



## Subject card

Subject name and code	Geodesy and geodetic astronomy, PG_00044833						
Field of study	Geodesy and Cartography						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Geodesy -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jerzy Pyrchla					
	Teachers	dr hab. inż. Jerzy Pyrchla					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study		SUM
	Number of study hours	30	6.0		14.0		50
Subject objectives	After the course, the student has the knowledge and abilities to solve geodetic problems on the sphere, ellipsoid with the use of novel technology and measurement systems. Student acquainted the methodology of the Earth shape estimation using gravimetric methods knows the influence of the gravitational field on the geodetic measurements and knows the different height system.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_W06] has a well-grounded knowledge and understands geodesy concepts including the main methods of obtaining data about space together with the surveying and computational methods, which from the one hand are compatible with the current legal status and from the other hand refer to measurements on the plane and cover the use of modern geodetic instruments, with taking into account the curvature of the Earth and the impact of gravity on the manner of measurements and results		The student is able to use different reference systems and coordinate frames used in geodesy, geodynamics, satellite geodesy and astronomy.				
	[K6_U06] can solve geodetic tasks and select measurement methods for typical engineering tasks including the curvature of the Earth and the impact of gravity		Can use knowledge from the field of mathematics and physics in the higher geodesy.				
Subject contents	Spherical trigonometry: trigonometric line, properties of a spherical triangle, sinus theorem, cosine theorem for side and for angles, tangents theorem. Brod formulas, Neper analogies. Spherical excess. Field of the spherical triangle. Introduction to higher geodesy: division of geodesy, the shape of the Earth, reference surfaces, geodetic networks. Flattered rotational ellipsoid as a reference surface: elementary relationships between ellipsoid parameters, geodetic coordinates system, normal sections of the ellipsoid and its curvatures, geocentric latitude, reduced latitude, parametric equation of the ellipsoid, geodetic line on the surface of the rotational ellipsoid. Translation of geographical coordinates on the surface of the rotational ellipsoid. Introduction to physical geodesy: gravity force, level surfaces, plumb lines, height. Reference system, coordinate frames used in the geodesy—definitions and mutual relations.						

Prerequisites and co-requisites	High school level.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		100.0%	100.0%
Recommended reading	Basic literature	Barlik M., Pachuta A. Pruszyńska-Wojciechowska M.: Ćwiczenia z geodezji fizycznej i grawimetrii geodezyjnej; Wydawnictwa Politechniki Warszawskiej, Warszawa 1992; Barlik M.: Pomiary grawimetryczne w geodezji; WPW, Warszawa 1996; Barlik M.: Wstęp do teorii figury Ziemi; WPW, Warszawa 1995; Barlik M., Pachuta A.: Geodezja fizyczna i grawimetria geodezyjna; Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2007; Czarnecki K.: Geodezja współczesna w zarysie; Wiedza i Życie Warszawa 1996; Hlibowicki R. i inni: Geodezja Wyzsza i Astronomia Geodezyjna; PWN, Warszawa 1981;	
	Supplementary literature	The current article in higher geodesy from polish and international journals. For example: Journal of Geodesy; Marine Geophysical Research; Journal of Geodynamics; Journal of the Geodetic Society of Japan	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	What is the subject of higher geodesy? Basic properties of the spherical triangle. Scope of application for spherical trigonometry equations. Give the definition and characterise basic reference surfaces in geodesy. Basic parameters and quantities characterising the flattened rotational ellipsoid. Application of the Clairaut, Euler and Meusnier formulas in the geodetic calculation. Geodetic line. Clark's algorithm. Principles of the Earth shape estimation using gravimetric methods. The influence of the gravitational field on the geodetic measurements.		
Work placement	Not applicable		