**CN407 GNSS Signal Propagation: Theory and Practice**
**September 15, 2008, 6:45 pm-9:30 pm, CEU: 2.5, prior to ION GNSS 2008**
**Marriott Savannah Riverfront, Savannah, GA**

**Instructor:** Professor Richard B. Langley, Professor, University of New Brunswick
Professor Peter Dare, Professor, University of New Brunswick

**Prerequisite:** Knowledge of mathematics, computer science, and introduction to satellite navigation systems (e.g., CN405 or CN406 Fundamentals of GNSS I & II with emphasis on GPS) will be useful.

**Intended Audience:** Engineers, scientists, and managers involved with the area of GNSS using GPS, Galileo, Glonass and/or other satellite navigation systems. 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 II with emphasis on GPS.

**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 vapor 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. For further error mitigation using

differential GNSS techniques, CN410 Fundamentals of Differential GNSS applications and CN415 Fundamentals of GNSS Baseline RTK and Network RTK applications are recommended.