University of Connecticut
Department of Civil & Environmental Engineering
CE 2410 Geomatics and Spatial Measurements

Fall Semester 2017
Lecture: Tuesday and Thursday 9:30–10:45AM UTEB 175

Instructors:
Dr. Amy Burnicki (amy.burnicki@uconn.edu) Office hours: MW 3:00-4:00PM Castleman 326, or by appointment

Course Description:
Introduction to various data measurement issues in civil and environmental engineering, including collection techniques, analysis, error evaluation, and visualization; Topics include leveling, distance and angle measurement, mapping and topographic surveys, GPS and Geographic Information Systems (GIS), geospatial frames of reference.

Course Objectives:
Upon successful completion of this course, students will gain a basic understanding of geomatics theory and practice.

1. Understand how horizontal and vertical position is determined.
2. Solve basic geomatics problems using geometry and trigonometry.
3. Describe how we measure and visualize terrain
4. Calculate and minimize error in data collection.
5. Construct and interpret various types of data visualization including planimetric maps, topographic maps and site plans.
6. Understand geographic reference systems & common coordinate systems.
7. Gain practical experience using surveying equipment such as Total Station, automatic levels and GPS to perform basic data collection.
8. Introduction to basic application of GIS and computer-aided drafting (CAD) software to visualize spatial data.
9. Experience working as a member of an integrated team to collect, analyze and visualize geospatial data.

Required Textbook:
Surveying: Principles and Applications, 9th edition, Barry F. Kavanagh and Tom B. Mastin, Pearson

Supplementary Textbooks:
Surveying Fundamentals and Practices, 6th edition, Jerry A. Nathanson, Michael Lanzafama, Philip Kissam, Prentice Hall
Introduction to Geospatial Technologies, 2nd edition, Bradley A. Shellito, W.H. Freeman and Company

Additional Required Materials:
Surveying field notebook ELAN 64-8x4W
3H-4H pencils
Basic scientific calculator

- examples of acceptable calculators: Texas Instruments TI-30Xa or Casio FX-260
- graphing calculators **will not** be allowed during exams

Prerequisites:
MATH 1060Q or 1120Q or 1131Q

Course Policies:
In class:

- Arrive to the classroom on time and respect your classmates and instructor by keeping quiet during the lecture.
- Refrain from answering phone calls or texting during the lecture; laptops should be used for note taking only.

- Clarifying questions related to the presented material will be addressed during lecture; however, specific questions or concerns will be addressed after class or during office hours.
- Include the course number in all email correspondence.
- Emails sent after 5pm and before 9am or during weekends will not be answered until the next business day.

In lab:

- Your participation in the lab sessions is **mandatory**.
    - A student who fails to attend a lab session will receive a 0 for the missed lab session.
- Arrive to lab on time and prepared for the week's activity.
- Students are expected to follow all safety rules and regulations. Safety rules and general lab policies will be covered, in detail, during the first lab meeting.
- **Lab sessions will be held regardless of the weather**; dress appropriately.
    - Sturdy shoes or boots are preferred; however, sneakers are acceptable. Open toed shoes, high heels, sandals, crocs, and flip-flops are **prohibited** for safety reasons.
- **Surveying equipment in this class costs thousands of dollars.** Follow handling/use instructions given before or during the labs.
- Surveying requires teamwork. Students will work as part of a surveying team throughout the semester.
    - Your performance in lab will be evaluated by your teaching assistants and teammates after each lab session.
- See Laboratory syllabus for complete set of Lab Policies.

Academic integrity

- The instructors of this class have a **zero-tolerance policy** for academic misconduct, that is copying others' work either in lab, on an assignment, or on an exam. Any student work that is found to be in violation of the university policy regarding academic misconduct (http://www.community.uconn.edu/student_code.html) will be assigned a grade of zero at a minimum. Students with multiple offenses are at risk of failing the course.
- Read and understand UConn Student Code of Conduct.

Course Evaluation:

Letter	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Points	>=93	90-92.9	87-89.9	83-86.9	80-82.9	77-79.9	73-76.9	70-72.9	67-69.9	60-66.9	<60

Grading:

Your grade will be based on your performance on:

Homework (20%)	Lab Exercises (20%)	Semester project (20%)
Lab Practical (5%)	Midterm exams (20%)	Final exam (15%)

Homework Assignments:

- You will have weekly homework assignments. Each assignment will consist, on average, of 6-8 problems.
- Assignments will be posted to HuskyCT by noon on Wednesday and are ***due by the end of the day (11:59pm) the following Tuesday***.
- Homework assignments must be submitted as a **single** document to HuskyCT.
    - Submitted assignments must include your name and lab section.
    - Assignments can either be hand written and scanned to create a single pdf document OR typed and saved as a docx or pdf document. ***If illegible, your homework will not be graded.***
    - Every calculation used in your response must be included in your submitted document; i.e., **all work must be shown to earn full credit**.
    - Clearly identify the problem number for each solution, highlight your final answer, and answer questions in the assigned order.
- Solutions will be posted after the due date on HuskyCT. **Therefore, late homework will NOT be accepted.**

Lab Exercises:

- You will have weekly lab exercises that will entail work in the field or computer lab.
- Instructions and requirements for each lab exercise will explained in class during each lab session.
- Your weekly lab score will be based on attendance, participation, pre-lab quiz score, and field notebook submission. Field notebook specifications will be provided prior to each lab.
- Lab exercises and pre-lab quizzes will be posted to HuskyCT one week prior to your lab session. **It is your responsibility to arrive prepared to work each week.**
- See Laboratory syllabus for complete description of the lab evaluation grading component.

Semester Project:

- All students will be assigned to a surveying team and will work together to collect, analyze and visualize data for a mapping project around an assigned campus building.
- Lab exercises are designed to provide surveying teams with the skills needed to obtain and analyze the data required to complete the semester project. As such, your team will work to complete the project throughout the semester.
- While the semester project is a group project, each member of the team will be individually evaluated based on their performance.
- Survey teams will be assigned during the second week of the semester.
- The semester project consists of a series of documents: 1) mid-term assessment report, submitted to HuskyCT by the end of Week 10 (see Course Schedule); 2) final report, printed submission due the last day of the semester (see Course Schedule); and 3) series of maps created using both CAD and GIS software, printed submissions included as appendices to the final report.
- Instructions for the Semester Project will be posted to HuskyCT and discussed in lab during the second week of the semester.
- See Semester Project document for an overview of project goals and a complete description of project requirements.

Lab Practical:

- Active participation in lab is essential to the understanding of geomatics theory and practice. Laboratory sessions are designed to provide all students with first-hand experience using surveying and data collecting technologies (e.g., Total Station, GPS, automatic levels).
- Students will be assessed on their ability to operate surveying equipment. Students will complete a two-part lab practical testing their ability to set-up instrumentation and operate the equipment to collect data.
- See Laboratory Syllabus for additional information and Course Schedule for dates.

Midterm Exams:

- Two midterm exams will be given during the semester on **Sept. 28th** and **Oct. 26th**.
- No make-up midterms will be given, with the following exceptions: a) medical emergency with a letter from the hospital or doctor; or b) athletic team members with a letter from their coach (in case of a conflict between an exam and a tournament/meet).
- Students with a disability can contact CSD to schedule their exam in a private room with extended time.

Final Exam:

- A cumulative final exam will be given at the end of the semester during Finals week.
- Students will follow all University regulations concerning the final exam.

Course Schedule[!!]

Week	Day	Reading		Lecture Topic	Lab Topic
1	8/29		Preliminaries	Course overview & Introduction to Geomatics and Spatial Data Collection	Introduction to Lab & Pacing (meet in CAST 136)
	8/31	1.1-1.14, 1.20-1.21		Measuring Location: Surveys, Frames of Reference, Units of Measurement, Field Notes & Visualization	
2	9/5	N: 3.1-3.3[#]		Geo-mathematics	Establishing Reference Stations (meet in CAST 136)
	9/7	N: 2.3-2.4[#]		Error Analysis	
3	9/12	3.1-3.2, 3.5-3.17	Data Collection	Horizontal Distance Measurement	Horizontal Distance Measurement (meet in CAST 136)
	9/14	3.18-3.23 & 2.1-2.7		Horizontal / Vertical Distance Measurement	
4	9/19	2.8-2.9, 2.13-2.17		Vertical Distance Measurement	Vertical Distance Measurement (meet in CAST 136)
	9/21	4.1-4.12		Measuring Angles	
5	9/26	5.1, 5.3-5.6, 5.10-5.14		Total Station & Exam Review	Total Station Basics: Angles & Distances (meet in CAST 136)
	9/28			**Exam 1 (weeks 1-4)**	
6	10/3	6.1-6.5		Traverse: Introduction & Control Surveys	Traversing I (meet in CAST 136)
	10/5	6.6-6.11		Traverse Calculations	
7	10/10	6.12-6.16		Traverse Calculations	Traversing II (meet in CAST 136)
	10/12	8.1, 8.5-8.8, 5.15-5.15.4		Topographic Surveys & Measuring Terrain	
8	10/17	7.1-7.5.1		GPS: Basics	Topographic Survey I (meet in CAST 136)
	10/19	7.5.2-7.7		GPS: Errors and Improvements	
9	10/24	7.9-7.11		GPS: Applications & Exam Review	Determining Location with GPS (meet in CAST 136)
	10/26			**Exam 2 (weeks 5-9)**	***Lab Practical I: Instrument Setup***
10	10/31		Data Visualization	CAD: MicroStation*	Topographic Survey II (meet in CAST 136)
	11/2	8.5-8.6 and S: pp.418-427[#]		CAD: MicroStation*	
	11/3			*Semester Project – Midterm Report***	
11	11/7	8.2-8.4 and S: pp.418-427[#]		Maps & Terrain Representation	MicroStation: Topographic Mapping (meet in CAST 117)
	11/9	10.1, 10.10 and S: pp.33-41[#]		Horizontal Control Surveys & Geographic Reference Systems	***Lab Practical II: Measurement***
12	11/14	7.12		Vertical Control Surveys & Geoid	MicroStation: Planimetric Mapping (meet in CAST 117)
	11/16	10.2-10.3 and S: pp.41-44[#]		Projecting Geospatial Data for Mapping and Analysis	
				Thanksgiving Break	
13	11/28	10.4-10.5 and S: pp.44-50[#]		Coordinate Systems	Visualizing Data with GIS (meet in CAST 117)
	11/30	S: pp.109-123[#]		GIS: Overview and Data Structures	
14	12/5	S: pp.158-172[#]		GIS: Analysis and Applications	Semester Project Work Session (meet in CAST 117)
	12/7			Final Review & Semester Project Work Session	
	12/8			*Semester Project – Final Report***	
15		**Final Exam (cumulative)**			

!! class and lab schedule is subject to change; changes will be announced in class and on HuskyCT
* MicroStation lectures will be presented online; no in-class lectures during week 10
** no class meeting; project submission due by 5pm
[#] supplementary readings available on HuskyCT; N = Nathanson *et al*.; S = Shellito