University of Gdańsk

Subject card

Subject name and code	Marine Acoustics - lecture, PG_00205013		
Field of study	Oceanography		
Date of commencement of studies	October 2027	Academic year of realisation of subject	2027/2028
Education level	Master's studies	Subject group	Obligatory subject group in the field of study 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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
Conducting unit	Department of Geophysics -> Faculty of Oceanography and Geography -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Jarosław Tęgowski	
	Teachers		

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	2.0	18.0	50

Subject objectives

1. This advanced course will allow students to gain a deeper understanding of the complex phenomena involved in the propagation of acoustic waves in the sea and their generation and recording, to learn about the laws governing these processes and advanced methods of their study.
2.To provide knowledge about the most important issues in the field of marine acoustics and their links to other fields of oceanography (extended scope).
3.To demonstrate the effectiveness of using innovative remote hydroacoustic techniques in interdisciplinary marine environmental research (extended scope).
4.Familiarizing students with the practical applications of innovative remote hydroacoustic techniques for monitoring
the marine environment for its sustainable exploitation and effective management (extended scope).
5. Transferring knowledge and developing the skills necessary to conduct natural science research and effective practical use of hydroacoustic techniques (extended scope)

Learning outcomes

Course outcome	Subject outcome	Method of verification
[OCEANMU2-W04] has an in-depth understanding of the latest research trends in oceanography, as well as the possibilities for practical application of related achievements; evaluates their usefulness and limitations in solving scientific research problems, and critically analyzes and assesses their applicability	Knows and understands in-depth complex research issues/ problems and the latest research trends in the field of marine acoustics	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[OCEANMU2-U02] is able to fluently and accurately use scientific terminology when presenting and discussing oceanographic issues, and to propose and justify innovative solutions	Can fluently and correctly use scientific terminology in the field of marine acoustics	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[OCEANMU2-U05] is able to use source information in Polish and a chosen foreign language, including archival and electronic databases, within the field of oceanography; critically analyzes and synthesizes information, and is capable of performing critical interpretation and synthesis of data	is able to use source information on marine acoustics in Polish and English, available in traditional and electronic form, perform synthetic analysis and synthesis of information	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[OCEANMU2-W01] knows and understands in-depth specialized terminology used in oceanography and related sciences (in Polish and a selected foreign language)	Has an in-depth knowledge and understanding of specialized terminology related to marine acoustics	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[OCEANMU2-W02] knows and understands complex processes and phenomena occurring in the marine environment, with particular emphasis on the coastal zone, as well as complex relationships between living and non-living elements of the aquatic environment	Knows, understands in-depth and correctly describes complex physical phenomena related to the generation, reception, and propagation of acoustic waves in the marine environment and the laws governing them.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[OCEANMU2-K03] is ready to effectively organize his/her own work, is active and persistent and punctuality in completing tasks, is ready to carrying out evaluation of their own activities	is ready to effectively organize his/ her own work, is active and demonstrates perseverance and timeliness in completing tasks related to the subject of marine acoustics.	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written

Subject contents

A.1 Fundamentals of wave theory (definition of a wave, classification of waves, wave phenomena). Equations of hydrodynamics. Equations of linear acoustics. Wave equation and its solutions for selected situations.
A.2 Propagation of acoustic waves in the sea: reflection and transmission of waves at the boundary between two media, absorption of sound in seawater, refraction in underwater sound channels (in-depth mathematical description).
A.3 Scattering of acoustic waves in the sea: scattering at uneven sea boundaries, scattering at volume inhomogeneities, coherent and diffuse fields, physical models of acoustic wave scattering.
A.4 Principles of operation of modern hydroacoustic transceivers, their characteristics and applications.
A.5 Passive and active acoustics and its application to marine ecosystem research.
A.6 Hydroacoustic data processing.
A7. The use of innovative remote acoustic methods for monitoring the marine environment for the purpose of its sustainable exploitation and effective management.

Prerequisites and co-requisites

Knowledge of higher mathematics and basic physics is required.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
final written examination	51.0%	90.0%
in-class discussions and activities	51.0%	10.0%

Recommended reading	Basic literature	1. Lurton X., 2002. An Introduction to Underwater Acoustics. Principles and Applications, Springer 2. Clay C. S. and Medwin H., 1977. Acoustical Oceanography: Principles and Applications. Wiley, New York 3. Medwin H. and Clay C. S., 1998. Fundamentals of Acoustical Oceanography. Academic Press, Boston 4. Medwin H., 2005. Sounds in the Sea. From Ocean Acoustics to Acoustical Oceanography. Cambridge University Press, New York 5. Śliwiński A., 2001. Ultradźwięki i ich zastosowania, Wyd. NT, Warszawa 6. Brekhovskikh, L.M., Lysanov, Yu.P., 2003, Fundamentals of Ocean Acoustics, Springer 7. Urick R. J., 1975. Principles of underwater sound, McGraw-Hill
	Supplementary literature	Selected scientific articles in Polish and English
	eResources addresses	
Example issues/ example questions/ tasks being completed	Describe sound refraction in underwater sound channel	
Work placement	Not applicable	

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