

## Land Surveying (SURV)

### **SURV 1020**

#### **Introduction to Surveying and Mapping WE 1**

Provides an orientation to the field of Surveying and Mapping including Boundary Surveying, Geodesy, Forensic Surveying, Construction Surveying, Geographic Information Systems (GIS), and other types of surveys. Involves presentations by community/industry professionals encompassing the surveying and mapping occupations. Covers college success principles and practices for the Surveying and Mapping program. Lab access fee of \$45 for computers applies.

### **SURV 1030**

#### **Fundamentals of Geodesy and Control Surveys 3**

Explores the science of geodesy or the size and shape of the earth. Involves Global Positioning Systems theory for computing a position on the earth using three-dimensional coordinate systems, reference coordinate systems, state plane coordinates, transformations, geoid datums, orthometric heights and leveling. Introduces basic properties and characteristics of the most common map projections. Explains principles and theories used to establish control surveys and survey networks based on geodesy. Introduces traverse, triangulation, and elevation adjustment computations along with random and systemic errors in measurement. Offers field application assignments of typical survey control networks using GPS and Total Stations to collect GPS data. Includes post processing coordinate transformation, creation, and report generation using the NGS OPUS system. Requires verifiable demonstration of field skills and techniques. Lab access fee of \$45 applies.

### **SURV 1220**

#### **Remote Sensing and Photogrammetry 3**

\* Prerequisite(s): MAT 1010 or appropriate math placement score

Introduces and describes digital imagery, aerial triangulation, Remote Sensing and their history. Covers principles of Remote Sensing and the integration of Remote Sensing with Geographic Information Systems (GIS). Teaches a fundamental knowledge of aerial photography, photogrammetry, multispectral, Hyperspectral, Thermal, RADAR, LiDAR image analysis. Identifies various equipment and instrumentation used in producing Remote Sensing products. Describes image preprocessing and image enhancements as well as differentiating and classifying various accuracy assessment techniques. Software fee of \$18 applies. Lab access fee of \$45 for computers applies.

### **SURV 1340**

#### **Fundamentals of Boundary Law 3**

Explains the fundamental responsibilities of a land surveyor in recognizing, locating and creating land boundaries, including sequential and simultaneous conveyances, easements and reversions, riparian and littoral rights. Presents basic rules of evidence. Provides exposure to principles and procedures used to establish new boundaries and locate existing boundaries.

### **SURV 2010**

#### **Land History of America 3**

Discusses how, what, and why certain countries, events, and individuals have significantly impacted the history of the lands of America. Describes how the contributions of the various inventions, instruments, individuals, conditions, and events impacted the lands of America. Identifies how current land conditions, policies, and laws in the State of Utah have been impacted by Utah land history. Lab access fee of \$45 for computers applies.

### **SURV 2030**

#### **Geodesy 3**

\* Prerequisite(s): EGDT 2400, MATH 1060 or EGDT 1600 and 1610 or appropriate math placement score

Examines the science of geodesy. Includes size and shape of the earth, spherical and ellipsoidal geometry, the celestial sphere, and astronomical trigonometry. Involves Global Positioning Systems theory for calculating position on the earth using three-dimensional coordinate systems, reference coordinate systems, state plane coordinates, transformations, spheroid, ellipsoid, geoid datums, celestial sphere, orthometric heights and leveling. Covers basic properties and characteristics of the most common map projections with emphasis on the projections used in State Plane Coordinates such as Lambert Conformal, Universal Transverse Mercator (UTM). Exposes the student to survey applications of practical astronomy including time systems, astronomical azimuth, and Solar/Polaris observations and calculations. Lab access fee of \$45 applies.

### **SURV 2100**

#### **Mapping From Field to Finish 3**

\* Prerequisite(s): EGDT 1400, EGDT 1040, GIS 2640

Teaches how to identify, operate, and maintain common instrumentation used to collect field data including GPS, Total Stations, and Drones. Integrates survey field data, Geographic Information Systems (GIS) data, and Computer Aided Drafting (CAD) data to develop static and dynamic maps and plans often used by public and private entities. Demonstrates best practice field and office procedures and techniques commonly used by federal, state, and local governments and private industry. Explains potential field safety considerations, problems, and issues, as well as the development of a safety plan. Includes written and oral presentations. Lab access fee of \$45 applies.

### **SURV 2310**

#### **Surveying US Public Lands 3**

\* Prerequisite(s): EGDT 1400, MATH 1060 or EGDT 1600 and 1610 or appropriate math placement score

Studies U.S. Public Land Survey System (PLSS) as described in the current official Department of the Interior-Bureau of Land Management (BLM) Manual of Instructions for Surveying Public Lands with emphasis on federal, state, and other applicable laws, evidence, resurveys, and subdivision of sections. Covers a detailed study of general and special instructions, irregularities in subdivisions, lost and obliterated corners, single and double proportion methods, monumentation, riparian boundary laws and rights, hiatuses, mineral surveys, and official survey documents. Introduces Spanish and Mexican land grants, as well as state and national boundaries. Lab access fee of \$45 for computers applies.

### **SURV 2320**

#### **Property Descriptions and Public Land Records 3**

\* Prerequisite(s): (ENGL 1010 or ENGH 1005) and EGDT 1400

Involves analysis, interpretation, and writing of legal descriptions with proper form, controlling elements, metes-and-bounds, sectionalized land descriptions, easements, and rights-of-way. Discusses different types of descriptions, junior-senior rights in descriptions, latent & patent ambiguities, basis of bearing and interpretation, easements, and reversions. Applies practical exercises and case studies. Studies the responsibilities of the professional land surveyor regarding due diligence in searching public land records and performing applicable legal research. Examines public records and recording laws. Emphasizes title search to patent and includes zoning laws relating to land. Involves tour(s) of local record systems and/or public offices..

# Course Descriptions

## **SURV 3010**

### **Measurement Analysis and Adjustments**

**4**

\* Prerequisite(s): EGDT 2400, MATH 1060 or (EGDT 1600 and 1610) or appropriate math placement score; and University Advanced Standing

Examines observation theory, and observational error analysis. Discusses the theory of measurement errors, principles of error propagation, variance and covariance, and the theory of the least squares method. Studies variances and co-variances of observed, derived, and adjusted quantities; regression analysis, and polynomial curve fitting. Involves systems of linear equations, linearization, and iteration of nonlinear equations; adjustment validation using hypothesis testing; modeling of surveying problems using different techniques of least squares and also presents several methods used to fit survey data to mathematical and survey models. Software fee of \$18 applies. Lab access fee of \$45 for computers applies.

## **SURV 3030**

### **Land Development Planning, Platting, and Mapping**

**3**

\* Prerequisite(s): EGDT 1040, EGDT 1400, matriculation into the Geomatics BS degree, and University Advanced Standing

Discusses land use planning techniques for residential and commercial developments. Subdivisions, industrial parks, and commercial complexes are studied along with the associated governmental regulations, codes, rules, and approval processes and procedures. Requires a mock public presentation on course projects. Uses current surveying/engineering software to develop and plot drawings including; subdivision plats, records of survey, ALTA surveys, topographic site surveys, and other maps. Software fee of \$18 applies. Lab access fee of \$45 for computers applies.

## **SURV 3210**

### **Advanced Photogrammetry**

**3**

\* Prerequisite(s): EGDT 1400, MATH 1060, or (EGDT 1600 and 1610), or appropriate math placement score; and University Advanced Standing

Examines principals of photogrammetry as applied to surveying and mapping. Analyzes geometry of vertical and aerial photographs, stereoscopic parallax, geometry of tilted photographs, and stereoplotter mapping. Discusses close-range photographic analysis, planimetric and topographic maps, flight planning, digital photogrammetry, aerial cameras and camera calibration. Involves the theory and techniques of photo orientation, digital imagery, and aerial triangulation. Software fee of \$18 applies. Lab access fee of \$45 for computers applies.

## **SURV 3220**

### **Control Surveys**

**3**

\* Prerequisite(s): SURV 2030, SURV 3010, matriculation into the Geomatics BS degree, and University Advanced Standing

Applies principles and theories presented in prerequisite courses and moves the student to an advanced applications level. Studies the establishment of control surveys and survey networks. Reviews compass rule adjustment computation, matrix methods and least squares adjustment methods, random and systemic errors in measuring, and error propagation. Offers field applications of Radial and GPS surveying systems: static, kinematic and RTK procedures, data collection, post processing coordinate transformation, creation, and report generation. Teaches practical applications of network adjustment, control surveys, triangulation, and precision traverses with precise elevation control. Requires demonstration of field skills and techniques. Software fee of \$18 applies. Lab access fee of \$45 for computers applies.

## **SURV 3230**

### **Construction and Route Surveys**

**3**

\* Prerequisite(s): EGDT 2400, MATH 1060 or EGDT 1600 and 1610, or appropriate math placement score; and University Advanced Standing

Applies principles and theories presented in prerequisite courses. Develops computations, standard practices and practical applications for common construction and route surveys. Includes survey staking of pipes, curbs, streets, parking lots, buildings, and other typical land development and infrastructure project elements. Develops volume and area calculations. Requires computer derived solutions and applications from plans and specifications using modern data collection and coordinate geometry (COGO) computer software. Lab access fee of \$45 for computers applies. Software fee of \$18 applies.

## **SURV 3340**

### **Boundary Law**

**3**

\* Prerequisite(s): Matriculation into the Geomatics BS degree required and University Advanced Standing

Studies the responsibilities of the land boundary surveyor in protecting rights, title, and interest of the land; riparian and littoral rights, bona-fide rights, boundary easements and reversions, conveyances; sequential and simultaneous. Presents principles and rules of evidence. Includes monuments and monumentation, boundary locations, and procedures used to establish new boundaries and locate existing boundaries. Lab access fee of \$45 for computers applies.

## **SURV 3400**

### **Surveying Applications and Field Techniques III**

**3**

\* Prerequisite(s): EGDT 2400, GIS 3600, and University Advanced Standing

Focuses on state of the art surveying applications and field survey techniques often employed by surveyors for various field and office tasks some of which may include horizontal and vertical networks and traverses, route surveys, and topographic/site surveys, and machine control methods. Teaches the construction, care, maintenance, calibration, effective setup and observation methods used for the latest in surveying instrumentation often including; global positioning systems (GPS), total robotic stations, 3D laser scanners, automatic levels, modern data collectors, coordinate geometry (COGO), computer-aided drafting (CAD) software, Drone surveying, and other geospatial surveying systems and instruments. Lab access fee of \$45 applies. Software fee of \$25 applies.

## **SURV 4340**

### **Surveying Legal Principles**

**3**

\* Prerequisite(s): SURV 2320, SURV 3340, ENGL 2310, matriculation into the Geomatics BS degree, and University Advanced Standing

Focuses on researching the body of law as it applies to the practice of surveying. Covers common law associated with the Statute of Frauds, Constructive Notice, and Surveyor/Attorney interaction and roles. Discusses principles and concepts of dispute and conflict resolution as well as the specific role of the expert witness. Reviews the fact finder role of the surveyor in research/investigation techniques and sources while focusing on facts of a case and the applicable laws. Completers will work on case studies and prepare a final legal research paper. Involves tour(s) of a law library.

## **SURV 4400**

### **Surveying Applications and Field Techniques IV**

**3**

\* Prerequisite(s): SURV 3400 and University Advanced Standing

Focuses on projects both lab/office and field work. Uses a mentor based teaching model to engage in several projects from inception to final deliverables. Requires students to make project decisions individually and as a team regarding each aspect of the various assigned projects. Requires each team member to demonstrate their own ability to perform all tasks required to complete the assigned projects within a given time frame resulting in deliverables that meet a pre-professional level of competency. Lab access fee of \$45 applies. Software fee of \$25 applies.

**SURV 4500**  
**Professional Services Practicum**

**3**  
 \* Prerequisite(s): University Advanced Standing

Examines the planning, organizing, and application of field and office practices, and develops a practical business plan including policies and procedures associated with a typical professional services firm providing civil engineering, architectural, and surveying services to the public and private sector. Reviews and applies a myriad management principles and functions including: operations, financial, marketing, human resource, project, and risk management. Exposes the student to the functions of typical financial software. Explores business concepts specific to professional services; pricing, fees, bidding, proposals, contracts, and professional liabilities. Involves developing a business plan for a professional services firm. Lab access fee of \$45 for computers applies.

**SURV 451R**  
**Surveying and Mapping Lecture Series**  
**.5 to 2**

\* Prerequisite(s): University Advanced Standing

Consists of lectures presented by guest speakers or faculty on various topics in Surveying and Mapping including but not limited to: land surveying, mapping, remote sensing, geodesy, legal issues, photogrammetry, and various new and emerging technologies. May be repeated for a maximum of 2 credits toward graduation.

**SURV 455G**  
**Global Professional Ethics and Liabilities**  
**3**

\* Prerequisite(s): PHIL 2050 and University Advanced Standing

Teaches the code of ethics adopted by the various professional services state and national organizations and/or associations. Explains meaning and attributes of professionalism along with the ethical, moral, and social responsibilities of professional engineers, architects, and surveyors. Integrates laws for practicing as a professional service with professional ethics as well as the roles of multi-culturalism and globalization. Includes model standards (international, national, and state), professional liability cases, safety, risks, professional client relationships, bribery, global engagement, contracts, and intellectual property. Involves lecture, readings, case studies, and other media.

**SURV 481R**  
**Surveying and Mapping Internship**

**1 to 8**  
 \* Prerequisite(s): Junior or Senior Standing, departmental written approval, matriculation into the Surveying and Mapping BS degree, and University Advanced Standing

Provides opportunities to apply classroom theory and principles to actual on-the-job work experience, on a paid or non-paid basis, in the field of Surveying and Mapping. Emphasizes the establishment of goals, learning objectives, and expected outcomes with their Faculty Sponsor at the beginning of the internship and/or semester. Involves the submittal of a comprehensive written report at the end of the semester consisting of an evaluation of original goals and objectives and reflects on the achieved outcomes gained from the work experience. May be repeated for a maximum of 8 credits toward graduation. May be graded credit/no credit.

**SURV 490R**  
**Professional Topics in Surveying and Mapping**  
**2 to 4**

\* Prerequisite(s): University Advanced Standing

Studies a chosen topic in Surveying and Mapping. May include research, experimentation, analysis, and reporting. May be taken more than once for different topics and for a maximum of 9 credits toward graduation.

**SURV 4930**  
**Senior Surveying and Mapping Capstone**  
**WE**  
**4**

\* Prerequisite(s): University Advanced Standing, Senior Standing

Provides an opportunity for a senior Surveying and Mapping student to participate in a significant and current research project which may advance the field of Surveying and/or Mapping. Includes independent study and laboratory/field work as necessary and must be approved and supervised by assigned faculty and technical mentors. Culminates in the preparation and presentation of a written paper describing the results of the research and/or completed project to project stakeholders, interested students, faculty, administration, the professional community, or the broader general audience. Lab access fee of \$45 applies. Software fee of \$25 applies.