UNIWERSYTET PRZYRODNICZY WE WROCŁAWIU

Geodetic reference frames

Educational subject description sheet

Basic information

Field of study Geodesy and carthography	**Education cycle** 2023/24
Speciality -	**Subject code** ID000000IGIS.I8A.0776.23
Organizational unit The Faculty of Environmental Engineering and Geodesy	**Lecture languages** polish
Study level First-cycle (engineer) programme	**Mandatory** optional
Study form Full-time	**Block** general subjects
Education profile General academic	**Disciplines**
	Subject related to scientific research Yes
	Subject shaping practical skills Tak

Teacher responsible for the subject	Krzysztof Sośnica, Grzegorz Bury, Radosław Zajdel, Dariusz Strugarek
Other teachers conducting classes	Krzysztof Sośnica, Grzegorz Bury, Radosław Zajdel, Dariusz Strugarek

Period Semester 4	**Examination** graded credit **Activities and hours** lecture: 15 laboratory classes: 15	**Number of ECTS points** 2.0

Goals

C1	The course develops skills and competences in using reference systems and coordinate systems used in geodesy, geodynamics, satellite geodesy and astronomy, as well as performing transformations between systems. Mathematical basics of ball and ellipsoid calculations, cartographic mappings, principles of geodetic measurements in large areas, classification of geodetic matrices and methods of obtaining, interpreting and using data in geodetic documentation centers are taught.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	Student has knowledge of terrestrial and blue systems and spatial reference systems; The student knows the classification and methods of establishing geodetic warp; The student has knowledge of mapping distortions and the characteristics of cartographic mapping / exam and 2 tests / GK_P6S_WG10.	GK_P6S_WG07	written credit, oral credit, test
Skills – Student can:			
U1	The student can perform the transformation between different reference systems. The student is able to choose the appropriate observation technique to set up the carcass or the appropriate category system. The student is able to choose and derive the appropriate cartographic projection depending on the needs and purpose of the map / Kartówki during exercises, tests, reports.	GK_P6S_UW09	written credit, active participation, test
Social competences – Student is ready to:			
K1	The student is ready to independently solve tasks and solve problems in a group and during field measurements in sections / activity during exercises, reports / GK_P6S_KK01.	GK_P6S_KK01	observation of student’s work, active participation

Balance of ECTS points

Activity form	Activity hours*
lecture	15
laboratory classes	15
exam / credit preparation	15
lesson preparation	10

Student workload	**Hours** 55	**ECTS** 2.0
Workload involving teacher	**Hours** 30	**ECTS** 1.0

Practical workload	Hours 15	ECTS 0.6

* hour means 45 minutes

Study content

No.	Course content	Activities
1.	Geodetic reference systems, geodetic reference frames, geodetic datum. International Celestial Reference System and Frame (ICRS, ICRF), International Terrestrial Reference System and Frame (ITRS, ITRF), European terrestrial reference system and frame (ETRS and ETRF). IERS Conventions 2010. Transformation between the International Terrestrial Reference System and the Geocentric Celestial Reference System. Techniques of satellite and space geodesy for the realization of ITRS/ITRF. Local reference system and frames in Poland. Control points as a practical realization of reference systems. Displacement of reference points. Rotation of the Earth. Tidal variations in the Earth's rotation. General relativistic models for space-time coordinates and equations of motion. General relativistic models for propagation. Coordinate systems on the ellipsoid. The geometric parameters of ellipsoids. Normal cross-sections of the ellipsoid. Determination of ellipsoid parameters (classical methods). Geodetic line. Relations between ellipsoidal and Cartesian coordinates. Definitions and classification of cartographical projections used in geodesy. Distortions of cartographical projections.	lecture
2.	Geodetic reference systems, geodetic reference frames, geodetic datum. International Celestial Reference System and Frame (ICRS, ICRF), International Terrestrial Reference System and Frame (ITRS, ITRF), European terrestrial reference system and frame (ETRS and ETRF). IERS Conventions 2010. Transformation between the International Terrestrial Reference System and the Geocentric Celestial Reference System. Techniques of satellite and space geodesy for the realization of ITRS/ITRF. Local reference system and frames in Poland. Control points as a practical realization of reference systems. Displacement of reference points. Rotation of the Earth. Tidal variations in the Earth's rotation. General relativistic models for space-time coordinates and equations of motion. General relativistic models for propagation. Coordinate systems on the ellipsoid. The geometric parameters of ellipsoids. Normal cross-sections of the ellipsoid. Determination of ellipsoid parameters (classical methods). Geodetic line. Relations between ellipsoidal and Cartesian coordinates. Definitions and classification of cartographical projections used in geodesy. Distortions of cartographical projections.	laboratory classes

Course advanced

Teaching methods:

teamwork, computer lab/laboratory, lecture, classes

Activities	Examination methods	Percentage in subject assessment
lecture	written credit, oral credit	50%
laboratory classes	written credit, observation of student’s work, active participation, test	50%

Literature

Obligatory

1. Plag H.P., Pearlman M. (Ed.), (2009) Global Geodetic Observing System. Springer.
2. Pearlman, M., Arnold, D., Davis, M., Barlier, F., Biancale, R., Vasiliev, V., Ciufolini, I., Paolozzi, A., Pavlis, E.C., Sośnica, K. and Bloßfeld, M., 2019. Laser geodetic satellites: a high-accuracy scientific tool. Journal of Geodesy, 93(11), pp.2181-2194.
3. Sośnica, K., & Bosy, J. (2019). Global Geodetic Observing System 2015–2018. Geodesy and Cartography, 121-144.
4. Petit, G., & Luzum, B. (2010). IERS conventions (2010). Bureau International des Poids et mesures sevres (france).
5. Bosy, J. (2014). Global, regional and national geodetic reference frames for geodesy and geodynamics. Pure and applied geophysics, 171(6), 783-808.
6. Altamimi, Z., Rebischung, P., Métivier, L., & Collilieux, X. (2016). ITRF2014: A new release of the International Terrestrial Reference Frame modeling nonlinear station motions. Journal of Geophysical Research: Solid Earth, 121(8), 6109-6131.

Optional

1. Altamimi, Z. (2018). EUREF Technical Note 1: Relationship and transformation between the international and the European terrestrial reference systems. Pubblicato da EUREF.

Kierunkowe efekty uczenia się

Kod	Treść
GK_P6S_KK01	Absolwent jest gotów do uznawania znaczenia wiedzy w rozwiązywaniu problemów praktycznych i poznawczych związanych z zawodem geodety oraz zasięgania opinii ekspertów w przypadku trudności z samodzielnym rozwiązaniem problemu, a także do krytycznej oceny posiadanej wiedzy i odbieranych treści.
GK_P6S_UW09	Absolwent potrafi wykonać pomiary i obliczenia związane z geodezyjnymi układami i systemami odniesienia. Umie zastosować technologię GNSS do prac geodezyjnych.
GK_P6S_WG07	Absolwent zna i rozumie w stopniu zaawansowanym zagadnienia z zakresu geodezyjnych układów współrzędnych oraz nowoczesne techniki pomiarowe i obliczeniowe umożliwiające określenie przestrzennego położenia szczegółów terenowych i ich prezentacji w postaci mapy.