

PRINCIPLES OF AIR POLLUTION (11:375:421; 06257)

10:55 -12:15 PM Tuesday, Friday

Hickman Hall, Rm 211

89 George St, New Brunswick, NJ 08901, [Map](#)

Instructor: Dr. Gedi Mainelis, Associate Professor
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Guest Lecturers: TBD

Course Materials: 1. Air Quality 4th Ed. Thad Godish, ISBN-13: 9781566705868
2. Supplemental Handouts
3. Course Website: use <https://sakai.rutgers.edu/>
Log-in with your own NetID and password

Grading:	Exam 1	25%
	Exam 2	25%
	Homework	10%
	Final Exam	40%

What is expected of students:

- Arrive on time and participate in every class
- Listen attentively and be active in class discussions
- No texting or web browsing during the class.

COURSE DESCRIPTION

- The course provides scientific basis to understand and become familiar with the sources, causes, health and environmental effects, research, control, and regulation of air pollution
- The course follows the analysis and application of the above along a process continuum that starts from the source and stops at the effects of air pollutants

LEARNING GOALS

The learning goals for the Environmental Science major are posted on our website at http://envsci.rutgers.edu/current_students/envsci_undergrad_program/learning_goals.shtml

This class will contribute toward students' ability to:

- Goal 1. Apply knowledge from the sciences and mathematics to environmental problems and solutions
- Goal 2. Use the skills and modern environmental science techniques and tools necessary for a successful career in the field
- Goal 5. Communicate technical information effectively (orally, in writing, and through electronic media)
- Goal 7. Understand contemporary environmental science issues and the impact of environmental science in a global and societal context

	Topics <i>(Sequence may vary depending on the availability of guest lecturers)</i>
1	Introduction, pollution definition, structure of atmosphere
2	Air pressure and density, Boyle's law, Charles's law, ideal gas law; Partial pressures; Conversion from ppm to $\mu\text{g}/\text{m}^3$
3	Sources and pollutant categories; Chapter 2
4	Major pollutants and their properties; Chapter 2
5	Major pollutants and their properties; Pollution trends. Chapter 2
6	Particulate matter: sources and concentrations
7	Particulate matter: sources and concentrations
8	Basic properties of aerosol particles
9	Basic properties of aerosol particles
10	Exam 1
11	Atmospheric Chemistry
12	Regulations and regulatory process; Chapter 8
	Mobile sources and their control; Chapter 9
14	Mobile sources and their control; Chapter 9
15	Mobile sources and their control; Chapter 9
16	Stationary sources and their control; Chapter 10
17	Stationary sources and their control; Chapter 10
18	Atmospheric dispersion, effects of meteorology; Chapter 3
19	Exam 2
20	Dispersion modeling
21	Dispersion modeling
22	Exposure
23	Health effects; Chapter 5
24	Atmospheric effects; Chapter 4
25	Atmospheric effects; Chapter 4
26	Welfare effects; Chapter 6
27	Air quality and emissions assessment; Chapter 7
28	Review
	FINAL EXAM

Suggested reading:

- “Atmospheric Pollution. History, Science, and Regulation”, Mark Z. Jacobson, 2002, Cambridge University Press, ISBN-13: 9780521010443.
- “Air Pollution. Its Origin and Control”, 3rd edition, K. Wark, C.F. Warner, W.T. Davis, 1998, Addison Wesley Longman, Inc., ISBN-13: 9780673994165.
- “Fundamentals of Air Pollution”, Daniel Vallero, 2007, Academic Press, ISBN-13: 978-0123736154.
- “Air Pollution. Measurement, modeling and mitigation”, 3rd edition, A. Tiwary and J. Colls, 2010, Routledge, ISBN-13:978-0-415-47933-2
- “Dust: The Inside Story of its Role in the September 11th Aftermath”, Paul J. Liroy, 2010, Rowman & Littlefield Publishers, Inc., ISBN-13: 9781442201484.

ASSESSMENT ACTIVITIES

1. Ability to apply knowledge from the sciences and mathematics to environmental problems and solutions

Instructional Activity:

Concepts of air pressure and density, Boyle's law, Charles's law, ideal gas law, partial pressures, pollutant concentrations based on mass ($\mu\text{g}/\text{m}^3$) and volume (ppm), mathematical description of basic properties of aerosol particles will be covered in lectures. Students will practice these skills in homeworks and in class exercises.

Assessment Activity:

Application of sciences and mathematics in specific problem sets (10% of assessment)

Application of sciences and mathematics in specific Exam 1 questions (40% of assessment)

Application of sciences and mathematics to specific final exam questions (50% of assessment)

2. Ability to use the skills and modern environmental science techniques and tools necessary for a successful career in the field.

Instructional Activity:

Concept of air pollution modeling and its application will be covered in class. Students will practice this skill in homeworks and in class exercises.

Assessment Activity:

Application of air pollution modeling in specific problem sets (50% of assessment)

Application of air pollution modeling in specific final exam questions (50% of assessment)

5. Communicate technical information effectively (orally, in writing, and through electronic media)

Instructional Activity:

Description and discussion of various technical concepts that relate to air pollution, such as devices and techniques used to control air pollution

Assessment Activity:

Communication of answers to specific technical questions in Exam 2 (50% of assessment)

Communication of answers to specific technical questions in the final Exam (50% of assessment)

8. Understand contemporary environment science issues and the impact of environmental science in a global and societal context

Instructional Activity:

Description and discussion of various environmental and human health impacts of air pollution

Assessment Activity:

Demonstration of understanding by answering specific questions in problem sets (10% of assessment)

Demonstration of understanding by answering specific questions in Exam 1 (25% of assessment)

Demonstration of understanding by answering specific questions in Exam 2 (25% of assessment)

Demonstration of understanding by answering specific questions in the final Exam (40% of assessment)