University of Connecticut

Department of Civil & Environmental Engineering

CE 2410 – Geomatics & Spatial Measurement

Instructors:

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Course Description:

Elementary plane surveying, geospatial coordinate systems, error and accuracy analysis, introduction to Geographic Information Systems (GIS), theory and uses of Global Positioning Systems (GPS), introduction to photogrammetry and land surface remote sensing in the context of civil & environmental engineering.

Corse Goals and Learning Objectives:

Goal 1) To familiarize the students with the theory and techniques used in making horizontal and vertical measurements with the tape, automatic level and total station.

Learning Objectives:

- Indentify the various types of surveys in common use and explain the purpose of each;
- Recognize the capabilities and limitations of modern surveying instruments;
- Identify sources of both random and systematic error in linear and angular measurements.

Goal 4) To become familiar with the mapping capabilities of CAD and GIS and the use of mapping software in the support of civil engineering design.

Learning Objectives:

- Prepare a scale drawing of the exterior of a building based on field measurements using CAD software (ABET 3g & 3k);
- Prepare a sketch, with both vertical and horizontal components of a three dimensional measurement scenario based on field measurements using CAD software (ABET 3g & 3k);
- Prepare a large scale map of a control traverse based on field measurements using CAD software (ABET 3g & 3k);
- Create a small scale map using GIS software and describe its possible applications in Civil Engineering (ABET 3j & 3k).

Goal 5) To become familiar with the terminology and applications of GNSS systems and more specifically the Global Positioning System (GPS)

Learning Objectives:

- Describe the various elements of the Global Positioning System as currently configured (ABET 3a);
- Describe the basic operational theory of GNSS (ABET 3a);
- List the various components of the GNSS signal (ABET 3a);
- Describe the difference between the various types of GNSS survey methods, how they operate; their various components, the errors associated with each, their uses, and their limitations (ABET 3a);
- Operate a mapping grade GPS receiver to collect positions and attributes of physical features (ABET 3k).

Goal 6) To gain an understanding of the broad range of topics encompassed by the Geomatics discipline and the applicable technologies and ethical responsibilities involved in modern professional practice.

Learning Objectives:

- Describe the relationship of GIS, Photogrammetry, Boundary Surveying and Remote Sensing to the practice of Land Surveying, Civil Engineering and Environmental Engineering (ABET 3j);

Additional Required Materials:

- Surveying field notebook, Only those field notebooks sold in the bookstore (ELAN Orange, Spiral Bound) will be allowed.
- 3H-4H pencils. 2H or HB are too soft and not acceptable.
- Each student is REQUIRED to have a TI30Xa scientific calculator for use in all laboratory sessions, lecture, and for all tests. NO OTHER CALCULATORS WILL BE ALLOWED.
- See section below entitled "Lab" regarding appropriate attire for the lab sessions.

Strongly Suggested Materials (but not required):

- 6" C-Thru ruler/straight edge.
- Small "french curve" template.
- Travel Umbrella

Suggested Readings:

From time to time relevant articles on the surveying and engineering profession may be assigned. To the extent possible these reading will be made available through HuskyCT, however, materials may be placed on reserve at the library for your review.

Resources:

Students are encourage to use internet resources, such as on-line tutorials, web pages from other academic institutions, etc. to augment the text and lab manual in those areas where they may be having difficulty.

Lab:

You are responsible to dress for the weather. Lab will be held rain or shine, and we will likely be outdoors regardless of the weather. Hats, gloves, boots, and other winter weather work clothes may be necessary as the semester progresses. Sturdy shoes or boots are preferred for lab, however, sneakers are acceptable. Under no circumstances will open toed shoes, high heels, sandals, crocs or flip-flops be allowed for safety reasons. Students who are not properly dressed for lab may be asked to leave and return in proper attire.

The lab manual contains a section on Surveying Lab Safety Rules. These rules are to be strictly observed at all times. As each new piece of equipment in introduced, students will be instructed

The grading system for homework will generally be as follows:

- Check Plus (4) All homework problems completed and majority correct.
- Check (3) All homework problems completed or attempted.
- Check Minus (2) Majority of homework problems complete or attempted.
- Zero (0) Majority of homework problems missing, incomplete or incorrect.

Student field notebooks must be turned in to the instructor as directed. Generally this is at the beginning of Thursday lecture for Tuesday labs and at the beginning of Tuesday lecture for Thursday labs. Students wishing to hand their field notebooks LATE should have them placed in the instructor's mailbox in the department office. Field notebooks turned in later will be marked down a full letter grade for each day late. 3H or 4H lead should be used for all field notebook entries. NO credit will be given for a lab where the field notes were taken in ink. The quality of field notes is expected to constantly improve as the semester proceeds, and notes will be graded continually harsher as the semester proceeds. Each week's field notes will be graded on a scale of 1-10. The index is expected to be kept up to date, and a grade for the index will be given at the end of the semester and will count as one full lab grade when final grades are computed. Some labs require that a calculation sheet and/or map be produced and will factor in to the lab grade for that particular week.

Projects:

There will be one "traverse adjustment and mapping project" required in this course. It will count for 1/3 of the homework grade for the course. Students are advised to budget their time for this project, since it accounts for a significant portion of their grade in the course. A set of expectations for the project will be provided.

Tests:

There will be three tests and one final exam. The tests will each count for 8% of your overall grade in the course. The final exam will count for 15% of your grade in the course. The tests and the final exam are closed book, closed note, however a formula sheet will be provided by the instructor. A practical field test will be administered late in the semester and will count for 8% of your overall grade in the course. No make-ups for any tests or exams will be allowed without a signed doctor's note specific to the date and time of the class missed.

University of Connecticut student athletes must meet with the instructor during the first two weeks of classes (by September 9, 2008) to go over their competition schedule, otherwise no makeup exams will be allowed.

All makes-ups will be at a time and place to be determined by the instructor, and may be in the evenings.

Students with learning disabilities must meet with the instructor during the first two weeks of classes (by September 9, 2008) to go over documentation requirements and any special accommodations needed.

CE 2410 Geomatics & Spatial Measurement, Fall 2009

Lecture & Lab Schedule (Tentative)

Day	Date	Lecture Topic	Readings	Lab #	Lab Title
T	9/1/09	Introduction to surveying, trig refresher, syllabus review, field notes.	Chapter 1, 2 & 3	1	Pacing & Fieldnotes
TH	9/3/09	Field notes, accuracy, precision, error.			
T	9/8/09	Methods for measuring distance, Taping, EDM theory	Chapter 5 & 6	2	Taping (including building measurement)
TH	9/10/09	Sources of error in Taping			
T	9/15/09	Leveling theory, methods and equipments	Chapter 4, 5	3	Introduction to CAD (Castleman 117)
TH	9/17/09	Leveling field procedures, computations			
T	9/22/09	Profiles and cross sections		4	Leveling
TH	9/24/09	Angle measurement & Total Station	Chapter 8		
T	9/29/09	Bearing & Azimuth computations, Review for Exam 1.	Chapter 7	5	Closing the Horizon
TH	10/1/09	**TEST 1**			
T	10/6/09	Bearing & Azimuth Computation, Coordinate Geometry	Chapter 7, 9, 10	6	Traversing
TH	10/8/09	Traverse Pre-Adjustment calculations			
T	10/13/09	Traverse Adjustment calculations (Compass Rule)		6	Traversing
TH	10/15/09	Area Calculation	Chapter 12		
T	10/20/09	GNSS/GPS	Chapter 13, 14, 15	7	GPS
TH	10/22/09	GNSS/GPS			
T	10/27/09	Contouring, Topographic and site detail mapping	Chapter 17	8	Remote Elevation
TH	10/29/09	Horizontal curves	Chapter 24		
T	11/3/09	Horizontal curves, Review for Exam 2.		9	Detail Mapping
TH	11/5/09	**TEST 2**			
T	11/10/09	Volumes	Chapter 26	**PRACTICAL FIELD EXAM**	
TH	11/12/09	Vertical Curves	Chapter 25		
T	11/17/09	Vertical Curves		11	Construction Layout
TH	11/19/09	Construction Layout	Chapter 23		
T	11/24/09	Thanks Giving, No Class			
TH	11/27/09	Thanks Giving, No Class			
T	12/1/09	Photogrammetry & Remote sensing	Chapter 27	12	GIS (Castleman 117)
TH	12/3/09	Photogrammetry & Remote sensing	Chapter 27		
T	12/8/09	GIS	Chapter 28		
TH	12/10/09	Review of the Class			
		FINAL EXAM			

Note: Home works will be assigned each week and due dates will be posted accordingly.