GG 460 Geological Remote Sensing (Spring)
Lectures (TTh) and Labs (F)

Instructors:  Scott Rowland  POST 617A (63150)  scott@hawaii.edu
Rob Wright  POST 526A (69194)  wright@higp.hawaii.edu

<table>
<thead>
<tr>
<th>Week</th>
<th>Lab or Lecture (SLO*)</th>
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| Week 1 | Class Organization, Overview and Examples of Remote Sensing (1)  
The nature of light (generation and propagation of radiation; 1, 3, 5)  
ENVI familiarization, Contrast Enhancements, Band Combinations, Subsampling (2) |
| Week 2 | The passage of light from source to the sensor (how much radiation is available for us to measure, and the composition of that radiation; 1, 3, 5)  
The reflection of light from the target (interaction of radiation with matter; 1, 3, 5)  
Digital Image Processing I: Spatial Resolution and Spatial Filters (2) |
| Week 3 | Data Collection I: Satellite Platforms and Orbits (1, 3, 5)  
Data Collection II: Signal Collection, Data Depth, Image File Types (1, 3, 5)  
Digital Image Processing II: Band Ratios, NDVI, Density Slices (2) |
| Week 4 | Image Co-Registration, Resampling, Geo-coding, and UTM (1, 3, 5)  
The spectral reflectance properties of some common targets (the spectral fingerprints of Earth surface materials; 1, 3, 5)  
Digital Image Processing III: Resampling, Co-Registration, Geo-Registration (2) |
| Week 5 | How well do remote sensing data capture real-world variability, spatially, spectrally, radiometrically, and temporally? (1, 3, 5)  
Thermal remote sensing I: basic physics (heat, temperature, energy, and blackbody Radiation; 1, 3, 5)  
Digital Image Processing IV: Reflected and Emitted Energy (2) |
| Week 6 | Transmittance and Temperature (1, 3, 5)  
The effect of the atmosphere on the quality of a remotely sensed measurement (1, 3, 5)  
Digital Image Processing V: Scatter Plots (2) |
| Week 7 | Intro to GPS (1, 3, 5)  
Using a hand-held GPS, in-class exercise (2)  
GPS Mapping (2) |
| Week 8 | Image Classification (1, 2, 3, 5)  
MID-TERM EXAM #1  
Digital Image Processing VI: Image Classification (2) |
| Week 9 | Principal Components (1, 2, 3, 5)  
Introduction to Synthetic Aperture Radar (SAR) (1, 3, 5)  
Digital Image Processing VII: Principal Components, Decorrelation Stretches (2) |
| Week 10 | Geological applications of SAR data (1, 3, 5)  
Hyperspectral remote sensing (1, 3, 5)  
Digital Image Processing VIII: Pan-sharpening, Hyperspectral Data (Scott gone; 2) |
Week 11

SPRING BREAK !!!!!

Week 12

Detecting wildfires and volcanic eruptions from space (1, 2, 3, 5)
Digital Elevation Models and Interferometric SAR (InSAR) (1, 3, 5)
Distribute Data Sets for Big Island project, Intro. to Hawaiian Volcanic Products (1)

Week 13

Large-scale Topographic Change from InSAR (1, 3, 5)
Small-scale Topographic Change from InSAR (1, 3, 5)
Work on Big Island project

Week 14

Air Photos, parallax, distortion (1, 3, 5)
MID-TERM EXAM #2
Work on Big Island project anyway

Week 15

Components of a space mission (how spacecraft work to support remote sensing Missions; 1, 2, 5)
Computer Graphics Packages, Vector vs. Raster, Image Compression (1, 2, 3, 5)
Digital Image Processing IX: DEMs, Cross-Sections, and Perspective Views (2)

Week 16

High spatial resolution data, orthorectification (1, 2, 3, 5)
no class, but Preliminary Big Island projects due (start of Big Island field trip) (4)
Big Island Field Trip (1, 3, 5)

Week 17

no class – work on final projects
FINAL PROJECT DUE AT 4:00 PM! (4)
NO EXCEPTIONS!!!!

This course is partially supported by the Hawai’i Space Grant Consortium and the Dept. of Geology & Geophysics; computer support kindly provided by Pat Townsend, Sharon Stahl, and Ross Ishida

Labs are due at the beginning of the following lab – no late labs will be accepted, sorry.
The Big Island project is due twice. The first version, which will require the most work, is due on Thursday May 1 (before we get on the plane). No late final projects will be accepted, sorry.

Grading:

<table>
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<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>homework</td>
<td>5%</td>
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<tr>
<td>midterms</td>
<td>15% each</td>
</tr>
<tr>
<td>lab assignments</td>
<td>40%</td>
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<tr>
<td>Big Island project</td>
<td>25%</td>
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Useful Textbooks:

Remote Sensing Journals:
International Journal of Remote Sensing
Remote Sensing of the Environment
IEEE Transactions on Geoscience and Remote Sensing

*SLOs - Student Learning Objectives*
The Geology & Geophysics Dept. has decided that the following Student Learning Objectives are key goals for any G&G student:

1. Students can explain the relevance of geology and geophysics to human needs, including those appropriate to Hawai‘i, and be able to discuss issues related to geology and its impact on society and planet Earth.

2. Students can apply technical knowledge of relevant computer applications, laboratory methods, and field methods to solve real-world problems in geology and geophysics.

3. Students use the scientific method to define, critically analyze, and solve a problem in earth science.

4. Students can reconstruct, clearly and ethically, geological knowledge in both oral presentations and written reports.

5. Students can evaluate, interpret, and summarize the basic principles of geology and geophysics, including the fundamental tenets of the sub-disciplines, and their context in relationship to other core sciences, to explain complex phenomena in geology and geophysics.

Kōkua: If you have a disability and related access needs the Department will make every effort to assist and support you. For confidential services students are encouraged to contact the Office for Students with Disabilities (known as “Kōkua”) located on the ground floor (Room 013) of the Queen Lili'uokalani Center for Student Services.

Title IX: The University of Hawai‘i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community. Here are some of your options:

As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, use the confidential resources available here: [http://www.manoa.hawaii.edu/titleix/resources.html#confidential](http://www.manoa.hawaii.edu/titleix/resources.html#confidential)

If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono,Title IX Coordinator (808) 956-299 t9uhm@hawaii.edu