GGS 579 - Remote Sensing – 10951 - 001

Syllabus

Instructor: Dr. Ron Resmini

Course description and objective: GGS 579, Remote Sensing, will provide graduate students with the concepts, principles, and methods of earth remote sensing. This course examines the use of various types and combinations of electromagnetic energy to obtain spatial and compositional information. Course content concentrates on: 1) nonphotographic, airborne, and spaceborne remote sensing concepts, systems, and sensors; and 2) essential operational parameters for existing and future systems and strategies for visual and digital extraction of features and information. The objective of this course is to provide graduate students with in-depth knowledge of the concepts, theories, principles, technologies, and methods of earth remote sensing and remote sensing data analysis.

Credit hours: 3

- Introductory Concepts
  - Energy Sources
  - Energy Interactions
  - Data
  - Remote Sensing Systems

- Photographic and Photogrammetric Principles (brief overview)
  - Film-Based Imaging, cameras
  - Filters
  - Electronic Imaging
  - Geometric Characteristics of Photographs

- Image Analysis and Interpretation
  - Fundamentals
  - Various Applications

- Digital Image Processing: Summary & New Concepts
  - Image Enhancement
  - Image Manipulation
  - Information extraction

- Multispectral Remote Sensing/Thermal Imaging
  - Physical principles
  - Algorithms
  - Applications

- Hyperspectral Remote Sensing
  - Physical principles
  - Algorithms
  - Applications
Remote Sensing Systems/Hardware; Airborne and Satellite
AVIRIS
Landsat
SPOT
Other Earth Resource Sensors

Microwave and Lidar Sensing
Physical principles
Systems and sensors
Data and applications

Additional Information

Textbook:
Remote Sensing and Image Interpretation, 7th Edition, 2015,
by Lillesand, Kiefer, and Chipman, John Wiley & Sons, publ.

Class meeting:
Wednesday, 4:30 p.m. to 7:10 p.m. in Exploratory Hall 2310

Office hours:
Wednesday, 3:30 p.m. to 4:30 p.m. or by appointment, Exploratory Hall 2212

Contact information:
Dr. Ron Resmini: resmini@gmu.edu; v: 703-470-3022 (voice and text)

Assignments:
1) Weekly
2) A mini-project (a PowerPoint briefing)

Software:
ENVI® v5.5 (or v5.x) (I suggest you purchase a student license but you have access to this software in Exploratory Hall 2310. I'll say more about this at the first class meeting.)

Exams:
One midterm exam (date: 20 Mar., 2019); in class, open notes, open book
One final exam (date: 8 May, 2019); in class, open notes, open book; cumulative

Grading:
25% assignments, homework
20% term mini-project
30% midterm exam
25% final exam

Grading Policy:
Grading in GGS 579 will follow university policy.
From the online GMU University Catalog:
http://catalog.gmu.edu/policies/academic/grading/#text

Scroll down to ‘AP.3.2 Graduate Grading’ and see the following:

Grade Quality Points Graduate Courses
A+ 4.00 Satisfactory/Passing
A  4.00 Satisfactory/Passing
A- 3.67 Satisfactory/Passing
B+ 3.33 Satisfactory/Passing
B  3.00 Satisfactory/Passing
B- 2.67 Satisfactory/Passing
C  2.00 Unsatisfactory/Passing
F  0.00 Unsatisfactory/Failing

* Although a B- is a satisfactory grade for a course, students must maintain a 3.00 average in their degree program and present a 3.00 GPA on the courses listed on the graduation application.”

For this class, letter grades are based on the following numerical score ranges:

A+ $\geq 97.0$ to 100.0
A  $\geq 93.0$ to < 97.0
A- $\geq 90.1$ to < 93.0
B+ $\geq 83.3$ to < 89.9
B  $\geq 76.7$ to < 83.3
B- $\geq 70.1$ to < 76.7
C  $\geq 60$ to < 70.1
F  $\leq 59.9$

**Important websites:**

**USGS EarthExplorer:** http://earthexplorer.usgs.gov/
NASA Earth Observatory: http://www.earthobservatory.nasa.gov/
NASA Earth Science Enterprise: http://www.earth.nasa.gov/
NASA GSFC Landsat programs: http://landsat.gsfc.nasa.gov/
USGS Landsat Program: http://landsat7.usgs.gov/
EROS Data Center: https://eros.usgs.gov/usa
ASPRS homepage: http://www.asprs.org/
There are many others!
• **Important journals (there are many others, too):**

  Remote Sensing of Environment (RSE)
  ASPRS Photogrammetric Engineering & Remote Sensing (PE&RS)
  IEEE Transactions on Geosciences and Remote Sensing (IEEE TGARS)
  International Journal of Remote Sensing (IJRS)

• **Other textbooks that are great remote sensing references (but not required):**


• Schedule and textbook reading assignments (the schedule may change):

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture Topic(s)</th>
<th>Lillesand et al. Chapter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>23-Jan-19</td>
<td>Intro. to course and Intro. to remote sensing and...</td>
<td>1, Appendices</td>
</tr>
<tr>
<td>2</td>
<td>30-Jan-19</td>
<td>Physical principles of remote sensing</td>
<td>1, Appendices</td>
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<tr>
<td>3</td>
<td>6-Feb-19</td>
<td>Photographic Principles and Photogrammetry</td>
<td>2, 3</td>
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<td>4</td>
<td>13-Feb-19</td>
<td>Looking at Remotely Sensed Imagery with ENVI</td>
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<tr>
<td>5</td>
<td>20-Feb-19</td>
<td>Image Analysis/Imagery Interpretation</td>
<td>7</td>
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<tr>
<td>6</td>
<td>27-Feb-19</td>
<td>Image Analysis/Imagery Interpretation</td>
<td>7</td>
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<tr>
<td>7</td>
<td>6-Mar-19</td>
<td>Image Analysis/Imagery Interpretation</td>
<td>7</td>
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<td>--</td>
<td>13-Mar-19</td>
<td>Spring Break</td>
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<td>8</td>
<td>20-Mar-19</td>
<td><strong>Midterm Exam</strong></td>
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<tr>
<td>9</td>
<td>27-Mar-19</td>
<td>Exam Review, Thermal and Multispectral Remote Sensing</td>
<td>4</td>
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<tr>
<td>10</td>
<td>3-Apr-19</td>
<td>Thermal and Multispectral Remote Sensing</td>
<td>4</td>
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<td>11</td>
<td>10-Apr-19</td>
<td>Hyperspectral Remote Sensing</td>
<td>4.13 and other reading</td>
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<td>12</td>
<td>17-Apr-19</td>
<td>Lidar Remote Sensing</td>
<td>8</td>
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<td>13</td>
<td>24-Apr-19</td>
<td>Radar/SAR/PoliSAR Remote Sensing</td>
<td>6</td>
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<td>14</td>
<td>1-May-19</td>
<td>Data Clinic/Visual Image Interpretation and Applications</td>
<td>5, 8</td>
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<td>15</td>
<td>8-May-19</td>
<td><strong>Final Exam Due at 7:15 p.m.</strong></td>
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See also: [https://registrar.gmu.edu/calendars/spring-2019/](https://registrar.gmu.edu/calendars/spring-2019/)

**Academic Integrity/Honor Code:** Students are expected to review and abide by the GMU Honor Code ([http://oai.gmu.edu/the-mason-honor-code/](http://oai.gmu.edu/the-mason-honor-code/)).