THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Advanced Geospatial Sensors and Methods

CIVILEN 8462

Credit Hours:
4.00 - 4.00

Course Levels:
Graduate (5000-8000 level)

Course Components:
Lecture
Lab
Field Experience

Course Description:
Technologies, methods and sensors for geospatial information acquisition using land-based, airborne and spaceborn platforms. Methods and techniques of data processing and analysis, error characteristics, sensor calibration and integration.

Prerequisites and Co-requisites:
Prereq: 7461 and 8443, or permission of instructor.

Course Goals / Objectives:
- Become familiar with advanced geospatial methods of data acquisition, processing and interpretation, sensor and data error characteristics for LiDAR, RADAR, optical imagery, HSI, INS, GPS, cellular and WiFi networks, ultra-wide band, etc.
- Become familiar with advanced geospatial numerical methods of data and senor integration, quality assurance/quality control and data modeling techniques
- Become familiar with applications of advanced geospatial systems in positioning and remote sensing

Course Topics:

- Introduction to imaging and navigation sensors, general principles of direct georeferencing concept, pros and cons of direct georeferencing, requirements and limitations of direct georeferencing using GPS/INS fusion.
- Position, location, coordinates, fundamentals of reference systems and frames; remote and autonomous positioning. Inadequacies of GPS/GNSS, need and requirements for augmentation, concept of ubiquitous positioning/geolocation
- Radio-positioning, communication and sensing: GNSS and GPS, cellular, WiFi,and ultra-wide band positioning, dedicated short-range communications systems and active RFID. Network architecture, ad hoc network formation. Example applications.
- Non-radio and sensor-based positioning: infrared, ultrasonics, optical video cameras, magnetic fields, inertial systems, pedometers, sensor fusion concept. Simultaneous location and mapping concept. Example applications.
- Visual positioning: outside-in positioning, inside-out positioning, ubiquitous digital cameras, vehicle location, motion capture, maps and whereness. Example applications in positioning and remote sensing.
- Introduction to laser ranging, profiling and scanning; airborne, spaceborn and terrestrial systems and sensors. LiDAR systems and their calibration.
- Accuracy, quality assurance and quality control for LiDAR data, data filtering, DEM/DTM generation. Integration with photogrammetric data. Example applications.
- Algorithms and methods of sensor and data integration: linear and non-linear filtering, Artificial Intelligence-based methods and Knowledge Based Systems: Artificial Neural Networks and Fuzzy Logic supporting traditional filtering techniques.

Designation:

Elective
Required