OGLALA LAKOTA COLLEGE

Course Syllabus for
Elementary Surveying Engr - 213
Elementary Surveying Laboratory - Engr 211
Spring 2010

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Course Description:
Care and operation of instruments, concepts of horizontal and vertical control; measurement of horizontal distances, vertical angles and elevation differences, basic surveying computations and field practice. Coverage includes the definition and analysis of errors of measurement. Additional topics include: horizontal curves, traverse work and construction surveying. The course includes an introduction to the concepts and applications of GPS and GIS to surveying practice. 3-Credits. Corequisite course: Engr 211 – Elementary Surveying Lab.

Prerequisites:
Math 163, MIS 113; all completed with a grade of "C" or better

Course Overview:
The Spring 2010 Elementary Surveying course is being offered concurrently between South Dakota State University (SDSU) and OLC as part of a grant provided by NSF through the PreEngineering Education Collaborative (PEEC). The lecture will originate each Tuesday and Thursday from SDSU between 9:00-10:30. We will have a 30-minute homework recitation session following class between 10:30 – 11:00. We will have a lecture over chapters one and two during the first laboratory on the first Friday of the semester from 9:00 – 12:00. We will have a hands-on surveying laboratory co-taught by Dr. Bruce Berdanier and Jason Tinant from 10:00 – 4:00 at Piya Wiconi on the Fridays of even weeks for the course. During the laboratories we will practice surveying around the Piya Wiconi campus. We will discuss how gas vouchers will be handled for the course during the first weeks lecture.

Course Educational Objective:
The objectives of this course is to provide the engineering student with an introduction to the concepts and practices of using elementary surveying as a tool for data acquisition in the development and implementation of civil / geological engineering projects.

Course Learning Outcomes:
Upon completion of this course the student should be able to:

1. Choose and operate appropriate basic equipment to gather horizontal and vertical field data for engineering projects, e.g. theodolite, total station, automatic level, engineer's tape, etc.

2. Calculate elevations for specified new locations from established elevations by gathering and balancing field data or using provided field data,
3. Calculate the components of a horizontal curve,
4. Calculate the components of a vertical curve,
5. Compute earthwork volumes using gathered or provided field data,
6. Compute horizontal coordinates for external points of a closed or open land area by gathering and balancing field data or using provided field data,
7. Calculate the area enclosed in a geometric figure of land by gathering and balancing field data or using provided field data.

Required Textbook:

Ghilani, Charles D., and Wolf, Paul R., (2008/2010), Elementary Surveying: An Introduction to Geomatics, 12th / 13th Ed., Pearson Prentice Hall, Upper Saddle River, NJ.

Descriptive Reading Load:

Grade 14 reading level. We will be covering approximately one chapter every week.

Types and Amounts of Writing Expected: The nature of this course offering requires that a significant amount of writing to be completed as homework.

Homework is an opportunity to practice professionalism. All homework involving writing should be completed in paragraph form, which consists of: i) a topic sentence; ii) 3-5 body sentences; and iii) a conclusion or transition sentence. Professional ethics requires referencing the author of any text or pictures that are used in assignments. Plagiarism (i.e. passing off another author's work off as your own) will not be tolerated. Please refer to the Oglala Lakota College Student Handbook for the official policy on plagiarism. Please contact the Instructor if you have questions on plagiarism, or on how to site another person's work. Suspected cases of plagiarism or academic dishonesty will be referred to the OLC Administration.

Lakota Perspective:

This course stresses **Wolakotakiciapi** or "learning Lakota ways of life in the community". Participants in this course are expected to practice respect for each other, the instructor, and for all living and natural things used during this course.

Course Requirements:

The homework will utilize the Internet and spreadsheets. Students are expected to have a working knowledge of the Internet and spreadsheets, or the capacity to learn these skills ***on their own time*** over the course of the semester. Much of the homework this semester will be required to be submitted in spreadsheet format.

Course Grading:

Grade Component	**Final Grade**
3 midterm exams 45%	90-100% A
Homework 15%	80-89% B
Final Exam 15%	70-79% C

Lab	25%	60-69%	D
		0-59%	F

Homework Policy:
Late homework will have a penalty. Any homework submitted more than 1 week past the due date will receive no credit (grade = 0). No homework will be accepted after the last day of class. Homework must be submitted on engineering paper with work on the front side of the paper only. Homework should be prepared with neat engineering lettering only, and use a straight edge for figures. Identify answers with a box. Point penalties will be assigned for disordered, cluttered, confused, or disorganized work.

Test Policy:
One 8 ½” x 11" page of notes, one side, in your own neat hand lettering, will be permitted during tests and the final exam. No photocopies, no photo-reduction, no open book or notes.

Special Accommodations:

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please inform me and we will make appropriate arrangements with the Office of Disability Services.

Tardiness (From OLC Policy Handbook):
In formulating this policy it is understood that unique problems exist for both students and faculty due to the decentralized nature of OLC. Since classes meet only once per week, it is important that they be held – even if they begin late.

Generally speaking, if an instructor is going to be late getting to a college center for a class, the center staff should always be notified. The following policy applies to cases where this has not been done:

A student shall be considered tardy for class, if he/she arrives late for class, but during the first hour of the class. A student arriving later than this, may be marked absent. This policy will not interfere with the instructor's prerogative to grade for class participation.

If an instructor is late for a class, students must wait for one-half hour. After this time, the class will be considered cancelled for that week and must be made up.

In the event that no students appear for class at the scheduled starting time, the instructor should wait at least one-half hour before deciding to cancel the class.

All missed classes must be made up.

Attendance (From Policy Handbook):
Students are required to attend classes regularly. Instructors will submit attendance on-line weekly to the end of the semester.

If a student wishes to be excused from a class, it is the student's responsibility to clear the absence with the instructor. At that time the student must arrange for a make-up assignment. However, an excused absence is the same as an absence until the student has completed work equivalent to being in class. Once the make up assignment is completed, the instructor will then change the absent to present.

A student may be dropped from a course after three consecutive absences and will be dropped by the Registrar after five total absences.

There are NO reinstatements and No exceptions for students who are dropped for five absences.

Course Philosophy: You are not studying and learning for the instructor, but for yourself. Grades are important for your academic career; nevertheless, your professional life really begins after you graduate. Understanding waste management will help you not only in your professional career, but also to understand and appreciate your surroundings and life itself.

This is a foundational course in engineering. This is your chance to start build onto your existing knowledge and excel in it. But it is up to you. You have to invest your time. The instructor will work to provide time within the allotted class period and laboratory time outside of the class when students will have the opportunity to work on homework in a collaborative fashion.

Tips to Succeed in this Course:

Read chapters **before** trying to do the homework or the quiz. Then it will be much easier for you to follow the online lecture and to use online forums to ask questions about material that you did not understand.

Do not just "read" your textbook. Keep good notes in a separate notebook that you can use to study for the final exam. Use your notebook to comprehend new concepts and define new terms **in your own words.** This notebook will be useful for studying for the final exam.

Homework, quizzes, and the final exam will include essay questions. Be sure that you can define (in full, comprehensible sentences) any new concepts and key terms when reading through a chapter so that you can use these terms in a meaningful way in your homework.

When you do your assignments, go back through the appropriate chapters and read them carefully a second time to find the answers.

Actively take part in the class activities. This will help you solve problems in your homework in a collaborative fashion.

Note: **The instructor reserves the right to make changes. Students will be informed of any such change.**

Suggested Course Outline – Follows Previous Semester Final Exam

Chapter 1

1. Students should develop an understanding of and appreciation for the historical significance of surveying as well as some of the current opportunities for use of surveying techniques in the

implementation of engineering projects.

Chapter 2

1. Students should be able calculate and convert data from US customary and System International data.
2. Students should be able to convert historic land measurement data for distances and acreages to current systems.

Chapter 3

1. Students should be familiar with the sources and types of errors that occur in surveying along with the definitions and general theory associated with analysis of error residuals.
2. Students should be able to calculate the error resulting from the normal error propagation in a series of surveying measurements, in a product (area), and in the mean of observations.

Chapter 4

1. Students should be familiar with the definitions related to the theory of elevations and leveling.
2. Students should understand the historic development of NGVD29 and NAVD88.
3. Students should be able to calculate the impact of curvature and refraction on leveling operations.
4. Students should understand the theory, be able to apply the principles for gathering field data, and be able to calculate results for differential and trigonometric leveling from field or supplied data.

Chapter 5

1. Students should be familiar with the definition of precision for a level survey and be able to calculate and apply allowable misclosure.
2. Students should be able to apply the calculations to adjust and balance a level circuit.
3. Students should be familiar with the sources of error in level surveys.
4. Students should understand field procedures for stadia and profile leveling operations and be able to perform associated calculations.

Chapter 6

1. Students should be familiar with the definitions of various error sources for measurements observed with steel tapes and electronic distance meters.
2. Students should be able to calculate and properly apply corrections for standardized tape length, temperature, sag, and pull for a steel tape.
3. Students should be familiar with the theory for electromagnetic energy propagation in the atmosphere and how it applies to engineering surveying with an EDM.
4. Students should be able to calculate the group refractive index in standard air and for actual atmospheric conditions at the time of measurement, and to utilize formulas to determine velocity, frequency and wavelength relationships.
5. Students should be able to calculate the total predicted error in EDM measurement based on given or estimated data and instrument specifications.

Chapter 7

1. Students should understand the importance of and the application of a reference line, direction of angle turning, and angular distance in engineering surveying.
2. Students should be able distinguish the differences between angles to the right, deflection angles, and interior angles and apply them to calculations for completing closed traverses.
3. Students should be familiar with definitions for meridians, azimuths and bearings; and be able to calculate angles from azimuths and bearings and vice versa; and be able to convert between the two systems of angular definition.
4. Students should understand the difference between “true” meridians or azimuths and “magnetic” and be able to perform the calculations to convert between true and magnetic.

Chapter 8

1. Students should be able to properly set up a total station instrument on a tripod with adjustable

legs.
2. Students should be able to calculate the average or most probable zenith or horizontal angle and angular misclosure at a station given direct and reverse readings.
3. Students should understand and be able to calculate indexing error for a total station.

Chapter 9

1. Students should understand how to properly set up and complete a radial survey with a total station.
2. Students should be able to calculate the angle misclosure for a closed traverse.
3. Students should be able to calculate the level of accuracy that their field closure represents.

Chapter 10

1. Students should understand and be able to complete the procedure to properly set up and complete a traverse closure from raw survey data gathered in the field or given in a defined problem.
2. Students should be able to calculate the misclosure in latitude or departure for a course or traverse.
3. Students should be able to calculate the linear misclosure and relative precision of a traverse.
4. Students should be able to use the Compass (Bowditch) Rule to adjust (balance) all components of a traverse and calculate the resulting lengths and bearings (azimuths) of the traverse's courses.
5. Students should be able to inverse coordinates to determine the length and bearing (azimuth) of a course.

Chapter 11

1. Students should be able to use coordinates along with whatever angle, bearing, azimuth and distance relationships that are available to complete intersection procedures to determine additional engineering surveying information, including: distance-distance intersections, direction-direction intersections, and direction-distance intersections.

Chapter 12

1. Students should be able to use coordinates to calculate the area of a surveyed or given polygon.
2. Students should be able to use the Double Meridian Distance (DMD) method to calculate the area of a surveyed or given polygon.
3. Students should be able to use coordinates of complicated polygon areas to determine discreet triangles and/or trapezoids to calculate the area.

Chapter 24

1. Students should understand the meaning of and interrelationship between the components of a horizontal circular curve including: tangent, PC, PT, PI, POC, POT, M, E, LC, R, and L.
2. Students should understand the difference between the arc and chord definitions of a horizontal curve.
3. Students should be able to calculate all of the components of a circular horizontal curve by applying the proper formulas for the arc definition.

Chapter 25

1. Students should understand the meaning of and interrelationship between the components of a vertical parabolic curve.
2. Students should be able to calculate station elevations for a vertical curve given beginning and ending grades, VPI, and curve length.
3. Students should be able to design a vertical curve to fit field conditions of beginning and ending grades, VPI, and fixed points.

Chapter 26

1. Students should understand the concepts of calculating volume for engineering projects using field data provided or determined from cross section and topographic surveys.
2. Students should be able to utilize the cross-section method and average end areas to calculate material volumes for an engineering project.