University of Gdańsk

Subject card

Subject name and code	Navigational Equipment - lecture, PG_00201125						
Field of study	Marine Hydrography						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		1.0		
Learning profile	practical		Assessment form		credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Krzysztof Jaskólski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	17.0	0.0	0.0	0.0	0.0	17
	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	17		1.0		7.0	25
Subject objectives	Teaching the principles of operation, use, and effective utilization of typical navigation devices, including accuracy and the determination of corrections.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[HML3-W06] knows and understands, at an advanced level, principles of operation and use of navigation devices and systems and issues related to the determination of the position of the object using all available methods	knows: - errors of magnetic compasses and gyrocopes; methods for adjusting course control systems (autopilots); principles of measuring the distance traveled, principles of measuring depth; digital and analog methods of recording navigational data; the use of voyage data recorders in navigation; - principles of determining position and movement vector in radionavigation systems; - the structure and operation of the automatic identification system for ships; - the principle of radar measurements; detection problems related to range; - types of distortions and interferences, their causes, and responses to their presence; accuracy of radar charts; - principles of operation, purpose, and handling of typical shipborne navigational devices; - the construction of magnetic compasses, including fluxgate compasses, their limitations, and methods for determining the deviation table; - the construction, principles of operation, operational handling, as well as sources of errors and methods for determining corrections for gyroscopic compasses; - the construction, principles of operation, and operational handling of autopilots; - the specificity of using radio technology for navigational purposes, including principles of radionavigation and the organization and operational capabilities of LORAN and AIS systems; - organization, principles of operation, and specifics of GNSS systems as well as the operational handling principles of shipborne receivers; - the structure, principles of operation, operational handling, and the nature of errors in inertial-based systems	[SW4] test/exam - oral or written

Course outcome	Subject outcome	Method of verification
[HML3-W03] knows and understands, at an advanced level, directions of development and the latest discoveries in the field of scientific disciplines forming the theoretical basis appropriate to the field of study	knows: - general trends in the automation of navigation, including details of the NMEA standard; - errors of magnetic compasses and gyrocompasses; methods for adjusting course control systems (autopilots); principles of measuring the distance traveled, principles of measuring depth; digital and analog methods of recording navigational data; the application of voyage data recorders in navigation; principles of position and motion vector determination in radio navigation systems; the construction and operation of the automatic identification system for vessels; principles of radar measurements; detection problems related to range; types of distortions and interferences, their causes, and ways to respond to their presence; accuracy of radar charts. Directions for the development of gyroscopic technology and the resulting developments in gyrocompasses and inertial devices	[SW4] test/exam - oral or written
[HML3-W12] knows and understands, at an advanced level, the key processes occurring in the life cycle of devices, facilities, and technical systems	knows: - errors of magnetic compasses and gyrocompasses; methods for regulating course control systems (autopilots); principles of measuring the distance traveled, principles of depth measurement; digital and analog methods of recording navigational data; the use of voyage data recorders in navigation; principles of determining position and motion vector in radionavigation systems; structure and operation of automatic identification systems for ships; principle of radar measurements; detection problems related to range; types of distortions and interference, their causes and ways to respond to their presence; accuracy of radar charts; - principles of operation, intended use, and operating procedures for typical shipborne navigational devices	[SW4] test/exam - oral or written
[HML3-K01] is ready to correctly identify and resolve professional dilemmas, especially in the aspects of security and entrusted property	is ready to master the principles of operation and use of typical navigation equipment, as well as to accurately calculate corrections and assess their accuracy	[SK4] test/exam - oral or written

Subject contents

BASIC NAVIGATIONAL DEVICESConstruction and operating principles of magnetic, electromagnetic, and electronic compasses. Determining total correction.Construction and operating principles of gyrocompasses.Operation of autopilots.Measurement of vessel speed.Depth measurement.Operation of basic navigational devices.Integrated bridge systems.Automatic Identification System (AIS).Voyage Data Recorders (VDR, S-VDR).SATELLITE RADIO NAVIGATION SYSTEMSDetermining position using GNSS systems available in coastal navigation areas such as GPS, DGPS, EGNOS.Operation of radio navigation system receivers.RADAR UTILIZATIONThe ability to use, interpret, and analyze information obtained from radar, especially:radar image distortion and accuracy of indications,powering up the radar and tuning the image,identification of interference and image distortions, false echoes, echoes from waves, etc., racons, and SART.The ability to acquire, interpret, and analyze information from ARPA.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Subject required by the Regulation of the Minister of Infrastructure and Development of February 5, 2014, on framework training programs and examination requirements for deck department seafarers (i.e., Journal of Laws 2023, item 1566): attendance at all classes is mandatory. AMW allows students to make up for up to 20% of excused absences from these classes in a form that enables them to acquire the missing knowledge and skills. Students who have passed the course but, due to absences exceeding 20% of classes or failure to make up for classes in a form that allows them to obtain the missing knowledge and skills, do not receive an entry in the supplement confirming completion of studies recognized at the operational level in coastal shipping.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>written test</td><td>51.0%</td><td>80.0%</td></tr><tr><td>laboratory reports</td><td>100.0%</td><td>20.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. FELSKI A., JASKÓLSKI K.: Okrętowe urządzenia nawigacyjne. Zbiór przewodników do zajęć laboratoryjnych. AMW, Gdynia 2016. (in Polish; 2016 and English; 2018)
2. FELSKI A.: Pomiar prędkości okrętu. AMW, Gdynia 1998.
3. GUCMA M., MONTEWKA J.: Podstawy morskiej nawigacji inercyjnej. AM, Szczecin 2006.
4. JANUSZEWSKI J.: Systemy satelitarne GPS, Galileo i inne. WN PWN, Warszawa 2006.
5. ŁUSZNIKOW E., DZIKOWSKI R.: Dewiacja kompasu magnetycznego. WN AM, Szczecin 2012.
6. POSIŁA J., SZYBKA P.: Klasyczne kompasy żyroskopowe z korektą wewnętrzną. AMW, Gdynia 2006.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. The principles of navigation. The Admiralty Manual of Navigation vol. 1.</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Construction and Working Principle of the Magnetic Compass (figure+ description)Construction and Working Principle of the Electronic Compass (Fluxgate) (figure+ description)Methods for Determining Magnetic Compass Deviation, Development of Deviation Tables, Calculations (figure+ descriptions)Construction of the Gyrocompass (figure + description)Working Principle of the Gyrocompass (figure + description)Types of Gyrocompass Deviation (figure + description)Methods for Determining Gyrocompass Correction (figure + description)Construction of the Autopilot (Block Diagram) of the Ship Control System (figure + description)Working Principle of the Autopilot (figure + description)Determining Position using the LORAN C System (figure + description)Working Principle of the AIS System (figure + description)Interference in the Radio Wave Propagation PathConstruction of the GPS System (figure + description)Working Principle of the GPS System (figure + description)Construction and Working Principle of the Inertial System using Inertial Techniques (figure + description)</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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