Subject Description Form

Subject Code	CSE20206
Subject Title	Geology for Engineers
Credit Value	3
Level	2
Exclusion	CSE206 Geology for Engineers
Objectives	This subject is intended to: (1) Provide students with instruction on the fundamentals of Geology; (2) Provide an essential background for studies in rock engineering, foundation engineering and geotechnical designs.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Apply the fundamentals of geology knowledge to identify geotechnical problems, including soil and rock slope, foundation and tunnel, that may have bearing on civil engineering projects; b. Identify and analyze the data from site investigation and suggest suitable designs for foundations, tunnels and slopes; c. Synthesize logical solution to geotechnical problems independently such as the suitable locations for dam foundation and tunnel alignment; d. Work professionally and ethically with foundation engineers, tunneling engineers, rock and soil engineers; e. Explain geological problems logically and lucidly through drawing and writing.
Subject Synopsis/ Indicative Syllabus	1. Mineralogy, Petrology and Geology of Hong Kong (3 weeks) Physical properties of silicate and non-silicate minerals and their identification; classification of igneous, metamorphic and sedimentary rocks and their identification. Rocks and geological structure of Hong Kong, geological history of Hong Kong. 2. Surface Processes and Ground Water Geology (2 weeks) Weathering; erosion and deposition including river, marine, desert, glacier, karst; formation of engineering soils, hydrological cycle; aquifers and ground water table. 3. Structural Geology (2 weeks) Unconformities, fold, fault, joint, map reading, mapping skill maps and the use of stereographic projection. 4. Basics of Rock Mechanics (1 weeks) Index properties for rock specimen, rock mass classification (rock mass rating), uniaxial and triaxial compressive strength, Brazilian test, and Point Load Index test. 5. Site Investigations (2 weeks) Plan for site investigation; direct and indirect methods for site investigation and sampling, logging of boreholes; in-situ tests (e.g. SPT, CPT, PMT, DMT, VST); interpretation of test results. Methods of geophysical exploration. 6. Geology for Engineering (3 weeks)

<table>
<tr><td></td><td>Geological application to tunnels, transportation links, dams, reservoirs and catchments, coastline protection, slopes, and foundation.

7. <u>Laboratory and Fieldwork</u>
Identification of common minerals and rocks. Field and site visits to illustrate course topics. Mapping, borehole logging.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Fundamental knowledge will be covered in lectures. Laboratory sessions will provide opportunities for identification of minerals & rocks, learning the mapping skill and bore log skill. The students need to complete the work sheets in laboratory sessions. Laboratory works and field studies will help students appreciate the basic principles and familiarize themselves with basic instruments.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td>1. Coursework</td><td>30</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Final Examination</td><td>70</td><td>√</td><td>√</td><td>√</td><td></td><td>√</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="5"></td></tr>
</table>
Students must attain at least grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall result.

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

The students will be assessed with three components: the laboratory sessions, field trip session and assignment, minerals test and rocks test will be arranged after about one month of the laboratory session of identification of minerals and rocks, an examination at the end of the semester. The student will be required to attend laboratory sessions and submit laboratory reports. The laboratory sessions will strengthen geology knowledge of students include identify minerals & rock, mapping skill and bore log skill. The student will be required to attend field trip session and submit field trip report. The works in the laboratory sessions and field trip session are closely related to practicing geotechnical engineering requirements. Students will have to exert engineering judgment to complete the laboratory sessions and field trip session. The assignment, laboratory sessions and field trip session to together with the report writing are best to achieve intended learning outcomes a), b), c), d), and e). Minerals test and rocks test will emphasize on assessing student basic concept and current practices of mineral and rock identification. It is appropriate to achieve intended learning outcome a) and b). The examination will consolidate students' learning in lectures. It is appropriate to achieve the intended learning a), b), c), and e).</td></tr>
<tr><td rowspan="2">Student Study Effort Expected</td><td>Class contact:</td><td>Average hours per week</td></tr>
<tr><td>Lectures / Laboratory / Field Trip</td><td>4 Hrs.</td></tr>
</table>

	Other student study effort:	
	Self Study	5 Hrs.
	Total student study effort	9 Hrs.
Reading List and References	Atherton, M. J. and Burnett, A. D., Hong Kong Rocks, Urban Council, 1986. Bell, F.G., Engineering Geology, Second Edition, Butterworth-Heinemann, 2007. Davis, G. H. and Reynolds, S. J., Structural geology of Rocks and Regions, Third Edition, Wiley, 2012. Fletcher, C. J. N., Geology of Site Investigation Boreholes from Hong Kong, C. Fletcher, 2004. Goodman, R. E., Introduction to Rock Mechanics, Second Edition, Wiley, 1989. Lisle, R. J., Geological Structures and Maps, Third Edition, Butterworth-Heinemann, 2004. Lutgens, F. K., Tarbuck, E. J. and Tasa, D., Essentials of Geology, Thirteenth Edition, Pearson Prentice Hall, 2018. McLean, A. C. and Gribble, C. D., Geology for Civil Engineers, Allen & Unwin, 1985. Mottana, A., Crespi, R. and Liborio, G., Simon & Schuster's guide to Rocks and Minerals, Simon & Schuster, 1978. Raymond, L. A., Petrology: The study of Igneous, Sedimentary & Metamorphic Rocks, Second Edition, McGraw Hill, 2002. Sewell, R. J., Campbell, S. D. G., Fletcher, C. J. N., Lai, K. W. and Kirk, P. A., The Pre-Quaternary Geology of Hong Kong, Printing Dept., 2000. West, T. R., Geology: Applied to Engineering, Prentice Hall, 1995.	