Effective Term: Fall Semester 2020

COURSE OUTLINE FOR CREDIT COURSE

Basic Course Information

Courses numbered 1 - 49 are remedial or college preparatory courses which do not apply toward an A. A. Degree and are not intended for transfer. Courses numbered 50-99 apply toward an AA Degree, but are not intended for transfer. Courses numbered 100 and higher apply toward an AA Degree and/or are intended for transfer to a four-year college or university.

Discipline: GEOG
Course Number: 145
Title: LiDAR Data Processing and GIS Integration

Units and Hours

Units: 1.00
Grade Option: Grade/Pass/No Pass
Course Length in Weeks: Min Weeks - 16 Max Weeks - 18
Semester Hours

Hour Type	Hours	Min Semester Hours	Max Semester Hours
Lecture Category	1.00	16.00	18.00
Lab Category	0.00	0.00	0.00
Subtotal	1.00	16.00	18.00
Out of Class Hour	2.00	32.00	36.00
Totals	3.00	48.00	54.00

Grading Basis: Grade/Pass/No Pass
Basic Skills Requirements: Appropriate Language and/or Computational Skills.

Requisites

To satisfy a prerequisite, the student must have earned a letter grade of A, B, C or P(Pass) in the prerequisite course, unless otherwise stated.

Prerequisite: None
Corequisite (Course required to be taken concurrently): None
Prerequisite: (Completion of, or concurrent enrollment in): None
Recommended Preparation: None
Limitation on Enrollment (e.g. Performance tryout or audition): None

Catalog Description

This course will introduce students to basic concepts in Light Detection and Ranging (LiDAR). Students will also learn to process LiDAR data collected by unmanned aircraft systems (UAS), and analysis these data using Geographic Information Systems (GIS).

Student Learning Outcomes

Upon successful completion of the course, the student will be able to:

1. Describe the functions of the major components of a UAS LiDAR system.
2. Explain laser return and point density, and their implication for LiDAR data analysis.

Specific Course Objectives

Upon successful completion of the course, the student will be able to:

1. Evaluate the difference between point cloud data from photogrammetry versus LiDAR.
2. Analyze the different applications of LiDAR in the UAS industry.
3. Compare the advantages and disadvantages of manual versus automated point cloud classification techniques.
4. Implement the workflow needed to process and analyze LiDAR data.

Methods of Instruction

Methods of Instruction may include, but are not limited to, the following

1. Lecture
2. Group Projects/Activities
3. Learning Modules
4. Discussion

Content in Terms of Specific Body of Knowledge

I. Introduction to LiDAR
   A. Principles
      1. Point density
      2. Laser returns
      3. Intensity values
   B. Hardware Components
      1. LiDAR sensors
      2. Inertial measurement unit
      3. GPS
      4. Onboard computer and storage

II. Data Processing
   A. Manual classification
      1. Data requirements
      2. Advantages
      3. Disadvantages
   B. Automated classification
      1. Data requirements
      2. Advantages
      3. Disadvantages

III. Data Analysis
   A. Feature extraction
      1. Industry use cases
   B. 3-D modeling
      1. Industry use cases
   C. Volumetric analysis
      1. Industry use cases

Textbooks/Resources

Textbooks

1. Pinliang Dong, Qi Chen. *LiDAR remote sensing and applications.* 1st CRC Press, 2018.

Assignments

Required Reading:

Students will review textbooks and journal articles to learn about the principles of photogrammetry and LiDAR. They will also review trade publications to learn how LiDAR is applied in the UAS industry.

Required Writing:

Students will be require to write up the results from their learning modules and also summarize different industry applications of LiDAR.

Critical Thinking:

Students will be required to reflect on the development of LiDAR hardware and data analysis techniques. They will also need to identify the advantages and disadvantages of various analytical methods introduced in the course.

Outside Assignments:

Students will need to reserach novel applications of LiDAR in the UAS industry.

Students are expected to spend a minimum of three hours per unit per week in class and on outside assignments, prorated for short-term classes.

Methods of Assessment

Methods of Assessment may include, but are not limited to, the following:

1. Class Work
2. Class Participation
3. Oral Presentation
4. Homework
5. Standardized instrument objectively measuring student knowledge

Open Entry/Open Exit

Not Open Entry/Open Exit

Repeatability

Course is Repeatable for Reasons other than a Deficient Grade? No

Contact Person

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