University of Gdańsk

Subject card

Subject name and code	Marine Optics - lecture, PG_00202036						
Field of study	Oceanography						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2026/2027			
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	2		ECTS credits	2.0			
Learning profile	academic		Assessment form	exam			
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Aleksandra Cupiał				
	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		1.0		19.0	50
Subject objectives	Presentation of topics applicable to the analysis of the optical state of water and the attenuation of radiant energy in the water column within the framework of linear optics in a scalar formulation.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[OCEANMU2-W01] knows and understands in-depth specialized terminology used in oceanography and related sciences (in Polish and a selected foreign language)	knows and understands in-depth specialized terminology used in marine optics (in Polish and English)	[SW4] test/exam - oral or written
[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 and understands, in-depth, complex processes and phenomena of marine optics in ocean and coastal waters including the interaction of light with marine life.	[SW4] test/exam - oral or written
[OCEANMU2-K04] is ready to critically evaluate his/her knowledge and received content in the field of natural sciences in in particular in the field of the studied specialty, a in problematic situations, supports oneself with knowledge experts	is ready to critically evaluate their knowledge of marine optics and information received on this subject.	[SK4] test/exam - oral or written
[OCEANMU2-W03] has an in-depth understanding of research methods used in oceanography and related sciences, and interprets their mechanisms and interrelationships across different spatial and temporal scales	knows and understands, in-depth, research methods used in marine optics	[SW4] test/exam - oral or written

Subject contents

1. Characteristics of solar radiation; quantities of objective and subjective photometry.
2. Phenomena at the water surface: reflection directional and diffuse reflectance coefficients; modification of radiation magnitude due to refraction.
3. Phenomenological description of absorption and elastic scattering of radiant energy by optically active constituents of seawater; inelastic Raman scattering and fluorescence.
4. Spectral characteristics of optically active constituents of seawater; absorption and scattering of light by optically soft suspensions within the anomalous diffraction approach approximation; the packaging effect; particle size distributions of suspensions and their influence on the spectra of attenuation coefficients.
5. The radiative transfer equation; irradiance transport in a horizontally stratified sea; the Gershun equation and the heating rate of seawater; optical classifications of marine and oceanic waters; the inverse problem.
6. Diffuse irradiance reflectance and remote reflectance in applications to satellite investigations of seas.
7. Theory of underwater visibility.

Prerequisites and co-requisites

Basics of single variable calculus and first order, linear differential equations.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
written examiantion	51.0%	100.0%

Recommended reading

Basic literature	Jerzy Dera 2003, Fizyka morza, PWN, 540
Supplementary literature	Mobley C.D., 1994, Light and water - radiative transfer in natural waters, Wyd. Academic Press, London, 592 www.oceanopticsbook.info (Ocean optics web book)
eResources addresses	

Example issues/ example questions/ tasks being completed

Describe the light scattering mechanism

Work placement

Not applicable

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