

**NEXT PUBLIC COURSE: APRIL 27–28, 2021 (TAUGHT REMOTELY)
PRIVATE GROUP LIVESTREAM REMOTE OPTION AVAILABLE.**

**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

The instructor for April 2021 will be Dr. Chris Hegarty

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