
Global Positioning Systems (GPS)

Course No. 173

FOR WHOM INTENDED individuals involved in a wide range of activities where GPS systems are or could be used to enhance their activities. This would include: engineering, technical, quality, product procurement and anyone who needs to become familiar with the overall GPS system and the terminology used.

BRIEF COURSE DESCRIPTION This course provides an in-depth overview of the Global Positioning System and covers the growth of the GPS concept. Included in the course is a description of the NAVSTAR constellation and the various types of augmented GPS systems. Basic GPS components are covered, including satellites, ground stations, antennas and receivers. Emphasis is placed on signals, timing and false signals including spoofing, jamming and cryptographic concepts.

International GPS systems such as Galileo and GLONASS are discussed. Various GPS applications in transportation, oil and gas exploration, mapping, surveying and communications are discussed. The course concludes with a brief review on the future of GPS and ongoing developments in GPS technology. A useful appendix including information such as a Glossary and definitions is included in the course workbook and provides an excellent reference tool.

CERTIFICATE PROGRAMS This course is a recommended elective for TTI's [Instrumentation Test Specialist \(ITS\) Certificate Program](#), and may be used as an elective for any other TTI [specialist certificate program](#).

PREREQUISITES There are no definite prerequisites for this course. However, this course is aimed toward individuals involved in a related technical field.

TEXT Each participant will receive a [course workbook](#), which contains most of the viewgraphs used during the presentation.

COURSE HOURS, CERTIFICATE AND CEUS Open courses meet seven hours per day. Upcoming presentation dates can be found on our current [open course schedule](#). Class hours/days for on-site courses can vary from 14–35 hours over 2–5 days as requested by our clients. Upon successful course completion, each participant receives a certificate of completion and one Continuing Education Unit (CEU) for every ten class hours.

For [schedules](#), [general information](#) and a [registration form](#), see TTI's web site.

Course Outline

- Introduction to GPS Systems
 - NAVSTAR System, Space, Control and User, History of GPS
 - Background, Current applications
- Basic GPS components
 - Satellites: GPS Constellation
 - Block II / IIA, IIR / IIR-M / IIF / IIIA
 - Ground stations
 - Antennas, Receivers, Master Control stations, Monitor stations
 - Mobil receivers
 - Calibration
- Location of Satellites
 - Triangulation • Control, launch, positioning, steering
 - NAVSTAR Constellation, Iridium satellites.
- GPS Systems
 - Nationwide Differential GPS (NDGPS)
 - Wide Area Augmentation (WAAS)
 - Augmented GPS (AGPS)
 - Global Differential GPS (GDGPS) • Differential GPS (DGPS)
- Signals
 - UHF bands (L, C and S) Code-phase, Carrier-phase
 - Code correlation techniques • C/A-code, P(Y)-code
- Timing
 - Coordinated Universal Time (UTC), Atomic clocks, IRIG Clock
 - Position and Time from GPS
 - Code Phase Tracking (Navigation), Pseudo-Range Navigation
 - Receiver Position, Velocity, and Time, Carrier Phase Track
- Control of the GPS System
 - Master control of GPS constellation at Schriever AFB, CO
 - GPS signal: pseudo-random code for timing, navigation message with ephemeris information
- Corrections
- False Signals
 - False Signals (spoofing)
 - Navigation Message Authentication (NMA)
 - Public spreading Code Authentication
 - Certificates of Authorization
 - Signal Interference or Jamming
- Cryptographic Concepts
- International GPS Systems
 - Galileo, GLONASS, other International GNSS systems
- Actual applications of GPS
 - Military, Government/Civilian
 - Railroad systems, Aviation control, Marine navigation
 - Civilian: Mapping, Surveying, Offshore Oil and Gas applications.
 - Globalstar System, Satellite phones, Cell phone navigation, Child Finder
- Ongoing GPS developments
 - NASA, Military, Civilian
- Appendix
 - Glossary • Definitions
 - Location of Tracking Stations in the US
 - History of Block I Satellites and Status • Loran-C
- Conclusion, Final exam
- Award of certificates for successful completion



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