ATMS 4510: Remote Sensing for Atmospheric Science: SYLLABUS

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332 ABNR

Office Hrs: TR 1230 – 1330 and by arrangement

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Objective: To introduce students to the principles and practices of satellite remote sensing as used in the atmospheric and natural sciences.

Learning outcomes:

At the end of the class students should be able to:

- Understand the theory behind remote sensing observations and be able to select suitable data sources to investigate conditions in the atmosphere and on the Earth's surface.
- Identify large-scale meteorological features from examination of single satellite images.
- Describe the development of synoptic and mesoscale atmospheric conditions from a series of satellite images.
- Discover features of clouds and the Earth's surface from the analysis of combinations of satellite images taken at different wavebands.
- Understand how the science of remote sensing is developing and will be used in the future

Teaching method

There will be some formal lecturing as a means of introducing important concepts. This is meant to be interactive, so be prepared to ask and answer questions. Classroom exercises will be common. Other than this, students will be invited to work with remote sensing imagery both individually and in groups in order to actually analyze and interpret data. Homework is used to encourage you to learn detail that is important, but cannot be covered in class.

Assessment:

Tests in class – 15%
Homeworks – 25%
In class exercises: There will be five in-class exercises that involve interpretation of satellite imagery using the computing facilities in Ag 1 -120. – 10%
Group project and presentation: Essay on chosen application of remote sensing (from the list) and presentation – describe the application, how it works and show some images if possible – 20%
Image of the day: Select a satellite image or interest in question and relate the features of the image to other meteorological data available -10%

Term paper – 15%.
Attendance and participation – 5%

The graduate requirement for this class will involve two additional homework assignments of greater difficulty and depth than those required for the undergraduate credit. One of these will involve the review of a research article from a peer reviewed journal.

Grading: 85 - 100 A
73 - 84 B
60 - 72 C
50 - 60 D
< 60 F

Detailed Syllabus / Topics list in sequence

Week 1: Electromagnetic radiation:
a. The spectrum

Week 2: Absorption and scattering
a. Channel selection

Week 3: Detection of radiation and formation of images
a. Scan strategies

Week 4: Operational satellites, orbits and sensors
a. Geostationary satellites
b. Polar orbiters

Week 5. Visible and infrared imagery

Week 6. Remote sensing of Clouds

Week 7. Satellite estimates of rainfall

Week 8. Water vapor imagery
a. Theory of WV imagery
b. Moisture flow
c. Jet streams

Week 9. Synoptic scale meteorology
a. Fronts
b. Cyclones

Week 10. Convective storms

Week 11. Sounders
a. Sounding theory

Week 12. Land use, SST and climate applications
Week 13. Microwave imagers and sounders

Week 14. The future of satellite remote sensing

Other possible topics: Will be partly covered by projects, but can also be requested.

Books

Course book:

Conway / Maryland: An introduction to satellite image interpretation – Nice (and reasonably priced), but little theory.

Other satellite books:

Lillesand and Kiefer: Remote sensing and Image interpretation – Good but little atmospheric science
Jensen: Remote sensing of the environment – Little theory and very little atmospheric science
Kidder and Vonder Haar: Satellite Meteorology – very thorough, but heavy and no natural resources
Bader et al.: Images in Weather Forecasting : A Practical Guide for Interpreting Satellite and Radar Imagery

Other book:

G. Petty: A first course in atmospheric radiation. Detailed, but accessible theory behind it all, with good examples of RS applications. Grad students planning on taking ATMS 8500: Radiation in the atmosphere will need this book.

ADA Statement
Please do not hesitate to talk to me!
If you need accommodations because of a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please inform me immediately. Please see me privately after class, or at my office.
Office location: 332 ABNR Hall
To request academic accommodations (for example, a notetaker), students must also register with Disability Services, AO38 Brady Commons, 882-4696. It is the campus office responsible for reviewing documentation provided by students requesting academic accommodations, and for accommodations planning in cooperation with students and

instructors, as needed and consistent with course requirements. Another resource, MU's Adaptive Computing Technology Center, 884-2828, is available to provide computing assistance to students with disabilities.

Academic Dishonesty (Reference: MU sample statement and policy guidelines)

Any student who commits an act of academic dishonesty is subject to disciplinary action.

The procedures for disciplinary action will be in accordance with the rules and regulations of the University governing disciplinary action.

Academic honesty is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person's work has been responsibly and honorably required, developed, and presented. Any effort to gain an advantage not given to all students is dishonest whether or not the effort is successful. The academic community regards academic dishonesty as an extremely serious matter, with serious consequences that range from probation to expulsion. When in doubt about plagiarism, paraphrasing, quoting, or collaboration, consult the instructor. In cases of suspected plagiarism, the instructor is required to inform the provost. The instructor does not have discretion in deciding whether to do so.

It is the duty of any instructor who is aware of an incident of academic dishonesty in his/her course to report the incident to the provost and to inform his/her own department chairperson of the incident. Such report should be made as soon as possible and should contain a detailed account of the incident (with supporting evidence if appropriate) and indicate any action taken by the instructor with regard to the student's grade. The instructor may include an opinion of the seriousness of the incident and whether or not he/she considers disciplinary action to be appropriate. The decision as to whether disciplinary proceedings are instituted is made by the provost. It is the duty of the provost to report the disposition of such cases to the instructor concerned.