

# Advanced Surveying Certificate & Land Surveying Certificate (ASC & LSC)

## Advanced Surveying Certificate (ASC)

The Advanced Surveying Certificate at Cincinnati State, offered in cooperation with Northern Kentucky University, is for graduates of Cincinnati State's Surveying and Mapping (formerly Land Surveying Technician) associate's degree or other related associate's degree programs, and serves as the third year of a bachelor's degree program at Northern Kentucky University or the University of Cincinnati.

The certificate program has been approved by the State Boards of Registration in Ohio, Indiana, and Kentucky.

Most courses in the certificate are offered through online education, including classes in geographic information systems (GIS), global positioning systems (GPS), and legal topics.

Students should check with their state licensing board for possible changes to specific requirements before taking any coursework.

Graduates of other associate's degree programs must complete all prerequisite material in the Cincinnati State Surveying and Mapping (Land Surveying Technician) program prior to acceptance into the certificate program.

Prospective students must meet with the certificate advisor prior to admission to the program.

For more information, please contact the Engineering and Information Technologies Division at (513) 569-1743.

To apply for this program at Cincinnati State, visit the Admissions (<http://www.cincinnati.edu/academics/admission/>) section of the College website.

## Land Surveying Certificate (LSC)

The Land Surveying Certificate is for students enrolled in or who have graduated from a bachelor's degree civil engineering program who wish to pursue Professional Surveying registration in Ohio, Kentucky, or Indiana.

The certificate program offers designated courses required by the Board of Registration for Professional Engineers and Surveyors in these states to qualify for the surveying fundamentals examination.

The certificate program courses are offered in the evening and may be completed in consecutive semesters.

For more information, please contact the Engineering and Information Technologies Division at (513) 569-1743.

To apply for this program at Cincinnati State, visit the Admissions (<http://www.cincinnati.edu/academics/admission/>) section of the College website.

## Advanced Surveying Certificate (ASC)

**Program Prerequisites:** Graduate from the Cincinnati State Land Survey Technology associate's degree, or complete comparable coursework. Meet with the certificate advisor prior to admission to the program.

Most required courses are offered via online education.

| Semester 1            |  | Lec       | Lab      | Credits   |
|-----------------------|--|-----------|----------|-----------|
| SUR 300               | Advanced Surveying Calculations and Statistics | 4         | 0        | 4         |
| SUR 420               | Photogrammetry and Remote Sensing              | 2         | 3        | 3         |
| Semester 2            |  |           |          |           |
| SUR 310               | Surveying Laws and Ethics                      | 4         | 0        | 4         |
| SUR 305               | Geospatial Surveying                           | 4         | 0        | 4         |
| XXX XXX               | Science Elective <sup>1</sup>                  | 1         | 5        | 3         |
| <b>Total Credits:</b> |  | <b>15</b> | <b>8</b> | <b>18</b> |

## Electives

### Science Elective <sup>1</sup>

|                   |   |   |
|-------------------|---|---|
| BIO 131           | Biology 1                                       | 5 |
| CHE 110           | Fundamentals of Chemistry                       | 4 |
| CHE 121 & CHE 131 | General Chemistry 1 and General Chemistry 1 Lab | 5 |
| EVS 120           | Environmental Geology                           | 4 |
| LH 130            | Woody Plant Materials                           | 3 |
| PHY 152           | Physics 2: Algebra and Trigonometry-Based       | 4 |
| PSC 105           | Stars and Galaxies                              | 4 |

<sup>1</sup> Students seeking Surveyor Registration in Indiana must complete (or have previously completed) these courses: MAT 251 (Calculus 1), and six semester hours from the following areas: Freshman Chemistry, Astronomy, Geology, or Dendrology (Woody Plants).

## Land Surveying Certificate (LSC)

**Program Prerequisite:** Enrolled in or a graduate of a Civil Engineering bachelor's degree program.

This program meets the Board of Registration for Professional Engineering and Surveyors education requirements to be eligible for the registration exam for professional surveyors in Ohio, Kentucky, or Indiana.

| Semester 1 |                                  | Lec | Lab | Credits |
|------------|----------------------------------|-----|-----|---------|
| SUR 201    | Elements of Boundary Surveying 1 | 3   | 2   | 4       |
| SUR 200    | Route Location and Design        | 3   | 2   | 4       |
| Semester 2 |                                  |     |     |         |
| SUR 202    | Elements of Boundary Surveying 2 | 3   | 3   | 4       |
| SUR 130    | Surveying History                | 4   | 0   | 4       |
| Semester 3 |                                  |     |     |         |

|                                    |                           |           |           |           |
|------------------------------------|---------------------------|-----------|-----------|-----------|
| XXX XXX<br>Technical<br>Elective 1 |                           | 3         | 0         | 3         |
| XXX XXX<br>Technical<br>Elective 2 |                           | 3         | 0         | 3         |
| SUR 230                            | Control Surveying         | 3         | 3         | 4         |
| SUR 310                            | Surveying Laws and Ethics | 4         | 0         | 4         |
| <b>Semester 4</b>                  |                           |           |           |           |
| SUR 30X<br>Surveying<br>Elective   |                           | 4         | 0         | 4         |
| <b>Total<br/>Credits:</b>          |                           | <b>30</b> | <b>10</b> | <b>34</b> |

## Electives

### Technical Electives

Students seeking registration in Indiana are required to take:

MAT 251 Calculus 1  
& PHY 152 and Physics 2: Algebra and Trigonometry-Based

Students seeking registration in Ohio or Kentucky choose technical electives in consultation with the Program Chair

### Surveying Elective

|         |  |   |
|---------|--|---|
| SUR 300 | Advanced Surveying Calculations and Statistics | 4 |
| SUR 305 | Geospatial Surveying                           | 4 |

## Courses

### SUR 100 Introduction to Land Surveying

**3 Credits. 2 Lecture Hours. 2 Lab Hours.**

A course on foundational concepts in land surveying. Topics include: Land Surveying program expectations and curriculum, career preparation, licensing, ethics, diversity, first aid, and OSHA regulations. Students use Microsoft Word, Excel, and PowerPoint to complete assignments.

Prerequisites: None

### SUR 105 Surveying Fundamentals

**3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A course on foundation concepts of land surveying and site planning. Topics include: angle, distance, and elevation measurement; contours; and mapping and site planning fundamentals. Students complete outdoor field exercises and manual drafting lab exercises.

Prerequisites: MAT 124 or MAT 096 or appropriate placement

### SUR 110 Surveying for Construction Layout

**3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A course in land surveying and construction layout. Topics include: traverse calculations, coordinate geometry, and field construction layout with methods of providing line and grade for varied projects. Students complete outdoor field exercises and computer lab exercises.

Prerequisites: SUR 105

### SUR 120 Computer Aided Design, Civil 3D, and Surveying Software

**4 Credits. 2 Lecture Hours. 4 Lab Hours.**

A course on applying advanced concepts of computer aided design, using Civil 3D and other surveying software. Students complete outdoor field and computer lab exercises and take the National Society of Professional Surveyors (NSPS) CST Level I exam.

Prerequisites: CET 115

### SUR 130 Surveying History

**4 Credits. 4 Lecture Hours. 0 Lab Hour.**

A course on the history of surveying in Ohio, Indiana, and Kentucky, including the original surveys in these states.

Prerequisites: Placement into ENG 101A

### SUR 191 Part-Time Cooperative Education 1: Land Surveying

**1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking a bachelor's degree participate in a part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: CET 100 or SUR 100

### SUR 192 Part-Time Cooperative Education 2: Land Surveying

**1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking a bachelor's degree participate in a part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 191

### SUR 193 Part-Time Cooperative Education 3: Land Surveying

**1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking a bachelor's degree participate in a part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 192 or SUR 291

### SUR 194 Part-Time Cooperative Education 4: Land Surveying

**1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking a bachelor's degree participate in a part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 193

### SUR 200 Route Location and Design

**4 Credits. 3 Lecture Hours. 2 Lab Hours.**

A course on highway design criteria and standards. Topics include: design and layout of horizontal curves, verticals, and spirals; superelevation use; typical sections; and boundary, area, and right-of-way determination. Students complete outdoor field exercises and computer lab exercises.

Prerequisites: SUR 110

**SUR 201 Elements of Boundary Surveying 1****4 Credits. 3 Lecture Hours. 2 Lab Hours.**

A course on fundamental concepts and techniques of land boundary surveying. Topics include: records research, state minimum standards, monumentation of corners, and simple plats and legal descriptions. Students must complete field exercises.

Prerequisites: SUR 110

**SUR 202 Elements of Boundary Surveying 2****4 Credits. 3 Lecture Hours. 3 Lab Hours.**

A continuation of SUR 201. Topics include: sequential and simultaneous boundaries, riparian and littoral boundaries, public land surveys, easements, and legal principles of property relating to surveyors.

Prerequisites: SUR 201

**SUR 215 Land Information Modeling****3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A course on concepts and techniques of land modeling. Topics include: mapping, using geographic information system software, advanced digital terrain modeling, 3D laser scanning, LIDAR, high-definition surveying, and 3D site modeling for visualization and machine-control projects.

Prerequisites: SUR 110

**SUR 221 Dendrology 1****2 Credits. 2 Lecture Hours. 0 Lab Hour.**

A 7-week course on identification of commonly-encountered woody plants of southwestern Ohio, southeastern Indiana, and northern Kentucky, emphasizing use of botanical keys for identification during the summer season. Topics include: identifying markings and evidence of tree remnants to identify property corners and witness corners for land surveying.

Prerequisites: None

**SUR 222 Dendrology 2****1 Credit. 0 Lecture Hour. 2 Lab Hours.**

A 7-week course that is a continuation of SUR 221, emphasizing use of botanical keys for identification during the winter season while identifying commonly-encountered woody plants of southwestern Ohio, southeastern Indiana, and northern Kentucky.

Prerequisites: SUR 221

**SUR 230 Control Surveying****4 Credits. 3 Lecture Hours. 3 Lab Hours.**

A course in concepts and techniques of control surveying. Topics include: basic geodesy, state plane coordinate concepts and calculations, establishing horizontal and vertical control, GPS positioning, and network adjustment. Students complete outdoor field and computer lab exercises and take the National Society of Professional Surveyors (NSPS) CST Level II exam.

Prerequisites: SUR 200

**SUR 291 Full-Time Cooperative Education 1: Land Surveying****2 Credits. 1 Lecture Hour. 40 Lab Hours.**

Students seeking an associate's or bachelor's degree participate in a full-time field learning experience related to their degree. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 100 or CET 100

**SUR 292 Full-Time Cooperative Education 2: Land Surveying****2 Credits. 1 Lecture Hour. 40 Lab Hours.**

Students seeking an associate's or bachelor's degree participate in a full-time field learning experience related to their degree. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 291

**SUR 300 Advanced Surveying Calculations and Statistics****4 Credits. 4 Lecture Hours. 0 Lab Hour.**

A course on survey calculations employing statistical concepts. Topics include: descriptive and inferential statistics, advanced coordinate geometry methods, least squares adjustment, and error theory.

Prerequisites: SUR 200

**SUR 305 Geospatial Surveying****4 Credits. 4 Lecture Hours. 0 Lab Hour.**

A course on surveying using geospatial methods. Topics include: satellite positioning, geographic information systems, remote sensing, and laser scanning.

Prerequisites: SUR 230

**SUR 310 Surveying Laws and Ethics****4 Credits. 4 Lecture Hours. 0 Lab Hour.**

An advanced surveying course on survey law and surveying ethics in Ohio, Indiana, and Kentucky. Topics include: legislation affecting land surveyors including minimum standards, registration, and ethics laws and regulations governing land surveyors in Ohio, Indiana, and Kentucky.

Prerequisites: SUR 202

**SUR 391 Part-Time Cooperative Education 1: Land Surveying****1 Credit. 1 Lecture Hour. 20 Lab Hours.**

Students seeking a bachelor's degree participate in a part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 194 or SUR 292

**SUR 392 Part-Time Cooperative Education 2: Land Surveying****1 Credit. 0 Lecture Hour. 20 Lab Hours.**

Students seeking a bachelor's degree participate in a part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 391

**SUR 393 Part-Time Cooperative Education 3: Land Surveying****1 Credit. 0 Lecture Hour. 20 Lab Hours.**

Students seeking a bachelor's degree participate in a part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 392

**SUR 394 Part-Time Cooperative Education 4: Land Surveying****1 Credit. 0 Lecture Hour. 20 Lab Hours.**

Students seeking a bachelor's degree participate in a part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 393

**SUR 420 Photogrammetry and Remote Sensing**

**3 Credits. 2 Lecture Hours. 3 Lab Hours.**

A course on concepts and techniques for photogrammetry and remote sensing. Topics include: laser scanning, data storage and usage, data sharing, unmanned aerial vehicles, and other current advanced surveying technologies.

Prerequisites: SUR 300 and SUR 305

**SUR 465 Subdivision Design and Drainage Control**

**4 Credits. 3 Lecture Hours. 3 Lab Hours.**

A course on applying land surveying and civil engineering design principles to land development projects. Topics include: subdivision regulations, zoning regulations, lot layout, street layout, utility design, drainage, and site grading. Students create a set of subdivision drawings to meet local standards.

Prerequisites: SUR 120 and SUR 200

**SUR 490 Land Surveying Capstone**

**3 Credits. 1 Lecture Hour. 6 Lab Hours.**

Students complete a field project that demonstrates integrated competencies in advanced surveying concepts and techniques. Students also prepare for and take the National Council of Examiners for Engineering and Surveying (NCEES) Fundamentals of Surveying exam.

Prerequisites: SUR 200 and SUR 310

**SUR 491 Full-Time Cooperative Education 3: Land Surveying**

**2 Credits. 1 Lecture Hour. 40 Lab Hours.**

Students seeking a bachelor's degree participate in a full-time field learning experience related to their degree. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 194 or SUR 292

**SUR 492 Full-Time Cooperative Education 4: Land Surveying**

**2 Credits. 1 Lecture Hour. 40 Lab Hours.**

Students seeking a bachelor's degree participate in a full-time field learning experience related to their degree. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.

Prerequisites: SUR 491