



## Course Syllabus (Academic Year 2020)

### School of Interdisciplinary Studies, Kanchanaburi Campus, Mahidol University

- Course No. and Title** : KAED 353 Air Pollution Management and Control  
**Credit (study hours)** : 3(3-0-6)
- Program Name** : Bachelor of Engineering Program in Environmental Engineering and Disaster Management
- Course Module** : Major Required Courses  
**Pre/co-requisite** : None
- Class Semester** : 2<sup>nd</sup> Semester Academic Year 2021
- Class Schedule & Venue:** Thursday 9:00-12:00, Room XXXX

#### 6. Class Coordinator

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#### 7. Course Description

ชนิดและแหล่งกำเนิดของมลพิษทางอากาศ ผลกระทบต่อสุขภาพและสิ่งแวดล้อม หลักการควบคุมฝุ่นและก๊าซมลพิษ การชักตัวอย่างและวิธีการวิเคราะห์ กฎหมายและข้อกำหนด หลักการและการออกแบบหน่วยควบคุมฝุ่นละอองและก๊าซ การออกแบบระบบระบายอากาศ

Types of air pollutants and sources; effects on health and environment; principles of particulate and gaseous pollutant control; sampling and analysis methods; laws and regulations. Principles and design of air pollution control units for particulate and gases; ventilation system design.

#### 8. Course Objectives / Course Learning Outcomes (CLOs)

No.	Objectives / CLOs	Expected Skills / Knowledge			Sub-PLOs
		Specific	Generic	Knowledge	
8.1	Describe potential sources and physio-chemical characteristics of air			/	1.1, 1.2
8.2	Predict dispersion of air pollution under			/	1.1, 1.2,

	different climate stability conditions				2.2
8.3	Sample air pollutants according to the standard guideline			/	1.1
8.4	Design air pollution control system for the selected industries (Project based)			/	2.2, 4.2, 5.4, 6.3, 7.3
8.5	Design air ventilation system for selected case studies (Project based)	/		/	2.2, 4.2, 5.4, 6.3

### Program learning outcomes

- 1.1. Accurately explain basic concept, theories and principles of environmental engineering
- 1.2. Systematically summarize important issues from collected data
- 5.1 Integrate economics, social and environmental issues to environmental engineering and disaster management works
- 6.3 Develop a conceptual model or prototype from fundamental engineering knowledge
- 5.5. Learn and experience from real working environments and solve engineering problems occurred in organizations or industries

### 9. Course Outline

Week	Date	Contents	CLOs	Learning method	Instructor
1	6 Jan 2022	-Introduction to course outline, objectives, and assessment -Air Pressure, Air density, Air composition, Air - Air Ventilation for Occupation health and Heat mitigation	5	Lecture In-class calculation	AB
2	13 Jan 2022	Fan -Fan characteristic curve -System curve	5	Presentation In-class calculation	AB
		Criteria Air Pollutants - Effects -National Ambient Air Quality Standards	1 4	Presentation	AB
3	20 Jan 2022	Criteria Air Pollutants (cont)	1 4	Presentation Submit Homework 1	AB
		Group Discussion		Presentation	AB

Week	Date	Contents	CLOs	Learning method	Instructor
4	27 Jan 2022	Air Pollution Management and Control - Traffic, Urban, Industries	3	Presentation	AB
5	3 Feb 2022	Measurement and monitoring of air pollutants, Sampling	3	Presentation	AB
6	10 Feb 2022	Meteorology for air pollution control	2	Presentation	AB
	16 Feb 2022	9.00 AM to 4.30 PM LEAN Canvas workshop			BA faculty members
7	17 Feb 2022	Group project		Group project discussion and planning	AB
8	24 Feb 2022	Introduction to Air pollution control technology -Gravity Settling Chamber -Cyclone	4	Presentation In-class calculation	AB
28 Feb to 4 Mar 2022 Midterm Examination					
9	10 Mar 2022	Wet scrubber Bag house, Bag Filter Electronic Precipitator	4	Presentation In-class calculation	AB
10	17 Mar 2022	Group project		Group project discussion and planning	AB
11	24 Mar 2022	Adsorption Absorption Biofiltration	4	Presentation In-class calculation	AB
12	31 Mar 2022	Thermal Oxidation	4	Presentation In-class calculation	AB
13	2 Apr 2022 9.00 AM to 16.00 PM (6 hour) Sat	VOCs inventory in petroleum industry: field experience Air pollution model: field experience	1, 2	Presentation & workshop	MP, AS
14	7 Apr 2022	Group project discussion	4,5	Group Presentation	AB
15	TBA	Group Project Presentation: ED Innovation Day		Group Presentation	AB
2 to 13 May 2022 Final Examination					

## 10. Course Assessment

No.	Methods/Activities	Regulations	CLOs	Week	Weight Distribution
1	Class participation and Class attention	<ul style="list-style-type: none"> <li>● Student must submit the assignments in time</li> <li>● Student must attend classes on time &gt; 80% of the course, by CC</li> </ul>		All	5
		Student must participate in class activity		All	5
2	Assignment	I. Learner must practice the engineering skills from exercises and assignments II. The score will be evaluated according to the quality and details of work by instructors. (Correctness, Determination)	All	Weekly	25
3	Group Project *	I. Topic assigned by lecturer II. Exhibit in ED Innovation Day III. Grade evaluated by Rubric criteria *	All	15	25
3	Midterm Examination	III. The exam will be held on schedule. IV. It is <b>close-book exam</b> which student can use personal calculator. V. The scope of exam will be cover topics of the 1 <sup>st</sup> -8 <sup>th</sup> week in this course.	All	9	20
6	Final Examination	VI. The exam will be held on schedule. VII. It is <b>close-book exam</b> which student can use personal calculator. VIII.III. The scope of exam will cover all topics of this course.	All	16	20
				Total	100

**\*Group Project topic**

- I. Mueng Kanchanaburi Smart City
- II. Evaluate efficiencies of 10 reusable facial masks in the market for PM2.5 reduction and provide recommendations to users
- III. Estimate changes in the efficiency of a standard facial mask with time – How it fit with fabric filter calculation?
- IV. Estimate dust capturing capacity of 10 popular city plants and discuss factors influencing the capturing capacity
- V. Estimate efficiency of water springer for ambient PM2.5 removal – How it fit with wet scrubber calculation?
- VI. Compare best efficiencies of settling chamber and cyclone for bagasse ash removal (sugarcane industry)
- VII. Assess potential sources of haze in Bangkok and Chiangmai using backward trajectory analysis
- VIII. Evaluate bed contact time for removing household waste composting odor using bagasse-based biofiltration
- IX. Establish user-interface model for estimating plume rise and maximum downwind ground-level concentration using Gaussian Dispersion Model

**Rubric for Group project**

Accurately explain basic concept, theories and principles of environmental engineering	Integrate economics, social and environmental issues to environmental engineering and disaster management works	Solve engineering problems occurred in organizations or industries	Express ideas and use appropriate media for communication
10	5	10	5

**11. Grading System**

Criterion-referenced evaluation

The student performance in overall course will be measured by Criterion-referenced assessment as following table.

Grade	Score	Grade	Score	Grade	Score	Grade	Score
A	80%	B	70 – 74.99%	C	60 – 64.99%	D	50 – 54.99%
B+	75 – 79.99%	C+	65 – 69.99%	D+	55 – 59.99%	F	< 50 %

## 12. References

1. กรมโรงงานอุตสาหกรรม. ตำราระบบบำบัดมลพิษทางอากาศ. ศูนย์บริการวิชาการแห่งจุฬาลงกรณ์มหาวิทยาลัย. พิมพ์ครั้งที่ 1. กรุงเทพมหานคร. 2547.
2. ศิวพันธุ์ ชูอินทร์. การเก็บตัวอย่างและตรวจวัดสารมลพิษทางอากาศ. สำนักพิมพ์แห่งจุฬาลงกรณ์มหาวิทยาลัย. พิมพ์ครั้งที่ 1. กรุงเทพมหานคร. 2560
3. รศ.ดร.วันที พันธุ์ประสิทธิ์. การระบายอากาศในโรงงานอุตสาหกรรม สำหรับนักสุขศาสตร์อุตสาหกรรมและนักอาชีวอนามัย. พิมพ์ครั้งที่ 2.
4. สภาวิศวกร. ระบบควบคุมมลพิษทางอากาศ. โดยคณะอนุกรรมการมาตรฐานการประกอบวิชาชีพ.  
**Download <http://www.coe.or.th/coe-2/Download/Articles/ENV/CH6.pdf> (06/02/2560)**
5. Theodore, L. (2008). Air Pollution Control Equipment Calculations. Wiley.
6. Myer, K. editor (2018). Handbook of environmental engineering. First Edition, Wiley: USA
7. Schnelle Jr, K. B., Dunn, R. F., & Ternes, M. E. (2015). *Air pollution control technology handbook*. CRC press..

13. PLOs (update 26/10/2018)

<b>Program Learning Outcomes</b>	
1	Apply environmental engineering principles and knowledge to systematic solutions according to Professional Standards
2	Apply practical skills in environmental engineering and disaster management to real situations based on academic principles and professional ethics
3	Apply geo-informatics system and information technologies in planning to handle environmental and disaster problems in accordance with academic principles
4	Present, discuss, and transfer knowledge clearly to persons related to professional works according to communication objectives
5	Work as an environmental engineer with other people to solve complicated problems according to economic, social, and environmental issues
6	Design and invent a creative innovation in environmental engineering and disaster management