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	AY2017-2018
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Lee-Chua Lee Hong
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Course Title	Environmental Engineering Laboratory A
Course Code	EN2711
Academic Units	1
Contact Hours	30
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

The aim of this course is to provide you with practical applications and an understanding of theories, which are related to typical topics in the areas of environmental engineering and geotechnical engineering. By completing ten lab sessions, you are able to appreciate engineering applications, which include coagulation treatment, solids analysis, water and wastewater quality analysis, air quality analysis, permeability observation, and soil compaction and consolidation.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Carry out experiments and verify theories in ENV courses relating to water and wastewater quality analysis and treatment, air quality detection and analysis, and geotechnical engineering.
ILO 2	Carry out investigative open-ended projects to include independent methodology to relate theories and principles to experimental results on various test apparatuses relating to the above courses.
ILO 3	Estimate percent uncertainty in experimental data and results.
ILO 4	Analyse, interpret and infer from experimental data and results.
ILO 5	Write a project report with professional and technical competency and clarity.

Course Content

S/N	Topic	Lecture Hrs	Tutorial Hrs
1	Hydrostatic forces	-	3
2	Solids analysis	-	3
3	Water quality analysis (turbidity, colour, pH, and alkalinity test)	-	3
4	Wastewater quality analysis (DO, BOD, COD and TOC analysis)	-	3
5	Bacterial Examination	-	3
6	Ambient Air Quality Detection and Analysis	-	3
7	Atterberg limits and grain size analysis	-	3
8	Permeability and quick sand model observation	-	3
9	Compaction	-	3
10	One-dimensional consolidation test	-	3
	Total:	-	30

Reading and References (if applicable)

Beyond the laboratory manual, reference materials are also provided/recommended by instructors.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	-				
2	Hydrostatic forces	(a), (b), (c), (d), (e)		In-person	Manual, Experiment, Data analysis, Discussion, Report-writing
3	Solids analysis	(a), (b), (c), (d), (e)		In-person	Manual, Experiment, Data analysis, Discussion, Report-writing
4	Water quality analysis (turbidity, colour, pH, and alkalinity test)	(a), (b), (c), (d), (e)		In-person	Manual, Experiment, Data analysis, Discussion, Report-writing
5	Wastewater quality analysis (DO, BOD, COD and TOC analysis)	(a), (b), (c), (d), (e)		In-person	Manual, Experiment, Data analysis, Discussion, Report-writing
6	Bacterial Examination	(a), (b), (c), (d), (e)		In-person	Manual, Experiment, Data analysis, Discussion, Report-writing

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
7	Ambient Air Quality Detection and Analysis	(a), (b), (c), (d), (e)		In-person	Manual, Experiment, Data analysis, Discussion, Report-writing
8	Atterberg limits and grain size analysis	(a), (b), (c), (d), (e)		In-person	Manual, Experiment, Data analysis, Discussion, Report-writing
9	Permeability and quick sand model observation	(a), (b), (c), (d), (e)		In-person	Manual, Experiment, Data analysis, Discussion, Report-writing
10	Compaction	(a), (b), (c), (d), (e)		In-person	Manual, Experiment, Data analysis, Discussion, Report-writing
11	One-dimensional consolidation test	(a), (b), (c), (d), (e)		In-person	Manual, Experiment, Data analysis, Discussion, Report-writing

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Laboratory	In each session, the lab instructor first gives an introduction to the experiment, which includes relevant theory, experimental setup, and data analysis. Then technical staff shows main steps for conducting the experiment and collecting data. Finally, the students formed in groups conduct experiment, collect data, perform data analysis and write a report. This helps students to achieve one or more of the outcomes as they need to work as a group for experimental setup, data sampling and processing.
Individual and group report	Group reports are submitted for 9 labs. To run experiments, the class is organized into several groups, each having 3-5 students. Each group conducts experiment, collect data, perform analysis and complete a report within a 3-hour session. This helps students to achieve one or more of the outcomes as they need to work together for data analysis and report-writing. Individual reports are submitted only for 1 pre-arranged lab, within two weeks from the date of the lab attended. This helps students to achieve one or more of the outcomes as they need to do self-study and research, on individual basis, for a lab-specified topic.

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): Assignment(Continuous assessment)	a,b,c,d,e	CEE SLOs (a), (b), (d), (e), (i), (j) and (l)	100	Team	Holistic	Relational

Description of Assessment Components (if applicable)

* CEE SLO = Civil and Environmental Engineering Learning Outcomes (as per EAB Student Learning Outcomes (subset of 12 points))

https://www.ies.org.sg/professional/eab/EAB%20Accreditation%20Manual%20-%20Draft%20Revision%203%20full%20document%20.pdf

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.
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.
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.
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.

Formative Feedback

All reports submitted will be marked by tutors. They are kept in the lab for students' view.

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
Collaboration	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)

Policy (Absenteeism)

Policy (Others, if applicable)

Students must abide by the lab protocols and regulations shared during the safety briefings at all times.

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