

# EHS C152D/C252D: PROPERTIES AND MEASUREMENT OF AIRBORNE PARTICLES

## UCLA School of Public Health Syllabus - Spring 2017

### Course information

**Time:** Mondays and Wednesdays, 10:00-11:50 AM  
**Location:** 71-257 CHS  
**Cap on Attendance:** 28 total (8 in C152D and 20 in C252D)  
**Units:** 4

#### Instructors:

**Yifang Zhu, PhD**  
Professor, 51-295 CHS  
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TA: Tony Wang (Email: hpinvent@ucla.edu)

### Text Books and Required Readings

\*Hinds, W.C., Aerosol Technology: Properties, Behavior and Measurement of Airborne Particles, Second Edition, Wiley, New York (1999).

Lecture slides and journal articles will be posted on the class website on a weekly basis. Students are required to read the posted material before coming to the class.

### Course Topics and Tentative Schedule

<u>WEEK</u>	<u>TOPIC</u>	<u>CHAPTER*</u>	<u>PROB. SET#</u>
1	Introduction, Properties of Gases	1, 2	1.4, 1.6a
2	Uniform Particle Motion	3	2.4, 2.10
3	Particle Size Statistics, Acceleration	4, 5	3.5, 3.12
4	Impactors, Adhesion, Hour Exam	5, 6	3.18, 4.3
5	Brownian Motion, Filtration	7, 9	4.6, 5.10
6	Sampling, Respiratory Deposition	10, 11	6.1, 7.2
7	Coagulation, Hour Exam, Condensation	12, 13	9.4, 10.3
8	Evap., Atm. Aerosols, Elect. Prop.	14, 15	11.2, 12.5
9	Elect. Prop	16	12.7, 13.3
10	Optical Properties, Dust Explosions Bioaerosols, Review	18, 19	13.5, 15.1, 16.6

Final Exam: Wednesday, June 14, 2017: 3:00 PM - 6:00 PM

### Course Website

All homework assignments are posted on the course website:

<https://ccle.ucla.edu/course/view/16S-ENVHLTC252D-1>

If you are unable to access the course website, please contact Yifang Zhu ([yifang@ucla.edu](mailto:yifang@ucla.edu)).

## Course Structure and Grading Methods

Lecture will be given on Mondays and Wednesdays. There are two 1-hr midterms and a final exam. All students are expected to attend class regularly and participate in group discussions and contribute to the group projects, etc.

Criteria	Weight	Remarks
1st Midterm (04/27)	20%	Close book! Chapters 1-4
2nd Midterm (05/18)	20%	Open book! Chapters 5-12 excluding chapter 8
Final Exam	35%	Open book! All covered chapters with emphasizes on chapters 13 and beyond.
Home Work	20%	Content, organization, delivery
Class participation	5%	Attendance and participation in class discussion

## Learning Objectives and Competencies

Upon completion of this course, you should be able to demonstrate the skills listed as “Course Learning Objectives” below. These learning objectives were selected to help you build skills related to help undergraduates build competencies outlined in the ASPH Undergraduate Public Health learning Outcomes Model (<http://www.asph.org/document.cfm?page=1085>) and to help MPH and MS students in Environmental Health Sciences.

<b><i>COURSE LEARNING OBJECTIVES</i></b>
1. Understand the importance of particle size in controlling aerosol properties.
2. Use statistical methods on particle size distribution to calculate aerosol properties.
3. Calculate gravitational settling velocities for the full aerosol particle size range.
4. Calculate cutoff diameter for a flat plate impactor.
5. Determine particle size distribution by analyzing cascade impactor data.
6. Understand the relationship between particle size and adhesive forces.
7. Understand the nature of Brownian motion and diffusion of aerosol particles.
8. Understand how aerosol filtration works.
9. Understand how to sample aerosol isokinetically.
10. Understand the nature of respiratory deposition of aerosols.
11. Calculate the effect of coagulation on particle number concentration and size distribution.
12. Calculate particle growth rates and evaporation times for pure materials.
13. Understand the electrical properties of aerosols.
14. Understand the nature of optical properties of aerosols and their effect on visibility.
15. Understand the conditions and requirements for dust explosions.
16. Utilize opportunities to interact weekly with the instructor and teaching assistant to further the student's learning experience and interest in the subject.

**HOW THESE LEARNING OBJECTIVES ALIGN WITH COMPETENCIES FOR SPECIFIC DEGREE PROGRAMS**

***MPH Core Competencies  
(for all MPH students)***

- C1. Describe the direct and indirect human, ecological and safety effects of major environmental and occupational agents.
- C2. Develop and assess appropriate data collection instruments (e.g., questionnaires, physical exam, lab assays, etc.) and evaluate the use of questionnaires and measurement instruments in collection of data to maintain internal validity
- C3. Identify an appropriate target population for investigating the research question.
- C4. Specify current environmental risk assessment methods.
- C5. Identify potential sources of systematic error (bias) as well as random error.
- C6. Identify key sources of data and use existing databases to provide background or supportive data to address research questions.

***ESH MPH Discipline-Specific Competencies  
(for MPH students in the EHS concentration)***

- I1.1. Describe major direct and indirect human health and safety effects of major environmental or occupational agents or conditions.
- I1.2. Identify the most important disease burdens with major environmental or occupational risk factors and the environmental or occupational risk factors that produce the most disease burden in either the general population or in heavily affected subgroups.
- I1.3. Identify significant gaps in the current knowledge base concerning health effects of environmental or occupational agents.
- I3.1 Describe how humans are exposed to chemical, physical, and biological agents in the workplace and environment and how exposures are determined.
- I3.2. Describe how exposures can be controlled through administrative procedures, personal protective equipment, various engineering technologies, and social interventions.
- I5.2 Identify areas of uncertainty in exposure and risk assessment processes.
- I6.1 Describe major types of institutions responsible for occupational or environmental health policy.
- I6.2 Identify major state, federal, international regulatory programs or authorities for occupational or environmental health.
- I8.1 Describe importance of community and home environments and what contributes to cumulative impacts.

***EHS MS Competencies***

- A2 Use existing databases to provide background information or data to address research questions and draw appropriate inferences/estimates from environmental health data.
- A3 Evaluate seminars and presentations in environmental health and distill the critical and salient issues from them.
- B1 Formulate a research question.
- B2 Evaluate the scientific merit and feasibility of study designs.
- B3 Identify an appropriate target population or organism for investigating the research question.
- B4 Identify potential sources of systematic error (bias) as well as random error.
- B5 Be able to articulate interdisciplinary approaches to solving public health problems.
- C1 Use computer systems and analytic software packages.
- C2 Produce working tables, statistical summaries, and effective figures to summarize data.