Remote Sensing of the Atmosphere

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Class time and Place: MWF 12:30-1:20 LINDLEY HALL 228

Office Hours: Tuesdays and Thursday 9 - 10 AM or by appointment

Prerequisites: ATMO 680, EECS 138

Course Goals:

- Develop an intuitive understanding for the theory or radiative transfer within the atmosphere
- Become acquainted with some of the technology/methods for measuring radiation within the atmosphere, and transforming radiation measurements to other necessary quantities such as temperature and wind profiles.

Text Book:

Remote Sensing of the Lower Atmosphere. G. L. Stephens. Oxford University Press, 1994. (Required)

A First Course in Atmospheric Radiation. G. W. Petty. Sundog Publishing, 2004. (Optional)

Readings from the text book will be supplemented with relevant readings from other sources.

Grades:
40 % Exams (4 exams at 10% each)
20 % Final Exam
40 % Homework

Grades will follow standard scoring, although I reserve the right to make the grading easier. If there is a curve, you must have at least a 50 % raw score to pass the course, and I will curve at most one letter grade.

Homework: Assignments will be given approximately weekly. I encourage you to work together to answer homework questions, however each student must complete their own work. In addition to weekly assignments, several larger projects will be assigned throughout the semester, and you will be given more

time to complete these. These will be more in depth, will focus on analysis of real data, and will require some computer programming.

Tentative Schedule:

Week	Date	Topic	Stephens
1	**21-Jan**	**Introduction**	
		Inverse Problems	1.2
		Satellite platforms/orbits	1.7
		Earth-Sun geometry	
		Solid Angles	A1.3
2	**24-Jan**	**Radiative Transfer**	
		Spectrum	2.1
		Waves	2.2
		Polarization – Stokes Parameters	2.3-2.4
3	**31-Jan**	Radiation Laws	2.5
		Planck	
		Stefan-Boltzmann	
		Kirchhoff	
		EXAM 1	
4	**7-Feb**	**Microscale**	
		Atomic Absorption spectrum	3.1-3.2
		Line shapes	3.3
		Pressure/Doppler Broadening	
5	**14-Feb**	Absorption coefficient	3.4.1
		Transmission Function	3.4.2
		Atmospheric Absorption/trace gas	3.5
6	**21-Feb**	**Refraction/Reflection**	
		Polarization	4.1-4.2
		Refractive index	4.3
7	**28-Feb**	Reflection	4.4
		Transmission	4.4
		EXAM 2	
8	**7-Mar**	**Absorption/Scattering**	
		Single/multiple dipoles	5.1-5.2
		particle extinction	5.3
9	**14-Mar**	scattering functions	5.4
		Lorentz-Mie	5.6
		Backscattering	5.7

11	**28-Mar**	**Remote Sensing by Scattering**	
		Beer's Law	6.1
		Extinction based methods	6.2
		Scattering as a source of radiation	6.3
		multiple scattering	6.4
11	**4-Apr**	Applications	6.5-6.6
		Aerosols	
		Ozone	
		Clouds	
		EXAM 3	
12	**11-Apr**	**Remote Sensing by Emission**	
		RTE with scattering	7.1
		Applications	
		SST	7.2
		Path-integrated quantities (LWC)	7.3
13	**18-Apr**	Rainfall	7.4
		Soundings of temperature and humidity	7.5
		Clouds by emission	7.6-7.8
14	**25-Apr**	**Active Sensing**	
		Range/Scanning mode	8.1
		Radar	8.2-8.3
15	**2-May**	Lidar	8.4-8.5
		Doppler wind	8.6
		UHF/VHF radar	8.8
		EXAM 4	
	19-May	**Final Exam (10:30 AM)**	

Students with Special Needs: The staff of Services for Students With Disabilities (SSD), 135 Strong, 785-864-2620 (v/tty), coordinates accommodations and services for KU courses. If you have a disability for which you may request accommodation in KU classes and have not contacted them, please do so as soon as possible. Please also see me privately in regard to this course.