

COURSE OUTLINE **Advanced GIS/GPS**

Course Description

SR 210. Advanced GIS/GPS. 3 hours credit. Prerequisite: SR 110 with a C or better. This course will enable the student to understand and demonstrate advanced spatial referencing concepts, Geographic Information Systems (GIS) and Global Positioning Systems (GPS).

Course Relevance

The skills learned in this class will introduce the student to advanced concepts in GIS/GPS.

Required Materials

Gorr. (2008). *GIS tutorial, workbook for ArcView (wCD/DVD)*. (3rd ed.). Redlands, CA. ESRI Press.

Van Sickle, J. (2008). *GIS/GPS for land surveyors*. (3rd ed.). Michigan: Sleeping Bear Press.

Learning Outcomes

The intention is for the student to be able to

1. Employ advanced spatial referencing concepts and Global Positioning Systems (GIS/GPS) technology and its applications
2. Be aware of the impact that GIS/GPS has had on the surveying industry
3. Apply the advanced GIS/GPS technology to the successful creation and maintenance of robust GIS/GPS technology

Primary Learning PACT Skills that will be DEVELOPED and/or documented in this course

Through the student's involvement in this course, he/she will develop his/her ability in the following primary PACT skill areas:

1. Field-Related Technology
 - Through analyzing and interpretation of GIS/GPS data, the student will demonstrate proficiency in the use of GIS/GPS software and hardware.

Secondary skills (developed but not documented):

Problem solving
Reading
Listening
Writing
Nonverbal Communication

Teamwork
Ethical conduct

Major Summative Assessment Task(s)

These learning outcomes and the primary Learning PACT skills will be demonstrated by:

1. Completing an advanced GIS/GPS project

Course Content

- I. Themes – Key recurring concepts that run throughout this course:
 - A. Advanced GIS/GPS concepts
 - B. Advanced GIS/GPS theories
- II. Issues – Key areas of conflict that must be understood in order to achieve the intended outcome:
 - A. GIS/GPS data format, accuracy and validation
 - B. Safety issues
 - C. Ethics in GIS/GPS
- III. Concepts – Key concepts that must be understood to address the issues:
 - A. Setting up and using GIS/GPS software and hardware
 - B. Correct use of advanced GIS/GPS data formats and accuracies
- IV. Skills/Competencies – Actions that are essential to achieve the course outcomes:
 - A. Demonstrate knowledge of advanced GIS/GPS methodologies and accuracies
 - B. Demonstrate how to operate a survey grade GPS receiver
 - C. Demonstrate how to conduct a georeferencing and geodetic survey
 - D. Demonstrate use of Automated Vehicle Location (AVL) and GPS location, navigation, and tracking
 - E. Demonstrate how to collect static GPS data
 1. Post process
 2. Obtain corrected coordinates
 - F. Demonstrate how to obtain geodetic control for a project using National Geodetic Survey data
 - G. Demonstrate an understanding of advanced GIS/GPS post-processed and real-time differential corrections
 - H. Demonstrate how to set a control network and conduct a Real-Time Kinematic (RTK) survey
 - I. Demonstrate how to create a geodetic survey using the Continuous Operating Reference Station (CORS) network and the On-line User Processing System (OPUS)
 - J. Demonstrate how to plan, develop, conduct, manage, and complete an integrated GIS/GPS project.
 - K. Demonstrate knowledge of the fundamentals of GPS machine control

Learning Units

- I. Advanced concepts of spatial relationships of georeferencing, GPS, and GIS systems
 - A. People

- B. Software
 - C. Hardware
 - D. Data
 - E. Spatial analysis
- II. Review operation of GPS receivers
 - A. Consumer grade
 - B. Sub-meter grade
 - III. Advanced concepts of GPS
 - A. Navigation
 - B. Tracking
 - C. Positioning
 - IV. Advanced GPS survey
 - A. Methodologies
 - B. Accuracies
 - V. Advanced techniques on using a handheld GPS receiver
 - A. Mark positions
 - B. Navigate to known positions
 - VI. Advanced concepts of GPS
 - A. Post processed
 - B. Real time differential correction
 - VII. Use a sub-meter accuracy GPS receiver to establish positions
 - A. Post-processed
 - B. Real-time corrections
 - C. Navigate using real-time corrections
 - VIII. Continued post-process GPS field data
 - A. Data from local reference station
 - B. Data from Continuous Operating Reference Station (CORS) network
 - IX. Advanced real-time broadcast differences and corrections
 - A. Coast Guard Beacon GPS
 - B. Real-Time Kinematic GPS
 - X. Advanced creations of new GIS
 - A. Layers
 - B. Databases
 - XI. Advanced modifications of existing GIS
 - A. Layers
 - B. Databases

- XII. Advanced imports of GPS data from a variety of sources
 - A. Create new layer
 - B. Modify existing layers

- XIII. Advanced GIS/GPS integrated project
 - A. Plan
 - B. Develop
 - C. Conduct
 - D. Manage
 - E. Complete

Learning Activities

Learning activities will be assigned to assist the student to achieve the intended learning outcomes through lecture, instructor-led class discussion, guest speakers, group activities, skill practice, and others at the discretion of the instructor.

Grade Determination

The student will be graded on learning activities and assessment tasks. Grade determinants may include the following: daily work, quizzes, chapter or unit tests, comprehensive examinations, student projects, student presentations, class participation, and other methods of evaluation employed at the discretion of the instructor.