

CN405 Fundamentals of GNSS using GPS I
ION GNSS 2006, September 25, 2006, 8:30 am-12:00 pm, CEU: 3.0

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

Prerequisite: Some knowledge of mathematics and computer science will be useful.

Intended Audience: Engineers, scientists, and managers somewhat new to the area of satellite navigation using GPS, Galileo, and/or Glonass. The course provides a solid basis in the fundamentals of satellite navigation. The course is more advanced than a simple user's course, but not too detailed 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 GNSS with emphasis on GPS. The core functions need to be performed in obtaining a user solution using GPS in an error free environment will be explained. The course concludes with an illustration of a user state calculation, and an introduction to an error budget in GPS.

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

- Positioning vs Navigation
- GPS Segments: Control, Space, User.
- Coordinate frames and datum's used in the application of GNSS.
 - Terrestrial and Inertial Reference Frames
 - Earth Centered Earth Fixed (ECEF), a.k.a. EFG
 - Latitude, Longitude, Height (LLH), Mean Sea Level (MSL)
 - Height: Geodetic, MSL, WGS-84, Undulation
 - Local Level Tangent (LLT)
 - Coordinate Conversions
- GPS signal structure formats for current and future signals.
 - Basic GPS: C/A, P(Y) code formats
 - Modernized GPS & Galileo (Overview)
- GPS Link Budget
- GPS Receiver Architecture Overview
- GPS Navigation Message Data Format Descriptions
- Calculation of the GPS space vehicle (SV) position using the broadcast Kepler parameters (ephemeris and almanac)
- GPS Time Considerations
- Calculation of user state (i.e., position and time)
- Associated performance parameters (i.e., dilution of position terms)
- GPS error budget (overview)

Course Outcomes: At the completion of this course, the attendee should have the ability to understand the fundamentals of GNSS as applied to GPS and knowledge of the core functions that need to be performed to obtain a users solution in an error free environment.