

King Fahd University of Petroleum & Minerals
Chemical Engineering Department
CHE 470: Process Air Pollution Control
Spring 2005 (042)

Instructor: Dr. Raafat Alnaizy Office: 16-242
Meeting times: SMW 8:00 to 8:50 AM Location: 19-401
Homepage: <http://faculty.kfupm.edu.sa/CHE/alnaizy/> Off Hrs: Sat., Mon., Wed. 9AM–10AM

Description

This course focuses on the fundamental concepts needed to understand the field of air pollution, and on strategies and technologies for complying with air pollution control regulations. The basics of air pollutant dispersion and transport are also covered. The main focus of the course is on emission control technologies for particulate matter, carbon monoxide, sulfur oxides, nitrogen oxides, organic and inorganic toxic pollutants. The following technologies are discussed: cyclones, scrubbers, electrostatic precipitators, bag-houses, adsorption, absorption and incineration.

Objectives

On completing the course, a successful student will

1. Develop a basic understanding of the impacts of air pollution on human health, human welfare, living organisms, materials, and the ecosystem.
2. Develop a basic understanding of the chemical and physical processes that transform and transport pollutants in the atmosphere.
3. Learn how to design devices and systems for air pollution control.
4. Develop a basic understanding of the mechanism that lead to the formation and emissions of air pollutants.
5. Develop a basic understanding of the control technologies used to control air pollution emissions, including process operations, process design, and process limitations.

Prerequisites

1. Previous undergraduate coursework in thermodynamics, physics, chemistry, statistics, and mathematics through differential equations.
2. This course will emphasize engineering design based upon application of fundamental principles. Please contact the instructor if you have any questions.

Textbook

Air Pollution: Its Origin and Control, 3rd Edition, by Wark, Warner and Davis, Addison Wesley, 1998.

Updates and Corrections for Textbook by Chapter <http://web.utk.edu/~wtdavis/updates.html>

Schedule

WW	Class Date	Subject	Chapter
1	February 12	Introduction, Physical/Chemical Characteristics Of Pollutants, Growth of Air Pollution	1
2	February 19	Effects of Air Pollution, Air Quality Management, Clean Air Act	1,2
3	February 26	Emission Standards, Clean Air Act 1990, Air Toxics	2
4	March 5	Meteorological Bases of Air Pollution, Climatology/Plume Behavior Dispersion Modeling, Gaussian Equation, Point Sources	3,4
5	March 12	Line Sources, Puffs, Plume Rise	4
6	March 19	Test # 1 Elements of Regulatory Control, Engineering Control Concepts Introduction to APC Devices, Collection Efficiency	5
7	March 26	Particle Size Distributions, Particulate Control Equipment Settling Chambers/Cyclones	5
8	April 2	Electrostatic Precipitators, Particulate Wet Scrubbers	5
	April 9	Midterm Break	
9	April 16	Fabric Filters	5
10	April 23	Control of Gases and Vapors Adsorption and Absorption	6
11	April 30	Test # 2 The Combustion Process	6
12	May 7	Kinetics of Pollutant Formation, Incineration	6
13	May 14	Control of Combustion Processes, Control of Acid Gases (SO ₂ , HCl...)	7
14	May 21	Control of NO _x /APC of Other Sources	8
15	May 28	Mobile Sources: Regulations/Control, Source Sampling Photochemistry	10, App. A 9
16		Final examinations, Test # 3	

Grades

Your grade will be determined from a composite score as follows:

Homework: 10 %, Attendance and Participation 10%, Two Exams of equal weight (25% each), Final Exam (30%). Exams are open book and notes.

Note

Attendance is very important for this course. In accordance with university policy, a DN grade will be issued to a student if he exceeds nine unexcused absences.