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	
Semester/Trimester/Others (specify approx. Start/End date)	
Course Author * Faculty proposing/revising the course	Lee-Chua Lee Hong
Course Author Email	clhlee@ntu.edu.sg
Course Title	Environmental Transport Processes
Course Code	EN3003
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	Year 3 standing
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This course aims to introduce material balance analyses and the principles of mass transfer and pollutant transport in the natural and engineered environmental systems. Students will be able to apply these concepts in environmental process modelling for the various environmental systems. This course covers several fundamental concepts that will reinforce your learning of other environmental engineering and water resources courses in the aspects of analyzing and solving complex problems.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Examine environmental systems and develop material balance equations to analyse the mass and energy balances.
ILO 2	Apply mass transfer principles in modelling of various environmental transport processes occurring in the hydrosphere and atmosphere.
ILO 3	Apply several important reactor models to understand the dynamic characteristics of environmental systems.
ILO 4	Apply the material balance equations and mass transfer principles in analyzing fate and transport of pollutants in natural environmental and engineered systems.
ILO 5	Apply the material balance equations and mass transfer principles in designing and analyzing performance of engineered environmental systems.

Course Content

S/N	Topic
1.	Introduction to natural and engineered environmental systems
2.	Material balances
3.	Processes affecting fate of pollutants in environment
4.	Material flows in environmental systems: global carbon cycle; nitrogen cycle
5.	Diffusion, advection and dispersion
6.	Basic reactor theory for process modeling
7.	Partitioning of chemicals in environment and phase equilibrium
8.	Interphase mass transfer and modeling
9.	Quiz, synopsis

Reading and References (if applicable)

Textbooks :

1. Course materials by instructors
2. Logan B.E. (1998) Environmental transport processes. John Wiley and Sons.

References :

1. Weber W.J. (2002). Environmental Systems and Processes: Principles, Modelling, and Design. John Wiley and Sons.
2. Schnoor J.L. (1996). Environmental Modelling: Fate and Transport of Pollutants in Water, Air, and Soil. John Wiley and Sons.
3. Nazaroff W.M. and Alvarez-Cohen L. (2001). Environmental Engineering Science. John Wiley and Sons.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Introduction and Material Balance	1	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
2	Principles of Mass Transport Analysis	2, 4	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
3	Principles of Mass Transport Analysis	2, 4	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
4	Reactions	2, 4	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
5	1. Quiz 2. Analysis of mass transport in rivers	2, 4	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
6	1. Analysis of mass transport in rivers 2. Analysis of mass transport in lakes and reservoirs	2, 4	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
7	1. Analysis of mass transport in lakes and reservoirs 2. Basic reactor theory	2, 3, 4	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
8	Basic reactor theory	3	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
9	Partitioning of chemicals in environment and phase equilibrium	2, 4	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
10	Partitioning of chemicals in environment and phase equilibrium	2, 4	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
11	Interphase mass transfer	5	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
12	1. Quiz 2. Interphase mass transfer	5	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	
13	1. Interphase mass transfer 2. Synopsis	5	Course materials by instructors; ppt as the main reading material and Lecture Note as supplementary material.	In-person	

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lecture	Conduct 2 hours of TEL-based or normal lectures or open interactions per week for 13 weeks.
Tutorials	Conduct 1 hour per week of classroom-based discussions of tutorial questions and solutions on related topics.
Quizzes	The first quiz will be conducted after 30% of lectures are covered, while the second quiz will be conducted after 75% of lectures are covered.

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	Summative Assessment (EXAM): Final exam(Final Examination)	1,2,3,4,5	ENE SLOs* a, b, c	60	Individual	Holistic	Relational
2	Continuous Assessment (CA): Test/Quiz(Quiz)	2,3,4	ENE SLOs* a, b, c	20	Individual	Analytic	Multistructural
3	Continuous Assessment (CA): Test/Quiz(Quiz)	1,2,3,4,5	ENE SLOs* a, b, c	20	Individual	Analytic	Multistructural

Description of Assessment Components (if applicable)

Formative Feedback

Two quizzes will be conducted. The solutions to the quiz questions will be discussed in the class. You will be able to see their marked quiz papers.

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	Basic
Creative Thinking	Basic
Curiosity	Basic
Problem Solving	Basic

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)

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Policy (Absenteeism)

(1) Absenteeism

The Quizzes are conducted during regular lecture sessions, which is a form of in-class activities. Absence from Quizzes without a valid reason will result in zero mark. 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. There will be no make-up opportunities for in-class activities.

Policy (Others, if applicable)

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