Hong Kong Institute of Vocational Education
Construction Discipline
Department of Construction

Module Syllabus

Module Title

SOIL MECHANICS AND GEOLOGY

Module Code

CSE2500

Formal Tuition Hours

60 hours

Module Value

1.0

Course Code/Year

51301, Higher Diploma in Civil Engineering, Year 2
51302, Higher Diploma in Structural Engineering, Year 2
53401 & 55401, Higher Certificate in Civil Engineering, Year 1
51201, Diploma in Civil Engineering, Year 2

Module Aims

The aim of this module is to equip students with the basic knowledge of the principles of soil mechanics and geology, and to prepare them for more advanced modules in the field of geotechnical engineering. Upon completion of this unit, students should be able to:

- understand the basic engineering properties and behaviour of soils, and the basic skills in soil testing;
- appreciate the significance of soil mechanics in foundation and civil engineering;
- develop a basic knowledge of geology and its application in civil engineering.

Teaching & Learning Strategies

The module consists of 30 hours of formal lectures, 12 hours of laboratory work and 18 hours of tutorials. There will be class quizzes at suitable intervals throughout the year to monitor the progress of students.

Assessment Scheme

Coursework	30%
Examination	70%

Topic Area	Principal Objectives plus Indicative Contents
1. Soil Properties (12 hours)	*Understand the index properties of soils for use as engineering materials:* Origin, composition and definition of engineering soil. Soil as a 3-phase model. Mass-volume relationship. Void ratio, porosity, moisture content, specific gravity, density, unit weight, degree of saturation, soil suction. Particle-size distribution. Soil consistency and Atterberg Limits. Soil identification and classification.
2. Soil Compaction (12 hours)	*Understand the principles of soil compaction:* Theory of compaction. Dry density-moisture content relationship. Maximum dry density and optimum moisture content. Standard and modified compaction tests. Field compaction theory and control. Relative density and in-situ density. Soil improvement methods.
3. Water in Soil (12 hours)	*Understand the occurrence of groundwater and its significance in civil engineering application.* Hydrological cycle. Surface and ground water flow. Underground water conditions and formations. Permeability of soils and its measurement in the laboratory and in the field. Hydraulic gradient, seepage and hydraulic instability. Design of filters. Construction of flow net. Pore water pressure and effective stress concept.
4. Fundamentals of Geotechnical Engineering (9 hours)	*Understand the basic principles of geotechnical engineering:* Concepts of shear strength. Consolidation process and one-dimensional consolidation and settlement. Earth pressures: at-rest, active and passive. Rankine and Coulomb's earth pressure theories.
5. Minerals and Rocks (7 hours)	*Understand how minerals and rocks are formed and their classification:* Physical properties of minerals. Formation, characteristics and classification of igneous, sedimentary and metamorphic rocks. Identification of minerals and rocks.

6. Structural Geology and Geological Maps (8 hours)	*Understand structural geology and its application to civil engineering:* Geological forces in rock formations. Characteristics and features of folds, faults, joints and bedding planes. Dip, strike and structure contour of rock bedding. Engineering geology survey. Air photography and its use. Mapping of geological features and interpretation of geological maps. Local geological formations and maps.

Text/References

1. Das, B.M. (1994). *Principles of Geotechnical Engineering*, 3rd Ed, PWS publishing Company.
2. Craig, R.F. (1992). *Soil Mechanics*, 5th Ed, Chapman & Hall.
3. Smith G.N. (1990). *Elements of Soil Mechanics*, 6th Ed, BSP Professional Books.
4. Sutton, B.H.C (1986). *Solving Problems in Soil Mechanics*, 2nd Ed, (Longman).
5. Head, K.H. (1983). *Manual of Soil Laboratory Testing (VOL. 1-3)*, Pentech Press.
6. Geotechnical Engineering Office (1987). *Geoguide 2 – Guide to Site Investigation*, CED, HK Government, Government Publishing Centres.
7. Geotechnical Engineering Office (1988). *Geoguide 3 – Guide to Rock & Soil Descriptions*, CED, HK Government, Government Publishing Centres.
8. Geotechnical Engineering Office (1984). *Geotechnical Manual for Slopes*, 2nd Ed. CED, HK Government, Government Publishing Centres.
9. Gribble, C. (1985). *Geology for Civil Engineers*, Chapman & Hall.
1. Blyth, F.G.H. and De Freitas, M.H. (1984). *Geology for Engineers*, Edward Arnold.