

CN 473 Land Navigation using Integrated Systems
September 20, 2010, 6:45 pm-9:30 pm, CEU: 2.5
GNSS Solutions® Tutorials prior to ION GNSS 2010, September 20-21, 2010
Oregon Convention Center, Portland, Oregon, USA

Instructor: Dr. David M. Bevly, Associate Professor, Auburn University

Prerequisite: Some knowledge of GPS, INS, and dynamics will be useful.

Intended Audience: Engineers, scientists, and managers interested in navigation system integration issued for manned and unmanned vehicle technologies. The course provides an overview of GPS and IMU measurements used for navigation and control of ground vehicles as well as the fundamental dynamics used to describe the motion of ground vehicles.

Notes Provided: Slides presented will be professionally spiral bound, with clear plastic cover, including color to add clarity where needed.

Reference List: A reference list will be provided as part of the note package for completeness and to allow the interested attendee to obtain additional information.

Course Overview: This course emphasizes the fundamentals of integrated navigation systems for land vehicles applications. The course reviews common sensors used in integrated navigation systems such as: GPS, INS, IMU, odometer, vision, and Lidar for navigation in benign and GPS denied environments. The course includes examples of work on a variety of vehicles with illustrations of navigation and estimation results.

Course Content: The main topics to be covered by this course are:

- GPS/INS Integration for Vehicle dynamics
 - Brief overview of GPS and its errors
 - IMU modeling and ground vehicle dead-reckoning errors
 - Introduction of the Kalman Filter
- Ground Vehicle Dynamics
 - Ground vehicle models
 - Estimation of vehicle navigation states
 - Estimation of vehicle parameters
- Integration of additional navigational signals
 - Vision
 - Lidar
 - Doppler Radar
 - Odometer
- Application Examples
 - DARPA Grand Challenge
 - John Deere Auto Steer Tractor
 - Other UGVs

Course Outcomes: At the completion of this course, the attendee should have an understanding of how to use of navigation sensors can be used for in land vehicle applications. The user will also obtain knowledge of the core vehicle dynamics and how they can be measured using various navigation sensor measurements. For additional knowledge on the integration of GPS and INS, CN462: Applications of Strapdown Inertial Navigation I and CN463: Applications of Strapdown Inertial Navigation II - Integrated Inertial Navigation Systems, or CN 482: Fundamentals of GPS/INS Integration I and CN 483: Fundamentals of GPS/INS Integration II are recommended.