

## Engi 9601, Envs 6004: Environmental Pollution and Mitigation

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**Communication**      *It will be easiest in person right after class or by MUN email.*

### COURSE DESCRIPTION:

*Sustainable development and UN Goals are introduced. Aspects of air pollution and climate change impacts and management are covered with focus on the small farm model. Noise pollution and water quality control are introduced. The course ends with sustainability topics including population growth, planetary boundaries, biodiversity, water scarcity and food security.*

**PREREQUISITES:**                      Engineering or Science undergraduate degree

**SCHEDULE:**                              LECTURE: Tues. & Thurs. 10:30 -11:45 am    Room: EN 4008

**CREDIT VALUE:**                      3 credits

### RESOURCES:

#### TEXT BOOKS

- *Introduction to Environmental Engineering, 5th Edition, 2011, M. L. Davis and D. A. Cornwell, McGraw-Hill. (1 hard copy, 1 paper back on reserve, TD 145 D26 2013)*

#### REFERENCES - BOOKS

- *Simon & Schuster Handbook for Writers, Fourth Canadian Edition, 2005, L. Q. Troyka and D. Hesse, Prentice Hall. (PE 1408 T696 2006)*
- *Field Guide for Science Writers: The Official Guide of the Nat. Assoc. of Science Writers, 2005, D. Blum, M. Knudson and R.M. Henig, Oxford University, Press. (online)*
- *The great climate robbery; how the food system drives climate change and what we can do about it, 2016, by GRAIN, New International Publications Ltd.*
- *Environmental Engineering, Fundamentals, Sustainability and Design, 2010, J. R. Mihelcic and J. B. Zimmerman, John Wiley & Sons, Inc. (air pollution, climate change)*
- *Introduction to Environmental Engineering and Science, 3rd Edition, 2008, G. M.*

- Masters and W. P. Ela, Prentice Hall (air pollution, climate change)*
- *Mark's Standard Handbook for Mechanical Engineers, 10th Edition, p. 12-97,98,102.*
  - *Environmental Urban Noise, 2001, A. García (Ed.), WIT Press, Southampton UK, pp. 149-225. (noise pollution)*
  - *Geoenvironmental Sustainability, 2007, Yong, R. N., Mulligan, C. N., Fukue, M., CRC Press, p. 9, 20.*
  - *Natural Resource Conservation, Management for a Sustainable Future, 10<sup>th</sup> Edition., 2010, Chiras, D.C., Reganold, J.P., Pearson Prentice Hall, p. 141-169.*

### REFERENCES – JOURNAL PAPERS

- *Al-Sahlawi, M.A., 1999, Seawater desalination in Saudi Arabia: economic review and demand projections, Desalination, 123:143-147.*
- *Cardinale, B.J. et al., 2012, Biodiversity loss and its impact on humanity, Nature, 486:59-68*
- *Charles, H., Godfray, J., Garnett, T., 2014, Food security and sustainable intensification, Philosophical Transactions of the Royal Society, B, 369, 20120273.*
- *Goines, L., Hagler, L. 2007, Noise Pollution: A Modern Plague, Southern Medical Journal, 100(3):287-294.*
- *Griggs, D., Stafford-Smith, M., Gaffney, O., Rockstroem, J., Oehman, M., Shyamsundar, P., Steffen, W., Glaser, G., Kanie, N., Noble, I., 2013, Sustainable development goals for people and planet, Nature, 495(7441):305-307.*
- *Harris, J.M., Kennedy, S. 1999, Carrying capacity in agriculture: global and regional issues, Ecological Economics, 29:443-461.*
- *Høiby, L., Clauson-Kaas, J., Wenzel, H., et al., 2008, Sustainability assessment of advanced wastewater treatment technologies, Water Science & Technology, 58:963-968.*
- *Kuylenstierna, J., Najlis, P., Björklund, G., 1998, The comprehensive assessment of the freshwater resources of the world – Policy options ...., Water International, 23:17-20.*
- *Marcott, S.A., Shakun, J.D., Clark, P.U., Mix, A.C., 2013, A Reconstruction of Regional and Global Temperature for the Past 11,300 Years, Science, 339(6124):1198-1201.*
- *Pawłowski, A., 2008, How many dimensions does sustainable development have?, Sustainable Development, 16:81-90*
- *Quiblier, C., Wood, S., Echenique-Subiabre, I., et al., 2013, A review of current knowledge on toxic benthic freshwater cyanobacteria – Ecology.... Journal of Water Research, 47:5464-5479.*
- *Rasmussen, P.E., Subramanian, K.S., Jessiman, B.J., A multi-element profile of house dust in relation to exterior dust and soils.... The Science of the Total Environment, 267:125-140.*
- *Redford, K.H., Groves, C., Medellin, R.A., Robinson, J.G., 2012, Conservation stories, conservation science, and the role of the Intergovernmental Platform on Biodiversity and Ecosystem Services, Conservation Biology, 26(5):757-759.*
- *Stansfeld, S.A., Matheson, M.P., 2003, Noise Pollution: non-auditory effects on health, British medical Bulletin, 68:243-257.*
- *Steffen, W., Richardson, K., Rockström, J., et al., 2015, Planetary boundaries: Guiding human development on a changing planet, Science, 347(6223):736-746.*
- *Svrcek, C., Smith, D.W., 2004, Cyanobacteria toxins and the current state of knowledge on water treatment options, Journal of Environmental Engineering & Science, 3:155-185.*

## REFERENCES – VIDEOS

- <http://www.bbc.com/news/av/world-africa-40173337/is-this-africa-s-tallest-tree>
- <https://www.theguardian.com/environment/2016/oct/15/climate-change-environmentalists-hail-deal-to-limit-use-of-hydrofluorocarbons>
- <http://www.theguardian.com/world/video/2016/feb/13/why-150000-penguins-have-died-in-antarctica-video-explainer>
- <https://www.theglobeandmail.com/news/british-columbia/as-bc-blaze-continues-to-burn-researchers-ask-will-wildfires-get-too-intense-tofight/article35699915/>
- <https://ca.yahoo.com/news/hundreds-firefighters-battling-largest-wildfire-151932544.html>
- <http://www.bbc.com/news/av/world-asia-40995930/the-village-in-nepal-cut-off-by-floods>
- <http://www.aljazeera.com/indepth/features/2017/08/sierra-leone-mudslide-170816053741558.html>
- <http://www.youtube.com/watch?v=SdqUyLTUyqk>
- <http://www.bbc.com/news/av/40885831/al-gore-on-the-paris-agreement-trump-and-climate-change>
- <https://www.youtube.com/watch?v=F47IX5d1FxY> (Toilet Water PSA)
- <https://www.youtube.com/watch?v=m74EBa7UOP8> (Censored, John Oliver)
- <http://www.cbc.ca/news/politics/wherry-trudeau-carbon-pricing-1.3789417> (Trudeau)
- <http://www.cbc.ca/news/politics/climate-change-al-gore-canada-wherry-analysis-1.4243449> (Al Gore with CBC)
- <https://www.youtube.com/watch?v=CDOLdF0PnA0> (Cyanobacteria)
- <http://www.stockholmresilience.org/research/research-news/2017-02-16-wef-2017-beyond-the-anthropocene.html> (Johan Rockström)
- <https://www.youtube.com/watch?v=ysa5OBhXz-Q> (How wolves change rivers)
- <https://www.youtube.com/watch?v=3h1UbYZV-IU>
- <http://www.nytimes.com/video/us/100000003577285/californias-extreme-drought-explained.html>
- <http://globalnews.ca/news/3302074/quebec-grocery-stores-first-in-canada-to-send-unused-produce-to-food-banks/>

## REFERENCES – WEBSITES

- <https://www.theguardian.com/environment/2016/jun/20/three-environmental-activists-killed-each-week-in-2015>
- <https://www.theguardian.com/environment/ng-interactive/2017/jul/13/the-defenders-tracker>
- <http://www.cbc.ca/radio/unreserved> (Interview with David Suzuki)
- <https://sustainabledevelopment.un.org/?menu=1300> (UN Sustainable Development Goals)
- <http://www.theguardian.com/environment/2016/may/09/people-may-be-breathing-in-microplastics-health-expert-warns>
- <http://www.mission2020.global/>
- <http://www.cbc.ca/news/canada/nova-scotia/climate-change-air-travel-costs-1.4180243>
- <https://ca.news.yahoo.com/melting-greenland-ice-changing-ocean-053000486.html>
- <http://www.bbc.com/news/world-40415756> (food security)
- <https://www.theguardian.com/environment/2017/jun/23/from-heatwaves-to-hurricanes-floods-to-famine-seven-climate-change-hotspots>
- <https://www.theguardian.com/environment/2015/dec/07/global-emissions-to-fall-for-first>

- [time-during-a-period-of-economic-growth](#)
- <https://ca.style.yahoo.com/scientists-warning-only-three-years-000018930.html>
  - [http://oceanservice.noaa.gov/facts/coral\\_bleach.html](http://oceanservice.noaa.gov/facts/coral_bleach.html)
  - <https://www.theguardian.com/environment/2015/jul/10/fossil-fuel-industry-must-implode-to-avoid-climate-disaster-says-top-scientist>
  - [http://www.ccohs.ca/oshanswers/phys\\_agents/exposure\\_can.html](http://www.ccohs.ca/oshanswers/phys_agents/exposure_can.html) (Safe noise levels)
  - <https://www.theguardian.com/environment/2017/may/04/noise-pollution-is-drowning-out-nature-even-in-protected-areas-study>
  - <http://naturalunseenhazards.wordpress.com/tag/cyanobacteria/>
  - <http://www.theguardian.com/environment/2015/aug/26/lord-stern-hits-out-at-claims-about-cost-of-climate-cuts>
  - <https://www.theguardian.com/environment/2013/jan/27/nicholas-stern-climate-change-davos>
  - <https://www.theguardian.com/environment/2016/aug/15/toyota-tesla-and-vestas-ranked-among-worlds-top-green-companies>
  - <http://pennspectrum.org/2013/12/01/what-is-the-implication-of-a-growing-world-population/>
  - <https://www.populationeducation.org/content/population-information>
  - <http://www.theguardian.com/artanddesign/gallery/2016/apr/05/nick-brandt-inherit-the-dust-africa>
  - <http://www.theguardian.com/world/2015/may/22/france-to-force-big-supermarkets-to-give-away-unsold-food-to-charity>
  - <http://www.theguardian.com/environment/2015/dec/02/arable-land-soil-food-security-shortage>
  - <http://www.mapsofworld.com>
  - <https://www.theguardian.com/environment/2016/nov/28/shrinking-glaciers-state-of-emergency-drought-bolivia>
  - <https://www.theguardian.com/environment/2016/feb/12/four-billion-people-face-severe-water-scarcity-new-research-finds>
  - <http://www.bbc.com/news/magazine-33907737>

#### MAJOR TOPICS:

- Introduction to sustainable development, planetary boundaries, and 17 UN goals
- Air pollution, terminology, criteria air contaminants, human health, air pollution disasters, indoor air pollution, acid rain, ozone depletion, global climate and warming, areas of concern, how cities make their own weather, meteorology and dispersion of pollutants, air pollution control (Chapter 9)
- Historical temperatures, greenhouse effect, Intergovernmental Panel on Climate Change (IPCC), climate change impacts, monitoring, mitigation, including specifically in agriculture and a mitigation timeline, adaptation and ocean changes (Chapter 9, starting on p. 613), recent news and comedic portrayals
- Noise pollution, detrimental effects, noise properties, terminology and characterization, sound pressure levels, sound frequencies, noise rating systems, noise transmission, air and ground attenuation of noise, noise control, standards (Chapter 10)

- Water quality management, BOD calculations, determination of BOD constants, laboratory BOD measurement, COD, TOC, ThOD, re-aeration of rivers and dissolved oxygen sag curve, lakes management, eutrophication, cyanobacteria (Chapter 7)
- Sustainable development concepts and overview, moral aspects, human population sustainability, planetary boundaries, key areas including biodiversity and ecosystem functions and services, water and drought, agriculture and food security

**ASSESSMENT:**

		<b>Proposed Due Dates</b>
Individual paper (final submission)	30%	Thurs. Oct. 5 <sup>th</sup> , 10:30 a.m.
Paper presentation	15%	Thurs., Tues., & Thurs, Oct. 12 <sup>th</sup> , 17 <sup>th</sup> & 19 <sup>th</sup>
Two assignments in class	15%	Thurs., Nov. 2 <sup>nd</sup> and Thurs., Nov. 16 <sup>th</sup>
Group noise presentations	15%	Tues., Nov. 28 <sup>th</sup> and Thurs., Nov. 30 <sup>th</sup>
Final exam (within exam period)	25%	Wed., Dec. 6 to Fri., Dec. 15
Last class		Thurs., Nov. 30 <sup>th</sup>

Assignments will be based on the following two journal papers:

- 1) "The adaptation and mitigation potential of traditional agriculture in a changing climate", 2017, Altieri, M.A., and Nicholls, C.I., *Climate Change*, 140:33-45.
- 2) "Reducing meat consumption in developed and transition countries to counter climate change and biodiversity loss: a review of influence factors, 2017, Stoll-Kleemann, S., and Schmidt, U.J., *Regional Environmental Change*, 17:1261-1277.

*The final exam will include a closed book theory part and an open book numerical part with only scientific calculators being permitted. The paper is to be submitted as an electronic Word file and students must make sure images are printable. The group project may require permissions.*

*Personal laptops and recording or other electronic devices should be turned off during class. One exception is that cell phones may be used to photograph images from the class notes.*

**ACADEMIC INTEGRITY AND PROFESSIONAL CONDUCT:**

Students are expected to conduct themselves in all aspects of the course at the highest level of academic integrity. Students are encouraged to consult Memorial University's Code of Student Conduct at <http://www.mun.ca/student/conduct/>

Any student found to commit an academic offence will be dealt with according to the practices as outlined by the School of Graduate Studies. The related calendar information is available at <http://www.mun.ca/regoff/calendar/sectionNo=GRAD-0029>

**INCLUSION AND EQUITY:**

Students who require physical or academic accommodations are encouraged to speak privately



to the instructor so that appropriate arrangements can be made to ensure full participation in the course. All conversations will remain confidential.

Diversity of viewpoints, values, and backgrounds can enrich the university experience. For insightful and comprehensive discussion among class participants, there is an expectation that dialogue will be collegial and respectful across disciplinary, cultural, and personal boundaries.

**STUDENT ASSISTANCE:** Student Affairs and Services offers help and support in a variety of areas, both academic and personal. More information can be found at [www.mun.ca/student](http://www.mun.ca/student).

The Writing Centre, at SN 2053, will assist students with their writing. To make an appointment refer to <http://www.mun.ca/writingcentre/> , call 864-3168 or email [ennisd@mun.ca](mailto:ennisd@mun.ca) .

**ADDITIONAL INFORMATION**

FALL 2017 SCHEDULE, Dr. C. A. Coles

TIME	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
9:00					
9:50					
10:00					
10:50		ENGI 9601 10:30 – 11:45 am EN 4008		ENGI 9601 10:30 – 11:45 am EN 4008	
11:00					
11:50					
12:00		OFFICE HOUR 12:00 – 12:50 am EN 3004		OFFICE HOUR 12:00 – 12:50 am EN 3004	
12:50					
1:00					
1:50					
2:00	ENGI 9614 2:00 a.m. – 3:15 p.m. EN 4035		ENGI 9614 2:00 a.m. – 3:15 p.m. EN 4035		
2:50					
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Engi 9601: Environmental Pollution and Mitigation  
Engi 9614: Renewable Energy and Resource Conservation