PUBLIC VENUE OR ON-SITE COURSE

Course 346: GPS/GNSS Operations for Engineers & Technical Professionals: Principles, Technology, Applications and an Introduction to Basic DGPS (2.7 CEUs)

Course Description
Take this 4-day course to gain a comprehensive understanding of GPS/GNSS system concepts, design and operation, including information on GPS signal processing by the receiver, techniques by which GPS obtains position, velocity and time, and a brief introduction to differential GPS (DGPS) and Kalman filtering. This course is similar to Course 356 (5 days), but with less emphasis on DGPS and Kalman filtering.

Objectives
This course is designed to give you
- A comprehensive introduction to GPS, system concepts, an introduction to DGPS, design, operation, implementation and applications.
- Detailed information on the GPS signal, its processing by the receiver, and the techniques by which GPS obtains position, velocity and time.
- Current information on the status, plans, schedule and capabilities of GPS, as well as of other satellite-based systems with position velocity and time determination applications.
- Information to fill the technical gaps for those working in the GPS/GNSS fields.

Who Should Attend?
Excellent for engineering staff who need to be rapidly brought up to speed on GNSS, and for those already working in GPS who need exposure to the system as a whole in order to work more effectively.

Prerequisites
Familiarity with engineering terms and analysis techniques. General familiarity with matrix operations and familiarity with signal processing techniques is desirable.

Materials You Will Keep
- A color electronic copy of all course notes on a USB Drive or CD-ROM. Bringing a laptop to this class is highly recommended for taking notes using the Adobe® Acrobat® sticky notes feature; power access will be provided.
- A black and white hard copy of the course notes will also be provided.

Public Venue Course Fee Entitles You to the Following Books

Instructor
Dr. Chris Hegarty

To REGISTER or for MORE INFORMATION, Contact Carolyn McDonald at (703) 256-8900 or cmcdonald@navtechgps.com.

DAY 1 AND 2 MAY BE TAKEN AS COURSE 122. SEE REGISTRATION FORM

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Lunch is on your own

Legacy GPS Signals
- Signal structure and characteristics
- Modulations: BPSK, DSSS, BOC
- Signal generation
- Navigation data

Measurements and Positioning
- Pseudorange and carrier phase measurements
- Least squares solution
- Dilution of precision
- Types of positioning solutions

GPS Receiver Basics
- Types of receivers
- Functional overview
- Antennas

Error Sources and Models
- Sources of error and correction models
- GPS signals in space performance
- Ionospheric and tropospheric effects
- Multipath
- Error budget

Augmentations and Other Constellations
- Augmentations: local-area, satellite-based, and regional
- Russia’s GLONASS
- Europe’s Galileo
- China’s Compass (BeiDou)

Precise Positioning
- Precise positioning concepts
- Reference station networks
- RINEX data format

GPS Signal Structure and Message Content
- Signal structure
- Signal properties
- Navigation message

GPS Receiver Overview
- Functional overview
- Synchronization concepts
- Acquisition
- Code tracking
- Carrier tracking
- Data demodulation

GPS Antennas
- Antenna types
- Antenna performance characteristics
- Preemphasis
- Low noise amplifiers (LNAs)
- Noise figure

GPS Navigation Algorithms: Point Solutions
- Pseudorange measurement models
- Point solution method and example

Introduction to Kalman Filtering
- Algorithm overview
- Process and measurement models for navigation
- Simulation examples

Practical Aspects
- Types of GPS and DGPS receivers
- Understanding specification sheets
- Data links
- Antennas
- Receiver and interface standards
- Accessories
- Supplemental notes: Tracing a GPS signal through a receiver

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(Books for on-site contract courses are negotiated as part of contract.)

What Attendees Have Said
“I have been working with GPS since 1976 and still learned a lot from this course.”
— John Barry, FAA, November 2016

“Dr. Hegarty is extremely knowledgeable and well versed in the material. Well prepared and well designed course and course material! Course material was well organized with accompanying slides — Nice notebook!”
— David Wright, Course 346, June 2015.

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