

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	AY2021-2022
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Lee-Chua Lee Hong
Course Author Email	clhlee@ntu.edu.sg
Course Title	Water Resources Management
Course Code	EM5103
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

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

Course Aims

To introduce the basic principles of the hydrological principles, water quality and quantity, and water treatment which are essential fundamentals for the design of water resources related projects.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Describe the fundamental knowledge of hydrological principles, precipitation, evaporation, surface runoff and unit hydrograph.
ILO 2	Apply the hydrological principles in flood routing and groundwater.
ILO 3	Describe the fundamental knowledge of water demand and supply, water pollution and water quality standards.
ILO 4	Apply the knowledge to assess on urban impacts, dissolved oxygen and eutrophication.
ILO 5	Apply the knowledge to water and wastewater treatment.

Course Content

S/N	Topic	Lecture Hrs	Tutorial Hrs
1.	Hydrology, precipitation and evaporation	5	2
2.	Surface runoff, Unit hydrograph	4	2
3.	Flood routing, Groundwater	4	2
4.	Water demand and supply	2	1
5.	Water Pollution	3	1
6.	Water quality standards	1	1
7.	Urban Impacts	1	1
8.	Dissolved oxygen and eutrophication	3	1
9.	Water and wastewater treatment	3	2
	Total	26	13

Reading and References (if applicable)

Textbooks:

1. Linsley, R.K., Franzini, J.B., Freyberg, D.L. and Tchobanoglous, G., "Water Resources Engineering", Mc Graw Hill International, 4th edition, 1992.
2. Chapra, S.C., "Surface Water Quality Modelling" Mc Graw Hill International, 1997, Reissued 2008 by Waveland Press, Inc..

References :

1. Tchobanoglous, G. and Schroeder, E.D., "Water Quality: Characteristics, Modelling and Modification". Addison-Wiley, 1985.
2. Hammer, M.J. and Hammer Jr, M.J., "Water and Wastewater Technology" 7th Edition, New International Edition, Pearson Prentice Hall, 2013.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Hydrology, precipitation and evaporation	1			5 lectures and 2 tutorials
2	Hydrology, precipitation and evaporation	1			5 lectures and 2 tutorials
3	Hydrology, precipitation and evaporation	1			5 lectures and 2 tutorials
4	Surface runoff, Unit hydrograph	1, 2			4 lectures and 2 tutorials
5	Surface runoff, Unit hydrograph	1, 2			4 lectures and 2 tutorials
6	Flood routing, Groundwater	3			4 lectures and 2 tutorials
7	Flood routing, Groundwater	3			4 lectures and 2 tutorials
8	Water demand and supply,	4			2 lectures and 1 tutorials
9	Water Pollution and Water quality standards	5, 6			4 lectures and 2 tutorials
10	Water Pollution and Water quality standards	5, 6			4 lectures and 2 tutorials

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
11	Urban Impacts and Dissolved oxygen and eutrophication	7, 8			4 lectures and 2 tutorials
12	Urban Impacts and Dissolved oxygen and eutrophication	7, 8			4 lectures and 2 tutorials
13	Water and wastewater treatment	9			3 lectures and 2 tutorials

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lecture	Formal lectures on the topics with in-class discussion
Tutorial	<p>This helps you to achieve one or more of the outcomes as you would need to work on tutorial questions using the concepts and principles taught in the lectures.</p> <p>(The class is split into groups for tutorials so that the instructor-student interaction can be more effective)</p>

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	CVE SLO* a, c, e, g, j	60	Individual	Holistic	Relational
2	Continuous Assessment (CA): Test/Quiz(Quiz 1)	1, 2	CVE SLO* a, c, e, g, j	20	Individual	Analytic	Multistructural
3	Continuous Assessment (CA): Test/Quiz(Quiz 2)	3, 4, 5	CVE SLO* a, c, e, g, j	20	Individual	Analytic	Multistructural

Description of Assessment Components (if applicable)

* EAB SLO stands for the Engineering Accreditation Board Student Learning Outcomes. The list is below:

- a) Engineering knowledge: Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
- b) Problem Analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- c) Design/development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- d) 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
- e) 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.
- f) 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.
- g) 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.
- h) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- i) Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
- j) 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.
- k) Project Management and Finance: Demonstrate knowledge and understanding of the engineering and 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.

l) 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

The instructor (s) will provide feedback on your performance on the CA. Guidance will also be provided through active interactions during tutorial sessions and consultation meetings

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
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)

You are expected to complete all assigned readings, activities, assignments, attend all classes punctually and complete all scheduled assignments by due dates. You are expected to take responsibility to follow up with assignments and course related announcements. You are expected to participate in all project critiques, class discussions and activities.

Policy (Absenteeism)

In-class activities make up a significant portion of your course grade. Absence from class without a valid reason will affect your participation 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. There will be no make-up opportunities for in-class activities.

Policy (Others, if applicable)

You are advised to go through the class material and related texts before the lecture. You are also encouraged to share and deliberate on the challenges and difficulties of the tutorial exercises during the tutorials.

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