

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	Bajkiewicz-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-Ruhlowska 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 satellite photos? (Introduction to maritime optics and remote techniques)
Work placement	Not applicable

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