



**PUBH 5174
Control of Exposure to Physical and Chemical Hazards
Spring Semester 2005**

COURSE SCHEDULE

1/24/05 Week 1 **Course Introduction**
Course syllabus; units; hierarchy of control; types of ventilation systems

Properties of Air

Composition of air; kinetic theory of gases; concept of pressure; ideal gas law; air density; humidity

1/31/05 Week 2

HVAC Systems

Types of systems used to supply fresh air to buildings; common elements to all systems; similarities and differences between HVAC systems and ventilation systems for control of pollutants

General Exhaust Ventilation

Control by displacement and dilution; models for a well-mixed room; reasons to supplement general exhaust ventilation with local exhaust ventilation

Replacement Air Considerations

Flow rates; pressure differential; temperature considerations; humidity considerations; inlet/outlet placement

Required Reading: *Vent Manual*, Chapter 2

Supplemental Readings: *Vent Manual*, Chapters 7 & 8
Burgess et al., Chapters 4 & 15

HOMEWORK #1 DUE

2/7/05 Week 3

Airflow, Duct & Hoods

Basic fluid mechanics; concepts of static, velocity, and total pressure; types of duct; friction losses; types of hoods, booths, and enclosures

Required Reading: *Vent Manual*, Chapter 1

Supplemental Reading: Burgess et al., Chapter 2

HOMEWORK #2 DUE

- 2/14/05 Week 4 **Tour**
★★★ Meet in Regis Center for Art, West Bank Campus ★★★
Led by Mike Austin, Department of Environmental Health and Safety
- Hood Design**
Face velocity; capture velocity; consideration of cross flow drafts; entry losses; push-pull ventilation
- Required Reading: *Vent Manual*, Chapter 3
Supplemental Reading: Burgess et al., Chapters 5 & 13
- HOMEWORK #3 DUE**
- 2/21/05 Week 5 **Local Exhaust Ventilation System Design #1**
Single-hood systems; calculation sheets; tracking pressure through a system; bends; expansions/contractions; stacks
- Student Feedback Survey**
- Required Reading: *Vent Manual*, Chapter 5
Supplemental Reading: Burgess et al., Chapter 8
- HOMEWORK #4 DUE**
- 2/28/05 Week 6 **EXAM #1 (1st hour)**
Exam covers weeks 1-4
- Local Exhaust Ventilation System Design #2**
Multiple-hood systems; blast gates; branch entries; balancing ventilation systems
- Supplemental Reading: Burgess et al., Chapter 9
- 3/7/05 Week 7 **Ventilation Measurements**
Manometers, aneroid gauges, and micromanometers for pressure readings; pitot tubes, vane anemometers, and thermal anemometers for velocity measurement; orifice and venturi meters for flow measurement; tracer gases; flow visualization
- Introduction to Design Project**
Discuss design project requirements
- Required Reading: *Vent Manual*, Chapter 9
Supplemental Reading: Burgess et al., Chapter 3
- HOMEWORK #5 DUE**

3/14/05		SPRING BREAK
3/21/05	Week 8	Ventilation Measurements Laboratory ★★★ Meet in Industrial Hygiene Lab, Boynton S-35 ★★★ Measure velocity and flow in a duct; calibrate instruments for measuring velocity; measure face velocity of a laboratory hood; measure hood static pressure; measure static pressure entering and leaving a fan The lab session will be led by Seung Won Kim <u>Required Reading:</u> Instructions for Ventilation Measurement Lab <u>Supplemental Reading:</u> Burgess et al., Chapter 7
3/28/05	Week 9	Fans Types of fans; operating characteristics; fan static pressure curves; fan selection; fan efficiencies and power consumption; placement of fans <u>Required Reading:</u> <i>Vent Manual</i> , Chapter 6 <u>Supplemental Reading:</u> Burgess et al., Chapter 10 LAB REPORT DUE BY 3/31/05 AT 5:00 PM
4/4/05	Week 10	Air Pollution Control Equipment Evaluation criteria for control devices; absorbers; adsorbers; oxidizers; settling chambers; inertial collectors; cyclones; scrubbers Student Feedback Survey <u>Required Reading:</u> <i>Vent Manual</i> , Chapter 4 <u>Supplemental Reading:</u> Burgess et al., Chapter 11 HOMEWORK #6 DUE
4/11/05	Week 11	EXAM #2 (1st hour) Exam covers weeks 5-9 Air Pollution Control Equipment Electrostatic precipitators; fibrous and fabric filters; integration of control equipment into ventilation systems

4/18/05 Week 12 This lecture will be presented by Dr. Knutson

Control Economics

Operating costs; capital costs; hidden costs; estimating costs; ramifications of cost estimates

Example of a Real Ventilation Design

HOMEWORK #7 DUE

4/25/05 Week 13 **Respiratory Protection**
Types of respirators; respiratory protection program requirements; fit testing

Respirator Selection Activity

Required Readings:

Instructions for Respirator Selection Activity

OSHA Respiratory Protection eTool (investigate the web site!)

<http://www.osha-slc.gov/SLTC/etools/respiratory/index.html>

University of Minnesota Respiratory Protection Program

<http://www.dehs.umn.edu/safety/rpp/>

HOMEWORK #8 DUE

5/2/05 Week 14 **Personal Protective Equipment**
Hearing protection; chemical protective clothing; safety equipment; equipment to control ergonomic hazards

PPE Selection Activity

Required Readings:

Instructions for PPE Selection Activity

"Assessing the Need for Personal Protective Equipment: A Guide for Small Business Employers", OSHA 3151 (2000)

<http://www.osha-slc.gov/Publications/osha3151.pdf>

"Guide for the Selection of Personal Protective Equipment for Emergency First Responders", National Institute of Justice Guide 102-00, Volume 1 (2002)

<http://www.ncjrs.org/pdffiles1/nij/191518.pdf>

Course Evaluation

5/13/05 **DESIGN PROJECTS DUE BY 5:00 PM**