

University of Colorado Denver  
**Geomatics and GIS Courses: 2019-2020**

Note: All courses are for 3 graduate credit hours. All courses are given online and generally require CVEN 5381 Intro to GIS or similar material as a pre-requisite.

***CVEN 5381: Introduction to GIS (Fall and Spring semesters)***

This course provides an overview of and experience with GIS technology and its uses for natural resource and infrastructure planning, design, and management. The course involves a survey of GIS software and hardware, a review of cartographic mapping principles, and hands-on applications to prototype situations, such as environmental impact assessment, municipal facilities management, transportation, water resources, and demographics. GIS project management issues are addressed.

***CVEN 5382: Geospatial Data Development (Fall semesters)***

Geographic information systems require development of supporting spatial data and attributes with which to apply the required analyses. This GIS course builds on the introductory course and addresses principles and technologies for development and conversion of spatial data; including photogrammetry, surveying and geodesy, coordinate systems and transformations, and remote sensing. The course objectives are to: 1) introduce design concepts for GIS data collection and processing, 2) review principles of geodesy and coordinate reference systems, and 3) address methods for map data collections and conversions, including tablet digitizing, scanning, remote sensing, plane surveying, photogrammetry and global positioning systems (GPS).

***CVEN 5384: GIS Project Management (Fall semesters)***

This course explains how to build a foundation for GIS project success and deliver results. Topics include data governance, administration of technical infrastructure, managing roles and skills, key leadership concepts, and project management methodologies like Agile/Scrum. Best practices and real world applications are discussed. Also addressed are issues of GIS institutional acceptance, the role of computerized spatial data systems in decision-making, application of planning techniques for accomplishing resource goals, and administrative structures that enhance efficiency of use.

***CVEN 5385: GIS Relational Databases (Spring semesters)***

GIS Relational Databases introduces relational database management system concepts with emphasis on GIS. Includes examination of relational database systems from conceptual design through relational schema design and physical implementation. Topics include SQL, database design and implementation for large database systems, transaction management, concurrency control, distributed database management systems and the interaction and progressive integration of GIS technologies and RDBMS technologies.

***CVEN 5387: Advanced Remote Sensing (Spring semesters)***

Addresses remote sensing concepts including 1) imaging sensors and geo-referencing; 2) image processing for radiometric, multi-spectral image enhancement, and multi-sensor image fusion; and 3) multi-spectral image classification, including feature extraction, supervised and unsupervised classification, and extensions to hyper-spectral data.

***CVEN 5390: Interactive Web Mapping for GIS (Fall semesters)***

This course introduces students to designing, creating, delivering, and using interactive web maps. Many people rely daily on web maps to direct us from point A to point B and more. After starting

with a broad introductory background, this is a technical hands-on course in which students use several open source (FOSS) technologies.

***CVEN 5391: Geomatics for GIS (Fall and Spring semesters)***

This course is designed to present Geomatics data concepts and tools and their connections. The class includes topics from geodesy, surveying, spatial data collection methods, assessment and processing. The course also includes projections, coordinate conversion and transformation principals and solutions, and data transfer across different spatial software platforms

***CVEN 5392: Unmanned Aerial Systems (Fall semesters)***

This course covers the basic principles and practical skills for managing a project using unmanned aerial systems. The focus is on mission planning, operations, and data processing and the benefits of using unmanned aircraft as a tool in Geospatial, Engineering and other industries.

***CVEN 5395: GNSS and GPS (Spring semesters)***

This course provides a description of GPS signal structures and the derivation of observables; characteristics of instrumentation; analysis of atmospheric, orbital, random and non-random effects; derivation of mathematical models used for absolute and differential static and kinematic positioning; pre-analysis methods and applications; software considerations; introduction to GPS GNSS data structures.

***CVEN 5396 HDS/LiDAR Tools & Data Analyses (Fall semesters)***

High Definition Surveying (HDS) scanners are extremely reliable and accurate geospatial data collection devices for surveyors, GIS analysts, engineers, and planners. The goal of this unique course is to present the instrumentation and technological principals used in data collection, project phases, data processing and analyses. This course is designed to provide information and practical skills for students wanting to learn how to plan and execute terrestrial LIDAR data collection projects with HDS scanners and HDS data processing software.

**Courses Not Offered this Academic Year**

***CVEN 5383: GIS Analyses (Spring semesters)***

GIS Analyses covers a range of topics relevant to understanding the conceptual foundations of spatial analyses and for processing data to obtain analysis products. Review GIS software functions, including: data entry (input, editing), manipulation (projection, merge, window, aggregate), analysis (map algebra, overlay, Boolean, interpolation, network, measurements, distance, terrain modeling, statistical analysis), query (spatial, attribute), and display/reporting. Integration of various domain-specific systems analysis models with GIS databases is also addressed. Laboratory activities involve programming applications using available GIS software.

***CVEN 5386: GIS Laboratory (Fall semesters)***

GIS Laboratory covers a range of topics relevant to understanding the conceptual foundations of spatial analyses and for processing data to obtain analysis products. Review GIS software functions, including: data entry (input, editing), manipulation (projection, merge, window, aggregate), analysis (map algebra, overlay, Boolean, interpolation, network, measurements, distance, terrain modeling, statistical analysis), query (spatial, attribute), and display/reporting. Integration of various domain-specific systems analysis models with GIS databases is also addressed. Laboratory activities involve programming applications using available GIS software.