

**Revised Course Content**

<b>Academic Year</b>	2017-2018	<b>Semester</b>	2
<b>Course Coordinator</b>	Tuti Mariana Lim		
<b>Course Code</b>	EN3004		
<b>Course Title</b>	Air Pollution Control Engineering		
<b>Pre-requisites</b>	Year 3 Standing		
<b>No of AUs</b>	3		
<b>Contact Hours</b>	Lecture: 26 hrs; Tutorial: 13 hr		
<b>Proposal Date</b>	1 February 2018		

**Course Aims**

To provide an understanding of the sources & effects of air pollutants and their control legislations; and the fundamental theories and practices of various devices for major air pollutant control.

**Intended Learning Outcomes (ILO)**

At the end of this module, the students should be able to:

1. Describe air pollution, sources and effects on the human health & the environment;
2. Apply meteorology knowledge to estimate air pollutants' emissions and evaluate air quality;
3. Describe global environmental issues due to air pollution;
4. Explain the working principle of various air pollution control technology and propose appropriate approaches/control technologies to reduce air pollution;
5. Apply appropriate knowledge to evaluate the performance of air pollution control devices.

**Course Content :**

Introduction to air pollution control. Air pollution effects. Air pollution control legislations and philosophies. Measurement, emission estimates and meteorology. Air pollution concentration models. Indoor air quality and global climate. Engineering approach for air quality control. Natural of particulate pollutants. Control of particulates, volatile organics and hydrocarbons. Characteristics & control of sulphur oxides and nitrogen oxides. Control of mobile source pollutants. Special topic: global efforts & advanced technology for CO<sub>2</sub> control.

**Course Outline :**

S/N	Topic	Lecture Hrs	Tutorial Hrs
1.	Introduction to air pollution control (overview, sources and effects, emission standards, unit conversion, Air Quality Index, etc)	2	1
2.	Measurement, emission estimates and structure of atmosphere	2	1
3.	Meteorology & winds. Stability of the atmosphere, lapse rates & inversions	2	1
4.	Air pollution dispersion models, Gaussian equation and variation	4	2

5.	Indoor air quality and box model, global climate and global warming	2	1
6.	Combustion related emissions	2	1
7.	Engineering approach for air quality control & IAQ sampling analysis	2	1
8.	Properties of particulate matters & collection mechanisms	2	1
9.	Control of particulate matters	2	1
10.	Characteristics and control of VOCs and HCs	2	1
11.	Characteristics and control of sulphur oxides and nitrogen oxides	2	1
12.	Control of mobile source pollutants & special topic	2	1
Total:		26	13

**Assessment (includes both continuous and summative assessment)**

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team / Individual	Assessment rubrics
1. Final Examination (2.5 hours and Close Book)	1, 2, 3, 4, 5	EAB SLOs a, b, c, g, j	50%	Individual	
2. Quiz 1	1, 2 & 3	EAB SLOs a, b, f, g	15%	Individual	
3. Quiz 2	2, 4 & 5	EAB SLOs a, b, c, g	15%	Individual	
4. Group Project	1, 2, 3, 4, 5	EAB SLOs d, f, g, h, i, j, l	20%	Team	Appendix 1
Total			100%		

Part A - Continual Assessment (50%) consist of,

(1) 2 quizzes (15% each)

- Will be conducted during the Teaching Week to evaluate learning outcomes. Questions are designed to test students' understanding of basic concepts and principles as well as their ability in applying them in real application scenarios. The quizzes will be close book written exams.

(2) A group-based project (20%)

- The project is to test students' ability in understanding and applying basic concepts and principles in environmental sustainability. Students will be given a list of topics in environmental sustainability and each group (10 groups total) will pick one or come up with their own topic. Each group will be required to conduct a literature survey and present their work in a 5-min presentation and a final report.

Part B - Examination (50%)

- Examination covers topics taught in all 13 Teaching Weeks. Questions are designed to test students' ability in understanding and applying basic concepts and principles in environmental sustainability

- It will be a 2.5 hours closed book written examination.

### **Formative feedback**

The quiz questions will be discussed during tutorial sessions and the students will be able to view their quiz results individually through Blackboard Grade Centre.

The result of group project reports will be released through Blackboard Grade Centre. The students can opt to meet the lecturer in office to view and discuss their group project performance.

### **Learning and Teaching approach**

Class meets once per week over 3 hours in lecture and tutorials format

<b>Approach</b>	<b>How does this approach support students in achieving the learning outcomes?</b>
Lecture	Formal lectures on topics with in-class discussions
Tutorials	This helps you to understand the concept taught during lectures as well as promote life-long learning
Quiz	This helps you to achieve one or more of the outcomes as you need to do self-study and research.
Group Report	This helps you to achieve one or more of the outcomes as you need to do self-study and research as well as promote team works.

### ***Textbooks :***

1. "Air Pollution Control Engineering" Noel De Nevers, McGraw Hill International, 2nd or 3<sup>rd</sup> Edition.

### ***References :***

Nil

### **Course Policies and Student Responsibilities**

#### **(1) General**

Students are expected to 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. Students are expected to participate in all group project discussions and activities.

#### **(2) Absenteeism**

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.

### 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. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

### Course Instructors

Instructor	Office Location	Phone	Email
Fang Ming Liang	N1-1c-81	6790-5331	mliang@ntu.edu.sg
Tuti Lim	N1-1b-39	6790-5269	tlim@ntu.edu.sg

### Planned Weekly Schedule

S/N	Topic	Course LO	Readings/ Activities
1.	Introduction to air pollution control (overview, sources and effects, emission standards, unit conversion, Air Quality Index, etc)	1 and 2	Reading ppt slides Tutorial
2.	Measurement, emission estimates and structure of atmosphere	1 and 2	Reading ppt slides Tutorial
3.	Meteorology & winds. Stability of the atmosphere, lapse rates & inversions	1 and 2	Reading ppt slides Tutorial
4.	Air pollution dispersion models, Gaussian equation and variation	1 and 2	Reading ppt slides Tutorial Grouping for Project
5.	Indoor air quality and box model, global climate and global warming	1, 2, 3 and 5	Reading ppt slides Tutorial Group Project Selection
6.	Combustion related emissions	1, 2, 4 and 5	Reading ppt slides Tutorial Group Project Selection
7.	Engineering approach for air quality control & IAQ sampling analysis	2, 4 and 5	Reading ppt slides Quiz Tutorial Group Project Allocation
8.	Properties of particulate matters & collection mechanisms	2, 4 and 5	Reading ppt slides Tutorial Working on group project
9.	Control of particulate matters	2, 4 and 5	Reading ppt slides Tutorial Working on group project

10.	Characteristics and control of VOCs and HCs	2, 4 and 5	Reading ppt slides Tutorial Group Project report
11.	Characteristics and control of sulphur oxides and nitrogen oxides	2, 4 and 5	Reading ppt slides Tutorial
12.	Control of mobile source pollutants & special topic	2, 4 and 5	Reading ppt slides Quiz Tutorial

### Appendix 1: Assessment Criteria for Group Project Report

Criteria	Good (8-10)	Ave (6-7)	Fair (4-5)	Poor (1-3)	Remarks
Introduction/Project Background (10%) <u>ILO 1, 3, 4 &amp; 5</u>					Accurate analysis of project background and description.
Project Objective/purpose of the project (10%) <u>ILO 2 &amp; 4</u>					Well defined project; clear objectives.
Methodology/experiment (20%) <u>ILO 2, 4 &amp; 5</u>					Basic knowledge and application of appropriate approaches towards air pollution monitoring
Results and Discussion (25%) <u>ILO 1, 2, 4 &amp; 5</u>					Well-presented results with discussion showing the ability to evaluate the performance of the air sampling device and analysis.
Conclusion and Recommendation (25%) <u>ILO 4 &amp; 5</u>					Summarize the report clearly and concisely; apply appropriate approach to improve the monitoring; clear and workable recommendations
Reference and Report format and layout including clarity of expression / Style of report (10%) <u>ILO 1, 2, 3, 4 &amp; 5</u>					Clear and concise; good grammar and spelling with appropriate Tables/graphs/Figures; Report are presented well with logical sequence
TOTAL					