

**CN407 GNSS Signal Propagation: Theory and Practice**  
**ION GNSS 2006, September 25, 2006, 7:00-9:15 pm, CEU: 2.0**

**Instructor:** Dr. Peter Dare, University of New Brunswick (troposphere)  
Dr. Chris G. Bartone, P.E., Associate Professor, Ohio University (ionosphere)

**Prerequisite:** Knowledge of mathematics, computer science, and introduction to satellite navigation systems (e.g., CN405 or CN406 Fundamentals of GNSS using GPS I or II) 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 theory of signal propagation for GNSS, as well as, practices for error mitigation. This course will provide some additional detail on the propagation effects beyond what is covered in CN406 Fundamentals of GNSS using GPS II.

**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 provides details of atmospheric refraction effects on GNSS signals and how they can be minimized in positioning, navigation, and time transfer. Also discussed is the use of GNSS signals for studying atmospheric phenomena.

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

- Electromagnetic waves
- Refractive index
- Phase and group delay
- Ionospheric effects
- Complex refraction
- Corrections and models
- Scintillation and storms
- Neutral atmosphere effects
- Refractivity of air
- Corrections and models
- The water vapour problem
- Studying the atmosphere with GNSS GPS

**Course Outcomes:** At the completion of this course, the attendee should have the ability to understand the theory related to the propagation aspects of GNSS signals. Additionally, knowledge gain in the understanding and implementation of various practices for error mitigation techniques will enable an enhanced user's solution.

