Subject Description Form

Subject Code	BRE426
Subject Title	Geotechnical and Foundation Engineering
Credit Value	3
Level	4
Pre-requisite	CSE20290 & BRE302
Objectives	a) 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.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a) 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. b) Relate the importance of safety and geotechnical considerations in designing/undertaking site formation and earth-retaining works. c) Describe the basics concepts of soil mechanics and its application to analyze soil retaining structures. d) Illustrate an understanding of modern soil improvement techniques and retaining slopes, soil and excavation techniques. e) Appraise foundation design concepts in the choice of appropriate foundation and design simple foundations.
Subject Synopsis/ Indicative Syllabus	*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 stabilization, 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.

Teaching/Learning Methodology

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 Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
1. Problem-solving assignment	12 %	√	√	√	√	√
2. Laboratory report	3 %	√				
3. Mid-term test	15 %	√	√			
4. Final examination	70 %	√	√	√	√	√
Total	100 %					

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The problem –solving assignments are used to assess students' ability to solve geotechnical and foundation engineering problems with good numerical accuracy based on the theories and concepts studied in the lectures.

The laboratory report is used to assess students' ability to observe and verify the shear strength and the permeability of soils and to present the experimental results in a logical and clear format.

The mid-term test and the final examination are used to assess students' i) understanding of the geotechnical and foundation engineering theories and concepts learned in the lectures and ii) ability to solve geotechnical and foundation engineering problems with good numerical accuracy.

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial and Laboratory	13 Hrs.
Other student study effort:	
▪ Assignment, lab report	96 Hrs.
▪	Hrs.
Total student study effort	135 Hrs.

Reading List and References	**Recommended Text** Das, B M "Introduction to Geotechnical Engineering". ISE. 2nd edition, 2008, Thomson. **<u>References</u>** Bowles J E "Foundation analysis and design" McGraw Hill. "Code of Practice for Foundations" (2017), Buildings Department, HKSAR Government. Tomlinson M.J. "Foundation design and construction", 2001 Prentice Hall. Tomlinson M.J. "Pile design and construction practice", 1994 E & FN Spon. *Liu C and Evett J B "Soils and Foundations", 2014 Boston : Pearson. *Coduto, D. P., Yeung, M.-C., & Kitch, W. A. (2011). *Geotechnical engineering: Principles and practices*. Upper Sadddle River: Pearson. Geotechnical Engineering Office Geoguides 1, 2 and 3; CED Hong Kong Government, Government Publication Centre. Pile design and construction, GEO Publication No. 1/96 CED Hong Kong Government. ** Good reference books*