Subject Description Form

Subject Code	CSE6014
Subject Title	Surface Water Quality Modeling and Reactor System
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	Recommended background knowledge: Students should have a knowledge and understanding of undergraduate level of studies in engineering or science.
Objectives	1. To provide students a better understanding of the mechanisms leading to various types of water quality behavior. 2. To provide students a rational basis for devising water quality control strategies. 3. To provide students with the knowledge about the fundamental reaction kinetics and methods of analysis data collected from laboratory results. 4. To provide students with in-depth analysis and design ability of common water reactors and solutions to real problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able: a. to formulate and develop mathematical models for water quality prediction b. to devise suitable measures for water quality control c. to apply knowledge in the analysis of data and incorporate the result into aqueous reactor for application; and d. to perform critical thinking on design methods and solutions
Subject Synopsis/ Indicative Syllabus	**Keyword Syllabus** 1. Basic Concepts in Water Quality Management: waste load allocation, concentration and dilution, mass balance, mass transport. 2. Diffusion and Dispersion Processes: molecular diffusion, advective diffusion, turbulent diffusion, longitudinal shear flow dispersion, some useful solutions of the advective diffusion equation. Turbulent jets, plumes and buoyant jets. 3. Mixing in Rivers and Estuaries: river hydrology, tidal phenomena in estuaries, mixing processes, water quality parameters, simple models for water quality in rivers and estuaries, engineering controls. (The sections 1-3 are provided by Hydraulic Unit) 4. Reaction Kinetics: the introduction of common reaction kinetics (such as zero order, first order, and the others) for the use in the reactor system. 5. Reactor Hydraulics: flow distribution, flow in pipes, flow in open channels. 6. Hydraulic profiles: develop the hydraulic profile in a reactor involving the use of pumps, gravity flow, front/side weir, and branched channels in various inlet and outlet arrangement. (The sections 4-6 are provided by Environmental Unit)

Teaching/Learning Methodology

1. Lectures to deliver teaching materials. Lectures will provide fundamental methods and practical design approaches to the students, so that the students can achieve design goals through the optimization of the function of the studied issues.
2. Students should explore journal papers on new methods, advanced techniques or basic theory related to the subject content and their previous background.
3. Tutorials will provide chances to the students to discuss their individual reactor design in details with the lecturer in person. This is useful for best fitting the needs for the students with different backgrounds. The reports will relate to the subject contents and students' background.

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		
1. Assignments	50%	✓	✓				
2. Project report	50%			✓	✓		
Total	100 %						

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

Continuous assessment is based on

1) Assignments on water quality modeling (50%).
2) Report on the design or analysis of a special reactor in the student's research field (50%).

Student Study Effort Required

Class contact:	
▪ Lectures and Tutorials	39 Hrs.
▪ Examination	--
Other student study effort:	
▪ Reading of reference materials	36 Hrs.
▪ Assignments	30 Hrs.
▪ Project	30 Hrs.
▪ Total student study effort	135 Hrs.

Reading List and References

<u>Books</u>

Chapra, S.C., Surface Water Quality Modeling, Waveland Press, Inc.

	Thomann, R.V. and Mueller, J.A., Principles of Surface Water Quality Modeling and Control, Harper Int. Ed. Fischer, et al., Mixing in Inland and Coastal Waters, Academic Press. Tennekes and Lumley, A First Course in Turbulence, The MIT Press Metcalf & Eddy, Wastewater Engineering, Collection and Pumping of Wastewater, McGraw-Hill. Metcalf & Eddy, Wastewater Engineering, Treatment and Reuse; McGraw-Hall. **<u>Journals</u>** Water Research Environmental Science and Technology Chemical Engineering Research and Design Journal of Environmental Engineering, ASCE

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