EXPANDED COURSE DESCRIPTION
EARTH, SPACE SCIENCE AND ENGINEERING

Lassonde School of Engineering
Earth and Space Science and Engineering

LE / ESSE 4230 3.0 SECTION M
REMOTE SENSING OF THE ATMOSPHERE
FALL 2019 / WINTER 2020

Last Modified Date: 08/06/2019

COURSE CALENDAR DESCRIPTION
An introduction to and summary of the area of remote sensing of the atmosphere from space platforms and from the ground. Topics include atmospheric radiation, atmospheric spectroscopy, inversion theory, instrumentation, satellites, space platforms and future technology. Prerequisites: LE/ESSE 2010 3.00 or SC/PHYS 2060 3.00; SC/MATH 1025 3.00; SC/MATH 2015 3.00; SC/MATH 2271 3.00. Prerequisite or corequisite: LE/ESSE 3030 3.00 or permission of the Instructor. PRIOR TO FALL 2014: Prerequisites: LE/EATS 2010 3.00 or SC/PHYS 2060 3.00; SC/MATH 1025 3.00; SC/MATH 2015 3.00; SC/MATH 2271 3.00. Prerequisite or corequisite: LE/EATS 3030 3.00 or permission of the Instructor. PRIOR TO SUMMER 2013: Prerequisites: SC/EATS 2010 3.00 or SC/PHYS 2060 3.00; SC/MATH 1025 3.00; SC/MATH 2015 3.00; SC/MATH 2271 3.00. Prerequisite or corequisite: SC/EATS 3030 3.00 or permission of the Instructor.

INSTRUCTOR(S)

<table>
<thead>
<tr>
<th>Name</th>
<th>Section / Format / Term</th>
<th>Contact Email</th>
<th>Contact Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taylor, Peter</td>
<td>Sec. M / LECT / W</td>
<td><a href="mailto:pat@yorku.ca">pat@yorku.ca</a></td>
<td>York Ext. 77707</td>
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ADDITIONAL INFORMATION

TOPICS
• Active and passive sensing. Electromagnetic waves, solar and infra-red radiation, Plank’s law, brightness temperature. Doppler shift. Spectroscopy, inversion theory.
• Satellite based weather related remote sensing, GOES 16 and geostationary satellites, Rainfall rate and fog detection. Air composition (ozone, CO etc) ENVISAT and other projects.
• Ground based sensing, Dobson/Brewer spectrometers, weather radar, lidar, UHF and VHF wind profiling, temperature and humidity profiling. Radar, lidar, sodar.

COURSE LEARNING OUTCOMES
LSE requires formal "Course Learning Outcomes". For ESSE 4230 I inherited some CLOs but they were too narrow. I left them as stated but rearranged the order to highlight the current emphasis.
• Be familiar with different instrumentation techniques used for remote sounding of the atmosphere.
• Perform calculations using the Planck function
• Understand the radiative transfer equation and be familiar with the concept of retrieval theory
• Be familiar with the techniques used for measuring the composition and temperature of the atmosphere by spectroscopic remote sounding
• Apply the Beer-Lambert law in calculating the optical depth in the atmosphere
• Understanding Collisional and Doppler Broadening
• Be familiar with molecular vibration-rotation spectra
COURSE EVALUATION

4 Assignments (40%)
Mid Term Test (20%)
Final Exam (40%)

Assignment reports should be well-documented and professional, including any matlab or other codes.

TEXTS

The basic requirement is an understanding of radiation in the atmosphere. This is covered in:

- W. Petty: A First Course In Atmospheric Radiation, 2006, used for ESSE 3030,

WEBSITE

Course material will be online at http://www.yorku.ca/pat/ESSE4230/

ACADEMIC INTEGRITY LINKS

- Senate Policy on Academic Honesty - http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/
- Academic Integrity - http://lassonde.yorku.ca/academic-integrity

STUDENT LINKS

- Student Rights and Responsibilities - http://oscr.students.uit.yorku.ca/student-conduct
- Religious Observance - https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/wa/regobs
- Student Accessibility Services (SAS) - https://accessibility.students.yorku.ca/
- York University’s Policies on Gender/LGBTQ*/Positive Space - http://rights.info.yorku.ca/lgbtq/

LAND ACKNOWLEDGEMENT

- We acknowledge our presence on the traditional territory of many Indigenous Nations. The area known as Tkaronto has been care taken by the Anishinabek Nation, the Haudenosaunee Confederacy, the Huron-Wendat, and the Métis. It is now home to many Indigenous Peoples. We acknowledge the current treaty holders, the Mississaugas of the New Credit First Nation. This territory is subject of the Dish With One Spoon Wampum Belt Covenant, an agreement to peaceably share and care for the Great Lakes region.
- The Indigenous Framework for York University: A Guide to Action can be found here: http://indigenous.info.yorku.ca/
- Meaning of a land acknowledgement: http://healthydebate.ca/opinions/indigenous-land-acknowledgements

Many courses utilize Moodle, York University's course website system. If your course is using Moodle, click here to access it.

Moodle @ York University