Subject Code: BRE426
Level: 4
Contact Hours: Lect:21 Sem:10 Lab:11
Student Effort Hours: 120
Assessment Method: Coursework 30% Examination 70%
Credit Value: 3
Pre-requisites: CSE290, BRE302
Co-requisites: Nil
Exclusions: Nil
Subject Leader/Lecturer/Dept.: C.H. Yam (BRE)

GEOTECHNICAL AND FOUNDATION ENGINEERING

Subject Aim:
This subject is intended to:
1. Provide students with knowledge of the basic principles of geotechnical engineering and the relation and implications to foundation choices and designs and the ground works needed to be carried out.

Learning Outcomes:
Students will demonstrate their ability to:-

1. Apply the understanding of soil properties, mechanics principles and theories to the behaviour of soils under different kinds of pressures and the effects of water.
2. Relate the importance of safety and geotechnical considerations in designing/undertaking site formation and earth-retaining works.
3. Describe the basics concepts of soil mechanics and its application to analyze soil retaining structures.
4. Illustrate an understanding of modern soil improvement techniques and retaining slopes, soil and excavation techniques.
5. Appraise foundation design concepts in the choice of appropriate foundation and design simple foundations.

Brief Syllabus Content:

Soil Mechanics and Geology:
Shear strength of soil, lateral earth pressure.
Site investigation for deep and complex foundation/basement design and construction, interpretation of borehole log (field and laboratory tests).

Site Formation:
Techniques of excavation and de-watering.

Stability of Slopes and Earth Retaining Structure:
Slope stability, drainage of slopes, ground anchor, slope protection methods. Active and passive lateral earth pressures, analysis and design of soil retaining structures in particular gravity retaining walls, cantilever and anchored sheet pile walls, diaphragm walls, braced or strutted excavation, failure of retaining structure

Foundation Design and Geotechnical Problems:
Ground & soil stabilisation improvement: compaction and pre-compaction, grouting and chemical stablisation, vibratory methods, soil reinforcement and the use of geosynthetics for drainage.

Stresses in subsoil, load bearing capacity and settlement of foundations, rate/magnitude of settlement; factors to be considered in foundation design; pile foundation method and construction process of percussion and bored piles, pile capacity and pile driving formula, plant and equipment for piling, pile testing and Code of Practice.
### Learning and Teaching Approach (tasks and activities designed to achieve learning outcomes):

**Interactive Lectures** will enable students to:
1. appreciate basic concepts of soils mechanics;
2. relate geotechnical considerations regarding construction works.
3. apply the soil mechanics concept to analyse slope stability, retaining wall structure and design simple foundations.

**Tutorial** will enable students to:
1. consolidate the geotechnical and foundation engineering concepts through problem-solving assignments and discussions.

**Laboratory** will enable students to:
1. identify and appreciate the shear strength and permeability of soils.

### Assessment strategy (assessment of student performance resulting from learning tasks):

Assessment comprises of four parts:
1. Problem-solving assignment
2. Laboratory report
3. Mid-term test
4. Final examination

To assess students’ ability to:

a. appreciate the basic knowledge in geotechnical engineering and
b. apply the soil mechanics concept to analyse slope stability, retaining wall structure and design simple foundations.

Coursework: 30%
Final Exam.: 70%

### Reading List:

**Recommended:**

**Supplementary:**


