UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Faculty of Geoengineering

Course title: PHYSICAL GEODESY

ECTS credit allocation (and other scores): 6

Semester: spring

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 30

Course coordinator/ Department and e-mail: Wojciech Jarmolowski, PhD, wojciech.jarmolowski@uwm.edu.pl

Type of classes: classes

Substantive content

CLASSES: Calculation of normal gravity field of the Earth. Harmonic synthesis of lower order global geopotential models. Accuracy assessment of global geopotential models. Empirical covariance function of different physical quantities and its analytical representation. Least squares collocation of gravity anomalies. Geoid modeling by Stokes integral. Accuracy assessment of local covariance models. Harmonic synthesis of combined, high degree geopotential models and their accuracy assessment. Relations between dynamic, normal and orthometric height systems. Relations between geoid and quasigeoid.

LECTURES: Gravitational potential, centrifugal potantial and potential of the gravity. Earth's disturbing potential and its functionals. Normal gravity field of the Earth. Equipotential surfaces, geoid and quasigeoid. Fundamental equation of physical geodesy. Boundary conditions in geodesy. Spherical harmonic expansion of geopotential and global geopotential models. Synthesis of the functionals of disturbing potential from harmonic expansion coefficients. Stokes integral. Statistical methods in physical geodesy. Spectral decomposition of the functionals of disturbing potential. Gravimetry and gravimetric corrections. Height systems. Satellite observations of gravity field and geoid. Satellite geopotential models and combined geopotential models.

Learning purpose: Knowledge of the gravity model of the Earth. Understanding of the importance of gravity field in numerous geodetic observations and problems. Application of spherical harmonic expansion to calculation of different functionals of disturbing potential. Knowledge of harmonic synthesis algorithms. Skills in computation of global and local geoid heights and precise interpolation of gravity anomalies. Application of geopotential quantities in GNSS positioning and heighting and precise leveling. Knowing of the relationships between disturbing potential and its functionals. Knowledge in the field of height systems and relationships between different height systems.

On completion of the study programme the graduate will gain:

Knowledge: Gravity and figure of the Earth in geodesy, geopotential models, spherical harmonics, height systems

Skills: Normal gravity and gravity functionals, harmonic synthesis, covariance models, least-squares collocation

Social Competencies: Knowledge of the importance of Earth shape, creativity in statistical elaboration of the spatial data.

Basic literature:

Hofmann-Wellenhof B., Moritz H., Physical Geodesy, Springer-Verlag, 2005, pp. 403

Sneeuw N., Physical Geodesy, Universitat Stuttgart, 2006, pp. 137, https://www.gis.uni-stuttgart.de/lehre/campus-docs/LNErdm.pdf

Torge W., Geodesy, Walter de Gruyter, 1991, pp. 416

Supplementary literature:

Vaniček P, An Online Tutorial in Geodesy, University of New Brunswick, 2001, pp. 47

Wahr J, Geodesy and Gravity, t. , University of Colorado. Boulder, Samizdat Press , pp. 1996.

Forsberg R., Tscherning C. C. An overview manual for the GRAVSOFT

The allocated number of ECTS points consists of:

Contact hours with an academic teacher:

Student's independent work: