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. 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 (3)
Photogrammetric Mapping Principles, digital sensor including optical cameras, terrestrial, surveying control, IMU & GPS integration, stereo photography, analytical triangulation, orthorectification, precision and accuracy of measurement systems, SUAS (Small Unmanned Aerial Vehicles) applications to geospatial data collection and practical applications project flight/pre planning, sensor platform, FAA regulations and restrictions, introduction to laser scanning systems.
Prerequisite(s)/Corequisite(s): SUR 222 or DRFT 222.

SUR 292. Public Land Survey System Boundaries
3 Credits (3)
Fundamentals of the U.S. Public Land Survey System; rules for the survey of the public lands, field surveys; the rectangular system, corners, monuments, evidence; dependent and independent resurveys, corner restoration; plats and field notes, patents. Restricted to Las Cruces campus only.
Prerequisite(s): SUR 222.

SUR 312. Legal Principles and Boundary Law I
3 Credits (3)
Fundamentals of real property law; principles of land description; survey evidence and procedure in boundary determination, order of importance of conflicting elements; and liability, ethical and professional principles in boundary surveying; contemporary issues in boundary determination.
Prerequisite(s): SUR 222 or DRFT 222.

SUR 328. Construction Surveying & Automation Technologies
3 Credits (2+3P)
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. Spatial Data Adjustment I
3 Credits (3)
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.
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. Geodesy/Geodetic Control Surveying
3 Credits (2+2P)
Horizontal and vertical control network design and consideration. Understand ellipsoid, geoid, horizontal and vertical datum, coordinates, precise leveling, astronomic, establishment of state plane zones, understanding reporting. Transform data between geodetic Latitude/Longitude, state plane, ground data, perform geodetic computations, ability to design GPS networks utilizing CORS stations, network adjustments. Perform a control survey, process data, adjust network, and prepare control report with Meta-data.
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 401. Ethics and Professionalism in Surveying and Mapping
3 Credits (3)
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 (1)
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. Spatial Data Adjustment II
3 Credits (3)
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.
Prerequisite(s): SUR 451, (MATH 280 or MATH 480).

SUR 452. Spatial Data Integration and Analysis
3 Credits (3)
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.
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 (3)
ALTA Surveys and Standards, boundary evidence, order of evidence, Subdivision and Platting Law, Mexican and Spanish land grants, water boundaries, sequential and simultaneous conveyances. Consent of Instructor required.
Prerequisite(s): SUR 312.

SUR 485. Emerging Techniques in Geomatics
3 Credits (3)
Hydrographic, Altimetry, Space borne Imaging Systems, Mobile Mapping Systems, Mining and Agriculture Surveying Principles, Ranging technologies and applications such as LiDAR, SAR, and Bathymetry. Principles of terrestrial & airborne laser scanning, point cloud data management & extraction, scan registration and processing, and advanced ranging data acquisition systems. Consent of Instructor required.
Prerequisite(s): Consent of instructor and senior standing.