



Subject card

Subject name and code	Navigation Systems, PG_00049081						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2023/2024		
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	4	Language of instruction			Polish		
Semester of study	7	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Marine Electronic Systems -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jacek Marszał					
	Teachers	dr hab. inż. Jacek Marszał mgr inż. Andrzej Jedel mgr inż. Aleksander Schmidt					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	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	45		3.0		27.0	75
Subject objectives	The aim of the course is to acquaint students with the basics of the theory of navigation, as well as the use of navigation systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W03] Knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	Student defines navigation tasks and its basic concepts. Discusses mapping methods and maps. Classifies and describes classic navigation methods and technical methods of their implementation. Presents the principles of work and parameters of navigation devices. Explains the principle of work and gives the parameters of the GPS satellite navigation system.			[SW1] Assessment of factual knowledge		
	[K6_U06] can analyse the operation of components, circuits and systems related to the field of study, measure their parameters and examine technical specifications	Student discusses the basics of functioning and application of hydroacoustic navigation systems. Describes the operation of the radar as a navigation device used in sea and air navigation.			[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment		

Subject contents	<ol style="list-style-type: none"> 1. Organizing issue: rules of passing, consultations, literatures 2. Fundamentals of navigation 3. Navigation and geodesy 4. Shape of the Earth 5. Geographical position 6. Reference systems - review 7. WGS-84 i GRS'80 8. Projection types 9. Mercator Projection 10. Gauss-Krüger Projection and Universal Transversal Mercator 11. Projection „65” 12. Navigational maps 13. ECDIS digital maps 14. Directions, corrections – course, bearing, track angle 15. Magnetic declination and compass deviation 16. Drift, wind correction 17. Terrestrial navigation 18. Inertial navigation 19. Magnetic compasses - classical 20. Magnetic compasses - electronic 21. Gyro-compasses 22. Ring Laser Gyro 23. Screw log 24. Pitometer log 25. Electromagnetic log 26. Ultrasonic Doppler log 27. Ship berthing control systems 28. Accelerometers, inertial platforms 29. Structure and GPS principles 30. GPS space segment 31. GPS control segment 32. Position determination in GPS system 33. Signal transmitted by satellite GPS 34. Depesza nawigacyjna 35. DGPS, WAAS, EGNOS differential systems 36. GPS receivers 37. GPS in geodesy 38. Global navigational system GALILEO 39. Errors and precision of position in GPS system 40. Underwater navigation systems 41. Hydroacoustic buoys- pingers, transponders, responders 42. Hydroacoustic local navigation system with long base 43. Hydroacoustic local navigation system with short and super short base 44. Navigational echo sounder 45. Principles of radar 46. Radar in navigation 47. Instrument landing system ILS 											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 33%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Midterm colloquium</td> <td>60.0%</td> <td>67.0%</td> </tr> <tr> <td>Practical exercise</td> <td>60.0%</td> <td>33.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Midterm colloquium	60.0%	67.0%	Practical exercise	60.0%	33.0%
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	Midterm colloquium	60.0%	67.0%									
Practical exercise	60.0%	33.0%										
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Czarnecki K. Geodezja współczesna w zarysie. Wyd. Wiedza i Życie Warszawa 1997. 2. Narkiewicz J. Podstawy układów nawigacyjnych. WKŁ Warszawa 1999. 3. Narkiewicz J. GPS i inne satelitarne systemy nawigacyjne. WKŁ Warszawa 2007. 4. Hoggmann B., Lichtenegger H., Collind J. Global Positioning System Theory and Practice. Springer, Wien 1997 										
	Supplementary literature	<ol style="list-style-type: none"> 1. Stępczyński A. Nawigacja porównawcza, Wydawnictwo Gdańskie, 2001. 2. Narkiewicz J. GPS globalny system pozycyjny GPS, budowa, działanie, zastosowania. WKŁ Warszawa 2006. 										
	eResources addresses	Adresy na platformie eNauczanie: Systemy nawigacyjne AiR 2023 - Moodle ID: 33992 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33992										
Example issues/ example questions/ tasks being completed												
Work placement	Not applicable											