     |
|-------|-----|
| 1     | Nil |

#### Additional Readings

| Title |                                                                                                                                                            |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | Craig, R.F. 2004. Craig's Soil Mechanics. 7th Ed. Spon Press.                                                                                              |
| 2     | Geotechnical Control Office (GCO) 1984. Geotechnical Manual for Slopes. The Government of Hong Kong Special Administration Region, 2nd Edition, Hong Kong. |
| 3     | Geotechnical Control Office (GCO) 1987. Geoguide 2: Guide to Site Investigation. The Government of Hong Kong Special Administration Region. Hong Kong.     |

|   |                                                                                                                                                                |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | Geotechnical Control Office (GCO) 1987. Geoguide 3: Guide to Soil and Rock Descriptions. The Government of Hong Kong Special Administration Region. Hong Kong. |
| 5 | Muir Wood, D. 1990. Soil Behaviour and Critical State Soil Mechanics. Cambridge University Press.                                                              |
| 6 | Powrie, W. 2004. Soil Mechanics: Concepts and Applications. 2nd Ed. Spon Press.                                                                                |