Geomatics (GEO)

Courses

GEO A146 Geomatics Computations I 3 Credits
Introduces geomatic principles and methods of computation related to Cartesian coordinate systems, coordinate geometry, subdivision and area. Examines computations of circular, spiral and vertical curves. Presents methods of adjusting geomatics data and using a current industry-standard handheld calculator.

**Prerequisites:** GEO A156 with a minimum grade of C or concurrent enrollment and (MATH A151 with a minimum grade of C or concurrent enrollment or MATH A152 with a minimum grade of C or concurrent enrollment or MATH A155 with a minimum grade of C or concurrent enrollment or MATH A221 with a minimum grade of C or concurrent enrollment or MATH A251 with a minimum grade of C or concurrent enrollment).

GEO A155 Introduction to Surveying 3 Credits
Orientation and introduction to field surveying theory and techniques for non-geomatics majors. Subject areas include distance measurement, leveling, angular measurements, basic traversing, measurement adjustments, fundamentals of mapping, and use and care of surveying instruments.

**Prerequisites:** MATH A152 with a minimum grade of C or concurrent enrollment or MATH A155 with a minimum grade of C or concurrent enrollment or MATH A221 with a minimum grade of C or concurrent enrollment or MATH A251 with a minimum grade of C or concurrent enrollment.

GEO A156 Fundamentals of Surveying 3 Credits
Fundamentals of geomatics, survey measurement theory and techniques for geomatics majors. Subject areas include distance measurement, leveling, angle measurements, traverse adjustments, contouring, fundamentals of mapping, and proper use and care of surveying instruments.

**Prerequisites:** MATH A151 with a minimum grade of C or concurrent enrollment or MATH A152 with a minimum grade of C or concurrent enrollment or MATH A155 with a minimum grade of C or concurrent enrollment or MATH A221 with a minimum grade of C or concurrent enrollment or MATH A251 with a minimum grade of C or concurrent enrollment.

GEO A157 Computer-Aided Drafting for Surveyors 3 Credits
Introduction to the knowledge and skills necessary to create maps and plats using computer-aided drafting. Topics of study include basic drafting principles, drawing setup and scale, drawing commands, digital terrain modeling, and mapping standards and accuracies.

**Prerequisites:** GEO A156 with a minimum grade of C.

GEO A181 Construction Surveying 1 Credit
Basic construction surveying procedures, including staking for roads, buildings and excavations; use of maps, construction plans, datums and co-ordinate systems; machine control systems. The course is predominantly field work.

**Prerequisites:** MATH A105 with a minimum grade of C or MATH A151 with a minimum grade of C or MATH A152 with a minimum grade of C.

GEO A246 Geomatics Computations II 3 Credits
Covers principles and methods of geomatic computations, coordinate transformations, spherical coordinate systems as applied to spherical astronomy and introduces the mathematical techniques used in geographic information systems (GIS).

**Prerequisites:** GEO A146 with a minimum grade of C and (MATH A221 with a minimum grade of C or MATH A251 with a minimum grade of C).

GEO A256 Engineering Surveying 3 Credits
Covers the theory and application of engineering surveying, including design and implementation of horizontal and vertical control, route surveys, horizontal and vertical curves, control surveys, quantity surveys, and mining surveys. Discusses the application of the theory of errors, error budgets, and error simulation and calibration.

**Prerequisites:** GEO A266 with a minimum grade of C or concurrent enrollment.

GEO A266 Advanced Surveying 3 Credits
Examines advanced survey measurement techniques using conventional survey instrumentation, total stations and data controllers. Practical application of control surveys, leveling and field to finish mapping is provided through topographic surveying projects. Introduces basics of terrestrial LiDAR surveying.

**Prerequisites:** GEO A156 with a minimum grade of C and GEO A157 with a minimum grade of C.

GEO A267 Boundary Law I 3 Credits
Presents elements of boundary control and legal principles. Course topics include boundary history, ownership, rights, interests, title, transfer, description of real property, the rectangular system, sequential conveyances, simultaneously created boundaries and water boundary elements.

**Prerequisites:** WRTG A212 with a minimum grade of C and GEO A156 with a minimum grade of C.

GEO A354 City and Regional Planning 3 Credits
Introduction to fundamentals concepts, including physical planning, transportation, housing, land use, urban development and preservation. Population movement to cities and suburbs; rural depopulation. Regional growth and development. Political and economic development drivers. History, theory and ethics of planning. Virtual environments. GIS and support tools for planning decisions.

**Registration Restrictions:** Junior or senior standing.

GEO A355 Land Development and Design 3 Credits
Presents concepts governing land development. Examines analysis of soil, topography, geometry, environmental impact, aesthetic and economic principles in land planning. Discusses the permitting process and federal, state and municipality platting regulations. Covers automated subdivision design and platting and ethical considerations when developing land.

**Prerequisites:** GEO A157 with a minimum grade of C and GEO A267 with a minimum grade of C.
GEO A357 Photogrammetry 3 Credits
Outlines principles of optics, image formation and lens distortions. Introduces aerial and terrestrial cameras, close-range photogrammetry, stereoscopic image acquisition and measurements, 3D model reconstruction, and aerial photogrammetry.
Prerequisites: GEO A246 with a minimum grade of C and GIS A351 with a minimum grade of C.

GEO A359 Geodesy and Map Projections 3 Credits
Introduction to geometrical and physical geodesy. Examines computations on the ellipsoid, elements of datums, map projections and state plane coordinate systems.
Prerequisites: GEO A246 with a minimum grade of C.

GEO A364 Spatial Data Adjustments I 3 Credits
Examines fundamental concepts of statistical error analysis with applications to surveying measurements. Covers fundamental properties of data sets, including measures of central tendency, measures of data variation, sampling distribution theory, statistical confidence intervals and testing, and propagation of variance. Introduces least squares adjustment.
Prerequisites: GEO A246 with a minimum grade of C and STAT A253 with a minimum grade of C.

GEO A366 Spatial Data Adjustments II 3 Credits
Presents the theory and mechanics of least squares adjustment using the traditional surveying observations of distances, angles, azimuths and elevation differences. Covers post-adjustment analysis through the use of various statistical tests and error ellipse computation and analysis. Examines least squares adjustment and analysis of differential leveling, triangulations, trilateration, traverse and network observations.
Prerequisites: GEO A364 with a minimum grade of C.

GEO A369 Cadastral Surveys 3 Credits
Discusses the United States Public Land Survey System with emphasis on Alaska: sectionalized land subdivision, corner restoration, resurveys, evidence, sources for legal research, and current BLM procedures and regulations.
Prerequisites: GEO A267 with a minimum grade of C.

GEO A410 High-Density Surveying 3 Credits
Introduces principles of high-density surveying, outlines theory and practice of collection and processing of high-density spatial data (point clouds). Covers the use of automated photogrammetric and structure from motion (SFM) techniques, airborne LiDAR, terrestrial and mobile laser scanners.
Prerequisites: GEO A357 with a minimum grade of C.

GEO A420 Point Cloud Analysis 3 Credits
Introduces principles of point cloud data analysis for geospatial applications. Outlines theory and practice of processing of point clouds, generated from automated photogrammetric and structure from motion (SFM) techniques, airborne LiDAR, terrestrial and mobile laser scanners. Covers theoretical and practical aspects of high-density spatial data analysis including classification of LiDAR data, point cloud fusion, surface generation, shape fitting, and feature extraction.
Prerequisites: GEO A410 with a minimum grade of C and GIS A301 with a minimum grade of C.

GEO A433 Hydrographic Surveying 3 Credits
Provides students with knowledge of and skills to apply physical principles, instrumentation, data analysis methods, and visualization techniques associated with hydrographic surveying, chart publication, and related marine measurement practices of government and industry.
Prerequisites: GEO A266 with a minimum grade of C or concurrent enrollment.

GEO A457 Boundary Law II 3 Credits
Focuses on Alaskan survey history and case law, Alaska statutes and administrative code, writing legal descriptions, and the standards of practice for surveying in Alaska.
Prerequisites: GEO A369 with a minimum grade of C.

GEO A460 Geomatics Capstone Project 3 Credits
Utilizes techniques of research, design, data compilation, analysis and mapping learned throughout the geomatics curriculum to complete a geomatics capstone project. Addresses professional standards and ethical concerns for geomatics professionals.
Registration Restrictions: Completion of GER Tier 1 (basic college-level skills) courses and department approval
Attributes: UAA Integrative Capstone GER.

GEO A466 Geopositioning 3 Credits
Introduces the theory and practice of global positioning systems, primarily global navigation satellite systems (GNSS). Examines data collection, quality assessment, analysis and adjustment.
Prerequisites: GEO A364 with a minimum grade of C and GEO A359 with a minimum grade of C.

GEO A490 Selected Advanced Topics in Geomatics 1-6 Credits
Explores advanced theoretical or practical concepts in geomatics. Specific course content is determined according to student needs, developments in technology or licensing requirements.
Special Note: May be repeated four times for credit with change of subtitle.
Prerequisites: GEO A246 with a minimum grade of C and GIS A201 with a minimum grade of C.