

# Land Surveying Bachelor's Degreee (LS.BAS)

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The Bachelor of Applied Science degree in Land Surveying prepares students for work as professional surveyors, and meets the educational requirements for surveyors in Ohio, Indiana, and Kentucky.

Graduates also are prepared to take NCEES exams (National Council of Examiners for Engineering and Surveying) that are required to obtain professional licensure in land surveying in Ohio, Indiana, and Kentucky.

Bachelor's degree coursework includes fundamental principles of civil engineering, construction, and site design, as well as skills required to operate state-of-the-art surveying equipment and computer software.

In addition, students gain knowledge of boundary resolution, subdivision design, geographic information systems (GIS), and global positioning systems (GPS).

Students participate in experiential learning through cooperative education in each year of the bachelor's degree program.

A surveyor enjoys diverse job responsibilities. Many surveyors work outside for surveying firms collecting data, establishing control points, and determining boundary locations. Others work inside at a surveying firm, a civil engineering office, or in an architecture firm, helping with site design activities and developing plans while using the field data.

Surveyors may work on their own or with firms specializing in construction, architecture, or engineering. Surveyors also work in private industry or work for the public with responsibilities including planning and zoning, transportation, land development, forensics, boundary control, geomatics, or law.

Graduates of the bachelor's degree program have the knowledge and skills needed to establish their own company or work for a larger firm as a land surveying technician, professional land surveyor, or survey director.

The Bachelor of Applied Science degree program in Land Surveying is accredited by the Applied and Natural Science Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), [www.abet.org](http://www.abet.org) (<https://www.abet.org/>).

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 (LS)

### First Year

Semester 1		Lec	Lab	Credits
FYE 1XX		1	0	1
First Year Experience Elective				
MAT 151	College Algebra	4	0	4
SUR 100	Introduction to Land Surveying	2	2	3
CET 115	Architectural Drafting and Computer Aided Design	2	4	4
SUR 105	Surveying Fundamentals	2	3	3

### Semester 2

MAT 152	Trigonometry	4	0	4
SUR 120	Computer Aided Design, Civil 3D, and Surveying Software	2	4	4
SUR 110	Surveying for Construction Layout	2	3	3
SUR 130	Surveying History	4	0	4

### Semester 3

ENG 101	English Composition 1	3	0	3
SUR X9X	Cooperative Education Elective 1	1	40	2

### Second Year

#### Semester 1

PHY 151	Physics 1: Algebra and Trigonometry-Based	3	2	4
SUR 221	Dendrology 1	2	0	2
SUR 200	Route Location and Design	3	2	4
SUR 201	Elements of Boundary Surveying 1	3	2	4
SUR 215	Land Information Modeling	2	3	3

#### Semester 2

ENG 10X	English Composition Elective	3	0	3
ECO 110	Principles of Macroeconomics	3	0	3
COMM 110	Public Speaking	3	0	3
SUR 222	Dendrology 2	0	2	1
SUR 202	Elements of Boundary Surveying 2	3	3	4

#### Semester 3

SUR 230	Control Surveying	3	3	4
SUR X9X	Cooperative Education Elective 2	1	40	2

### Third Year

#### Semester 1

XXX XXX Social/ Behavioral Science Elective		3	0	3
XXX XXX Arts/ Humanities Elective 1		3	0	3
MAT XXX Mathematics Elective		2	2	3
SUR 300 Advanced Surveying Calculations and Statistics		4	0	4
<b>Semester 2</b>				
PHY 152 Physics 2: Algebra and Trigonometry-Based		3	2	4
XXX XXX Arts/ Humanities Elective 2		3	0	3
SUR 310 Surveying Laws and Ethics		4	0	4
SUR 305 Geospatial Surveying		4	0	4
<b>Semester 3</b>				
SUR X9X Cooperative Education Elective 3		1	40	2
<b>Fourth Year</b>				
<b>Semester 1</b>				
SUR 420 Photogrammetry and Remote Sensing		2	3	3
EVS 120 Environmental Geology		3	2	4
MKT 101 Principles of Marketing		3	0	3
MGT 120 Entrepreneurship		3	0	3
<b>Semester 2</b>				
XXX XXX Science Elective		3	2	4
SUR 465 Subdivision Design and Drainage Control		3	3	4
SUR 490 Land Surveying Capstone		1	6	3
<b>Total</b>		<b>101</b>	<b>173</b>	<b>126</b>
<b>Credits:</b>				

## Electives

### First Year Experience Elective

FYE 100	Essentials for College Success	1
FYE 105	Skills for Academic and Personal Success	2
FYE 110	Intensive College Success Strategies	3

### English Composition Elective

ENG 102	English Composition 2: Contemporary Issues	3
ENG 104	English Composition 2: Technical Communication	3
ENG 105	English Composition 2: Business Communication	3

### Mathematics Elective

MAT 131	Statistics 1	3
MAT 251	Calculus 1	5

### Social/Behavioral Science Elective (select 1 course)

ECO 105	Principles of Microeconomics	3
GEO 105	World Regional Geography: the Americas, Europe, and Australia	3
GEO 110	World Regional Geography: Asia, Africa, and the Middle East	3
GEO 115	Cultural Geography	3
HST 101	World History: First Civilizations to 1500	3
HST 102	World History: 1500 to Present	3
HST 111	American History: Early Settlers to 1877	3
HST 112	American History: 1877 to Present	3
HST 121	African American History: Origins to 1877	3
HST 122	African American History: 1877 to Present	3
LBR 105	Introduction to Labor and Employee Relations	3
POL 101	Introduction to American Government	3
PSY 110	Introduction to Psychology	3
PSY 200	Abnormal Psychology	3
PSY 205	Child Development	3
PSY 210	Adolescent Development	3
PSY 215	Adult Development	3
PSY 220	Social Psychology	3
PSY 225	Lifespan Development	3
SOC 105	Introduction to Sociology	3
SOC 115	Marriage and the Family	3
SOC 130	Sociology of Aging	3
SOC 140	Sociology of Gender	3

### Arts/Humanities Electives (select 2 courses)

ART 110	Introduction to Art	3
ART 111	Art History: Ancient to Medieval Periods	3
ART 112	Art History: Renaissance to the Present	3
COMM 130	Introduction to Film Studies	3
LIT 200	Introduction to Literature	3
LIT 210	The Short Story	3
LIT 220	Poetry	3
LIT 230	Drama	3
LIT 240	The Novel	3
LIT 251	American Literature to 1865	3
LIT 252	American Literature since 1865	3
LIT 255	African American Literature	3
LIT 261	British Literature: Medieval Period to 1800	3
LIT 262	British Literature: 1800 to Present	3
LIT 265	Shakespeare	3
LIT 270	Children's Literature	3
LIT 280	Science Fiction	3
LIT 285	Women Writers	3
MUS 101	Music History: Middle Ages to Late 19th Century	3
MUS 102	Music History: 20th Century	3
MUS 105	Music History: African-American Music	3
MUS 110	Jazz Appreciation	3

MUS 115	Rock and Pop Music	3
PHI 105	Introduction to Philosophy	3
PHI 110	Ethics	3
REL 105	World Religions	3
THE 105	Theater Appreciation	3
THE 110	History of Theater	3
<b>Science Elective</b>		
BIO 131	Biology 1	5
CHE 121 & CHE 131	General Chemistry 1 and General Chemistry 1 Lab	5
PSC 105	Stars and Galaxies	4
<b>Cooperative Education Electives: 1 &amp; 2 (4 credit hours required)</b>		
SUR 191	Part-Time Cooperative Education 1: Land Surveying	1
SUR 192	Part-Time Cooperative Education 2: Land Surveying	1
SUR 193	Part-Time Cooperative Education 3: Land Surveying	1
SUR 194	Part-Time Cooperative Education 4: Land Surveying	1
SUR 291	Full-Time Cooperative Education 1: Land Surveying	2
SUR 292	Full-Time Cooperative Education 2: Land Surveying	2
<b>Cooperative Education Elective: 3 (2 credit hours required)</b>		
SUR 391	Part-Time Cooperative Education 1: Land Surveying	1
SUR 392	Part-Time Cooperative Education 2: Land Surveying	1
SUR 491	Full-Time Cooperative Education 3: Land Surveying	2

Some courses are offered in alternative versions identified with a letter after the course number-- for example, ENG 101 and ENG 101A.

- This curriculum displays only course numbers without the added letter.
- The alternative version, when available, meets the requirements of the course version without the added letter.

## Land Surveying Bachelor's Degree (LS.BAS)

- An ability to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline.
- An ability to formulate or design a system, process, procedure, or program to meet desired needs.
- An ability to develop and conduct experiments or test hypotheses, analyze and interpret data, and use scientific judgment to draw conclusions.
- An ability to communicate effectively with a range of audiences.
- An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts.

- An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

## 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