University of Gdańsk

Subject card

Subject name and code	Hydrophysics with Elements of Hydraulics - lecture, PG_00201273		
Field of study	Aquaculture – Business And Technology		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
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 Jordan Badur	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	45.0	0.0	0.0	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	2.0	28.0	75

Subject objectives

The transfer of knowledge, along with the development of skills and competencies in the areas outlined below, essential for the subsequent courses in the ABiT Programme

Learning outcomes

Course outcome	Subject outcome	Method of verification
[AKWAL3-K04] is ready to identify and recognize dilemmas connected with the profession and understands the need to improve professional competence	Students recognize the constraints and dilemmas, as well as the necessity to improve their professional skills in Hydraulics when required	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written
[AKWAL3-U06] can apply basic techniques and technological processes related to the use of elements of the environment for practical purposes	Students have the ability to perform basic hydrophysical and hydrological calculations for practical applications	[SU4] test/exam - oral or written
[AKWAL3-U02] can make observations and perform simple physical / biological / chemical measurements that are typical in socio-economic activity based on natural sciences	Students are capable of conducting and analyzing the results of basic hydrophysical and hydrological measurements (Topics: A2, A5, A6)	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[AKWAL3_W02] has an advanced understanding of chemical, biological, physical processes and phenomena, identifies them, analyses their mechanisms in relation to the aquatic environment, and is aware of the connections between various natural disciplines	Students know and understand basic phenomena in Hydrophysics and Hydraulics as well as their relevance to biological and chemical processes (Topics: A1-A8, B3-B4)	[SW4] test/exam - oral or written

Subject contents

A. Elements of Fluid Mechanics and Hydraulics (30 hours):

Analytical problems, quizzes and discussions to reinforce lecture topics:

1. Properties of fluids.
2. Hydrostatics: pressure and manometers, hydrostatic forces on submerged flat walls, buoyancy and static equilibrium.
3. Hydrodynamics: Eulers and Lagranges frameworks, conservation of mass, momentum and energy; Euler and Bernoulli equations
4. Potential flows, applications of momentum and Bernoullis equations. Sub- and Supercritical flows. Laminar and turbulent flows. Flows in pipes and open channels.
5. Forces on submerged bodies, measurement techniques in channels, tanks and pipes.
6. Fluid flow through inlets, outlets and overflows, retention time in artificial and natural reservoirs.
7. Fluid flow in porous media, Darcys law, basic filtration equation, wells, ditches and drainage.
8. Elements of hydrology: hydrological cycle ,precipitation and evaporation, water balance for the catchment area, groundwater flow
9. Elements of coastal dynamics (waves, tides, storm surges, coastal currents) river and lake hydrology,

B. Physical properties of water and elements of biooptics

1. Water as a Physical Medium: Water particles, the physical properties of water including density, phase transitions, specific heat, thermal expansion, compressibility, solubility, and the components of natural waters along with their impact on water's properties.
2. Introduction to Optics, Radiant energy transfer in water, Inherent and apparent optical properties of water.
3. Optically active water components. Light absorption and diffusion by phytoplankton, mineral particles, detritus, colloids, air bubbles and dissolved organic matter (CDOM).
4. Applications of optical methods in the research of natural waters.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
finals - written / oral	51.0%	90.0%
active participation in lecture discussions	51.0%	10.0%

Recommended reading

Basic literature	Mitosek M., Fluid mechanics in environmental protection and engineering (in Polish), Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2014 Baran-Gurgul K., Problems in hydraulics with solutions (in Polish), Politechnika Krakowska, Kraków, 2005 Czetwertyński E., Utrysko B., Hydraulics and hydromechanics (in Polish), PWN, Warszawa, 1975 Dera J., Marine physics (in Polish), PWN, Warszawa, 2003
Supplementary literature	Bajkiewicza-Grabowska E., 2020, General Hydrology (in Polish), PWN, Warszawa, 2020 Kubrak J., Technical Hydraulics (in Polish), Wyd. SGGW, Warszawa, 1998 Kubrak E. J., Technical Hydraulics. Calculations. SGGW, Warszawa, 2004 Mobley C., Light and water, Academic Press, San Diego, 1994 Radlicz-Ruhlowa H., Szuster A., Hydrogeology and hydraulics with elements of hydrogeology (in Polish), WSIP, 1997 Woźniak B., Dera J., Light Absorption in Sea Water, Springer, New York, 2007
eResources addresses	

Example issues/ example questions/ tasks being completed	How to recognize an incompressible flow? Describe the forces acting on an element of a nonviscid fluid. Conclusions from basic operations on mass conservation equation and on the Euler equation. Description of the pipe and open channel flow as well as an outflow from a water reservoir. Approximate description the open and coastal sea dynamics. Wind waves. What can we see on satelite photos? (Introduction to maritime optics and remote techniques)
Work placement	Not applicable

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