



## Subject card

Subject name and code	Navigation Systems, PG_00049081						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2025/2026		
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					
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"> <li>1. Organizing issue: rules of passing, consultations, literatures</li> <li>2. Fundamentals of navigation</li> <li>3. Navigation and geodesy</li> <li>4. Shape of the Earth</li> <li>5. Geographical position</li> <li>6. Reference systems - review</li> <li>7. WGS-84 i GRS'80</li> <li>8. Projection types</li> <li>9. Mercator Projection</li> <li>10. Gauss-Krüger Projection and Universal Transversal Mercator</li> <li>11. Projection „65”</li> <li>12. Navigational maps</li> <li>13. ECDIS digital maps</li> <li>14. Directions, corrections – course, bearing, track angle</li> <li>15. Magnetic declination and compass deviation</li> <li>16. Drift, wind correction</li> <li>17. Terrestrial navigation</li> <li>18. Inertial navigation</li> <li>19. Magnetic compasses - classical</li> <li>20. Magnetic compasses - electronic</li> <li>21. Gyro-compasses</li> <li>22. Ring Laser Gyro</li> <li>23. Screw log</li> <li>24. Pitometer log</li> <li>25. Electromagnetic log</li> <li>26. Ultrasonic Doppler log</li> <li>27. Ship berthing control systems</li> <li>28. Accelerometers, inertial platforms</li> <li>29. Structure and GPS principles</li> <li>30. GPS space segment</li> <li>31. GPS control segment</li> <li>32. Position determination in GPS system</li> <li>33. Signal transmitted by satellite GPS</li> <li>34. Depesza nawigacyjna</li> <li>35. DGPS, WAAS, EGNOS differential systems</li> <li>36. GPS receivers</li> <li>37. GPS in geodesy</li> <li>38. Global navigational system GALILEO</li> <li>39. Errors and precision of position in GPS system</li> <li>40. Underwater navigation systems</li> <li>41. Hydroacoustic buoys- pingers, transponders, responders</li> <li>42. Hydroacoustic local navigation system with long base</li> <li>43. Hydroacoustic local navigation system with short and super short base</li> <li>44. Navigational echo sounder</li> <li>45. Principles of radar</li> <li>46. Radar in navigation</li> <li>47. Instrument landing system ILS</li> </ol>											
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"> <li>1. Czarnecki K. Geodezja współczesna w zarysie. Wyd. Wiedza i Życie Warszawa 1997.</li> <li>2. Narkiewicz J. Podstawy układów nawigacyjnych. WKŁ Warszawa 1999.</li> <li>3. Narkiewicz J. GPS i inne satelitarne systemy nawigacyjne. WKŁ Warszawa 2007.</li> <li>4. Hoggmann B., Lichtenegger H., Collind J. Global Positioning System Theory and Practice. Springer, Wien 1997</li> </ol>										
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Stateczny A. Nawigacja porównawcza, Wydawnictwo Gdańskie, 2001.</li> <li>2. Narkiewicz J. GPS globalny system pozycyjny GPS, budowa, działanie, zastosowania. WKŁ Warszawa 2006.</li> </ol>										
	eResources addresses	Adresy na platformie eNauczanie:										
Example issues/ example questions/ tasks being completed												
Work placement	Not applicable											