



13-G0-M036 - Global Navigation Satellite Systems and Orbit Determination -> 6 credits

Module description:

The lecture addresses selected topics of high-precision applications of Global Navigation Satellite Systems (GNSS) at the example of the European navigation systems EGNOS and Galileo:

- Overview on Navigation and time reference
 - Fundamentals of Satellite Navigation and Orbital Mechanics
 - Galileo and EGNOS system architectures
 - Satellite Geodesy and geodetic reference of Galileo
 - Signal structure and Navigation Message
 - Observation equations for multi-GNSS
 - Algorithms for Position, Velocity and Time (PVT) determination based on multi-GNSS measurements
 - Precise Point Positioning (PPP)
 - Precise Orbit Determination (POD) of satellites
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- Excursion with practical exercises in an operational environment in the ESA Navigation Facility at the European Satellite Control Center ESOC of the European Space Agency ESA as a block event.
 - The lecture is supplemented by selected material for self-study.

Teaching Outcomes:

On successful completion of this module, students should be able to:

- Explain the function and architecture of GNSS as well as areas of application
 - Explain the relations between localisation requirements, navigation, and the geoscience disciplines (e.g. Geodetic reference systems, Time reference, Earth rotation, Gravitational potential etc.)
 - Evaluate the performance and contributions of GNSS and to conceptualise GNSS applications
 - Apply the basic equations for satellite navigation, orbit determination and modelling in post-processing and analysis software
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- *Prerequisites: none*
 - *Literature:* Hofmann-Wellenhof, Lichtenegger, Wasle: GNSS - Global Navigation Satellite Systems. Springer-Verlag. 2008.