

Subject Description Form

Subject Code	CSE574
Subject Title	Drainage Design
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	<u>Recommended background knowledge:</u> Students should have a basic study background of fluid mechanics, hydrology and/or hydraulics at the undergraduate level.
Objectives	To provide students the knowledge of the theory and practice of the design of surface and subsurface drainage systems. The application of basic engineering principles to the solution of drainage problems is also emphasized.
Intended Learning Outcomes	Upon completion of the subject, students will be able: <ul style="list-style-type: none"> a. to grasp the knowledge of the hydraulics of drainage systems and skills to design simple drainage structures; b. to identify potential drainage problems and suggest remedial measures for rehabilitating/designing drainage systems; c. to function in a team project, write technically sound reports and work independently in solving engineering problems; and d. to have critical and creative thinking.
Subject Synopsis/ Indicative Syllabus	<u>Keyword Syllabus</u> <ul style="list-style-type: none"> i) <u>Urban storm drainage</u> Urban hydrological cycle. Empirical flood formulae; Flood probability. Runoff on paved and unpaved surfaces. Design of groundwater level. Design of storm sewers. Gutters, inlets, manholes and outlets. Design of road drainage - longitudinal and cross drainage, culverts. Runoff control. ii) <u>Subsurface drainage</u> Under drains and their layout. Design of closed underdrains. Design of open underdrains. Design for leaching requirement. Excavation dewatering - pumping methods; exclusion methods. iii) <u>Flood mitigation</u> River training; Design of dike and embankment; Channel improvement; Floodways. Polder scheme.

	<p>iv) <u>Pumped Drainage</u> Cost-benefit analysis; Design considerations; Pumping head; Selection of pump; Pumping station; Maintenance and control; Tidal outlet.</p> <p>v) <u>Outfall Design</u> Mixing phenomena – initial dilution, advection and dispersion processes. Outfall hydraulics.</p>																												
Teaching/Learning Methodology	<p>Fundamental knowledge will be covered in the lectures. Tutorials will provide opportunities for discussion of lecture materials and will also be conducted in the form of example class and problem-solving session to supplement understanding from lectures. Computer laboratory work will help students appreciate the basic principles and familiarize themselves with basic computer tools.</p>																												
Assessment Methods in Alignment with Intended Learning Outcomes	<table border="1" data-bbox="512 835 1390 1339"> <thead> <tr> <th data-bbox="512 835 877 1088" rowspan="2">Specific assessment methods/tasks</th> <th data-bbox="877 835 1034 1088" rowspan="2">% weighting</th> <th colspan="4" data-bbox="1034 835 1390 1016">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th data-bbox="1034 1016 1123 1088">a.</th> <th data-bbox="1123 1016 1212 1088">b.</th> <th data-bbox="1212 1016 1302 1088">c.</th> <th data-bbox="1302 1016 1390 1088">d.</th> </tr> </thead> <tbody> <tr> <td data-bbox="512 1088 877 1193">1. Continuous Assessment</td> <td data-bbox="877 1088 1034 1193">40%</td> <td data-bbox="1034 1088 1123 1193">√</td> <td data-bbox="1123 1088 1212 1193">√</td> <td data-bbox="1212 1088 1302 1193">√</td> <td data-bbox="1302 1088 1390 1193">√</td> </tr> <tr> <td data-bbox="512 1193 877 1265">2. Written Examination</td> <td data-bbox="877 1193 1034 1265">60%</td> <td data-bbox="1034 1193 1123 1265">√</td> <td data-bbox="1123 1193 1212 1265">√</td> <td data-bbox="1212 1193 1302 1265"></td> <td data-bbox="1302 1193 1390 1265">√</td> </tr> <tr> <td data-bbox="512 1265 877 1339">Total</td> <td data-bbox="877 1265 1034 1339">100%</td> <td colspan="4" data-bbox="1034 1265 1390 1339"></td> </tr> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>The continuous assessment will be based on laboratory/project reports (20%) and assignments/quizzes (20%).</p> <p>Written examination is evaluated by final examination (60%).</p> <p>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.</p>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				a.	b.	c.	d.	1. Continuous Assessment	40%	√	√	√	√	2. Written Examination	60%	√	√		√	Total	100%				
Specific assessment methods/tasks	% weighting			Intended subject learning outcomes to be assessed (Please tick as appropriate)																									
		a.	b.	c.	d.																								
1. Continuous Assessment	40%	√	√	√	√																								
2. Written Examination	60%	√	√		√																								
Total	100%																												
Reading List and References	<p><u>Textbooks and Manuals</u></p> <p>D. Butler, C.J. Digman, C. Makropoulos, and J.W. Davies, <i>Urban Drainage</i>, CRC Press, 2018.</p> <p>Drainage Service Department (DSD), Hong Kong Government, <i>Stormwater Drainage Manual, Planning, Design and Management (5th Edition)</i>, 2018.</p>																												

Fischer, H.B. et al., *Mixing in Inland and Coastal Waters*, Academic Press, 1979.

Haestad Methods Engineering Staff, et al. *Computer Applications in Hydraulic Engineering*, Haestad Methods Inc, 2002.

P. Smart & J.G. Herbertson, *Drainage Design*, Van Nostrand Reinhold, 1992.

D. Chin, *Water-Resources Engineering (3rd Edition)*, Pearson, 2012.

R.K. Linsley, M.A. Kohler, and J.L.H. Paulhus, *Hydrology for Engineers*, McGraw Hill, 1982.

J.E. Gribbin, *Introduction to Hydraulics & Hydrology: With Applications for Stormwater Management (4th Edition)*, Cengage Learning, 2013

S.N. Ghosh, *Flood Control and Drainage Engineering (4th Edition)*, Oxford & IBH Publishing Company Pvt. Limited, , 2014.

Technical Journals

IAHR Journal of Hydraulic Research

ASCE Journal of Hydraulic Engineering; and Journal of Irrigation and Drainage Engineering

Proceedings of the Institution of Civil Engineers