SUR-1. Introduction to Surveying Engineering
1 Credit
Review and discussion of career paths open to surveying engineers.
Restricted to: Main campus only.

SUR 201. GPS and Spatial Data Applications
3 Credits
Overview of spatial data applications based on GPS observations. Emphasis on positioning and navigation using code-phase techniques with handheld receivers. Use of coordinate systems. Students encouraged to have their own GPS handheld unit.

SUR 222. Plane Surveying
3 Credits (2+3P)
Theory and practice of geomatics as applied to plane surveying in the areas of linear measurements, angle measurements, area determination, differential and trigonometric leveling, and topographic mapping. May be repeated up to 3 credits. Crosslisted with: DRFT 222.
Prerequisite(s): MATH 190G.

SUR 264. Introduction to LIS
3 Credits (2+3P)
Introduction to land information systems. Land tenure systems, coordinate systems, computer methods. Pre/
Corequisite(s): DRFT 109.

SUR 285. Precise Digital Mapping
3 Credits
Perform basic photogrammetric mapping, and create digital terrain models. May be repeated up to 3 credits.
Prerequisite(s)/Corequisite(s): SUR 222 or DRFT 222.

SUR 292. Public Land Survey System Boundaries
3 Credits (2+3P)
Detailed study of the U.S. Public Land Survey System Instructions with special emphasis on New Mexico. Sectionalized land subdivision, corner restoration, and field surveys. Field trips required.
Prerequisite: SUR 222.

SUR 312. Legal Principles and Boundary Law I
3 Credits
Legal principles of property boundary retracement, and rights-of-way. Systems of law and legal research. Principles of the U.S. Public Land Survey System and manual of Instructions May be repeated up to 3 credits.
Prerequisite(s): SUR 222 or DRFT 222.

SUR 322. Laser Scanning Mapping Technologies
3 Credits (2+2P)
Perform basic terrestrial & airborne LiDAR scan, LiDAR Technologies and Applications will include ranging technologies such as LiDAR, SAR, and Bathymetry, point cloud data management & extraction, scan registration and processing.
Prerequisite(s): SUR 285.

SUR 328. Construction Surveying & Automation Technologies
3 Credits (2+3P)
Construction Surveying Principles: conventional and machine controlled. Layout alignments, grades, various infrastructure, buildings. Understand error identification, common quality control checks and blunder identification. May be repeated up to 3 credits.
Prerequisite(s): (SUR 222 or DRFT 222) and (MATH 191G or MATH 235).

SUR 330. Computer Applications of Surveying
3 Credits (2+3P)
Advanced application of concepts and tools used in the manipulation of geospatial data in a computer environment. Topics include the use of surveying-specific software applications for problem solving, analysis and generation of spatial data products. Advanced programming skills in a high level language are presented and applied.
Prerequisite(s): DRFT 109 AND SUR 222, and (MATH 191G or MATH 235) and (C S 187 or E T 262 or E E 161).

SUR 351. Introductory Spatial Data Adjustment I
3 Credits
Theory of random error in observations/measurements. Use of statistics in spatial data analysis, statistical testing, advanced data structures. Emphasis on computer based problem solving and programming to solve spatial data problems. May be repeated up to 3 credits.
Prerequisite(s): (SUR 222 or DRFT 222) and (MATH 191G or MATH 235) and (A ST 311G or STAT 251G) and (C S 151 or C S 152 or E T 262 or E E 161).

SUR 361. Introduction to Geodesy/Geodetic Control Surveying
3 Credits (2+2P)
Horizontal and vertical control network design and consideration. May be repeated up to 3 credits.
Prerequisite(s): (SUR 222 or DRFT 222) and (MATH 191G or MATH 235).

SUR 370. Control Surveying
3 Credits (2+3P)
Prerequisite(s): SUR 222 and (MATH 191G or MATH 235G).

SUR 384. Surveying Practicum
1-3 Credits
Surveying practice under the direction of a licensed, professional land surveyor requiring 45 hours per credit as per a plan worked out between the student and the surveyor and approved by the Surveying Engineering faculty. Work must be certified by the licensed, professional land surveyor. Requires a written report by the student.
Prerequisites: SUR 222 and junior standing.

SUR 401. Ethics and Professionalism in Surveying and Mapping
3 Credits
Ethics as applied to the surveying profession. Includes case studies and problems.
Prerequisites: SUR 312, SUR 328, and senior standing.

SUR 412. Advanced Topics in Boundary Surveying
3 Credits (2+3P)
Advanced land boundary topics including water boundaries, mineral claims, Spanish and Mexican land grants, state and national boundaries.
Prerequisite: SUR 312.

SUR 450. Senior Project
1 Credit
Research project prepared by student. Includes class presentation. Students will learn how to research after the end of their formal education.
Prerequisite(s): Senior Standing.
SUR 451. Advanced Survey Measurements, Analysis, and Adjustments
3 Credits
Rigorous analysis of the theory of observations as applied to spatial data, application of least squares adjustments, ability to perform statistical analysis to determine accuracy of final product, constrained/free geospatial data integration, error ellipses, and pre-analysis of spatial data acquisition procedures. May be repeated up to 3 credits.
Prerequisite(s): SUR 351, (MATH 280 or MATH 480).

SUR 452. Spatial Data Integration and Analysis
3 Credits (2+2P)
Methodologies of geospatial data acquisition and integration, knowledge of applications the source data is intended for, accuracies of acquired spatial data, types and analysis of coordinate transformation models. Integrating datasets for routing analysis, location study analysis, land management and long range plans as well as existing needs related to connectivity and safety. May be repeated up to 3 credits.
Prerequisite(s): SUR 451.

SUR 461. GNSS Positioning
3 Credits (2+3P)
Logistics of GNSS data collection, the GPS signal, codes and biases, error sources, differences between relative and autonomous GNSS positioning, code phase carrier phase, DGPS static and RTK surveys. Geodetic and GPS standards and specifications GNSS data processing, network adjustments, and evaluation of spatial data accuracy practical applications of GNSS May be repeated up to 3 credits.
Prerequisite(s): SUR 361.

SUR 464. Legal Principles and Boundary Law II
3 Credits
Concepts of real property, land tenure and ethics, and land registration systems; the function and design of multipurpose cadastre and land information systems. May be repeated up to 3 credits. Consent of Instructor required.
Prerequisite(s): SUR 312.

SUR 498. Emerging Technology in Geomatics
3 Credits
Hydrographic/Bathymetric, Altimetry, Space borne Imaging Systems, Mobile Mapping Systems, Mining and Agriculture Surveying Principles, and advanced ranging data acquisition systems. May be repeated up to 3 credits. Consent of Instructor required.
Prerequisite(s): Consent of instructor and senior standing.