SURV 56 Course Outline as of Fall 2022

CATALOG INFORMATION

Dept and Nbr: SURV 56 Title: INTRO TO GPS SURVEYS
Full Title: Introduction to GPS Land Surveying
Last Reviewed: 12/13/2021

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	4.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	4.00	Lab Scheduled	3.00	8	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	6.00		Contact Total	105.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 210.00

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
In this course students will explore the principles and applications of satellite-based land surveys, coordinate systems, Global Positioning Systems (GPS) and Global Navigation Satellite Systems (GNSS). Topics will also include concepts and practice of precise location, navigation, GNSS signal interpretation, data collection, data processing, statistical adjustment, and reporting.

Prerequisites/Corequisites:
Course Completion of APTECH 191, CEST 51, and SURV 60

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: In this course students will explore the principles and applications of satellite-based land surveys, coordinate systems, Global Positioning Systems (GPS) and Global Navigation Satellite Systems (GNSS). Topics will also include concepts and practice of precise location, navigation, GNSS signal interpretation, data collection, data processing, statistical adjustment, and reporting. (Grade Only)

Prerequisites/Corequisites: Course Completion of APTECH 191, CEST 51, and SURV 60
Recommended:
Limits on Enrollment:
Transfer Credit: CSU;
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**			Effective:	Inactive:
CSU GE:	**Transfer Area**			Effective:	Inactive:
IGETC:	**Transfer Area**			Effective:	Inactive:
CSU Transfer:	Transferable	Effective:	Spring 2009	Inactive:	
UC Transfer:		Effective:		Inactive:	

CID:

Certificate/Major Applicable:
Both Certificate and Major Applicable

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Properly set up and operate GPS/GNSS receivers for the recording of data.
2. Process and adjust GPS/GNSS data using post-processing software.
3. Describe and apply different types of coordinate reference systems with respect to datum type, epoch date and projection systems.
4. Complete accurate summaries and reports using GPS/GNSS data.

Objectives:
At the conclusion of this course, the student should be able to:
1. Identify types of control surveys and their applications in civil engineering and land surveying.
2. Operate both navigation grade and survey grade GPS/GNSS equipment for determining location.
3. Use conventional electronic surveying instruments (total stations) as well as the GPS equipment for control and topographic surveys, navigation, staking and mapping.
4. Determine and utilize appropriate field procedures for horizontal and vertical control of surveys.
5. Define, apply and provide illustrative examples of map projections and their associated data.
6. Determine the geographic coordinates and plane coordinates of points within the two California Coordinate Systems.
7. Summarize the use and setup of electronic surveying equipment such as total station global positioning systems.
8. Reduce, analyze, compile (post-process) and summarize GPS/GNSS land survey data using post-processing software.

Topics and Scope:

I. Introduction to GPS
   A. Definitions
   B. Principles
   C. Applications
   D. Skills
   E. Equipment
II. State Plane and Geographic Coordinate Systems
   A. Reference ellipsoid models
   B. Datums and epochs
   C. Map projections
   D. Computations
III. Navigating Using GPS
   A. Uploading navigational coordinates
   B. Locating by different coordinate systems
   C. Establishing locations
   D. Determining positions
IV. Planning a Survey
   A. Survey types, including control, topographic and layout
   B. Light Distance and Ranging (LiDAR), terrestrial, and photogrammetric control surveys
   C. Project planning
   D. Mission planning
   E. Field data collection methods
V. Performing a Survey
   A. Survey styles
   B. Collection methods
      1. Static, Rapid Static
      2. Real Time Kinematic (RTK)
      3. Real Time Network (RTN)
   C. Occupations
   D. Observations
   E. Data collection devices and methods
   F. Recording observation data
VI. Post-Processing Data
   A. Downloading field data into desktop analysis environment
   B. Uploading field data into online analysis environment
   C. Reduction and analysis of data in desktop and online environments
   D. Adjustment of data
   E. Reporting of data
VII. Related Mapping
   A. Control
   B. Topographic
   C. Planimetric
   D. 3D (GIS and Computer Assisted Drafting and Design (CADD))

Laboratory
I. Topcon University -- Educational Videos: GPS Surveying Methods and Techniques
II. Topcon University -- Educational Videos: GPS Data Processing with MagNET Software
III. Field Mapping and Data Collection Methods
   A. Field notes and field books
   B. Use of compass and tape

C. Field use of GPS measuring devices
1. Mission planning
2. Types of receivers and positional accuracy
a. Comparison: Static, RTK, RTN
3. GPS data collection methods
a. Navigation
b. Measurement
c. GPS receiver dashboard and controls
d. GPS data collector dashboard and controls
e. Device configuration, uploading, and downloading data
D. Office processing of GPS data
1. Data download and storage
2. Data Quality Control (QC), Quality Assurance (QA), reduction, edits, and preparation
a. Topcon MagNET software
b. National Geodetic Survey - Online Positioning User System (NGS OPUS) Static Software
c. NGS Geodetic Toolkit
d. Spreadsheets for descriptive analysis
3. Baseline (vector) processing
a. Topcon MagNET software
b. NGS OPUS Static Software
c. NGS OPUS Rapid Static (RS) Software
d. NGS OPUS Projects Software
4. Vector QC/QA, loop closure check
a. Use of spreadsheets for analysis summary and tracking
5. Adjustment of final solutions
6. Report preparation
a. Combined use of word processors and spreadsheets for reports
E. Datums, projections and coordinate systems
1. Datum transformation exercises
2. Applying projections: standard, custom, low distortion
3. Grid to ground and ground to grid conversion exercises
4. Obtaining scale factor and convergence angle information from NGS
F. Integration of field data into CADD or GIS project software

Assignment:

Lecture
1. Textbook reading (1-2 chapters per week)
2. Additional readings (1-2 selected topical articles or handouts weekly)
3. Homework sets (1-2 weekly)
4. Exams (1-3)
5. Quizzes (0-5)
6. Final exam

Lab
1. Field and laboratory exercises and performance evaluations (6-9)
2. Written lab reports (3-5)

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Lab reports	Writing 10 - 20%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Field exercises and homework sets	Problem solving 20 - 30%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Field work and performance evaluations	Skill Demonstrations 30 - 55%

Exams: All forms of formal testing, other than skill performance exams.

Quizzes and exams	Exams 15 - 30%

Other: Includes any assessment tools that do not logically fit into the above categories.

Class participation	Other Category 0 - 10%

Representative Textbooks and Materials:
Introduction to GPS the Global Positioning System (2nd). El-Rabbany, Ahmed. Artech House. 2006 (classic)
GPS for Land Surveyors (4th). Van Sickle, Jan. CRC Press. 2015 (classic)
Instructor prepared materials