Subject card

Subject name and code	Air navigation and meteorology, PG_00053254						
Field of study	Geodesy and Cartography						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2024/2025		
Education level	first-cycle studies		Subject group		Optional subject group		
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		6.0		
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 inż. Paweł Burdziakowski				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	15.0	0.0	0.0	60
	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	60		7.0	83.0		150
Subject objectives	The purpose of the course is to teach the student the basics of aerial navigation and meteorology for the preparation and implementation of unmanned aircraft flights.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U01] can apply the principles of physics and mathematics to a simple verification of measurement and computational methods and their results	Able to determine aircraft positions using available navigation equipment. Knows how to use on-board navigation equipment. Able to determine current meteo conditions and their impact on the navigation of an unmanned platform.	[SU2] Assessment of ability to analyse information
	[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 make a BSP path plan and program it into the BSP software. Can calculate the deviation and declination corrections of the BSP compass. Can perform compass calibration. Can calculate the observed position of a BSP using position lines. Can interpret numerical weather forecasts. Can use basic sources of meteo data.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
	[K6_W01] has basic knowledge and understands the concepts of physics which allow to use optical and immersive instruments as well as positioning and satellite imaging	Knows and understands the basic concepts of aeronautical navigation (course, bearing, way, route, waypoints). Knows and understands the basic concepts of meteorology. Knows the basics of the formation of baric systems, can describe the phenomena affecting BSP flight and hazards.	[SW2] Assessment of knowledge contained in presentation
	[K6_W02] has basic knowledge and understands mathematics concepts useful for coordinate calculus (in a set of real and complex numbers), for the purpose of field and volume calculations, mathematical statistics and vector calculus, as well as elementar topology	Knows and understands the principles of BSP navigation path planning. Knows aeronautical navigation equipment and can describe its operation. Can describe the basic elements of flight path planning in the context of current meteorological conditions. Knows and can perform basic meteorological analysis based on available forecasts.	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	1. Fundamentals of aeronautical meteorology a. Atmosphere, exosphere, ionosphere, aerial part of the atmosphere, tropopause, standard atmosphere2. Weather reporting a. Weather information, surface reports, data from higher layers of the atmosphere, synoptic maps3. Assessment of meteorological conditions based on published meteorological information a. TAF, METAR, GAMET, AIRMET, Significant, Storms, other available sources of meteo information.4. Assessment of compatibility of current weather conditions with unmanned aircraft operating conditions a. Principles and operating conditions of unmanned aircraft5. Assessment and impact of hazardous meteorological phenomena on the performance of unmanned flight. a. Dangerous meteorological phenomena in aviation, icing, thunderstorms, gusty winds, wind faults6. Fundamentals of aviation navigation. a. Basic concepts and definitions, types of air navigation7. Discuss basic geographic definitions used in aviation. a. Directions on the globe, geographic and magnetic path angle, course, wind direction and speed designation, airspeed8. Satellite navigation systems a. Types, principle of operation, indications and their interpretation, area of coverage, errors and accuracy, factors affecting coverage and accuracy9. Navigational flight preparation. a. Designation and use of navigation points, speed triangle navigation10. Navigation systems and instruments applied to the unmanned aircraft used for practical training. a. "Navigation according to the data from the systems applied to the unmanned aircraft used for practical training "11. Operation of the ground control station a. Types of ground control stations, construction, principle of operation12. Navigation based on video camera image a. Methods of BSP navigation on the basis of video camera image13. Navigation using other data sources a. Navigation on-board instruments and methods of their use

Prerequisites and co-requisites	

Assessment methods and criteria			

Subject passing criteria	Passing threshold	Percentage of the final grade
Presentation	80.0%	50.0%
Report	80.0%	50.0%

Recommended reading	Basic literature	https://calypteaviation.com/nauka-latania/ Nawigacja lotnicza S.S Fiedczyn Podręcznik nawigacji lotniczej - W.Wyrozumski Meteorologia i klimatologia - Krzysztof Kożuchowski, PWN
	Supplementary literature	Mechanika lotu szybowców - szkolenie szybowcowe, Dr inż. Wiesława Łanecka-Makaruk,
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		Development of a selected topic in meteorology. Development of a selected technical issue in the field of navigationProgramming a task in flight planning software
Work placement	Not applicable	

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