ENGR 523
Photogrammetric Engineering & Remote Sensing

Credits: 3

Term(s) to be offered: Spring

Catalog Description: Photogrammetry and remote sensing; image registration and resampling; image processing and classification; multi-sensor fusion; imaging spectroscopy

Prerequisites: CIVE 576 or CIVE 577, or consent of the instructor.


Software: All students (on-campus and distance) will be provided one year educational version licenses for ERDAS IMAGINE™ and ArcGIS 10™ software, and associated extensions. Other open-source remote sensing software packages may also be made available to the students.

Course Coordinator: Dr. John W. Labadie, Professor of Civil and Environmental Engineering

Course objectives: This course introduces the student to advanced topics and methods of photogrammetric engineering and remote sensing in GIS. An overview is provided of remote sensing physical models, remote sensing platforms and sensors, sources and types of geometric distortions and methods for correcting them. Image registration and resampling methods are presented, along with theoretical and practical aspects of georeferencing and geocoding. The course discusses image processing techniques, including radiometric enhancement methods, multispectral techniques, and spatial and spectral domain image enhancement methods, including advanced concepts of multisensory image fusion. The theory and applications of remote sensing multispectral image classification are presented, including a theoretical overview of feature extraction and reduction methods. Concepts and methods of supervised and unsupervised classification are extended to analysis of hyperspectral data. Numerous case study applications in environmental engineering are presented. Students successfully completing this course will be able to formulate remote sensing procedures and apply modern methods of image processing and classification for development and use of geospatial datasets by engineers.

Schedule:
wk 1  Remote sensing concepts in GIS and geospatial engineering
wk 2  Optical radiation
wk 3  Optical sensors
wk 4  Image statistics
wk 5  Radiometric enhancement
wk 6  Multispectral transformations
wk 7  Georeferencing
wk 8  Feature extraction and clustering
wk 9  Classification methods; image processing; supervised and unsupervised classification; image rectification and resampling
wk.10  Hyperspectral image analysis
wk.11  Geometric enhancement (spatial and frequency domain)
wk.12. Data fusion.
wk.13. Change detection
wk.14. Radar imagery; analysis of imagery in GIS
wk.15. Case study applications in environmental engineering
wk.16. Final Exam

**Mode of Delivery:** Two hours of class lectures and two hours of laboratory per week.

**Methods of Evaluation:** Term grades for this course will use the +/- grading system as described in the CSU catalog. The following scale will generally be used: A ≥ 95; A- ≥ 90; B+ ≥ 85; B ≥ 80; B- ≥ 75; C+ ≥ 70; C ≥ 60; D ≥ 50; F < 50. The course grade will be based on approximately the following distribution; however, the instructor may adjust these weights as necessary:

- Quizzes  5%
- Midterm Exam  15%
- Final Exam  20%
- Threaded Discussion  10%
- Weekly Homework  10%
- Lab Exercises  20%
- Term Project  20%