

Division of Natural Science

<http://natsci.info.yorku.ca/>

Course Outline

NATS1515, Section A, Atmospheric Pollution

Fall, 2017

Friday, 11:30-2:30 , Vari Hall B

Course Instructor(s) and Contact Information

- **Instructor name:** Rez Mani (PhD), **e-mail:** rmani@yorku.ca, **Office:** CB416
 - Students should send emails from @my.yorku.ca email as others including, hotmail, gmail, yahoo.... may be filtered and never make it to the intended yorku recipient.
 - It may take 24 hours to 48 hours to receive a response from the instructor.
- **Office hours:** Fridays 3-4 pm, CB416. Students can also make an appointment on other times.

Email Policies and Etiquette

- Please put your course number and student number in the title of the e-mail. The body of your e-mail should contain your name. In matters related to TAs, the name of TA should be mentioned.

Expanded Course Description

The course commences with the evolution of the Earth's atmosphere from its creation and moves to its development to the present throughout several stages. The cyclical climate change of Earth has been due to changes in orbital obliquity, eccentricity and precession (related to the change of Earth's rotation axis, distance from the sun and rotation rate respectively). The course proceeds to examine the history of atmospheric pollution from natural causes such as volcanoes, natural fires, desert dust, etc., to pollution caused by humans prior to the industrial revolution arising from the burning of wood and the clearing of land. Subsequently, modern day pollution due to the burning of fossil fuels and production of other anthropogenic harmful chemicals will be discussed. Different forms of pollution such as manifested as smog and acid rain are discussed and past successes in dealing with these types of pollution are recounted. The course concludes with topics on new policies and technologies that can be considered to ameliorate the deleterious effects of atmospheric pollution, such as the usage of green energy (solar, wind, fuel cell, geo-thermal, biomass, etc.).

Course Learning Outcomes

Upon successful completion of this course students should be able to:

- Recount the historical evolution of the Earth's atmosphere.
- Describe the composition and chemistry of urban pollution.
- Identify the composition and sources of indoor pollution.
- Recognize the harmful effects of pollution on the environment.
- Define atmospheric optical phenomena and changes in visibility and sky colour due to pollution.
- Identify measures that are needed to address atmospheric pollution and climate change.
- Understand measurement techniques to quantify levels of outdoor pollution.

Evaluation

- **3 assignments (10% each, 30% total)**

The assignments include some conceptual questions where students need to describe a particular topic such as indoor air pollution and its sources or distinguish between several different measures for dealing with atmospheric pollution. Students need to distinguish between pros and cons of different measures. There will also be some numerical questions related to atmospheric pollution. There is a one week turn around time for submitting the assignments. Each assignment will be distributed nearly towards the end of the month in September, October and November.

- **2 midterms (20% each, 40% total)**

The midterms consist of 80 multiple choice questions and 10 fill-in-the blanks. The latter is marked by TAs. The approximate dates are mid-October and mid-November.

- **Final (30%)**

The final includes 80 multiple choice questions, 10 fill-in-the blanks and 10 True-false questions. It will take place during the university examination period and its date will be announced by the registrar office.

- **Extra credit statement:** In order to be fair and consistent to the entire class, individual grades are not negotiable and "extra credit" assignments are not provided at any point during or after the course. Please contact the instructor about a grade **only** if there is a clear error (calculation, clerical, etc.) within two weeks of the grade being made available to you."

Course Materials

- **Text book:** Air pollution and global warming, history, science and solutions. Second edition (2012). Author: Mark Z.Jacobson. Publisher: Cambridge University Press.
- **The electronic copy of the textbook:** Here is the link an e-book via our website: <http://www.cambridge.org/ca/academic/subjects/earth-and-environmental-science/atmospheric-science-and-meteorology/air-pollution-and-global-warming-history-science-and-solutions-2nd-edition?format=AR#MP7fGrvTZDyfstJl.97>

It is also available from VitalSource.com.The price for the ebook is \$92.00 CAD.

- **Other recommended references:**
 - An Introduction to atmospheric physics. Second Edition (2012). Author: David G. Andrews, 2010.
 - Living in the environment. Third Canadian edition (2011). Authors: G.Tyler Miller, Jr and Dave Hackett.
 - Environmental science, a Canadian perspective. Fifth edition (2010). Author: Bill Freedman.
- **REEF:** This free downloadable software (accessible through any smart phone) will be used to poll the students for practice questions. This is only used for educational purposes and no weight is associated with the REEF activity.

Laboratory/Tutorial

- There may be a voluntary tutorial before each mid-term but that depends on the availability of a TA to conduct the tutorial.

Course Content and Format

- Basics and history of discovery of atmospheric chemicals. In this section the important atmospheric gaseous constituents are examined. Some historical accounts of the discovery of these gaseous compounds will be given **(3 hours)**.
- The evolution of the Earth's atmosphere. Our global atmosphere evolved through several stages to arrive at its present day composition. There were three principle evolutionary stages. The hydrogen-helium mix in the first stage was blown away by increased solar activity and replaced by a new atmosphere in the second stage due to volcanic activity comprising mainly of nitrogen, carbon dioxide, hydrogen and water vapour. After formation of oceans and the emergence of life and photosynthesis, carbon dioxide was consumed and oxygen produced in the third stage. All these stages are examined in detail. **(5 hours)**
- Structure and composition of present day atmosphere. Composition and temperature-pressure structure of the present day atmosphere is discussed. Different layers of the atmosphere such as the troposphere, stratosphere, etc., are introduced **(3 hours)**.

- Urban air pollution. Composition and chemistry of photo-chemical smog, formation of inversion layer, role of aerosols in formation of smog and regulations pertaining to urban air pollution are discussed (**3 hours**).
- Effects of pollution on visibility, UV radiation and atmospheric optics. Photochemical smog affects visibility and colour in the atmosphere through absorption and scattering. These processes are introduced and discussed briefly (**5 hours**).
- Indoor air pollution. The sources of indoor air pollution and sick building syndrome are examined. Regulations regarding indoor air pollution are discussed (**3 hours**).
- Acid deposition and global stratospheric ozone reduction. Both of these effects are mostly caused by anthropogenic activities. Acid deposition is caused by burning of fossil fuels such as coal in power plants and smelters. Ozone reduction is caused by release of CFC's. Success stories about controlling these harmful gaseous discharges, such as recovery efforts in Sudbury, Ontario (controlling acid deposition) and the Montreal protocol (Banning CFC's) are discussed. Measures taken to limit the emission of pollutants from power plants such as installation of scrubbers, injection of limestone, mercury monitors and capturing technology are discussed (**5 hours**).
- The greenhouse effect and climate change. Greenhouse effect is a natural phenomenon on Earth whereby the reflected radiation from the Earth's surface is trapped by certain atmospheric gases keeping the planet warmer than in its absence. Some greenhouse effect is beneficial and necessary, otherwise Earth would have evolved into a cold and uninhabitable planet. However, excess greenhouse gases in the atmosphere is one of the causes of the problem of climate change. The nearly 30 billion tons of CO₂ that are discharged into the atmosphere annually (along with other greenhouse gas emissions such as methane and nitrous oxide), increases the trapping of the infrared radiation re-emitted from the Earth and can lead to negative consequences. Other major effects of climate change include changes in rainfall, rising sea levels and melting of the arctic ice-cap. Many examples of climate change around the world will be discussed (**4 hours**).
- Plans to reduce the harmful effects of atmospheric pollution climate change. The switch to alternative sources of energy such as solar, wind, geothermal, fusion, biomass, etc. represent possible alternatives to protect our planet against harmful effects of atmospheric pollution and climate change. Although, green technology has its disadvantages which need to be considered, ways to reduce these consequences have to be found. For instance, wind turbine noise is a cause of headaches and sleeplessness among residents close to these. A solution would be to locate them at appropriate minimum distances from residential areas or install them off-shore, where wind intensities are higher and the distance sufficiently far away from residential areas. Carbon sequestering, reducing deforestation, building a super grid and improving the pollution profile of existing fossil fuels are other possible solutions that might help to reduce the effects of atmospheric pollution and climate change and will be discussed in detail (**5 hours**). This section's completion depends on availability of time.

Math Content

Basic math, division, multiplication, addition, subtraction. Very basic algebra and trigonometry. All needed mathematics will be explained in the class and examples will be worked out

Course Policies

- **Policy for a Missed Midterm**

The student needs to inform the Professor by e-mail within 24 hours of the time of exam that he/she is not able to attend the mid-term. Afterwards, the student has to provide the Attending Physician's Note within one week of the date of missed mid-term. After that period, medical notes will not be accepted and the student will get no mark for the mid-term. If the APN is received in a timely manner, the Prof will transfer the weight of the missed mid-term to other components of the course.

- **Policy for a Missed Final Exam**

Exactly similar to the missed mid-term policy except that the student has to write a deferred test. The weight of the final can not be transferred. The date for the deferred final exam will be announced by the Prof on Moodle.

- **Late Submissions and Late Penalties for the assignments**

There is a one week turn around time (Friday to Friday) for the assignments. Assignments need to be submitted in class. If not done, the assignment can be submitted the following Monday at Prof's office and there will be a 20% deduction. Past the Monday after the Friday of submission, the assignments will not be accepted. Medical reasons are not applicable to assignments. The idea is to start early on the assignment during the one week turn around time and not leave it for the last minute.

- **Policy regarding showing a valid id during the mid-terms and the final:**

Students need to provide a government approved id during the mid-terms and the final exam. This should preferably be a York U student card, or if not, could be a driver's license, a health card or a passport. If the student fails to provide the necessary id, he/she has to provide the id within 24 hours and present it to the Prof at his office (5 pm deadline the next day) or he/she will get no mark for that particular exam.

Copyright and Intellectual Property

- Students are not allowed to
 - Photograph the slides during lecture
 - record lectures for non-personal use (e.g. uploading to websites)
 - Upload or post slides, assignments and other intellectual property which is not theirs to websites.

University Policies

Important Sessional Dates

Includes sessional start and end dates, drop deadlines, and withdrawal dates.

See the Office of the Registrar website at <http://www.registrar.yorku.ca/enroll/dates/>

Academic Honesty and Integrity

Academic honesty requires that persons do not falsely claim credit for the ideas, writing or other intellectual property of others, either by presenting such works as their own or through impersonation. Similarly, academic honesty requires that persons do not cheat (attempt to gain an improper advantage in an academic evaluation), nor attempt or actually alter, suppress, falsify or fabricate any research data or results, official academic record, application or document. Finally, academic honesty requires that persons do not aid or abet others to commit an offence of academic dishonesty, including intentional acts to disrupt academic activities.

Suspected breaches of academic honesty will be investigated and charges shall be laid if reasonable and probable grounds exist.

Academic Honesty and electronic devices during assessments (e.g. exams)

- Internet capable and personal storage devices of all kinds must be turned off, including vibrate. These and any other unauthorized material must be placed under the student's chair and

should not be accessed at any point during the exam. Failure to comply with directive may be considered a break of academic honesty.

- See <http://registrar.yorku.ca/exams/tipsheet>

Please familiarize yourself with the full Senate Policy on Academic Honesty, found at <http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/>

Please also familiarize yourself with the SPARK Academic Honesty tutorial found at <https://spark.library.yorku.ca/academic-integrity-what-is-academic-integrity/>

Academic Accommodation for Students with Disabilities

York University shall make reasonable and appropriate accommodations and adaptations in order to promote the ability of students with disabilities to fulfill the academic requirements of their programs.

The nature and extent of accommodations shall be consistent with and supportive of the integrity of the curriculum and of the academic standards of programs or courses.

Please familiarize yourself with the full Senate Policy on Academic Accommodations for Students with Disabilities, found at <http://secretariat-policies.info.yorku.ca/policies/academic-accommodation-for-students-with-disabilities-policy/>

Note: Students should submit accommodation letters from Counseling and Disability Services (CDS) to the course instructor within the first two weeks of the course or as soon as issued.

Counseling and Disability Services - <http://cds.info.yorku.ca/>

York Accessibility Hub - <http://accessibilityhub.info.yorku.ca/>

Note: A student registered with CDS, and choosing to write with Alternate Exams, is responsible for making the appropriate writing arrangements within the timeframes outlined by Alternate Exams.

Alternate Exams - <http://altexams.students.yorku.ca/>

Religious Observance Accommodation

York University is committed to respecting the religious beliefs and practices of all members of the community, and making accommodations for observances of special significance to adherents.

<https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/15/wo/kmHGekTpzKLX6XYKBXYc8M/0.3.4.62.0>

Note: Students who will have an academic conflict as a result of a religious observance, at any point in the term, should make the instructor aware of such at least three weeks prior to the conflict.

For conflicts occurring during an official examination period, please complete the Examination Accommodation Form available at http://www.registrar.yorku.ca/pdf/exam_accommodation.pdf and submit to your instructor at least three weeks prior to the final exam.

Student Conduct in Academic Situations

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect and to refrain from actions disruptive to such a relationship. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. A statement of the policy and procedures regarding disruptive and/or harassing behaviour by students in academic situations is available on the website of the University Secretariat (<http://secretariat.info.yorku.ca/>).

NATS-AID

Free peer tutoring for students enrolled in Natural Science Courses.

See <http://natsci.info.yorku.ca/nats-aid/>

M-AID in NATS (Math Aid)

Free math help for students enrolled in Natural Science Courses (TA tutors)

See <http://natsci.info.yorku.ca/m-aid-in-nats/>

Other Resources**Learning Commons**

The Learning Commons brings together key supports for your learning: writing, research, learning skills and career services. <http://www.library.yorku.ca/cms/learning-commons/>

goSAFE

goSAFE is a complimentary service provided to the York Community. At the Keele campus, goSAFE has two routes: North Route & South Route which will safely transport community members by vehicle from one specified hub to another on campus. goSAFE operates seven days a week, all year round, including University closures (with the exception at Glendon during the Christmas holiday closure).

Call the goSAFE office at 416-736-5454 or extension 55454 during hours of operation. Please give your name, location and destination. <http://www.yorku.ca/goSAFE/>

Mental Health and Wellness at York University

Outlines a variety of resources available to support mental health and wellness

<http://mhw.info.yorku.ca/resources/resources-at-york/students/>

Good2Talk

Post-Secondary Student 24 hour Helpline

<http://www.good2talk.ca/> 1-866-925-5454