GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Automation systems and UAV construction, PG_00053255
Field of study	Geodesy and Cartography

Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Optional subject group 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	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	15.0	75.0	150

Subject objectives	The basic topics in the subject are: BSP - introduction and history BS categories, platforms, Propulsion systems, Power sources, Construction and functions of remote control apparatus, On-board computers, Positioning, orientation and navigation systems, BSP anti-collision systems, Navigation and communication devices and their vulnerability to external factors, Ground based flight control station, Camera in flight, Operation, Performance of BSP, Planning for take-off, flight and landing in manual and automatic flight .

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U08] can use modern measurement technologies to solve common tasks in 3D modeling	Be able to customize software interface, set up telemetry link, know how to operate flight parameter interface, know how to operate flight route interface Be able to plan a photogrammetric flight route	[SU5] Assessment of ability to present the results of task
	[K6_K01] can think and act in a creative and enterprising way; is ready to define priorities for the implementation of an individual or group task; understands the need for continuous education and professional responsibility for his own and his teamt activities, and being ready to assess their own limitations, knows when to ask experts	Be able to connect auxiliary equipment to the flight computer. Be able to perform a flight on the simulator. Able to install BSP microcontroller software, set parameters of devices for flight.	[SK1] Assessment of group work skills
	[K6_K02] is ready to solve problems related to the profession of geodesy and cartography engineer and to assess risks and effects of the performed activity	Knows how to identify landing sites taking into account the error of measurement systems. Be able to determine flight time taking into account external factors Be able to identify hazards along a sample route	[SK5] Assessment of ability to solve problems that arise in practice
	[K6_U14] can apply the necessary skills to conduct independent work in the field of topographic surveys along with the elaborating of results, geodetic investment service, surveying and inventory measurement, photogrammetry and remote sensing, and making the maps and elaborations for legal purposes including delimitation and subdivision of real estate	Knows how to use flight planning software. Knows how to plan a photogrammetric flight.	[SU1] Assessment of task fulfilment

Subject contents	
	Definitions, division, categories, classesLift ForceOperating principles of BSP according to CategoryConstruction MaterialsBLDC motors - principles of operation, parametersESC regulators - parameters, principle of operation, controlPropulsion unit and its efficient use.Accumulators, distribution, characteristicsDedicated batteries (used in RTF kits)Safe use of batteries and chargersCharging and chargers - principles, types, constructionRadio path elements and propagation of radio wavesIMU, GYRO, BARO - basic sensoricsIMU/AHRS unit and its influence on BSP behaviourSatellite navigation systems used on BSPOptical navigationAnti-collision sensors, classification, principle of operation, specificationCollision avoidance algorithmsHandling of special situationsInfluence of external factors on BSP flight performance.Errors of measurement systems in the planning of take-off, flight and landing of the BSP.Identification of hazards along the flight path.

Prerequisites and co-requisites	
	Create a pilot profile at https://drony.ulc.gov.pl/

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	0.0%	50.0%
	Laboratory	50.0%	50.0%

Recommended reading		
	Basic literature	1. Wiktor Wyszywacz, Drony, Poligraf Brzezia Łąka, 2, 2021 2. MICHAŁ KĘDZIERSKI, ANNA FRYŚKOWSKA, DAMIAN WIERZBICKI, OPRACOWANIA FOTOGRAMETRYCZNE Z NISKIEGO PUŁAPU, WOJSKOWA AKADEMIA TECHNICZNA, 2014 3. https://ardupilot.org/copter/docs/introduction.html 4. https://www.curtisswrightds.com/applications/platform-experience/unmanned-architecture.html
	Supplementary literature	1. Adam Juniper, The complete guide to drones: choose, build, photograph, race, 30 maja 2018 2. Audronis Ty, Drony. Wprowadzenie, Helion, 2015 3. Daniel Tal, John Altschuld, Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation, Willey, 2020
	eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. Perform basic maneuvers on the simulator 2. Connect the servo and program the griper 3. Install the BSP firmware 4. Review the BSP technology (modules) 5. Present the results of work
Work placement	Flight practice in a simulator. Practice flying in the training BSP (after mastering the maneuvers in the simulator)