

Course 122: GPS/GNSS Fundamentals & Enhancements (1.2 CEUs)

(Days 1 and 2 of Course 346)

SAME AS DAYS 1 AND 2 OF COURSE 346	
DAY 1	DAY 2
<p>Fundamentals of GPS operation. Overview of how the system works. U.S. policy and current status.</p> <p>GPS System Description</p> <ul style="list-style-type: none"> • Overview and terminology • Principles of operation • Augmentations • Trilateration • Performance overview • Modernization <p>GPS Policy and Context</p> <ul style="list-style-type: none"> • Condensed navigation system history • GPS policy and governance • Modernization program • Ground segment • Other satellite navigation systems <p>GPS Applications</p> <ul style="list-style-type: none"> • Land • Marine • Aviation • Science • Personal navigation • Accuracy measures • Error sources 	<p>GPS Principles and Technologies</p> <p>Clocks and Timing</p> <ul style="list-style-type: none"> • Importance for GPS • Timescales • Clock types • Stability measures • Relativistic effects <p>Geodesy and Satellite Orbits</p> <ul style="list-style-type: none"> • Coordinate frames and geodesy • Satellite orbits • GPS constellation • Constellation maintenance <p>Satellites and Control Segment</p> <ul style="list-style-type: none"> • GPS satellite blocks • Control segment components and operation • Monitor stations, MCS, and ground antennas • Upload operations • Ground control modernization
<p>Legacy GPS Signals</p> <ul style="list-style-type: none"> • Signal structure and characteristics • Modulations: BPSK, DSSS, BOC • Signal generation • Navigation data <p>Measurements and Positioning</p> <ul style="list-style-type: none"> • Pseudorange and carrier phase measurements • Least squares solution • Dilution of precision • Types of positioning solutions <p>GPS Receiver Basics</p> <ul style="list-style-type: none"> • Types of receivers • Functional overview • Antennas 	<p>Error Sources and Models</p> <ul style="list-style-type: none"> • Sources of error and correction models • GPS signals in space performance • Ionospheric and tropospheric effects • Multipath • Error budget <p>Augmentations and Other Constellations</p> <ul style="list-style-type: none"> • Augmentations: local-area, satellite-based, and regional • Russia's GLONASS • Europe's Galileo • China's Compass (BeiDou) <p>Precise Positioning</p> <ul style="list-style-type: none"> • Precise positioning concepts • Reference station networks • RINEX data format

JUST NEED THE FUNDAMENTALS?

Take Course 122, which covers all the major areas of GPS.

Instructor



Dr. Chris Hegarty

OR



Dr. John Betz

Objectives

- ◆ To give an comprehensive introduction to GPS technology, system concepts, design, operation, implementation and applications.
- ◆ To provide detailed information on the GPS signal, its processing by the receiver, and the techniques by which GPS obtains position, velocity and time
- ◆ Note: Course 122 is the same as days 1 and 2 of Courses 336, 346 and 356. The concepts presented in 122 are expanded in depth in the subsequent courses.

Prerequisites

- ◆ Some familiarity with engineering terms is helpful but not essential.

Who Should Attend?

- ◆ Engineers and technical professionals seeking conceptual explanations of GPS / GNSS technology, operation, capabilities, applications, and development trends
- ◆ Professionals in navigation, positioning, and related fields who are concerned with the capabilities, operation and principles of GPS and related GNSS systems.
- ◆ System analysts and specialists who need general information on position data and its use.
- ◆ Managers concerned with GPS, GNSS activities, or the positioning field.

Materials You Will Keep

- ◆ A color electronic copy of all course notes provided in advance on a USB drive or CD-ROM.
- ◆ Ability to use Adobe Acrobat sticky notes.
- ◆ NavtechGPS Glossary of GNSS Acronyms.
- ◆ A black and white hard copy of the course notes.
- ◆ *Introduction to GPS: The Global Positioning System*, 2nd ed., Ahmed El-Rabbany, Artech House, 2006., OR *GPS Basics for Technical Professionals*, P. Misra, 2019.
- ◆ Note: This textbook offer does not apply to private group contracts. Any books for group contracts are negotiated on a case by case basis.

Course Fee Entitles You to the Following Books

Introduction to GPS: *The Global Positioning System*, 2nd ed., Ahmed El-Rabbany, Artech House, 2006., *GPS Basics for Technical Professionals*, Pratap Misra, Ganga-Jamuna Press, 2016. (Note: This arrangement does not apply to on-site contracts. Any books for on-site group contracts are negotiated on a case by case basis.)

What Attendees Have Said

"I liked the overall flow and design of the course, especially because I was trying to take the full 4-day [course]. I feel we touched pretty much all major points."

— Devashish Chandekar, Spirent, San Jose, 2018

"I came into the course with only basic GPS knowledge. The course provided a wealth of information and appreciation of GPS technology. The course exceeded expectations."

— Rex Rotebuck, USCG, 2016

"My main objective was to gain a better understanding about the GPS system as a whole. The course met my objective and having the course content in hard/soft copy is a great bonus!"

— Military Attendee, Name withheld upon request, 2016