GEO 6115: Advanced Field Techniques

Topics: Airborne and Terrestrial Laser Scanning, GPS, and GIS Approaches

SPR 2014, Wed. 2-4:45PM

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Office Hours: W, 1-2 or by appointment

COURSE DESCRIPTION: This course is designed to introduce students to three types of spatial data acquisition and integration of this data into a GIS for mapping purposes. We will investigate spatial data acquired from terrestrial laser scanning (TLS) survey techniques, as well as aerial laser scanning (ALS) LiDAR applications and photogrammetry. The course will also introduce theoretical and practical applications of GPS data acquisition with the aid of mapping- and survey-grade instruments and their integration with laser scanning surveys. GIS mapping techniques will focus on development of spatial databases and proper cartographic techniques for visualizing the spatial data. Workflows for survey planning, data collection, and post-processing will be examined, with students exposed to a range of software and hardware applications for spatial data acquisition and visualization efforts. This is a graduate level methods course is in the School of Geosciences and satisfies elective credit hours and can be applied to the GIS Certificate Program.

TEXT: There is no required text. Course readings will be designed around journal articles, book chapters, and instrument manuals.

COURSE OBJECTIVES:
1) Provide a general overview of the concepts of spatial data acquisition, in particular, the basic measurement and operational principles of laser scanners and the relationship with other types of spatial data sets such as airborne (ALS) LiDAR and GPS.
2) Present “hands-on” experience in field planning, data collection, and post-processing.
3) Develop skills to collect geographical field data and incorporate such data into GIS.
4) Introduce methods of geographic visualization that will enhance exploration and decision-making processes.

LEARNING OUTCOMES
When you have completed this course, you will be able to:

1. Design and implement a strategy for capturing or sourcing geospatial data and any accompanying metadata (TLS Survey project)
2. Proven ability to collect and process spatial data;
3. Master the concept of integrating the spatial data into GIS environment for geovisualization products.
4. Assess the factors of scale and outcome for method choice and research design strategies and demonstrate proficiency in survey tool selection and integration
5. Assess the impact of state, national, and international data standards, and have knowledge of the sourcing and availability of geospatial data
6. Critically evaluate the potential impacts of data quality on spatial analysis and decision making

ATTENDANCE: There is no daily attendance policy. I expect each student to attend class on a regular basis to grasp all of the aspects of this course.
OTHER RULES
All communication devices such as, but not limited to, cell-phones, text messaging, etc. are not to be used during class time. It is permissible to ‘take notes’ in class using a laptop or similar device. The use of these devices for other purposes, such as ‘internet surfing’, IMing, watching movies, etc. is prohibited during class. These actions are distracting to others; therefore, when and if the laptops become a distraction, they will be prohibited for use in the classroom. Cheating and other academic dishonesty will be dealt with severely, in accordance with USF policy (see the current catalogue). Notes and tapes of instructors’ presentations are not permitted for sale or publication. During tests, communication devices such as cell phones, iPads, Google Glass, etc. are not allowed to be used. Special Facilities Individuals who have any disability, either permanent or temporary, which might affect their ability to perform in this class, are required to inform the instructor the first week of the semester. Adaptations of methods, materials, or testing may be made, as possible, for equitable participation.

EXPECTATIONS

1. Projects (50%) – 50 pts.
   Each student is expected to turn-in all a semester long project, on time in manner that meets and/or exceeds the guidelines handed-out in class. Late or incomplete projects will be penalized.

2. Take-home examinations (30%)- 30 pts. Two exams (mid-term and final) test individuals on materials from the readings, class discussions, lectures, and projects.

3. Class participation (10%) - 10 pts.
   a. Preparation for class through submission of summations each week in the form of a one page briefing overview of the readings (beginning week 2).
   b. Participation in class discussions
   c. Participation in field projects
   d. Assistance and coordination with other students in the class

4. Digital Portfolio (10%) 10 pts.
   a. Each student is expected to keep an organized binder of her/his progression through the course. The digital portfolio is turned in the final regular class day. He/she should include the following material at a minimum:
      • Articles
      • Projects and visualizations of data (e.g. videos, WebGIS, Google Earth, posters, etc.)
      • Take-home Exams
      • Class Notes
      • Other Materials collected throughout the semester
      • Synthesizing statement about the class
Course Schedule

**WK 1 Jan 8**  
Introduction to course and Terrestrial LiDAR basics and looking at laser scanner functions (phase shift and time of flight)

**WK 2 Jan 15**  
Scanning Components and How Terrestrial Laser Scanning Integrates with GPS

**WK 3 Jan 22**  
Understanding the Scan Environment and Reference System Planning and use of GPS

**WK 4 Jan 29**  
Introduction to 3D and laser scanning software (SCENE, Geomagic, Pointools, Autodesk)

**WK 5 Feb 5**  
Preparing and Conducting Your Terrestrial Laser Scan Project

**WK 6 Feb 12**  
Importing Scan Data into SCENE, and the Scan Project and Workspace

**WK 7 Feb 19**  
Preprocessing & Registering Scan Data, and the Scan Manager

**WK 8 Feb 26**  
Scan Data Viewing Options and Data Visualization

**WK 9 March 5**  
Introduction to Third Party Software (*MID TERM DUE*)

**WK 10 March 12**  
**SPRING BREAK**

**WK 11 March 19**  
Geo-referencing, Data Export and GIS Integration,

**WK 12 March 26**  
Other Data Types used with TLS projects (Aerial LiDAR, GPS, Photogrammetry)

**WK 13 April 2**  
Analysis and Product Deliverable Designs

**WK 14 April 9**  
Visualization Platforms

**WK 15 April 16**  
Bringing It All Together

**WK 16 April 23**  
Where Do We Go From Here? Ethics, Standards, Trends and the Future

**FINAL EXAM WEEK April 26th – May 2nd:** Our final is due to me on April 30th by 4PM turned in to CMC 102. No late exams accepted.