

**PRINCIPLES AND PRACTICES OF GEOMATICS**  
**BE 3200 COURSE SYLLABUS Fall 2015**

**Meeting times:** Lecture class meets promptly at 10:10-11:00 AM Mon/Wed in 438 Brackett Hall and lab meets promptly at 12:30-3:20 PM Wed at designated sites

**Course Basics**

**Geomatics** encompass the disciplines of surveying, mapping, remote sensing, and geographic information systems. It's a relatively new term used to describe the science and technology of dealing with earth measurement data that includes collection, sorting, management, planning and design, storage, and presentation of the data. ***In this class, geomatics is defined as being an integrated approach to the measurement, analysis, management, storage, and presentation of the descriptions and locations of spatial data.***

**Goal:** Designed as a "first course" in the principles of geomeasurement including leveling for earthwork, linear and area measurements (traversing), mapping, and GPS/GIS.

**Description:** Basic surveying measurements and computations for engineering project control, mapping, and construction layout. Leveling, earthwork, area, and topographic measurements using levels, total stations, and GPS. Application of Mapping via GIS.

**CT2:** This course is a CT<sup>2</sup> seminar in which you will not only study the course material but also develop your critical thinking skills.

**Prerequisite:** MTHSC 106: Calculus of One Variable I.

**Textbook:** Kavanagh, B. F. Surveying: Principles and Applications. Prentice Hall. 2010.

**Lab Notes:** Purchase Lab notes at Campus Copy Shop [REQUIRED].

**Materials:** Textbook, Lab Notes (must be brought to lab), Field Book, 3H/4H Pencil, Small Scale, and Scientific Calculator.

**Attendance:** Regular and punctual attendance at all classes and field work is the responsibility of each student. College work proceeds at such a pace that regular attendance is necessary in order for the student to obtain maximum benefits from instruction. All absences are matters to be resolved between the instructor and student. If a student finds it necessary to be absent from class, it is the student's responsibility to make up resulting deficiencies.

**The instructor reserves the right to reduce the semester grade if a student has more than one unexcused absences.** If it does become necessary to miss class, the student must take the responsibility to make up any work missed and obtain class notes from another student. **Makeup tests will not be given for quizzes or other unexcused tests if prior arrangements have not been made.**

Field work **cannot** be "made-up" because all work is done by a field party. A field book grade of **F** will be recorded for an **unexcused** lab absence. All field work is to be recorded in the **Field Book**.

**Mandatory First Day Class Attendance Policy:** All students are required to attend the first scheduled day of classes for which they are registered. A student who cannot attend the first class is responsible for contacting the instructor to indicate intent to remain in that class. If a student does not attend the first class meeting or make contact with the instructor by the second class meeting or the last day to add, whichever comes first, then the instructor may drop that student from the class.

**Texting:** Texting is not allowed during class.

**Online Information:** I will communicate with you via email and Blackboard for this class.

**Computers:** Excel spreadsheet and land surveying software. Respect all software licenses.

**Lateness:** If the instructor is late for the course, class will be cancelled after 15 minutes.

### **Instructor Information:**

**Instructor:** Dr. Tom Owino

**Email:** towino@clemson.edu (This is the best way to contact me.)

**Office:** 441A Brackett Hall

**Office Hours:** (*Subject to Change, TBA*)

1:00-3:00 PM. Monday

3:00-4:00 PM Monday. Recitation office hours and by appointment.

Please email me to set up an appointment outside of normal office hours.

**Office Phone:** (864)-656-4041

### **Field Work, Homework, Quizzes, and Exams:**

**Grading:** Your final grade will be computed using the following formula:

- 32% (2 Exams, 16% each)
- 10% Homework
- 6 % Quizzes
- 28% Field Work
- 8 % Practicum
- 16% Final

**Final Grades:** Final letter grades (after rounding) will be determined using the standard scale:

- A:  $\geq 90$
- B: 80 – 89
- C: 70 – 79
- D: 60 – 69
- F:  $\leq 59$

**Recitation Office Hours:** On one day a week, I will hold a “recitation office hour” in the afternoon where attendees will practice the course material in small groups. Here, you might work on practice problems or field work in more depth. Recitation office hours are not mandatory, but are suggested.

**Field Work:** All field work is to be recorded in the Field Book. Only neat, legible, logical, organized work on engineering paper and in the field book will be accepted. These qualities demonstrate a commitment to an orderly mental approach and to orderly work procedures. Late submission may be penalized one or more letter grades

**Lab Safety:** *In addition to applicable departmental/college safety policies, the following items apply to all labs:*

1. *Inspect equipment for safety hazards and report hazards to instructor.*
2. *Do not throw range poles, hatchets, plumb bobs, stakes, rocks, pins, etc.*
3. *Wear appropriate clothing for outdoor activities and for existing weather.*
4. *Be alert to sunburn, snakes, bees, other pests and to sharp and hidden objects in the grass.*
5. *Alcoholic beverages, drugs, or states of impairment are not allowed.*
6. *No activity requires students to place themselves in danger, such as proximity to a highway*
7. *Rainy day labs will meet in 403 Daniel Hall*

**Transportation:** *Transportation to survey site is student's responsibility. Notify instructor if you need transportation. Note that Kite Hill is served by CAT Bus. Direction to site(s) will be provided as required. Drive safely.*

**Emergency: Call 656-2222**

**Homework:** Due on the date specified by the instructor. The grade for late work will be reduced by one letter grade for each weekday that it is late. All assignments that involve calculations must be done on 8 1/2" x 11" engineering paper unless otherwise indicated such as computer printout. Sufficient information should be included in the problem solution so that it can easily be understood. It should be clear where each equation or number was obtained. Note that a thorough explanation of assumptions is necessary for you to receive full credit of your work. Be sure to include units and/or conversions as appropriate.

If you need help on homework or other areas, please come by and see me during office hours on Monday or email to set up appointment.

**Quizzes:** There will be six to eight unannounced short quizzes (5-10 minutes) at the beginning or during class. The quiz questions will be short answer questions which test your recall of the basic course material most recently covered .

**Practicum:** There will be practicums on the setup and use of an automatic level and Total station.

**Exams:** There will be two in-class exams in this course. The in-class exams will be held as shown on the course outline.

**Final Exam:** This will be held in accordance with the current final exam schedule. There will be no exemptions from the final

**Group Work:** Group work is encouraged on the homework, but you must write up your solutions separately. This means that the techniques and approaches that you use may be the same, but the text or explanation of the solution should be written up in your own words. Identical or very similar homeworks may not be graded. If you work on the homework together or receive a hint from someone else, you must write the names of the people with whom you worked at the top of your submission. By writing the names of the people with whom you worked, you are giving them credit for their contributions, just as you would expect credit for helping someone else.

### **Critical Thinking Integration**

Since this course is a CT<sup>2</sup> seminar, we will also explicitly discuss the role of critical thinking in geomatics. In particular, we will not only discuss the role of critical thinking in problem solving, but we will also discuss why surveying is done in the way it is, what makes good surveying, and why surveyors have chosen a particular framework for surveying

### **Learning Objectives**

Upon successful completion of this course, students will be able to

- Distinguish the different types of surveying.
- Identify and compute errors in land measurements.
- Evaluate land elevation measurement according to applicable criteria.
- Be able to set up and use an automatic level.
- Analyze land traverse computation.
- Be able to set up and use total station for determining horizontal/vertical angles and coordinates of sighted points.
- Integrate GPS and GIS to solve a surveying problem.
- Synthesis principles extrapolated from distinct geomatics concepts to perform a surveying project.
- Communicate complex geomatics principles effectively through written reports, engineering drawing (CAD), and presentation.
- Critique given field note book entry for correctness and completeness.
- Monitor and assess one's own thoughts and arguments (in field note book entry) for clarity, precision, correctness, and logicalness.

### **Academic Integrity:**

**Class Policy:** You are expected to follow the university's policy on academic integrity:  
"As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form."

In particular, in this course, if you use references outside of the course materials, e.g., the internet, a different book, or discuss the problems with anyone, you are expected to provide a short citation. On homeworks, you are also required to write the names of the people with whom you worked at the top of your submission.

### **Disability Services:**

**Class Policy:** It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities. Students are encouraged to contact Student Disability Services to discuss their individual needs for accommodation. The Student Disability Services department is located in Redfern Health Center.

In addition, students with disabilities who need accommodations should make an appointment with me to discuss specific needs within the first month of classes (I must receive the letter at least one week before an exam in order to provide accommodations). Students should present a Faculty Accommodation Letter from Student Disability Services when we meet.

### **Disclaimer:**

**Syllabus Changes:** This syllabus is subject to change, if necessary, for reasons including those related to unforeseen conflicts, course needs, or educational needs. I will contact you whenever a change must be made, and an up-to-date version of the syllabus will always appear on the course website.

### **What is This Course Not Like?**

In some courses, you can pass the course by memorizing all of the important data. Classes that are sometimes approached this way by students (even though this method is not the most effective) include organic chemistry and art history. BE 3200 is not this type of course. You will need to memorize some definitions and concepts this course (this material is tested on weekly quizzes), but memorization alone will not allow you to pass the exams. Memorization only allows you to repeat steps that have been taken before, and it does not help you solve new problems. If this course were just about memorization, surveyors could just look up everything that is needed in a database and surveyors would not be necessary. Fortunately, memorizing facts alone is not surveying. Instead, to succeed in this course, you must learn how to interpret and apply your knowledge.

## What is This Course Like?

This course is a CT<sup>2</sup> critical thinking seminar. Therefore, in addition to covering the material of BE 3200 in the attached course outline, this course has a critical thinking component, which is designed to improve your critical thinking skills. Critical thinking is more than memorization. Since improvement in your critical thinking is one of the goals of this course, we will spend time in this course analyzing your own thinking and discussing how to apply critical thinking to solving surveying problems. In particular, some of the critical thinking steps that we will discuss include the following:

- (1) When given a problem, you must make assessments of what of the given information is most important to the problem.
- (2) When given a problem, you must make assessments of what surveying knowledge will be most applicable to this problem.
- (3) After determining the appropriate surveying knowledge, you must plan out how to combine that knowledge into a coherent solution.
- (4) After planning out your solution, you must carry out your plan and turn it into a well-communicated short report that expresses how to combine the appropriate information.
- (5) After finishing your report, you will be expected to react upon it and study what made this report successful and how to apply or generalize the results.

## What is Expected of You?

- Some of the most important work that you do in this class will be outside of the Classroom during field work and when you practice and study on your own. Some of your assignments will guide you in how to practice and understand the course material successfully.
  - To get the most out of each class, you should prepare for class and review the material on blackboard after class. In order to encourage you to do this, there will be assignments after each class.

Before each class, the concepts that we will cover in that class will be posted blackboard, and you will be required to study the given information and try to connect the problems to your previous knowledge. You will be required to think about the problem and try to give a suggestion on how to solve it.

- It is very important that you are continuously studying the material in this class. If you only memorize the facts just before the exam, you will not know how to apply them when you face a problem you have never seen before.

This course is a CT<sup>2</sup> seminar on critical thinking. Therefore, your critical thinking skills will be evaluated, and explicit attempts will be made during the semester to develop your critical thinking skills.

## Classroom Strategies for Critical Thinking:

**Side-by-side:** Several times in the semester, I will give you several different methods for solving surveying problems. In class and for homework, the task will be to compare them side-by-side and discuss the advantages and disadvantages of each technique.

**Analyze the Work of Others:** Periodically throughout the semester, I plan on collecting your field note books and selecting a few of them for you to analyze. I will retype the work so that

your identities are hidden and you will be asked, not to grade, but to comment on the good and bad parts of the work.

**Reflect on Work:** A few homework assignments throughout the semester will go into metacognition in a little more depth. You will be asked to describe your thought processes. You will be asked about both good and bad ideas and how you were able to make them work.

**Artifacts:** The artifacts in your critical thinking portfolio will come from approximately three assignments over the course of the semester. These homework assignments will be identified as critical thinking artifacts, and they will be more substantial than typical homework problems. These artifacts will include reactive questions and may involve several drafts.

**Rubrics:** The artifacts will be evaluated using the "Problem Solving VALUE Rubric" to assess your development over the course of the semester..

### **CT<sup>2</sup> Course Assessment:**

CT<sup>2</sup> courses are assessed on the basis of their achievement of their learning outcomes, as measured by student improvement on CAT tests. The tests are used only to guide the further improvement of the course and they do not reflect on you, your participation in the course, or your final grade.

The test will be administered at the beginning of the course (Wednesday, August 20<sup>th</sup>) and at the end (December 3<sup>th</sup>)

### **What to do if You Need Help?**

**Instructor:** Whenever you're having difficulty, the first step should be to contact me, your instructor. I want to help you succeed while also challenging you. There is no need to make an appointment, just drop in during office hours. I will not give you answers during office hours, but will try to help you lead yourself to the solution.

**Academic Success Center:** The Academic Success Center is located in the Class of 1956 Academic Success Center building. The center provides many resources including tutoring and academic coaching and counseling. It is a great resource if you are struggling in this class.

### **Important University/Class Dates**

- Aug 25<sup>th</sup> (Tu): Last day to add a class
- September 1<sup>st</sup> (Tu): Last day to drop without a W.
- \*\*Sept 24<sup>th</sup>: First in-class exam (tentative).
- Oct. 12-13 (M-Tu): No class (university Fall break).
- \*\*Oct 16th: Second in-class exam (tentative).
- Oct. 27<sup>th</sup> (Tu): Last day to withdraw without a final grade.
- Nov. 25-27 (W-F): No class (university breaks-Thanksgiving)
- Dec. 7-11<sup>th</sup> (M-F): Final exams (check ticket times)

## BE 3200 Fall 2015 Course Outline

Lectures – M/W 10:10 – 11:00 – 438 Brackett Hall

Laboratory - (T, 12:30 – 3:20) **TBA: Jervey Meadows/Kite Hill/Daniel 403/Brackett 434 (Rain???)**

Instructor - Dr. Tom Owino, 441A Bracket Hall, 656-4041 t

<u>Date</u>	<u>Lect</u>	<u>Lab</u>	<u>Topic</u>	<u>Readings</u>	<u>HW</u>
08/19	1		Introduction	<u>Lect. 1, Chap1</u>	
08/24	2		Units and significant Figures	<u>Lect. 2</u>	
08/25		1	Pace & Break Chaining - (Jervey Meadows)		
08/26	3		Error Propagation & Linear Measurements	<u>Lect. 3</u>	
08/31	4		Intro to GPS	<u>Lect. 4</u>	
09/01		2	<b>CAT tests</b> ; Intro to GPS - (Brackett 434)		
09/02	5		Problem Solving in Linear Measurements	<u>Lect. 5</u>	
09/07	6		GPS Error	<u>Lect. 6</u>	
09/08		3	GPS Data Collection - (Carillion Gardens)		
09/09	7		GPS/GIS	<u>Problem Set 1</u>	
09/14	8		GIS	<u>Ch 2</u>	
09/15		4	GPS Data Post-Processing - (Brackett 434)		
09/16	9		(Begin Test 2 Material) Leveling: Introduction		
09/21	10		Equipment for Differential Leveling	<u>Ch 2</u>	
09/22		5	GIS - (Brackett 434)		
09/23	11		Profile and Grid Leveling		
09/28	12		Review for Test 1	<u>Ch 4</u>	
09/29			<b>TEST 1</b> (Bracket 434 *Practicum)		
09/30	13		Problem Solving – Diff. Leveling		
10/05	14		Cut & Fill	<u>Ch 7</u>	
10/06		6	Leveling; Peg-test, 3-wire – (Kite Hill)	<u>Ch. 7</u>	<u>Problem Set 3</u>
10/07	15		Topographic Surveying Total Station Applications		



<u>Date</u>	<u>Lect</u>	<u>Lab</u>	<u>Topic</u>	<u>Readings</u>	<u>Problem</u>
10/12			<b>Fall Break, No Class</b>		
10/13			<b>Fall Break, No Class</b>		
10/14	16		Topographic Surveying (Grid Leveling Data)		
10/19	17		(Begin Test 3 Material) Total Station Applications		<u>Ch. 7</u>
10/20		7	Grid & Profile Leveling – (Kite Hill)		
10/21	18		Bearing and Azimuths		
10/26	19		Traverse Computation	<u>Ch. 8</u>	
10/27		8	<b>Practicum</b> ; Topographical Maps – (Daniel 403)		
10/28	19		Traverse Computation		
11/02	20		Test 2 Review	<u>Ch. 8</u>	
11/03			<b>TEST 2</b>		
11/04	21		Traverse Computation		
11/09	22		Traverse Computation	<u>Ch.10</u>	
11/10		9	<b>Hands-on Lab Practicum</b> ; Total Station 01 – (Jervey Meadows)		
11/11	23		Traverse Software (Bring Laptop)		
11/16	24		Building Construction	<u>Ch.10</u>	
11/17		10	Total Station 02 – (Jervey Meadows)		
11/18	25		Ethics In Surveying		
11/23	26		Project Discussion	<u>Ch. 9</u>	
11/24			Make-up Lab Date		
11/25	27		No Class ( <b>THANKSGIVING</b> )		
11/30	28		Test 3 Review	<u>Ch.15</u>	
12/01		11	<b>Test 3</b>		
12/02	29		<b>Final Review / CAT Test</b>		
12/08?			<b>Final Exam</b>		