CVEN 303 Civil Engineering Measurement -- Fall 2013

Meeting Time & Location

Lecture Sections 501, 502 and 503: Monday and Wednesday 9:10AM-10:00AM. Room CE118.
Lab Section 501: Monday 1:50PM-4:40PM. Room CE214
Lab Section 502: Tuesday 11:10AM-2:00PM. Room CE214
Lab Section 503: Tuesday 2:20PM-5:10PM. Room CE214

Lecture Sections 504, 505, 506 and 507: Tuesday and Thursday 9:35AM-10:25AM. Room CE118.
Lab Section 504: Wednesday 1:50PM-4:40PM. Room CE214
Lab Section 505: Thursday 11:10AM -2:00PM. Room CE214
Lab Section 506: Thursday 2:20PM-5:10PM. Room CE214
Lab Section 507: Friday 1:50PM-4:40PM. Room CE214

Instructors

Sections 501, 502, & 503
Dr. Nasir G. Gharaibeh, Ph.D., P.E.
Office: 503-E CE/TTI
Zachry Dept. of Civil Engineering
Phone: (979) 845-3362
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Office Hours: Tuesday and Thursday 10:30 to noon (subject to change). Additional times are available by appointment.

Sections 504, 505, 506, & 507
Dr. Calvin Woods, Ph.D., P.E., RPLS
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Zachry Dept. of Civil Engineering
Phone: (979) 862-3157
Email: cwoods@civil.tamu.edu
Office Hours: Tuesday and Thursday 10:30 to noon (subject to change). Additional times are available by appointment.

Teaching Assistants

Sections 501, 502 & 503
M. Ehsanul Bari (Bobby)
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ehsanulbarihome@yahoo.com
Off. Hrs: Wed 11:30-12:30
Office: CE005

Sections 505 & 506
Sunny Goklani
Phone: 979-703-9286 (cell)
sunnyk.goklani@gmail.com
Off. Hrs: Thur, 10:00-11:00 am
Office: CE023

Sections 504 & 507
Mariel Polter
Phone: 512-694 -1931 (cell)
mpolter1@tamu.edu
Office Hrs: Monday 10:30-11:30 am
Office: CE005

Help Desk: Xiaosi (David) Zeng, CE 010, david_zeng@neo.tamu.edu, 979-739-1282 (cell), M-F 1-5pm.

Course Description

Students learn the theory of civil engineering measurement and errors as applied to surveying, including horizontal and vertical control, curves, earthwork, and mapping. Additionally, students are introduced to geodetic positions, datums, map projections, and Global Positioning Systems (GPS). In the lab portion of this course, students apply the theory in the field using state-of-the-art surveying measurement instruments. An overview of the surveying profession is provided, including licensing requirements and ethics.

This course is conducted in two lectures and one lab session per week. The theory, methods, and example applications are discussed in the lectures. The lab sessions focus on using electronic total station, automatic level, and GPS units. Most of the lab sessions are conducted out in the field, depending on weather conditions. Computer-based lab sessions are conducted in the computer labs in the Civil Engineering building. Most of the field work will be conducted in teams of three or four. While the field work is conducted as a team, each member of the team should complete and submit his/her own field notes individually.

Course Materials & Copyright

Unless otherwise notified, we will use eLearning to communicate with students and post class materials (lectures, homework assignment, lab assignments, etc.). Most materials will be posted as pdf files. Students are expected to obtain access to and be able to use eLearning. Students are expected to attend and participate in all lectures and lab sessions. The lecture notes that will be posted in eLearning are intended to show the main topics covered in class; they do not include all materials discussed in class. Thus, you are expected to attend and participate in every class.

Prerequisite: MATH 151 or equivalent.

Reference Textbook: Surveying: Principles and Applications, by B. Kavanagh, 8th Edition, Prentice Hall, 2009. Additional handouts will be provided through eLearning (primarily in the form of pdf files).

Learning Objectives

1. The students will be able to perform statistical analysis of measurements to determine error.
2. The students will be able to perform conversions among different distance types (Surface, Geodetic, Grid)
3. The students will be able to perform differential leveling to determine elevation of points (stations).
4. The student will be able to perform traversing to determine the relative position and coordinates of points.
5. The student will be able to layout horizontal and vertical curves.
6. The student will be able to set the grade stakes for and compute volumes of earthwork.
7. The student will be able to use Automatic Levels, Total Stations, and GPS devices to collect spatial measurements.

ABET Outcomes

The following established ABET outcomes are addressed in this course:

a. Ability to apply knowledge of mathematics through differential equations, science (including physics, chemistry, and one additional area of science), and engineering

b. Ability to design and conduct civil engineering experiments, as well as to analyze critically and interpret the resulting data

d. Ability to function on multi-disciplinary teams

e. Ability to identify, formulate and solve civil engineering problems

k. Ability to use modern tools, techniques, and computation methods necessary for civil engineering practice

l. Ability to apply knowledge in at least four of the following civil engineering areas:

- Construction
- Geotechnical
- Surveying
- Transportation
- Water resources

Grades

Grades will be based on the following:

- Homework Assignments: 15% (approximately 6 HW assignments)
- Lab Work: 25% (10% for field notes, 10% for 2 lab exams, and 5% for participation and attention to safety)
- Pop Quizzes and Participation in Lectures: 10%
- Midterm: 25%
- Final Exam: 25%

Letter Grades:

A - 90 or above
B – 80 to <90
C – 70 to <80
D – 60 to <70
F - < 60

Late Assignments: HW assignments are due to the beginning of class. -10 points for assignments late by 24 hours or less, -20 points for assignments late by 24-48 hours, -30 points for assignments late by 48-72 hours, -40 points for assignments late by 72-96 hours. Assignments that are late by more than 96 hours and are not excused by the university will receive a zero grade. Homework assignments received after graded homework has been returned to students cannot receive credit but may still be turned in for grading to obtain feedback.

Missed Lab: Make up labs (without point deductions) will be arranged only in the case of excused absence (e.g., medical reasons). Unexcused absence should be discussed with the TA to determine if it is possible to make up the missed lab in a different section (this will result in a 50% reduction of the grade of the missed lab).

Exams Schedule

- Midterm Exam: Tentatively, October 7, 2013 (tentatively 6:30-8:30 pm. Exam period maybe shorter.)
- Final Exam (students should confirm data by checking the Final Examination Schedules posted on the Office of Registrar website):
  - Sections 501, 502, & 503: Monday (December 9) 8-10 a.m.
  - Sections 504, 505, 506, & 507: Friday (December 6) 12:30–2:30 p.m.

Lecture Topics

Notes: 1) Adjustments may be made during the semester, 2) Schedule of topics and assignments will be provided on eLearning and updated weekly, 3) The schedule below is based on M-W lectures. However, the topics are common to all sections.

Wk	Date	Topic	Ch./Section	HW Due
1	M 8/26	**Course Introduction** Overview of surveying types, instruments, profession, measurement errors	1.1-1.6	
	W 8/28	**Location Referencing Systems** Geographic coordinates, plane coordinates, Map Projections, elevation (vertical coordinates)	1.8, 1.9, & Lecture Notes	
2	M 9/2	**Accuracy, Precision, and Random Errors of Engineering Measurements** Definition of Accuracy and Precision, Errors and Mistakes, Probability Curves, Propagation of Errors	1.15-1.19 & Appendix A	
	W 9/4	**Propagation of Measurement Error**	1.15-1.19 & Appendix A	HW 1
3	M 9/9	**Electronic Distance Measuring (EDM) Instruments**	3.18-3.24	
	W 9/11	**Angles & Directions** Angle Terminology, Meridians, Azimuth, Bearing, Relationships between Azimuth and Bearing	4	HW 2
4	M 9/16	**Computations of Traverse Angles & Directions** Angular balance, Concept of Latitude and Departure	7	
	W 9/18	**Balancing Traverse** Latitude and Departure closure, Balancing Latitudes and Departures using Compass Rule	7	
5	M 9/23	**Traverse Coordinates and Area** Computation of Traverse X and Y Coordinates as a function of Lat and Dep, Rectangular coordinates (line length, line equation), Computation of Traverse Area from Coordinates	7	
	W 9/25	**Magnetic Bearings** Declination, True North, Magnetic North, Change in Magnetic Declination over Time	4.12	HW 3
6	M 9/30	**Introduction to Leveling** Leveling Instruments and Rod, Reference Level (Datum), Leveling Survey Types and Accuracy, Key Measurements (BS, FS, TP, HI)	2	
	W 10/2	**Differential and Profile leveling** Running Line of Levels, Purpose of profile leveling, Procedure of Profile Leveling, Leveling Errors and Corrections	2	

Wk	Date	Topic	Ch./Section	HW Due
7	M 10/7	**No class on Monday 10/7 due to having a midterm evening exam on that day (6:00-8:00pm)**		
	W 10/9	**Discuss Solutions to Midterm Exam**		
8	M 10/14	**Global Positioning System (GPS)** What does it do, History, Segments, How it Works	Lecture Notes	
	W 10/16	**Control Surveys & GPS Application in Surveying** Texas State Plane Coordinate system, Distance Conversions (Surface, Geodetic, Grid), Elevation Types, Calculation of Missing Texas State Plane Coordinates	Lecture Notes & Section 11.6	HW 4
9	M 10/21	**Control Surveys & GPS Application in Surveying (cont.)**		
	W 10/23	**Earthwork Volumes 1** Earthwork Overview, Earthwork Volumes, Mass Diagram	9.5, 9.6, 9.8-9.11	
10	M 10/28	**Earthwork Volumes 2** Areas of Cross Sections (Level Cross Section, Three-level Cross Sections), Irregular Areas (Trapezoidal Method, Simposon's One-Third Rule)	9.12	
	W 10/30	**Horizontal Curves 1** Types, Notation, and Components of Horizontal Curves	14.1-14.3	HW 5
11	M 11/4	**Horizontal Curves 2** Curve Computations	14.4-14.8	
	W 11/6	**Horizontal Curves 3** Curve Layout Using Deflection Angles, Spiral Curves	14.4, 14.5, and 14.17-14.19	
12	M 11/11	**Vertical Curves 1** Notation and Geometry	14.12, 14.13, & 14.15.1	
	W 11/13	**Vertical Curves 2** Location of Highest or Lowest Point	14.14-14.16	
13	M 11/18	**Introduction to Geographic Information Systems (GIS)** How it Works, Software, Spatial Relationships	Lecture Notes	HW 6
	W 11/20	**Overview of the Surveying Profession** Licensing requirements and ethics	Lecture Notes	
14	M 11/25	**TBD**		
	W 11/27	**Review for Final Exam**		
15	M 12/2	**Redefined day**		

LAB TOPICS (Adjustments may be made during the semester)

Week	Lab	Description
1	Safety requirements, field note format, and setting up Total Station	Students will be provided with guidelines on recording field notes on the field book, check list for field notes, introduction to setting up a Total Station on any given station – centering and leveling. **Also, this lab includes safety instructions and contract signing.**
2	Total Station basic operations and finding out X,Y coordinates	How to setup and operate a Total Station on any given station: Centering and leveling, entering atmospheric data for ppm correction, entering station information for base and target station, and measuring distances and angles. Calculate X, Y coordinates of target stations, given the X, Y and Z coordinates of instrument station.
3	Total Station: Traverse 9/11/12/13/9 – sides, Δ elevation & interior angles	Traverse survey using Total Station: Find sides (stations 9-10, 10-11, 11-12, 12-13 and 13-9) and all interior angles. Use telescope in direct and reverse mode to avoid systematic errors. Also record Δ elevation between stations. In this lab, Students will compile data for a complete traverse.
4	Construction stakeout	Using Total Station for building stake out: Students will calculate angles

Week	Lab	Description
	using total station	and distances from instrument station to a building's corners while they are in the lab room and then locate these corners in the field.
5	Traversing using AutoCAD	Use AutoCAD to plot and solve a traverse, use a spreadsheet to perform traverse calculations.
6	Benchmark leveling (vertical loop)	Run levels from a known benchmark and find out elevation of two other benchmarks and come back to the starting point. Calculate error of closure and distribute it if needed.
7	**A)** Instrument check using Three Wire Differential leveling **B)** Reciprocal leveling	Calibrate Auto Levels using 3-wire concept (also known as peg test) and perform reciprocal leveling by using a large FS (as compared to BS) and then reversing it so that one will have a large BS and a small BS.
8	Profile and cross-section leveling	Using Auto Level, 1) find elevations along 3 lines and also cross elevations at every 50 ft interval, 2) take note of grade change points and measure their elevations, 3) plot profiles and cross sections on graph paper , and 4) take additional measurements to make a contour map of the survey site.
9	Leica GPS 900 basic setup and record point coordinates	This lab involves setting up a GPS base station, putting together mobile/rover unit, and making them ready for data exchange. After localization, put the GPS unit in survey mode and record northing, easting and ortho readings for points of interest.
10	GPS Applications Indoor Lab	Perform various computations for determining grid distance and distance at sea level using surface distance; and vice versa.
11	Leica GPS 900 – stakeout **Lab Written Exam 1**	Basic setup (repeat of Lab 9): This time, students will use stake out mode and locate given points. **Lab Exam 1:** this is a 20-minute written exam that focuses primarily on leveling.
12	V and H Curves- Total Station	Set out horizontal and vertical curves using Total Station.
13	Make up lab	This make-up lab is designated for excused missed labs.
14	**Lab Exam 2**	There is one field exam for this course, which doesn't have to be in the last week. Students work with Total Station separately and after taking measurements they are asked to calculate specific parameters. Detailed instructions will be provided prior to the exam.

Official Notices

Aggie Honor Code

"An Aggie does not lie, cheat, or steal or tolerate those who do." Students are expected to understand and abide by the Aggie Honor Code presented on the web at: http://www.tamu.edu/aggiehonor. No form of scholastic misconduct will be tolerated. Academic misconduct includes cheating, fabrication, falsification, multiple submissions, plagiarism, complicity, etc. These are more fully defined in the above web site. Violations will be handled in accordance with the Aggie Honor System Process described on the web site.

Other Academic Integrity Statements

All materials generated for this class are copyrighted. These include, but at not limited to, syllabi, notes, quizzes, exams, in-class materials, review sheets, and additional problem sets. Thus, no one has the right to copy these materials without my explicit permission.

No form of scholastic dishonesty (cheating, plagiarism, etc.) will be tolerated. As commonly defined, plagiarism consists of passing off as one's own the ideas, word, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have permission of that person. This includes copying material from books, reports, journals, pamphlets, handouts, other publications, web sites, etc., without giving appropriate credit for those ideas or without identifying material as quotations when taken directly from another source. Plagiarism is one of the worst academic sins, for

the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. Electronic copies of the course paper will be checked for plagiarism using Turn-It-In.

Cheating on quizzes and exams will not be tolerated. Cheating will be reported and handled in accordance with the Aggie Honor System Process. Some or all examinations will be closed book; "looking at another student's examination or using external aids (for example, books, notes, calculators, conversation with others, or electronic devices)" during these examinations is a violation of Texas A&M Aggie Honor Code, Cheating, unless specifically allowed in advance by the instructor.

Unless specifically allowed in advance by the instructor, all assignments and homework in this class are expected to be completed based on individual effort. Copying the work of others, including homework, is a violation of Texas A&M Aggie Honor Code, Cheating.

Americans with Disabilities Act (ADA) Policy Statement
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu.

Lab Safety Requirements

Please read these requirements carefully and complete all of the required tasks before the first lab.

Task 1: Read the following Student Safety Guidelines

Safety is a priority at Texas A&M University
These safety guidelines are provided to help prevent accidents. The goals are:

1. To avoid accidents in the lab, and
2. To respond promptly and appropriately should an accident occur.

Safety depends on you!
Students must be careful about their own safety and the safety of others during the lab.

Potential Physical Hazards Include:

- Conducting surveys in the open with the potential for sunburn, heat exhaustion, and insect bites, etc.
- Setting construction stakes with potential for bruises
- Working on and near streets with active traffic

Potential Accidents and Responses

- Cuts and bruises
  i. First aid kit will be present in equipment room
  ii. Severe injuries require calling 911
- Heat exhaustion & sunburns
  i. Students will be monitored by GATs
  ii. First aid kit will be present in equipment room
  iii. Severe injuries require calling 911

Task 2: Complete and Sign the Student Safety Contract Agreement (provided on the next page of this handout) and Give it to Your Lab instructor

Task 3: Sign Lab Safety Agreement (LSA) in Howdy

a. Log into howdy.tamu.edu
b. Click on your CVEN 303
c. Click on the link for "LSA"
d. Click the checkbox indicating you agree to abide by the LSA

Student Safety Contract Agreement

Look College of Engineering
Texas A&M University

By signing this form, I verify that I have read, understood, and agreed to follow the safety regulations required for this course as established by the Look College of Engineering and Texas A&M University. I have located all emergency equipment and personal protective equipment, and now know how to use it. While in the laboratory, improper conduct and horseplay of any kind that may endanger others or myself will not be tolerated and appropriate disciplinary action will be taken. I understand that I may be dismissed from this laboratory for failure to comply with the established safety procedures for this laboratory, and with all TAMU & TEES Safety Rules:

Date: _____

Course: _____ Section: _____

Instructor: _____

Student Name (print): _____

Address: _____ Phone: _____

Email: _____

Person(s) to be notified in the event of an accident of emergency:

Name (print): _____ Relationship: _____

Phone (home): _____ Phone (work): _____

(Optional: Any special medical conditions or other comments pertaining to laboratory safety)

Signature: _____