Syllabus: Applied Environmental Geophysics
MGG 525 Fall 2011, 3 credits
(Version 110824e)

Instructor:  Mark Grasmueck, Associate Professor
Marine Geology and Geophysics
RSMAS University of Miami
Tel: 305 421 4858
mgrasmueck@rsmas.miami.edu

Regular Class Hours: Wednesday 13:30 - 16:15,
Room N351 (Classes), N319 (Labs), Fieldsite TBA

Required Texts:

There is a packet (CD) of the required readings.

Note – read for next week. All readings should be completed before the class for which they were assigned. A portion of each class period will be set aside to discuss these readings. Thoughtfulness of your comments and questions will be considered when determining the Class Participation portion of your final grade.

Purpose:
The purpose of this course is to familiarize you with the fundamentals of near-surface geophysical site assessment. By the end of this course you will know how to efficiently and non-destructively characterize the shallow subsurface of a field site. For the practical part of this class we will use 2D and state-of-the-art 3D Ground Penetrating Radar. In a “learn-by-doing” approach you will acquire the skills to design, acquire, process, interpret and document a geophysical survey. Many of the learning points from this practical experience are transferable to other field sites and geophysical methods you might encounter in your future geoscientific and environmental projects.

Course Requirements:
1. Complete the readings for class.
2. Participate in class discussions, field and lab exercises.
4. Final Exam

Grades in this course will be determined based on the following scale:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Participation</td>
<td>20%</td>
</tr>
<tr>
<td>Field Project Report (2D &amp; CMP GPR survey)</td>
<td>30%</td>
</tr>
<tr>
<td>Final exam</td>
<td>50%</td>
</tr>
</tbody>
</table>

Main evaluation criteria of the project report are:
1) How well somebody else can reproduce and understand your results. Typical length of the report is 4-8 pages.
2) Timeliness of meeting the two report deadlines.

Course Outline

- Course Overview and Introduction: types of geophysics, anomaly detection, noise sources, potential- and wave-field methods, benefit vs. cost.
- Wavefield methods: Seismic and GPR: Echo principle, wave propagation, wave types, frequency, amplitude, phase, reflection, refraction, identify events on shot gathers
- GPR introduction: Applications, hardware, acquisition modes, what causes reflections, dielectric constant, attenuation, depth of penetration, frequency-wavelength-resolution relationships.
- 2D processing: Optimize processing parameters with an iterative approach (“forking”), dewow, gain, bandpass filter, zero-point adjustment, data display, clipping.
- Diffraction/CMP processing and velocity determination for depth conversion: Manual hyperbola velocity determination, automatic hyperbola fitting, semblance.
- Introduction of Field Exercise
- 2D profile and Common Mid Point GPR Acquisition at Fieldsite. Reconnaissance survey to select best location for subsequent 3D GPR survey.
- 3D GPR acquisition field exercise.
- Processing (including 3D migration) and analysis of results from the acquired 3D GPR survey.
- 3D workstation interpretation: Visualization and horizon mapping.
- Wrap-up and Course Review: The most important learning points.
- Final Exam, 1.5 hr short answer essay questions.