Subject Description Form

Subject Code	CSE518
Subject Title	Water and Wastewater Treatment
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Recommended background knowledge: A fundamental knowledge of biology and chemistry or environmental science would be helpful.
Objectives	To provide students with a working knowledge of the principles and current practices in water and wastewater treatment so that they can carry out process design and operation functions and organize analysis and laboratory studies for process trouble-shooting, evaluation, and upgrading.
Intended Learning Outcomes	Upon completion of the subject, students will be able: a. to apply the fundamental knowledge of water and wastewater treatment processes and engineering concepts to formulate effective solutions to environmental engineering problems relevant to water supply and wastewater disposal in Hong Kong and elsewhere; b. to identify, structure and analyze diverse problems arising from the changing constraints that influence engineering projects, such as environmental, legislative, sustainability, and technological considerations; c. to work with others in group works, and take responsibility for an agreed area of a shared activity; and d. to have creative and critical thinking and an ability to work independently.
Subject Synopsis/ Indicative Syllabus	**Keyword Syllabus** i) Kinetics of Treatment Processes Reaction rates and order, effect of pH and temperature on reaction rates, kinetics of biological growth. ii) Coagulation and Flocculation Coagulants, mechanisms of coagulation and flocculation, dosage requirements and flocculators. iii) Sedimentation Processes Discrete particle settling, flocculent settling, zone settling and compaction and their applications in water and wastewater treatment. Process design. iv) Filtration Processes Filter hydraulics, slow sand and rapid gravity filtration, direct filtration, filter backwashing. Process design.

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<tr><td></td><td>v) <u>Biological Treatment Processes</u>

Principles of biological conversion and degradation. Activated sludge processes, biological filters, continuous flow reactors and sequencing batch reactors, design of biological reactors.

vi) <u>Disinfection</u>

Chemistry of chlorination, breakpoint chlorination, ozonation, UV disinfection.

Vii) <u>Advanced Wastewater Treatment</u>

Membrane separation, wastewater reuse</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Lectures will provide fundamental knowledge relating to the theoretical processing operations, and treatment techniques of water purification and wastewater treatment systems. Students will be required to undertake various coursework activities, which will enable them to thoroughly digest the taught contents.

Tutorials will provide opportunities for students and lecturer to communicate and discuss any difficulties relating to the lecture programme. It will also provide a forum for students and lecturer to discuss the ongoing coursework and laboratory activities.

Laboratory will provide students with opportunities to carry out real experimental works for different processes of sedimentation, coagulation, filtration, and disinfection in order to facilitate their learning.

Independent study and associated reading will require students to conduct some problem-solving exercises independently, analyze the experimental data obtained from laboratory classes and prepare integrated laboratory reports.</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="6">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></td><td></td></tr>
<tr><td>1. Continuous Assessment</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>2. Written Examination</td><td>70%</td><td>✓</td><td>✓</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>Total</td><td>100%</td><td colspan="6"></td></tr>
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Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Continuous assessment is evaluated on a basis of the student’s performance on tutorial, assignments, tests, and laboratory practices and reports.

Written examination is evaluated by final examination.</td></tr>
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	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.
Reading List and References	The following list is by no means exhaustive, but does provide the majority of the basic materials to be covered in class. Students are encouraged to search for publications with advanced topics of interest to them. **<u>Books</u>** John C. Crittenden, et al., (2012) MWH's Water Treatment: Principles and Design, 3rd Ed., John Wiley & Sons, Inc. Mackenzie L. Davis (2011) *Water and Wastewater Engineering: design principles and practices*. McGaw-Hill. Metcalf & Eddy (2013), *Wastewater Engineering – Treatment and Resource Recovery*, 5th Ed., McGaw-Hill. **<u>Journals</u>** Journal of the American Water Works Association Water Research Water Science and Technology