University of Gdańsk

Subject card

Subject name and code	Chemical Oceanography - lecture, PG_00205262		
Field of study	Oceanography		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study 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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	3.0
Learning profile	academic	Assessment form	exam
Conducting unit	Laboratory of the Biogeochemical Cycle of Elements -> Department of Chemical Oceanography and Marine Geology -> Faculty of Oceanography and Geography -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Katarzyna Łukawska-Matuszewska, prof. UG	
	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	43.0	75

Subject objectives

To learn and understand the chemical processes occurring in the ocean in the context of the global circulation of water masses. To acquire knowledge of the exchange of substances of chemicals through the interfacial layers: the sea and the atmosphere, and overlying water and sediments, as well as between the land and the coastal zone. To learn about the interrelationships between physical, biological and chemical processes in the sea. To learn about the biogeochemical circulation of elements in the marine environment.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[OCEANL3-W04] has an advanced understanding of issues and research problems in oceanography, and recognizes their connection with other scientific disciplines	Knows the research problems in the field of chemical oceanography and is aware of their interrelationships with other disciplines of science	[SW4] test/exam - oral or written
[OCEANL3-W03] has an advanced understanding of the relationships between living and non-living components of aquatic environments, and is aware of the complex nature, intricacy, and natural variability of these environments	Knows and understands the relationship between the various components of the marine environment, is aware of its complex nature and natural variability	[SW4] test/exam - oral or written
[OCEANL3-U01] is able to use the current scientific terminology in the field of oceanography in various forms of expression	Is able to use the scientific terminology in the field of chemical oceanography	[SU4] test/exam - oral or written

<table>
<tr><td>Subject contents</td><td>
• Chemical composition of seawater, salinity, properties determining physical, biological and chemical processes.
• Sources of elements and chemical compounds in the sea, division of elements in seawater, ionic equilibrium.
• Division of ocean waters determined by chemistry and density stratification taking into account illumination (euphotic and aphotic layer), distance from land (estuaries, bays, open waters), salinity (brackish and saline waters).
• Gases in seawater (oxygen, nitrogen, carbon dioxide, ammonia, nitrogen oxides, gaseous sulfur compounds). Solubility processes, diffusion in seawater and at the water-air interface. Physical and chemical aspects of the interaction between the sea and the atmosphere. The role of the sea surface microlayer in mass exchange processes. Regional and seasonal variability of fluxes of chemical emissions and immissions.
• Carbonate equilibrium, seawater alkalinity, seawater pH.
• Biogeochemical cycles of elements (e.g., oxygen, carbon, nitrogen, phosphorus, silicon, sulfur and selected metals, e.g., Fe, Hg), forms of occurrence and processes in the atmosphere, biosphere, seawater, sediments). Effect of oxygen conditions on the course of cycles. Changes in the cycling of elements in the sea caused by human activity.Organic matter (dissolved, suspended and volatile) chemical composition, formation, oxidation - the importance of assimilation and destruction processes in seasonal and diurnal cycles occurring with the participation of microorganisms.
• The most important environmental problems in the Baltic Sea: eutrophication; pollution; water exchange with the North Sea; thermal-salinity stratification conditioning vertical exchange and diffusion of elements and chemical compounds.
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<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Exam</td><td>51.0%</td><td>100.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Millero F.J., 2002. Chemical Oceanography 2nd ed. CRC Press, Boca Raton, Boston, London, New York, Washington, DC, 490.
Korzeniewski K., 1995, Podstawy oceanografii chemicznej, Wyd. UG, Gdańsk (in Polish)
Falkowska L., Bolałek J., Łysiak-Pastuszak E., 1999, Analiza chemiczna wody morskiej, cz. 2., Wyd.UG, Gdansk (in Polish)
Bolałek J., Falkowska L., 1999, Analiza chemiczna wody morskiej, cz. 1., Wyd. UG, Gdańsk (in Polish)
Korzeniewski K., 1995, Podstawy oceanografii chemicznej, Wyd. UG, Gdańsk (in Polish)
Horne R.A., 1969, Marine chemistry, Wiley, New York
Riley J.P.., Chester R., 1971, Introduction to marine chemistry, Academic Press, London
Riley J.P., Skirrow G., 1975, Chemical oceanography, Wyd. Academic Press, London
Millero F.J., 2002. Chemical Oceanography 2nd ed. CRC Press, Boca Raton, Boston, London, New York, Washington, DC, 490.
Loon G.W., Duffy S.J., 2008, Chemia środowiska, PWN, Warszawa (in Polish)</td></tr>
<tr><td>Supplementary literature</td><td>Korzeniewski K., 1986, Hydrochemia, WSP, Słupsk, Skrypty i Monografie (in Polish)
Stumm W., Morgan J.J., 1981, Aquatic chemistry, Wiley, New York
Sienko M.J., Plane R.A., 1980, Chemia. Podstawy i własności, Wyd. PWN, Warszawa (in Polish)</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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