LARC/CIEG 222 Introduction to Surveying

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Contact Information & Office Hours

These are the office hours we will normally keep. Stuff happens, though, so we advise you to check on our availability. To contact your instructors, Dr. Balascio and Dr. Na, you can use Blue Hen Success Collaborative (BHSC). Instructions for using the BHSC system are posted on the home page of the Canvas course web site under the *Instructor Information and Office Hours* link.

Instructor: Carmine C. Balascio, Ph.D., P.E., SITES AP	**Office Phone:** 302-831-8872 **Office:** 157 TNS	**Email:** carmine@udel.edu
Day	**Time**	**Room**
Monday (check BHSC for conflicts)	02:30-04:30	PRS 116
Tuesday	01:00-02:00	TNS 157
Wednesday (check BHSC for conflicts)	12:30-02:00	PRS 116

Instructor: Ri Na, Ph.D.	**Office Phone:** 302-831-2657 **Office:** 342B DUP	**Email:** nari@udel.edu
Day	**Time**	**Room**
Monday (check BHSC for conflicts)	02:30-04:30	PRS 116
Tuesday	11:00-12:00	DUP 342B
Thursday(check BHSC for conflicts)	11:00-12:00	DUP 342B

Links

UD Library
Student Code of Conduct
Canvas
LON-CAPA Problem Set Site

Learning Outcomes

Catalog Course Description: Emphasizes concepts and methods of plane surveying for construction applications. Provides field experience with modern surveying instruments. Topics include: distance measurement, leveling, angle measurement, error analysis, coordinate systems, mapping, traversing, and calculation of land areas and earth volumes. RESTRICTIONS: Requires knowledge of trigonometry.

Course Objectives: Students will learn the fundamentals of surveying practice, especially for applications in construction and site engineering. Upon completion of this course the student will be able to:

1. Communicate results of surveying fieldwork using standard field-note formats recorded hand-written in a conventional field notebook.
2. Measure horizontal distance by pacing, taping, odometer, stadia, or total station.
3. Use a level or total station for measuring elevation differences with minimal error.
4. Understand elementary error analysis and propagation. Be able to calculate errors of misclosure, quantify error levels, and perform elementary distribution of errors for adjustment of field measurements to their most probable values.
5. Use profile leveling to collect data for route surveys and set slope stakes for trapezoidal cut or fill cross-sections.
6. Use proper field procedures for measurement of horizontal and vertical angles with a total station. Work with angle measurements, bearings, and azimuths to determine directions.
7. Use a total station to collect field data to produce planimetric and topographic maps.
8. Calculate earth volumes for berms or excavations of trapezoidal cross-section, from contour maps, and for borrow pits and stockpiles.
9. Use a total station for radial and boundary traverses. Balance traverses and calculate land areas by DMD and coordinate methods.
10. Understand geodetic and local, arbitrary and projected coordinate systems. Work with state plane coordinate systems.

UD General Education Objectives: The UD general education objectives are all addressed to varying degrees. Students will be able to:

1. Read critically, analyze arguments and information, and engage in constructive ideation.
2. Communicate effectively in writing, orally, and through creative expression.
3. Work collaboratively and independently within and across a variety of cultural contexts and a spectrum of differences.
4. Critically evaluate the ethical implications of what they say and do.
5. Reason quantitatively, computationally, and scientifically.

Landscape Architecture Program Student Outcomes: Elements of this course strengthen these UD Landscape Architecture student outcomes:

- II. Communicate Effectively
  a. Written
  c. Visually

- V. Problem Solving

EAC of ABET student outcomes: Elements of this course strengthen these EAC of ABET student outcomes:

- 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- 3. an ability to communicate effectively with a range of audiences
- 5. an ability to function effectively on a team … provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

Course Logistics

Course Information

Course Number and Title: LARC/CIEG 222 Introduction to Surveying
Semester: 2018 Fall
Meeting Times and Location:

- Lecture: Mo 12:20 – 02:00 PM, 046 Colburn Lab
- Lab, section 020L: Fr 09:05 – 12:05 PM, 007 Townsend Hall
- Lab, section 021L: Fr 12:20 – 03:20 PM, 007 Townsend Hall

Prerequisites: No course prerequisites. Students must have a basic background in trigonometry.

Text: Jack McCormac, Wayne Sarasua, and William Davis. 2013. Surveying, 6th Ed. John Wiley & Sons, Inc., New Jersey.

Note: Any student who has a need for accommodation/s based upon the impact of a disability should inform us as soon as possible. Contact the Office of Disabilities Support Services to coordinate appropriate accommodations.

Assignments/Exams

Information about Exams and Quizzes:

- **A brief content quiz** will be administered online that is due before the beginning of each lecture period. The intent is to give you an added incentive to review the reading assignments for that day's activities. The quiz must be completed before you come to class. In the absence of significant extenuating circumstances, **no opportunity to make up missed quizzes will be granted**! The quizzes are individual assignments! You are expected to AVOID COLLABORATION with your fellow students on the quizzes!
- There will be one midterm exam given during the semester and a cumulative final during finals week. Exams will be in two parts: the first part closed book, closed notes; the second part open book, open notes. When you've completed the closed book portion, turn it in to get the open-book part.

- On the days of the exams, you are responsible for having with you a calculator, pencil, eraser, and any resources you might need for the open-book portion of the exam: text, notes, reference materials, etc.
- For closed-book portions of exams, we don't expect you to memorize extremely detailed procedures or complicated formulas, but you should have a good grasp of the overall concepts, sequence of steps, and underlying theory. Simple formulas that are used all the time (e.g. trig relations for resolving distances into horizontal and vertical components, average end area formula for earth volume calculations, etc.) you should know by heart.
- You will be taking the exams in a computer laboratory and will have a work station at your seat. NO ACCESS TO THE COMPUTERS OR THE WEB WILL BE ALLOWED DURING THE EXAMS! We will ask you to turn off the computer screen at your seat before the exam begins, and it must remain off for the duration of the exam.

Deliverables (Assignments, Lab Write-ups, etc.):

- Field notebooks: You are required to purchase a field notebook for recording your surveying field data. Field notebooks will be turned in each week for marking.
  - Unless otherwise directed, field notebooks are due at the beginning of lecture on the Monday following the Friday labs.
  - Field notebooks submitted late may be assessed a penalty of 10% a day up to a maximum of 50%.
- Hand-graded assignments will be collected for grading on due dates specified at the time they are assigned. You may be required to submit them online through Canvas. As with the field notebooks, hand-graded assignments will be subject to a late penalty of 10% per day late up to a maximum of 50%.
- LON-CAPA problem sets: Computer-graded online problem sets on the LON-CAPA system are used in this course. The LON-CAPA system can be accessed through this URL:

  zappa.ags.udel.edu

  See http://zaphod.lite.msu.edu/student/getting_started.html for details about using the LON-CAPA system. Some important things to know about my policy for the problem sets:
  - Computer-graded problems on the LON-CAPA system must be completed by the due date posted on the web site to receive credit. You know immediately upon submittal whether your answer is correct. You will be able to see the correct answers after the due date.
  - You will be given 5 attempts to solve each problem. If you run out of attempts, **see one of us about getting more**. We'll try to find out what you're doing wrong before we reset your attempts.
  - You will receive full credit for each problem you correctly solve before the due date, regardless of the number of attempts you make. **You will receive zero credit for online problems not completed by the due date**.
  - If you can document an erroneous computer solution to a LON-CAPA problem, turn in a written error report. Upon confirmation, you will be awarded five times the point value for that problem as a bonus.
- I use the online system, LON-CAPA, because of the following advantages:

- Every student gets basically the same questions, but the numbers are different; so each student is forced to work out the solution for him- or herself.
- Mastery-based learning allows you to make multiple attempts to solve the problems. You get immediate feedback and remain engaged with the material until you understand it well enough to solve the problems.
- You have a good shot at getting every question correct and collecting full credit for each problem. Since the LON-CAPA problem sets are worth 25% of your grade, the same as your final, there is considerable incentive to devote some effort to them. You wouldn't decide to skip or just do half of the final, would you?

- Here are my suggestions for getting the most out of the problem sets:
  - By all means, discuss the LON-CAPA problems with your classmates. Talk about the possible approaches to solving the problems. **Do not simply plug your numbers into a class mate's solution, however!** You need to understand the solution procedure! If you're having trouble, ask the TA or instructor to help you understand how to solve the problems.
  - Maintain a written record of the solutions to the LON-CAPA problems, just as you would for homework problems assigned from the text. If you like, print out the problem statements to avoid rewriting them. Keep all your solved problems collected in a three-ring binder. Use the collected solutions to review for exams. There ***will*** be similar exam problems.
  - Please, feel free to contact one of us for assistance. You can contact us in person, over the phone, or by email. We prefer that you post questions on the Canvas site using the "Discussions" feature so other people who may have similar questions can benefit. Choose "All Participants" for the recipients of the post. Once posted, forward the message to one of us via email, so we'll be sure to see it.
  - We recommend that if you find you are spending more than 20 minutes on any single problem either because you don't understand it or for some reason can't figure it out, **STOP!** Contact Dr. Balascio or Dr. Na for assistance. Don't waste your time unproductively spinning your wheels!

Grading and Course Policies

Grading:

- Components of Your Grade: You will receive grades for the items in the table below, the components weighted as shown for your overall grade. There will be no opportunity for "extra credit". Concentrate on making a steady effort throughout the semester.

Item	Weight (%)
Mid-Term Exam	20
Cumulative Final Exam	25
Out-of-Class Content Quizzes	05
LON-CAPA Problem Sets	25
Laboratory Assignments & Field Book	25
Total:	100

- We will attempt to keep your grades reasonably up-to-date. Use the grade book feature of Canvas to keep track of your standing in class. This is an opportunity for you to check our record keeping. Please, let one of us know if you find any problems.

Course Policies:

- Attendance: Class attendance is critical. Students who consistently miss class will do poorly in this course. You will be working in teams throughout the semester and must be present to support your team. Legitimate reasons for missing class must be properly documented, usually through the Assistant Dean's office.
- Laboratory attendance is mandatory to ensure complete surveying parties. This is a "learn-by-doing" course; you can't learn if you're not here. If you have a legitimate reason for missing class, the reason for your absence should be documented (e.g. a note from your doctor). **You will not have an opportunity to make up work missed during an unexcused absence.** Laboratory sessions will be held rain or shine!
- The lab period is scheduled for 3-hrs. If we finish our field work before the 3-hrs is over, you are expected to remain in class to work on the problem sets and field notebook. You may leave before the end of the lab period only if you have finished the week's problem set and have all the data for your field notebook.
- Unexcused absence from an examination results in a grade of zero (0) for that exam. Legitimate reasons for missing a test must be well-documented. Oversleeping or "getting caught in traffic" are not acceptable. You must attempt to notify one of us as soon as possible.
- Preparation for Class: We would like to do as little lecturing as possible and rather have you focus on active learning undertakings. Your major responsibility is to come to class and laboratory prepared! To avoid confusion in the field, and to be prepared to ask relevant questions during lecture and especially the pre-lab, do the reading assignments before you come to class. The content quiz due before each lecture period should motivate you to do the assigned reading.
- Academic Integrity: Students are encouraged to help one another in learning the material and even to discuss specific assignments with one another. Copying or "teamwork" on assignments not done as a team or group is prohibited, however. Any work submitted that is the product of collaborative efforts must show the names of all collaborators.
- **You will be working in small surveying groups for most of the laboratories in this course. The data in your field notebooks will be obtained through collaborative efforts; it is important that you list the names of your fellow group members on the notes for each week. You are responsible for confirming all data and error checks in your field notebook. Any other assignments are not collaborative unless it is specifically stated. We would suggest you familiarize yourself with the the** university's code of conduct**.**

<<< DO YOUR OWN WORK! >>>

Teaching Methods

Instructional Approach:

- By its nature, surveying is a very hands-on subject that lends itself to active learning. We expect you to come to class prepared by having reviewed the reading assignments. We will emphasize learn-by-doing methods to the extent that lectures will not be comprehensive and a large portion of the class time will be devoted to work on problem sets and other active learning exercises. We will briefly review the notes and point out highlights. You may need to do a little digging through the reading assignments for all the information. **Do the reading assignments before class and be prepared to ask questions about points you don't understand!**
- The knowledge you'll gain in this course is very technical. It's difficult to understand it without working with the material and, perhaps, even struggling with it. The problem sets play an important part in your learning of the material. You will not do well if you don't work the problem sets! Please see comments under the Assignments section that provide more information about the problem sets.

Supplemental References

1. Brinker, R.C. and Minnick, R. 1987. The surveying handbook. Von Nostrand Reinhold, Inc., N.Y., N.Y.
2. Evett, J.B. 1979. Surveying, 1st Ed. Prentice Hall, Englewood Cliffs, New Jersey.
3. Field, H.L. 2012. Landscape surveying. Delmar Cengage Learning, Clifton Park, N.Y.
4. Ghilani, C.D. and P.R. Wolf. 2012. Elementary surveying – an introduction to geomatics, 13th Ed. Prentice Hall, Englewood Cliffs, New Jersey.
5. Herubin, C.A. 1991. Principles of surveying, 4th Ed. Prentice Hall, Englewood Cliffs, New Jersey.
6. Kavanagh, B.F. 2007. Surveying with construction applications, 6th Ed. Pearson Prentice Hall, Upper Saddle River, NJ.
7. McCormac, J.C. 1999. Surveying, 4th ed. Prentice Hall, Englewood Cliffs, New Jersey
8. Schwab, G.O. and R.K. Frevert. 1985. Elementary soil and water engineering, 3rd Ed. John Wiley and Sons, Inc., New York. (See chapters 2 through 4.)
9. Wolf, P.R. and C.D. Ghilani. 2006. Elementary surveying – an introduction to geomatics, 11th Ed. Prentice Hall, Englewood Cliffs, New Jersey.

Schedule of Events:

LARC/CIEG 222: Tentative Schedule of Topics and Activities for Introduction to Surveying, 2019F

Week	Monday Date	Monday Lecture, CLB 046, 12:20 PM – 2:00 PM	Friday Laboratory: TNS 007 Section 020L: 9:05 AM – 12:05 PM; Section 021L: 12:20 PM – 03:20 PM
1	08/26	No class. Classes start on Tuesday Aug 27th	Introduction to Surveying Concepts, Introduction to LON-CAPA, Horizontal Distance Measurement and Introduction to Surveying Tapes Introduction to Measurement Error and Analysis, Lab exercise: Calibration of Pace Length
2	09/02	No class. Labor Day	Surveying Tapes for Horizontal Distance Measurement, Field Procedures for Steel Taping, Error Analysis for Surveying Measurements. Lab Exercise: Horizontal Distance Measurement by Taping, Pacing, and Odometer
3	09/09	Introduction to the Surveying Level and Differential Leveling, Allowable Error	Lab Exercise: Horizontal Distance Measurement with Stadia, Introduction to Differential Leveling
4	09/16	Adjustment of Level Circuits, Curvature of the Earth and Refraction	Lab Exercise: Differential Leveling I
5	09/23	Profile Leveling and Slope Stake Setting	Lab Exercise: Differential Leveling II
6	09/30	Angles, Azimuths, and Bearings, Magnetic Declination	Lab Exercise: Profile Leveling
7	10/07	Introduction to the Total Station and Field Procedures for Angle Measurement, review for Mid Term Exam	Lab Exercise: Slope Stake Setting
8	10/14	**Mid Term Exam** – Covers from beginning of course through introduction to the total station and slope stake setting	Lab Exercise: Closing the Horizon by Direct/Reverse Pointing and by Doubling the Angle
9	10/21	Review of Exam, Horizontal Angle Data Reduction	Lab Exercise: Layout of Horizontal Angles
10	10/28	Introduction to Closed Traversing and Traverse Adjustment	Radial Traversing and Trigonometric Leveling, Lab Exercise: Radial Traverse with Trigonometric Leveling,
11	11/04	Area Computations by DMD method and Coordinates, Radial Traverse and Trigonometric Leveling Data Reduction	Lab Exercise: Closed Traverse
12	11/11	Map Scales, Topographic Mapping from Grid and Radial Surveys	Computational Lab Exercise: Boundary Traverse Adjustments and Area Calculations
13	11/18	Earth Volumes for Cross-Sections, Borrow Pits, and Stockpiles with Computational Lab Exercises.	Computational Lab Exercise: Contour Mapping from Radial Survey
	11/25	Thanksgiving Break	
14	12/02	Introduction to Coordinate Systems – Geodetic Coordinates and GPS, Projected Coordinate Systems, State Plane Coordinates	Coordinate Systems Problem Set, review for Final Exam
15		**Final Exam** (cumulative) Finals Week, Emphasizes Field Procedures for Angle Measurement through end of semester	

The A222 GNSS Smart Antenna is an affordable, portable solution with professional-level accuracy for agricultural, marine, GIS, mapping, and other applications. Focus on the job-at-hand with fast start-up and reacquisition times, scalable accuracy, and an easy-to-see LED status indicator for power, GNSS, and DGNSS. The durable enclosure houses both antenna and receiver. It can be powered through various sources, making the A222 smart antenna ideal for a variety of applications. Dual-Serial, CAN, and pulse output options make this DGNSS receiver compatible with almost any interface. Existing English unit survey data conversions to metric units is covered within Section 1.2 - Computations. Stationing and curve data representation in metric units is also provided, as they are integral pieces of survey computations. The terms precision and accuracy will be defined as they serve as important concepts related to the specific requirements of various types of surveys. 1.1 units of measurement. The basic measurement determinations associated with surveying are related to distance, angle, area, and volume. These measurements are based on English units or (SI metric unit system). A... Survey Methods Used For â€¢ Tapes are used for the measurement of linear distance. Stylon Tape. â€¢ A Stylon tape is made of plastic-coated steel, giving both stability and durability. â€¢ Examples Of Usage â€¢ Measuring distances for a variety of survey purposes, such as the length of a. base line between two survey stations. â€¢ Setting out a chain line as part of a chain and offset survey to carry out, for. example, detail mapping.Â baseline between two survey stations. â€¢ Setting out a chain line as part of a chain and offset survey to carry out, for. example, detail mapping. â€¢ Factors Which Influence the Use of Chains â€¢ Measured distances are limited to the length of the chain, usually 50 or 100.