GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Work placement, PG_00055406						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2021		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	4		Language of instruction	Polish			
Semester of study	7		ECTS credits	6.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Mirosław Gerigk				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	0.0	0.0	0
	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	0		4.0	146.0		150
Subject objectives	The aim of the lectures is to present to the students the basic technologies, research, design, construction and operation of the main technical objects particurally the unmanned objects.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U05] is able to plant an experiment within the range of measuring the basic operating parameters of mechanical devices using a specialized equipment, interpret the results and reach the correct conclusions	A student is able to identify and formulate the simple tasks, concerning the structure, strength and mechanics of motion, and associated with implementations concering the unmanned vehicles which are closely connected with mechatronics. A student is able to plan and perform the experiment including the set up the measuring system, conducting the experiment and analyzing the results.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[K6_U03] is able to identify, formulate and develop the documentation of a simple design or technological task, including the description of the results of this task in Polish or in a foreign language and to present the results using computer software or other aiding tools	A student has an ability to analyze the basic technologies necessary to design and manufacture the elements and simple mechatronic subsystems for the data unmanned vehicle. A student has the basic abilities to analyze the structure, strength and motion of unamnned vehicles. A student is able to work out the project documentation and show the presentation.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[K6_U08] is able to design a technological manufacturing process for typical elements of machines or devices, using analytical and numerical calculating tools	A student is able to choose and use the tools including the methods, models and algorithms to perform the analysis concernig the implemented subsystems of the unmanned vehicles according to the operational criteria. A student is able to select the tools to analyze the strength of structure and mechanics of motion of the unmanned vehicles. A student is able to plan and perform the technological process.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[K6_K01] is aware of the need for complementing the knowledge throughout the whole life, is able to select proper methods of teaching and learning, critically assesses the possessed knowledge; is aware of the importance of professional conduct and following the rules of professional ethics; is able to show resourcefulness and innovation in the realisation of professional projects	A student has the basic knowledge on the life cycle of the unmanned vehicles including their mechatronic subsystems. A student has the basic knowledge on the structure, strength and motion of the unmanned vehicles. A student knows that it is necessary to update the knowledge and all the difficulties and tasks tries to overcome according to the scientific methodologies, profesionally and ethic.	[SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice [SK1] Assessment of group work skills [SK2] Assessment of progress of work

Subject contents	The lectures concern, in turn the key technologies associated with the technics development: - autonomous systems - sensors and effectors - materials (AI materials, nano-materials) - energy supply - innovative propulsion - IT technologies (communication, navigation, steering) - stealth - cosmic and satelite technologies and - others During the lectures the following problems and design keydrivers should be discussed: 1 hull form arrangement of internal spaces,distribution of mases, payload; 2 energy supply system; 3 propulsion system; 4 steering, communication, navigation system; 5 sensors and effectors; 6 dedicated system but most the following: - mechanics of motion and - strength of structure.
Prerequisites and co-requisites	The student should have basic information in the field of applied physics and mathematics, mathematical analysis, numerical methods, mechanics, including kinetics and dynamics, strength of structure, mechatronics and basics of programming.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Half-exam and final exam	56.0%	100.0%

Recommended reading	Basic literature	Brzezina J. M. Atak dronów. Wojskowy Instytut Wydawniczy, Warszawa 2013. Cwojdziński L. Bezzałogowe Systemy Walki - charakterystyka, wybrane probelmy użycia i eksploatacji. Wojskowa Akademia Techniczna, Warszawa 2014. Dougherty M.J. Drony - ilustrowany przewodnik po bezzałogowych pojazdach powietrznych i podwodnych (Drones. An illustrated Guide to the Unmanned Aircraft That Filling Our Skies). Wydawnictwo BELLONAS.A., © 2015 Amber Books Ltd. Gerigk M.K. Modeling of performance and safety of a multi-task unmanned autonomous maritime vehicles (in Polish: Modelowanie ruchu i bezpieczeństwa wielozadaniowego bezzałogowego autonomicznego pojazdu wodnego). Journal of KONBIN, Safety and Reliability Systems, No. 1 (33), Warsaw 2015. Gerigk M.K., Wójtowicz S. An Integrated Model of Motion, Steering, Positioning and Stabilization of an Unmanned Autonomous Maritime Vehicle. TRANSNAV the International Journal on Marine Navigation and Safety of Sea Transportation. Volume 9, Number 4, December 2015, DOI: 10.12716/1001.09.04.18. Gerigk M.K. Challenges associated with the design of a small unmanned autonomous maritime vehicle. Scientific Journals of the Maritime University of Szczecin, No. 46 (118) 2016, DOI: 10.17402/113, Published: 27.06.2016. Gerigk M.K. Modeling of combined phenomena affecting an AUV stealth vehicle. TRANSNAV the International Journal on Marine Navigation and Safety of Sea Transportation, Vol. 10, No. 4, December 2016, DOI: 10.12716/1001.10.04.18. Gerigk M.K. Modeling of performance of a AUV vehicle towards limiting the hydro-acoustic field. TRANSNAV the International Journal on Marine Navigation and Safety of Sea Transportation, Volume 12, Number 4, December 2018, DOI: 10.12716/1001.12.04.06. Gerigk M.K. Modeling of performance of an AUV stealth vehicle. Design for operation. Proceedings of IMAM 2017, 17th International Congress of the International Maritime Association of the Mediterranean, Lisbon, Portugal, 9-11 October 2017. Volume 1, @ 2018 Taylor & Francis Group, London. A Balkema Book, ISBN 978-0-8153-7993-5, pp. 365-369. Kalicka R. Podstawy automatyki i robotyki. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2016. Ty Audronis. Drony- wprowadzenie, Technologia i rozwiazania (Building Multicopter Video Drones). Wydawnictwo HELION, © 2015 Helion S.A. Additional: 1. Bąk R., Burczyński T.: Wytrzymałość materiałów z elementami ujęcia komputerowego. WNT, Warszawa 2013. 2. Bilewicz E. Wytrzymałość Materiałów. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2013. 3, Case J., Chilver L., Ross C.T.F. Strength of materials and structures. Butterworth-Heinemann, ISBN 978-0-340-71920-6, https://doi.org/10.1016/B978-0-340-71920-6.X5000-6, Copyright ©1999 Elsevier Ltd.

		All rights reserved. 4. Dyląg Z., Jakubowicz A., Orłoś Z.: Wytrzymałość materiałów. WNT, Warszawa, t. I 1996, t. II 1997. 5. Faltinsen O.M. Sea Loads on Ships and Offshore Structures. © Cambridge University Press 1990. 6. Kaliński K. J.: Nadzorowanie procesów dynamicznych w układach mechanicznych. Gdańsk: Wydaw. PG 2012. 7. Misiak J.: Mechanika techniczna. Statyka i wytrzymałość materiałów. WNT, Warszawa 1996.
	Supplementary literature	1. Gerigk M.K. Badania interdyscyplinarne i rozwój zaawansowanych technologii w projektowaniu innowacyjnych platform i obiektów pływających. PISMO PG, Politechnika Gdańska, Nr 2 (209) Rok XXIII, Luty 2016. 2. Gerigk M.K. Technologie stealth w projektowaniu innowacyjnych obiektów pływających. PISMO PG, Politechnika Gdańska, Nr 4 (211) Rok XXIII, Kwiecień 2016. 3. Gerigk M.K. Konstrukcje bliskiej przyszłości. "PREZENTUJ BROŃ", 14th BALT-MILITARY-EXPO Baltic Military Fair, Gdańsk, June 20-22, 2016. 4. Gerigk M.K. Pływające konstrukcje bliskiej przyszłości - badanie, projektowanie, budowa i wdrożenie (prezentacja, promocja projektu). II Formum Bezpieczenstwa Morskiego Państwa, Ministerstwo Obrony Narodowej, Akademia Marynarki Wojennej, Warszawa, 19 stycznia 2017 r. 5. Gerigk M.K. Proponowane innowacyjne obiekty i systemy walki podwodnej opracowywane na Wydziale Mechanicznym i Politechnice Gdańskiej - (prezentacja, promocja projektu). Seminarium zamknięte, Wydział Mechaniczny PG, Gdańsk, 16 listopada 2017 r.
	eResources addresses	

Example issues/ example questions/ tasks being completed	**Q No. 1 (no more than 1 A4 page):** For the data object please describe the basic set of forces (loads) in operation: - external forces (external loads) - internal forces (internal loads) **Q No. 2 (no more than 2 A4 pages):** For the selected object please give the basic information (mathematical modelling) on the vehicle's motion: - degrees of freedom, - phenomena, - hydrodynamic coefficients, forces, etc. - equations of motion, - states of equilibrium, - steering and control. **Q No. 3 (no more than 1 A4 page):** For the data object please describe: - design requirements (parameters, characteristics) and operational requirements, - assessment of performance, including the assessment of performance and safe operation, - system engineering including the tests, - operational requirements. **Q No. 4 (no more than 1 A4 page):** - key technologies for technology development - any new technologies comming.
Work placement	Not applicable