

**CN410 Fundamentals of Differential GNSS with emphasis on DGPS
ION GNSS 2006, September 26, 2006, 8:30 am-12:00 pm, CEU: 3.0**

Instructor: Dr. Chris G. Bartone, P.E., Associate Professor, Ohio University

Prerequisite: Knowledge of mathematics, computer science, and introduction to satellite navigation systems (e.g., CN406 Fundamentals of GNSS using GPS II) will be useful.

Intended Audience: Engineers, scientists, and managers involved with the design, development, implementation, and/or use of system using GPS, Galileo, and/or Glonass. The course provides a solid basis in the fundamentals of differential satellite navigation and in particular details on various error mitigation techniques and method for applications of various baseline lengths and performance requirements. The course is more advanced than a simple introduction to GNSS course, but not too advanced for the beginner to GNSS.

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 differential GNSS with emphasis on differential GPS (DGPS) applications. The course will explore the various error mitigation techniques and methods for various high performance applications of various baseline lengths. Performance aspects with respect to accuracy, integrity, continuity, and availability will be presented.

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

- Introduction to differential GPS (DGPS) and different ways to implement it-(overview)
- Correlation and de-correlation of errors over type, baseline length, and time for differential GNSS architectures
- Integrity of a systems (review)
- GNSS Translators
- Remote Tracking, positioning, and control
- Differencing techniques;
 - Single difference
 - Double difference
 - Triple difference
- Error Mitigation (Advanced Techniques) for:
 - SV Orbit and Clock
 - Multipath
 - Smoothing techniques
 - Atmospheric Errors
 - Troposphere
 - Ionosphere
- Data link considerations for DGNSS systems.

- Example systems (overview):
 - Wide area augmentation systems
 - Regional area augmentation systems
 - Nationwide DPGS
 - Local area augmentation systems
 - Global area augmentation systems
- Introduction to carrier phase ambiguity based systems

Course Outcomes: At the completion of this course, the attendee should have the ability to understand the fundamentals of differential GNSS systems in the presence of measurement error. Additionally, knowledge gain in the understanding and implementation of various error mitigation techniques through differential techniques will enable an enhanced error mitigated user's solution.