

Subject card

Subject name and code	Introduction to marine acoustics -lecture, PG_00131479						
Field of study	Marine Hydrography						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2025/2026		
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	3	ECTS credits			2.0		
Learning profile	practical	Assessment form			exam		
Conducting unit	Laboratory of Physical Oceanography -> Department of Physical Oceanography and Climate Research -> Faculty of Oceanography and Geography -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Jakub Idczak				
	Teachers		dr Jakub Idczak				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30		3.0		17.0	50
Subject objectives	<p>1. To introduce students to the fundamental phenomena related to the propagation of acoustic waves in the sea, their generation and reception, the laws governing these processes, and the methods of their investigation.</p> <p>2. To provide knowledge on the most important research problems in the field of marine acoustics and their connection to other fields of oceanography and hydrography (basic level).</p> <p>3. To demonstrate the effectiveness of using innovative remote hydroacoustic techniques in interdisciplinary research and marine environmental monitoring (introductory level).</p> <p>4. To impart knowledge and develop the skills necessary for conducting natural science research and the effective practical use of hydroacoustic techniques (basic level).</p> <p>5. To lay the foundation for the effective use of courses related to the application of hydroacoustic techniques in marine hydrography.</p>						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[HML3-W03] directions of development and the latest discoveries in the field of scientific disciplines forming the theoretical basis appropriate to the field of study	Innovative remote hydroacoustic techniques used in interdisciplinary research and marine environmental monitoring.	[SW4] test/exam - oral or written
	[HML3-W04] the issue of measurements related to the exploration of sea basins and inland waters and tools allowing to describe, interpret and present the results of measurements	The most important research problems in the field of marine acoustics and their connections to other areas of oceanography and hydrography.	[SW4] test/exam - oral or written
	[HML3-U14] use the applicable terminology in presenting and discussing problems related to the field of study	To correctly use the appropriate terminology when presenting and discussing issues in the field of marine acoustics.	[SU4] test/exam - oral or written
	[HML3-W01] selected facts, phenomena and processes, as well as methods and theories concerning them, explaining the complex relationships between them, constituting basic general knowledge in the field of scientific disciplines forming the theoretical foundations specific to the field of study	Fundamental phenomena related to the propagation of acoustic waves in the sea, their generation and reception, and the laws governing these processes.	[SW4] test/exam - oral or written
	[HML3-U19] plan and implement independent learning and improvement of his/her professional competences	To plan and carry out self-directed learning and to improve one's professional competencies.	[SU4] test/exam - oral or written
	[HML3-K02] correctly determine the priorities in professional work for the implementation of a task specified by himself/ herself or others	Timely completion of tasks during individual and team work.	[SK4] test/exam - oral or written
	[HML3-U07] effectively use information and communication techniques, including utility programs to solve professional problems	Specialized software tools for the analysis and interpretation of hydroacoustic data.	[SU4] test/exam - oral or written
	[HML3-U08] independently use the professional literature available in traditional and electronic form, make an assessment, critical analysis and synthesis as well as the correct interpretation of the information obtained	Independently use professional literature in the field of marine acoustics, available in both traditional and electronic formats, to evaluate, critically analyze, synthesize, and correctly interpret the obtained information.	[SU4] test/exam - oral or written
Subject contents	<p>1. Acoustic wave: definition, parameters characterizing an acoustic wave (spatial and temporal changes).</p> <p>2. Propagation of acoustic waves: geometric spreading (traveling waves: plane, cylindrical, spherical waves), sound absorption in seawater.</p> <p>3. Wave phenomena: wave interference, reflection and transmission of waves at the boundary of two media, refraction of acoustic waves, scattering of acoustic waves.</p> <p>4. Hydroacoustic transducers: main operating principle, characteristics of transducers.</p> <p>5. Operating principles of selected acoustic devices and their applications (single- and multi-beam echosounder, side-scan sonar, sub-bottom profiler, ADCP, USBL).</p> <p>6. Acoustic data processing.</p> <p>7. Selected applications of acoustic methods for studying marine ecosystems.</p>		
Prerequisites and co-requisites	Fundamentals of physics and mathematics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	51.0%	100.0%

Recommended reading	Basic literature	<p>1. CLAY C. S., MEDWIN H.: Acoustical Oceanography: Principles and Applications. Wiley, New York 1977.</p> <p>2. MEDWIN H., CLAY C. S.: Fundamentals of Acoustical Oceanography. Academic Press, Boston 1998.</p> <p>3. MEDWIN H.: Sounds in the Sea. From Ocean Acoustics to Acoustical Oceanography. Cambridge University Press, New York 2005.</p> <p>4. ŚLIWIŃSKI A.: Ultradźwięki i ich zastosowania. Wyd. Nauk.-Tech., Warszawa 2001.</p>
	Supplementary literature	<p>1. KOWALIK Z., ŁĘGOWSKI S., SZYMBORSKI S.: Podstawy hydroakustyki, Wydawnictwo Morskie, Gdynia 1965.</p> <p>2. STEPNOWSKI A.: Systemy akustycznego monitoringu środowiska morskiego. Gd. Tow. Nauk., Gdańsk 2001.</p> <p>3. http://hyperphysics.phy-astr.gsu.edu/hbase/sound/soucon.html</p> <p>4. http://www.physicsclassroom.com/Class/sound/soundtoc.html</p> <p>5. http://www.dosits.org/science/intro.html</p>
	eResources addresses	
Example issues/ example questions/ tasks being completed	<p>1. Propagation of acoustic waves: geometric spreading (traveling waves: plane, cylindrical, spherical waves).</p> <p>2. Transmission losses: spreading of the acoustic wavefront, sound absorption in seawater (as factors affecting the reduction of acoustic wave propagation range in the sea).</p> <p>3. Wave phenomena: reflection and transmission of waves at the boundary between two media.</p> <p>4. Sound speed in water.</p> <p>5. Acoustic transducers: structure and main operating principle of hydroacoustic transducers.</p>	
Work placement	Not applicable	

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