EAES410: Advanced Topics in Geographic Information Science

~ Spring 2014 Syllabus ~

Professor: Dr. Mark Chopping  
Office: ML 350C, (973) 655-7384  
Office Hours: M/W 11:30 am-1 pm, OBA  
E-mail: choppingm@mail.montclair.edu

Classes:  
Classes start Monday, January 27 and end on or before May 7. 8:15–10:45 pm, ML258  
Final Exam: May 12. Sessions include lectures, practical work, movies, and discussions.

Textbook:  
As assigned and/or provided by your instructor. John R. Jensen's "Remote Sensing of the Environment: An Earth Resource Perspective", 2nd Edition, 2007 is one recommended – but not required – text. The ERDAS Field Guide is also useful. As this is an advanced course, you will be reading from published scientific papers as well as texts, some provided online.

Web:  
http://csam.montclair.edu/~chopping/rs

E-mail:  
You must maintain your Montclair State University e-mail account. If you send e-mail, always prefix the subject with EAES410: otherwise your mail will be filtered to JUNK.

Synopsis:  
Remote Sensing involves measurement of the properties of the Earth's surface or atmosphere at some distance: from aircraft and satellite-mounted sensors. Remote Sensing is at the forefront of technological developments and applications in Earth Science. There is almost no geoscience or geographic discipline which has not benefited from the application of Remote Sensing: from earthquake prediction to oceanography, forestry to volcanology, measuring atmospheric CO2 and aerosol loadings to the global energy budget, coral reef mapping to the hole in the ozone layer, crop yield estimation to coastal erosion, urban landscape mapping to water quality, geological prospecting to determination of rangeland productivity, estimating building energy (heat) loss to invasive species mapping...the list goes on and on and is only broadening with the advent of new technologies.

EAES410 is designed to build on knowledge and skills acquired in introductory classes in Remote Sensing and includes state-of-the-art aerial and satellite platforms and sensing technologies and techniques; a look at the wide range of applications in Earth Science and Geography; and a great deal of hands-on work with digital data sets. The class is divided into three parts: acquisition of domain knowledge, in-class practical work; and a semester review paper (a practical project that involves manipulation and exploitation of remote sensing data is not required but is an option if a suitable topic is selected in the first two sessions). In this course we leverage the small class size and higher level of motivation of students – but success also depends on the willingness to read and assimilate knowledge and the ability to complete assignments and practical work. Classes will include lectures revolving around remote sensing applications and discussion thereof, and practical work using information from orbiting satellites, aerial platforms, and various types of digital imagery, maps and charts.

Grading:  
Exams (2): 100 pts; In-class Practicals: 50 pts; Semester Project: 150* = Total: 300pts.
#note that 35 pts/150 are based on an in-class presentation of your findings.

Exams:  
The exam format is 50 – 75 multiple choice questions and 3 – 5 essay-like questions on topics covered in classes or in set readings.

Project:  
You must select a topic on which you will write a substantial review paper due at the end of the semester (15 – 20 pages, including figures, tables, and list of references). You are strongly advised to decide on a topic very early in the semester (if not selected by the 2nd class, a topic will be assigned). If a practical project is selected instead of a review, it must address a real environmental problem or issue, subject to my agreement.

Resources:  
1. Course website: http://csam.montclair.edu/~chopping/rs/ Please check the site frequently. It is used to distribute notes and data sets for exercises. 2. We use ERDAS Imagine (free student licence available for your computer) and the GIS Lab (ML258). 3. A large USB stick (8 – 32 GB) is recommended. BACK UP ALL WORK!
## Time Allocation for EAES 410 Advanced Topics in GI Science, Spring 2014

~ draft subject to change ~

<table>
<thead>
<tr>
<th>Mondays</th>
<th>Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/27</td>
<td>Overview; Semester Project Topic Selection &amp; Discussions</td>
</tr>
<tr>
<td>02/03</td>
<td>The NASA Earth Observing System, Project Topics &amp; Feasibility</td>
</tr>
<tr>
<td>02/10</td>
<td>Methods for Automated Interpretation of Imagery, Project Issues</td>
</tr>
<tr>
<td>02/17</td>
<td>Introduction to Programming for Remote Sensing, Project Issues</td>
</tr>
<tr>
<td>02/24</td>
<td>Modeling Light Transmission through the Atmosphere/Practical</td>
</tr>
<tr>
<td>03/03</td>
<td>Lidar Remote Sensing: Vegetation and More/Practical</td>
</tr>
<tr>
<td>03/17</td>
<td><strong>Mid-Term Exam</strong></td>
</tr>
<tr>
<td>03/24</td>
<td>Remote Sensing of Snow and Ice/Practical</td>
</tr>
<tr>
<td>03/31</td>
<td>Canopy Reflectance Modeling/Practical</td>
</tr>
<tr>
<td>04/07</td>
<td>Remote Sensing of Metrics of Climate Change/Practical: Survey</td>
</tr>
<tr>
<td>04/14</td>
<td>Remote Sensing of [ class choice ] (I will choose a topic if you do not!)</td>
</tr>
<tr>
<td>04/21</td>
<td>The Future of Remote Sensing</td>
</tr>
<tr>
<td>04/28</td>
<td>Practical Work: Semester projects / any overdue assignments</td>
</tr>
<tr>
<td>05/05</td>
<td><strong>Semester Review or Project Presentation</strong></td>
</tr>
<tr>
<td>05/12</td>
<td><strong>Final Exam</strong></td>
</tr>
<tr>
<td>05/14</td>
<td><strong>Project Write-Ups Due (OFFICIAL END OF SEMESTER)</strong></td>
</tr>
</tbody>
</table>

**PLEASE REGULARLY CHECK THE COURSE WEBSITE AT:**

http://csam.montclair.edu/~chopping/rs/
Assignment Write-Up Format: “OMRAD” (Objectives, Methods, Results And Discussion). **SAMPLE:**

Center the Title in Bold at the Top

~3 lines under this your name.
~1 line below this the course code and title.
~1 line below this your affiliation (Earth and Environmental Studies, Montclair State University, Montclair, NJ 07043).

~3 lines down the date of submission.

~4 blank lines

**Objectives (what we are trying to discover)**

The objective of this assignment was to take elevation data from a scanning LiDAR instrument in ASCII (text) XYZ format and use these data to produce a continuous raster Digital Elevation Model (DEM) image suitable for use in a Geographic Information System (GIS). DEMs are useful in GIS in a variety of applications, from soil erosion risk mapping to siting microwave transmitters/receivers for cellphone networks. .....etc..... [please expand on this!!]

**Methods (Data used and What You Did)**

Describe the data and what you did. *NOTE: this should not be a simple list of mouse clicks but a description of the FUNCTIONAL operations you had the software perform* (the main operation you performed to create the DEM is called SURFACING BY LINEAR INTERPOLATION. You should read about this in the online help and in the Field Guide). Describe also the importing of the data from text file and operation of the 3-D viewer. *Do NOT simply copy and paste the step-by-step instructions!!*

**Results And Discussion**

Describe the results and what they might be useful for (expand on the use of DEMs in general rather than the particular DEM you have created of a Southern New Mexico dunescape).

**References**

Provide references with items in this order: Author(s), (year of publication). Title of article [optionally in book...], *Journal name*, Volume[issue number]: page range. For example:


For articles or other material posted on the Intarweb, include the URL and date of last access:


----

**Figures:** Center on the page and include a numbered explanatory caption below; refer to figures in your text as Figure 1 or Fig. 1.

**Tables:** center on the page and include a numbered title above (Table I, Table II...).