OPTI 550- Fundamentals of Remote Sensing

Course Description:

Historical development of remote sensing; the sun and the E-M spectrum; radiometry; radiometry of optical systems; spectroradiometric instruments; reflectance, definitions and measurement; atmospheric properties, measurements and effects; satellite optical sensors; radiometric calibration of sensors; atmospheric correction.

Textbook:


Grading Policy:

Homework accounts for 30% of the final grade for graduates and 40% for undergraduates. Homework is due by the date and time listed on the assignment unless I am contact prior to the due date. Late homework has a 10% deduction if turned in prior to grading of other assignments and 20% if turned in after graded assignments are returned. Two exams are given, each worth 30%, after topics 13 and 29. A class project will also be assigned to graduate students in the class that accounts for 10% of the grade. Attendance is not explicitly included within the grading but it is in the student's interest to attend class because of the weight placed on the lectures in the homework and exams.

Outline

Introduction

1. Define remote sensing, E&M spectrum, spatial and spectral resolution
2. Historical perspective, film vs. digital, space-based vs. others, digital concepts
3. Analog and digital concepts, data visualization, specific sensor examples

Radiometry

1. Background, definition of terms, blackbody radiation
2. Fundamental radiometric laws and relationships.
3. Example radiometric computations
4. Earth's atmosphere, solar and terrestrial radiation
5. Scattering and transmittance of the atmosphere

Radiance at the sensor

1. Irradiance at the ground in the solar reflective
2. Reflected irradiance, BRDF, lambertian surface
3. Radiance at the sensor in the solar reflective, examples
4. Thermal radiance at the sensor
5. Spectral response, magnitude
6. Qualitative description of remote sensing of radiance at the ground

Sensors

1. General characteristics of multispectral imaging systems, cameras
2. Detectors
3. Detector performance
4. Methods of spectral selection
5. Mechanical scanning systems
6. Pushbroom systems, imaging spectrometers
7. Relative, spectral, and absolute calibration
8. Preflight and on-board calibration methods
9. Weak links in the chain - MTF
10. Weak links in the chain - noise and polarization, resolution

Correction and Validation

1. Retrieval of surface emissivity and temperature, ground measurements
2. Retrieval of surface emissivity and temperature, atmospheric correction
3. Retrieval of surface reflectance, ground measurements, atmospheric correction
4. Retrieval of Surface BRDF, ground measurements
5. Atmospheric field measurement techniques