Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

The sections shown on this interface are based on the templates UG OBTL+ or PG OBTL+
If you are revising/duplicating an existing course and do not see the pre-filled contents you expect in the subsequent sections e.g. Course Aims, Intended Learning Outcomes etc. please refer to Data Transformation Status for more information.

Expected Implementation in Academic Year	AY2022-2023
Semester/Trimester/Others (specify approx. Start/End date)	Semester 2
Course Author * Faculty proposing/revising the course	Lee-Chua Lee Hong
Course Author Email	clhlee@ntu.edu.sg
Course Title	Environmental Hydraulics
Course Code	EN4104
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	CV2020 Water Resources Engineering
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This course aims to provide a basic understanding of pollutant transport processes in lakes, rivers and coastal waters. At the end of the course, you will be able to acquire sufficient knowledge to perform engineering analysis of pollutant transport in different natural water bodies.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Identify and analyse pollutant transport processes covering diffusion and dispersion
ILO 2	Perform calculations relating to pollutant transport and mixing, and their concentrations in different water bodies covering lakes and rivers
ILO 3	Describe and examine mixing in estuarine flows
ILO 4	Identify and explain the differences between active and passive mixing of pollutants in coastal environment, and the regulations towards pollutant control
ILO 5	Perform calculations relating to pollutant transport and mixing, and their concentrations due to active mixing in coastal environment
ILO 6	Demonstrate how the calculations support the design of ocean wastewater discharge systems

Course Content

S/N	Topic	Lecture Hrs	Tutorial Hrs
1.	Introduction to pollutant transport processes	2	1
2.	Mixing in Lakes and Bays	3	1
3.	Mixing in Rivers	6	3
4.	Mixing in Estuaries	2	1
5.	Mixing Zone Approach for Environmental Regulations in Coastal Waters	4	2
6.	Mixing in Coastal Waters	6	3
7.	Design and Maintenance Issues of Discharge Outfalls	3	2
	Total:	26	13

Reading and References (if applicable)

Chapra.C., "Surface water quality modeling," McGraw Hill, 1997.

Fischer, H.B., et al., "Mixing in inland and coastal waters," Academic Press, 1979.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Introduction Overall mass balance Conservative vs. nonconservative substances Decay mechanisms	1		In-person	Lectures
2	Lakes and bays Ambient motions Residence time concepts Well-mixed systems Transient and steady state response	1, 2		In-person	Lectures & Tutorial
3	Lakes and bays Linear superposition Incompletely mixed systems Modeling of multiple discharged substances	2		In-person	Lectures & Tutorial
4	Mixing mechanisms in rivers Transport by advection, diffusion and dispersion Distances for complete lateral mixing Dispersion coefficient estimation	1, 2		In-person	Lectures & Tutorial

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
5	Discharge into rivers: Plug and mixed flow regimes Point and distributed sources Superposition	2		In-person	Lectures & Tutorial
6	Discharge into rivers: Transient and steady discharges Streeter-Phelps for DO and BO	2		In-person	Lectures & Quiz
7	Estuaries: 1-D dispersive model Tidal flushing and Dilution discharge	3		In-person	Lectures & Tutorial
8	Mixing Zone Analysis Need for analysis. Characteristics of wastewater discharges and coastal waters. Terminology.	4		In-person	Lectures & Quiz
9	Introduction to buoyant jets. Concept of mixing zone for acute and chronic effects. Active and passive mixing. Dimensional Analysis	4		In-person	Lectures & Tutorial

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
10	Analysis of pure jets. Plane and round jets. Zone of flow establishment, zone of established flow, dilution	5		In-person	Lectures & Tutorial
11	Analysis of pure plumes. Plane and round plumes. Turbulent mixing zones.	5		In-person	Lectures & Quiz
12	Analysis of buoyant jets. Transition from jet to plume	5		In-person	Lectures & Quiz
13	Application of buoyant jet theory to design of wastewater outfall systems	6		In-person	Lectures & Tutorial

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lecture	Formal lectures on the topics with examples
Tutorial	In depth discussion of tutorial problems with step-by-step solution process discussion.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Test/Quiz(CA1: Quiz 1)	1,2,3	(a), (b), (c), (g) and (l).	20	Individual	Analytic	Multistructural
2	Continuous Assessment (CA): Test/Quiz(CA2: Quiz 2)	4,5,6	(a), (b), (c), (g) and (l).	20	Individual	Analytic	Multistructural
3	Summative Assessment (EXAM): Final exam(Final Examination)	1,2,3,4,5,6	(a), (b), (c), (g) and (l).	60	Individual	Holistic	Relational

Description of Assessment Components (if applicable)

Engineering Knowledge
Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.

Problem Analysis
Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design / Development of Solutions
Design solutions for complex engineering problems and design systems, components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

Investigation
Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Modern Tool Usage
Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

The Engineer and Society
Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and Sustainability
Understand the impact of the professional engineering solutions in societal and environmental contexts, and

demonstrate the knowledge of, and need for the sustainable development.

Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Individual and Team Work
Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

Communication
Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Project Management and Finance
Demonstrate knowledge and understanding of the engineering management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Life-long Learning
Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Formative Feedback

1. Feedback will be through dissemination of performance in quizzes as well as review of quiz questions in class. Follow-up consultation arranged as needed.
2. Besides having interactive discussion during tutorial, we encourage you to initiative individual consultation sessions on your particular learning needs.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
Care for Environment	Intermediate
Creative Thinking	Intermediate
Learning Agility	Intermediate
Problem Solving	Advanced
Critical Thinking	Intermediate

Course Policy

Policy (Academic Integrity)

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values. As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Policy (General)

Students are expected to complete all assigned pre-class readings and activities, attend all seminar classes punctually and take all scheduled assignments and tests by due dates. Students are expected to take responsibility to follow up with course notes, assignments and course-related announcements for seminar sessions they have missed. Students are expected to participate in all seminar discussions and activities.

Policy (Absenteeism)

Absence from quiz without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.

Policy (Others, if applicable)

Last Updated Date: 04-07-2024 05:06:47

Last Updated By: Yang, En-Hua