

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

10:55 -12:15 PM Tuesday, Friday

Loree Building, Rm 115

72 Lipman Drive, New Brunswick, NJ 08901, [Map](#)

Instructor: Gedi Mainelis, Ph.D., Ph: 848-932-5712, email: mainelis@envsci.rutgers.edu
Office: Environmental Sciences Department. Rm 234

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%
	Exam 3 (Final)	30%
	Homework	20%

It is expected that students:

- Arrive on time and participate in every class
- Listen attentively and be active in class discussions
- Do not engage in 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
	Exam 3 (Final)

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.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Please follow the procedures outlined at <https://ods.rutgers.edu/students/registration-form>. Full policies and procedures are at <https://ods.rutgers.edu/>

ABSENCE POLICY

Students are expected to attend all classes; if you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

ACADEMIC INTEGRITY

The university's policy on Academic Integrity is available at <http://academicintegrity.rutgers.edu/academic-integrity-policy>. The principles of academic integrity require that a student:

- properly acknowledges and cite all use of the ideas, results, or words of others.
- properly acknowledges all contributors to a given piece of work.
- makes sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- obtains all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.
- treats all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitates academic dishonesty by others nor obstructs their academic progress.
- upholds the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- all student work is fairly evaluated, and no student has an inappropriate advantage over others.
- the academic and ethical development of all students is fostered.
- the reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

STUDENT WELLNESS SERVICES

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901 / www.rhscaps.rutgers.edu/

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy, and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / www.vpva.rutgers.edu/

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff, and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation:

<https://ods.rutgers.edu/students/documentation-guidelines> . If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS website at:

<https://ods.rutgers.edu/students/registration-form>.

Scarlet Listeners

(732) 247-5555 / <https://rutgers.campuslabs.com/engage/organization/scarletlisteners>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.

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)