<table>
<tr><td colspan="4">*Course*: Basics of environmental management and protection</td></tr>
<tr><td colspan="4">*Field of study*: geography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td>15</td><td rowspan="2">3</td><td rowspan="2">English</td></tr>
<tr><td>Practicals</td><td>15</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Przemysław Śmietana, Ph.D., D.Sc.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Acquiring knowledge about threats to the structure and functioning of the natural environment of the Earth as well as economic, natural and ethical grounds for the need to protect it.
Acquiring skills in using modern methods and means of identifying threats to the Earth's natural environment as well as methods and means of its protection and their legal conditions on a national and international scale. Shaping the attitude for initiating and co-organizing activities related to environmental protection.</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">Basic knowledge of ecology and the environment; ability to work with various natural and statistical sources</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">1. Basic concepts and problems of use of the environment and environmental protection
2. Natural and anthropogenic transformations of the environment
3. Degradation phenomena and processes in nature
4. The state of the environment in the world and in Poland
5. Biodiversity, its importance and threats
6. National and international strategy for environmental protection
7. Forecasting and assessment of future environmental threats</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">Lectures. Practical assignments, data-mining and synthesis in team presentations.</td></tr>
<tr><td>*Course approval format and conditions*</td><td colspan="3">Passing grade at written examination. Practical laboratory - approval of individual assignments.</td></tr>
<tr><td>*Required reading*</td><td colspan="3">Malik A., Grohmann E. (Editors) 2012. Environmental Protection Strategies for Sustainable Development. Imprint: Springer, https://link.springer.com/content/pdf/10.1007%2F978-94-007-1591-2.pdf
Poulopoulos S., Inglezakis, V. (Editors) 2016. Environment and Development: Basic Principles, Human Activities, and Environmental Implications. Imprint: Elsevier
Ciechanowicz-McLean J., Nyka M. 2016. Environmental Law Environmental Law. Imprint: Wydawnictwo Uniwersytetu Gdańskiego
Sulphey M.M. Introduction to environment management. Imprint: PHI Learning</td></tr>
</table>

COURSE SYLLABUS AND SPECIFICATION

Curriculum title: **USSPR-O-O-I-S-24/25Z**

Unit:
Podstawy paleooceanografii [moduł]

Course title:	Course code:
basics of palaeoceanography (podstawy paleooceanografii) (KIERUNKOWE)	**SPR38AIJ3446_8S**

Name of field of study:
oceanografia

Mode and cycle of study:	Profile of study:	Specialty:
first-degree, full - time	**general academic**	

Course / module status	Language of instruction:
elective	**semester: 4 - English language**

Year	Semester	Form of instruction	No. of hours		Type of credit	ECTS
				including e-learning		
2	4	laboratory	15	0	pg	4
		lecture	15	0	e	
Total			**30**			**4**

Course / module coordinator	**dr PRZEMYSŁAW DĄBEK**
Course instructor	**dr PRZEMYSŁAW DĄBEK**
Course / module objectives	**Acquiring by students a basic knowledge, skills and social competences related to the latest views on the genesis and development of the oceans, on the functioning of the ocean-atmosphere system today and in the geological past, and on the role of the oceans in shaping and regulating the Earth's climate.**
Prerequisites	**Basic knowledge of geology, including marine geology, climatology and meteorology, and physical and chemical oceanography.**

LEARNING OUTCOMES

Category	No.	Code	Description	Ref. to programme benchmarks
knowledge	**1**	**EP1**	**Student understands the origin and evolution of ocean basins, as well as the functioning of the ocean-atmosphere system at present and in deep time.**	**K_W03**
skills	**1**	**EP2**	**Uses the available sources for looking up information (e.g., latest scientific publications).**	**K_U03**
	2	**EP3**	**Student links information from the available sources and simple data generated in class.**	**K_U09**
	3	**EP4**	**Student acquires paleoceanographic data under the mentor's supervision.**	**K_U02**
social competences	**1**	**EP5**	**Student understands the need to perpetually improve his or her skills.**	**K_K02**

CONTENT	Semester	No. of hours	including e-learning
Subject title: **basics of palaeoceanography (podstawy paleooceanografii)**			
Format of instruction: **lecture**			
1. **Aim and scope of paleooceanographic research. History of the development of paleooceanography. Research material.**	4	2	0
2. **Formation of the lithosphere, hydrosphere, atmosphere and ocean basins. Dating of marine sediments.**	4	2	0
3. **Paleoreconstructions of temperature, salinity, biological production of seas and oceans.**	4	4	0
4. **Reconstructions of depth, paleocurrents, paleotides, paleostorms and ocean circulation.**	4	4	0

5. **The main climatic and geological events of the Cenozoic.**	4	3	0
Format of instruction: **laboratory**			
1. **Basics of laboratory work related to the collection and analysis of samples from sea and ocean cores. Laboratory preparation of samples**	4	4	0
2. **Paleooceanographic databases. Search for information about core information from ocean drilling. The process of ordering samples from DSDP / ODP / IODP. Analysis of significant paleooceanographic phenomena of the Cenozoic.**	4	4	0
3. **Biostratigraphic data. Performing the depth-age model and the linear rate of sedimentation (LSR).**	4	4	0
4. **Determination of water palaeotemperature with UK37 and TEX86 methods.**	4	3	0

Modes of delivery	**Laboratory and computer analyzes. Lectures in the form of a multimedia presentation based on the author's script.**	
	The course teacher shall specify how artificial intelligence should be used as part of implementation of the course according to University of Szczecin best practices and standards. The course teacher shall inform students in their first class about the scope and possibilities of using AI and shall present a catalogue of tools and applications adjusted to relevant learning outcomes and teaching needs and possibilities within a given course.	
Assessment methods		No. of learning outcome from the syllabus
	WRITTEN EXAM	**EP1**
	PRESENTATION	**EP2,EP3,EP4**
	PRACTICAL CLASSES	**EP2,EP3,EP4,EP5**
	Metody i formy weryfikacji efektów uczenia się mogą zostać zmienione dla studentów ze szczególnymi potrzebami na warunkach i zasadach określonych w Regulaminie Studiów Uniwersytetu Szczecińskiego.	
Grading criteria	**Oral examination verifies the knowledge gained during lectures. Graduation from practical sessions based on completion of practical assignments.**	
	Grade calculation principles	
	Final grade is an arithmetic average.	

Final grade calculation method	Sem.	Course	Type of credit	Grade calc. method	Weight for the average
	4	basics of palaeoceanography (podstawy paleooceanografii)		Ważona	
	4	basics of palaeoceanography (podstawy paleooceanografii) [laboratorium]	pg		0,40
	4	basics of palaeoceanography (podstawy paleooceanografii) [wykład]	exam		0,60

Basic reading	Fisher, G. & Wefer, G. (Ed.) (1999): Use of proxies in paleoceanography: Examples from the South Atlantic. Students receive from the tutor pdfs of selected and discussed in class issues., Springer
	Hillaire-Marcel, C. & de Vernal, A. (Ed.). (2007): Proxies in late Cenozoic paleoceanography. Students receive from the tutor pdfs of selected and discussed in class issues., Elsevier
Supplementary reading	Haq. B.U & Boresma, A. (Ed.) (1978): Introduction to marine micropaleontology., Elsevier
	Schopf, T.J.M. (1982): Paleooceanography
	Seibold, E. & Berger, W. (Ed.). (2017): The sea floor: an introduction to marine geology. Students receive from the tutor pdfs of selected and discussed in class issues., Springer

STUDENT WORKLOAD

	No. of hours	
		including e-learning
Contact hours	**30**	**0**
Participation in test / exam	**2**	**0**
Preparation for contact hours	**12**	**0**
Private reading and studying	**15**	**0**
Participation in tutorials	**10**	**0**
Preparation of project / essay / etc.	**16**	**0**

Preparation for test / exam	**15**	**0**
TOTAL workload	**100**	
ECTS credits	**4**	

<table>
<tr><td colspan="4">*Subject*: Biological invasions</td></tr>
<tr><td colspan="4">*Field of study*: oceanography, 1st degree, summer semester</td></tr>
<tr><td>*Form of classes*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>lectures</td><td>10</td><td rowspan="3">4</td><td rowspan="3">English</td></tr>
<tr><td>laboratory</td><td>20</td></tr>
<tr><td>field trip</td><td>15</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">dr inż. Jakub Skorupski</td></tr>
<tr><td>*Objectives of the subject:*</td><td colspan="3">familiarization with theories, methods and concepts of scientific foundations of invasion biology</td></tr>
<tr><td>*Requirement:*</td><td colspan="3">Basics of general biology and ecology</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">1. Introduction – definition, terminology and concepts
2. Non-indigenous species and cryptogenic species
3. Biological invasions and invasive species
4. The invasion proces. Pathways and vectors. Origin and distribution of invasive non-indigenous species
5. Invasion ecology
6. Biological invasions – risk assessment, predicting and preventing invasion
7. Socio-economic costs of non-indigenous species invasions. Impact of biological invasions on ecosystem services
8. Management, eradication and control of non-indigenous invasive species. Law on non-native species
9. Global climate change and invasive species
10. Guided field trip – invasive non-indigenous species in Poland</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">• lecture
• multimedia presentation
• work in groups
• problem discussion
• case study analysis</td></tr>
<tr><td>*Form and conditions of passing the subject*</td><td colspan="3">Written exam</td></tr>
<tr><td>*Literature*</td><td colspan="3">1. Lockwood J.L., Hoopes M.F., Marchetti M.P. 2013 (or earlier edition). Invasion Ecology. John Wiley & Sons, Ltd. Oxford
2. Nentwig W. (ed.). 2008. Biological Invasions. Springer-Verlag. Berlin
3. Skorupski J. (ed.) et al. 2017. Invasive Alien Species – identification of threats to protect biodiversity. Polish Society for Conservation Genetics LUTREOLA. Szczecin
4. Biological Invasions (Springer)</td></tr>
</table>

<table>
<tr><td colspan="4">*Course*: Biological oceanography</td></tr>
<tr><td colspan="4">*Field of study*: oceanography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>*Lectures*</td><td>30</td><td rowspan="2">7</td><td rowspan="2">English</td></tr>
<tr><td>*Laboratory*</td><td>45</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Przemysław Śmietana, Ph.D., D.Sc.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Acquiring knowledge about the structure and functioning of oceanic ecosystems in the context of the relationship between abiotic factors and biotic parameters in the view of regional and global oceanographic and climate processes. Mastering the basic methods and techniques used in biological marine studies.</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">Basic knowledge of biology, ecology and physical oceanography acquired in previous oceanography courses</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">1. Characteristics of areas of the marine environment and the restrictions they place on organisms and biocoenosis
2. Characteristics of the basics of functioning of marine ecosystems
3. Characteristics of the basic categories of ecological marine organisms
4. Processes and interactions in benthic-pelagic coupling
5. Processes and interactions in the coastal zone and estuaries
6. Characteristic marine ecosystems (coral reefs, mangroves, biocoenosis based on chemosynthesis)
7. Deep-sea ecosystems</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">Lectures. Practical assignments, data-mining and synthesis in team presentations.</td></tr>
<tr><td>*Course approval format and conditions*</td><td colspan="3">Passing grade at written examination. Practical laboratory - approval of individual assignments.</td></tr>
<tr><td>*Required reading*</td><td colspan="3">Miller C.B. 2012. Biological Oceanography. John Wiley & Sons
Kaiser M.J., Attrill M.J., Jennings S. et al. 2005. Marine Ecology. Processes, Systems, and Impacts, Oxford University Press, Oxford</td></tr>
</table>

<table>
<tr><td colspan="4">*Course*: Biology and Protection of Marine Fish</td></tr>
<tr><td colspan="4">*Field of study:* oceanography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>*Lectures*</td><td>17</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>*Practicals*</td><td>20</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Prof. Wojciech Piasecki, Ph.D., D.Sc.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Introduction to the basics of fish biology and their protection</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">Knowledge of systematic ichthyology and fish morphology</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">Fish physiology. Fish reproduction. Fish diseases. Fisheries management. Protection of marine fishes. Fish physiology. Fish reproduction. Fish diseases. Fisheries management. Marine aquarium.</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">Lectures using Power Point presentation and video. Practical classes with the use of the Internet and live and fixed biological preparations. A trip to a marine aquarium or ichthyological museum</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Positive grade from lectures (exam) and practical classes</td></tr>
<tr><td>*Required reading*</td><td colspan="3">Carl J. Walters, Steven J. D. Martell (2004): Fisheries Ecology and Management, Princeton University Press, USA

Douglas E. Facey, Brian W. Bowen, Bruce B. Collette, Gene S. Helfman (2022): The Diversity of Fishes: Biology, Evolution and Ecology, Willey and Sons , USA

Hart; Jd Reynolds Jd; John Reynolds (2002): Handbook of Fish Biology and Fisheries : Fish Biology, Wiley-Blackwell, USA</td></tr>
</table>

COURSE SYLLABUS AND SPECIFICATION

Curriculum title: **USSPR-O-O-I-S-23/24Z-GM**

Unit:
Ochrona strefy brzegowej [moduł]

Course title:	Course code:
coastal protection (SPECJALNOŚCI / SPECJALIZACJE / MODUŁY SPECJALNOŚCIOWE)	**SPR38AIJ3446_40S**

Name of field of study:
oceanografia

Mode and cycle of study:	Profile of study:	Specialty:
first-degree, full - time	**general academic**	**geologia morza**

Course / module status	Language of instruction:
elective	**semester: 6 - English language**

Year	Semester	Form of instruction	No. of hours		Type of credit	ECTS
				including e-learning		
3	6	discussion classes	15	0	pg	3
		lecture	15	0	e	
Total			**30**			**3**

Course / module coordinator	**dr hab. JOANNA DUDZIŃSKA-NOWAK**
Course instructor	**dr hab. JOANNA DUDZIŃSKA-NOWAK**
Course / module objectives	**To acquaint students with issues concerning the threats of the shore stability and their causes, as well as with the methods of shore protection used in present coastal engineering. Developing the ability to link the phenomena and processes taking place in the coastal zone with human engineering activities.**
Prerequisites	**Completed course in marine geology, marine physics and the basics of coastal geomorphology or an introduction tosea dynamics and coastal processes**

LEARNING OUTCOMES

Category	No.	Code	Description	Ref. to programme benchmarks
knowledge	1	EP1	Understands the basic phenomena and processes related to the structure and functioning of the marine coastal zone environment.	K_W05
	2	EP2	Describes and interprets the phenomena occurring under the influence of human engineering activities in animate and inanimate nature of the sea shore	K_W01
	3	EP3	Has knowledge of the basic concepts and terminology used in coastal engineering and morphodynamics, and knows the methods of shore protection	K W07 _
skills		EP4	Demonstrates the ability to draw conclusions based on the literature on the subject and to synthesize information from various sources and data obtained as a result of observations	K_U02 K_U07
	2	EP5	He can identify the causes of erosion threats in the coastal zone and propose methods of preventing their effects	K_U01
	3	EP6	He can predict the impact of engineering activities and various methods of shore protection on the shore development	K_U09
social competences	1	EP7	Understands the need to protect the marine environment of the coastal zone and to preserve its geodiversity and biodiversity	K_K04

CONTENT	Semester	No. of hours	including e-learning

Subject title: **coastal protection**			
Format of instruction: **lecture**			
1. **Factors influencing the reconstruction of sea shores. Coastal profile evolution**	6	2	0
2. **Coastal protection methods. Definitions and types of hydro-engineering structions and protection measures.**	6	2	0
3. **Natural methods of shore strengthening. Biological dune preservation and cliff slopes stabilization.**	6	2	0
4. **Artificial shore strengthening. Active and passive hydroengineering structures.**	6	4	0
5. **Artificial shore nourishment. Dykes.**	6	2	0
6. **Assessment of the influence of coastal protection to the morphodynamics of the shore.**	6	3	0
Format of instruction: **discussion classes**			
1. Criteria for planning hydro-engineering structures	6	2	0
2. Analysis of the impact of various protection methods on the processes of erosion, transport and deposition of sediments.	6	4	0
3. Project preparation for a selected section of the shore - analysis of present and historical data.	6	4	0
4. Project preparation - analysis of coastal changes and presentation of the results.	6	5	0

Modes of delivery	**Lecture with the use of a multimedia presentation and a movies explaining the phenomena and dependencies. Exercises: developing a project using various data sources.**	
	The course teacher shall specify how artificial intelligence should be used as part of implementation of the course according to University of Szczecin best practices and standards. The course teacher shall inform students in their first class about the scope and possibilities of using AI and shall present a catalogue of tools and applications adjusted to relevant learning outcomes and teaching needs and possibilities within a given course.	
Assessment methods		No. of learning outcome from the syllabus
	WRITTEN EXAM	**EP1,EP3,EP7**
	PRACTICAL CLASSES	**EP2,EP4,EP5,EP6**
	Metody i formy weryfikacji efektów uczenia się mogą zostać zmienione dla studentów ze szczególnymi potrzebami na warunkach i zasadach określonych w Regulaminie Studiów Uniwersytetu Szczecińskiego.	
Grading criteria	**Lecture: Obtaining a positive grade for the written exam in the field of the lecture content and the indicated literature. Classes: Completion of exercises based on the grade obtained for the implementation of the project and on the basis of activity in the classroom.**	
	Grade calculation principles	
	The grade for the subject is the arithmetic mean of the grades for the exam and exercises	

Final grade calculation method	Sem.	Course	Type of credit	Grade calc. method	Weight for the average
	6	coastal protection		Aritmetic	
	6	coastal protection [lecture]	exam		
	6	coastal protection [practicals]	pg		

Basic reading	Cooper J.A.G., Pilkey O.H. (red.) (2012): Pitfalls of Shoreline Stabilization: Selected Case Studies, Coastal Research Library 3, Springer
	Dudzińska-Nowak J. (2015): Metody ochrony zachodniego wybrzeża Polski i ich wpływ na zmiany brzegu w latach 1938-2011, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego
	Kostrzewski A., Musielak S., Furmańczyk K., Dudzińska-Nowak J., Osadczuk K., Winowski M., Wolski T., Zwoliński Z. (2021): Współczesna ewolucja rzeźby wybrzeża Bałtyku Południowego. W: Współczesne przemiany rzeźby Polski, red. L. Starkel i in., , Bogucki Wydawnictwo Naukowe, Poznań
	Musielak S., (2006): Geneza i funkcjonowanie systemu przyrodniczego morskiej strefy brzegowej. W: ZZOP t.2 Brzeg Morski - zrównoważony, red. K. Furmańczyk, , INoM US, Szczecin
	Reeve D., Chadwick A., Fleming Ch. (2004): Coastal Engineering. Processes, Theory and Design Practice, Spon Press, Taylor & Francis Grou, London–New York

Supplementary reading	Dudzińska-Nowak J. (2006): Coastline Long-term Changes of the Selected Area of the Pomeranian Bay, w: Tubielewicz A. (red), Coastal Dynamic, Geomorphology and Protection, EUROCOAST–LITTORAL, Gdańsk
	Reeve D. (2010): Risk and reliability: coastal and hydraulic engineering, Spoon Press, Taylor & Francis Group, London–New York
	Robin Davidson-Arnott (2010): An Introduction to Coastal Processes and Geomorphology, Cambridge University Press, Cambridge, UK
	Schwartz M. L., (red.) (2005): Encyclopedia of coastal science,, Springer, Washington

STUDENT WORKLOAD

	No. of hours	
		including e-learning
Contact hours	**30**	**0**
Participation in test / exam	**2**	**0**
Preparation for contact hours	**10**	**0**
Private reading and studying	**10**	**0**
Participation in tutorials	**10**	**0**
Preparation of project / essay / etc.	**13**	**0**
Preparation for test / exam	**0**	**0**
TOTAL workload	**75**	
ECTS credits	**3**	

<table>
<tr><td colspan="4">*Course*: Conservation of Genetic Resources</td></tr>
<tr><td colspan="4">*Field of study*: Exploitation of natural resources</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td>15</td><td rowspan="2">2</td><td rowspan="2">English</td></tr>
<tr><td>Practicals</td><td>10</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Jakub Skorupski, PhD, Eng.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">The course aims to provide a theoretical foundation in the conservation of gene pools of economically utilized species, focusing on preserving genetic diversity and ensuring the continuity of evolutionary and ecological processes that generate and maintain this diversity. It also seeks to develop practical skills in the conservation of genetic resources and foster a readiness to initiate actions for the sustainable and rational use of genetic resources in economically utilized organisms, as well as their protection.</td></tr>
<tr><td>*Requirements*:</td><td colspan="3">Basic knowledge in genetics, ecology and nature conservation.</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">1. Genetic resources as non-renewable resources.
2. Intensive and sustainable use of genetic resources in animals and plants.
3. Negative genetic effects of population exploitation.
4. Fundamentals of conservation genetics.
5. Controversial concepts in conservation genetics – de-extinction and conservation-oriented breeding improvement.
6. Conservation of genetic resources in cultivated plants and livestock.
7. Conservation of genetic resources in wild plants and animals.
8. Ethical, legal, and economic aspects of genetic resource conservation.
9. Methods used in molecular ecology and conservation genetics.
10. Bioinformatics tools for analyzing the genetic diversity of human-utilized populations.
11. Methods for identifying the negative effects of exploitation.
12. Genetically modified organisms and invasive alien species.</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">• lecture
• multimedia presentation
• problem discussion
• case study analysis
• critical discussion</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Written test</td></tr>
</table>

Literature	1. Ramamoorthy S., Buot I., Chandrasekaran R. 2021. Plant Genetic Resources, Inventory, Collection and Conservation. Springer. Berlin 2. Conservation Genetics Resources journal (ISSN 1877-7260). Springer Nature 3. Hawkes J.G., Maxted N., Ford-Lloyd B.V. 2000. The Ex Situ Conservation of Plant Genetic Resources. Springer Dordrecht. Dordrecht

Course:

Control, monitoring and prevention of biological hazards

(Kontrola, monitorowanie i profilaktyka zagrożeń biologicznych)

Field of study:

Exploatation of natural resources

Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	3	English
Practicals	15		
Fieldworks	15		

Coordinator:	Dr hab. Izabella Rząd, prof. US
Course objectives:	To familiarize students with hazards of biological origin occurring in organic natural resources of animal origin. To learn about the risk of diseases caused by biological agents occurring in organic natural resources exploited by humans. To learn about zoonoses.

Program content

Lectures:

Environmental aspects of biological hazards.
Endemic and epidemiological threats in Poland, Europe and the world.
Factors conducive to the spread of dangerous parasites for people and domesticated animals in the environment
Risk of infections and diseases caused by parasites present in nature.
Risk of infections and diseases caused by parasites present in food.
Parasites and zoonoses.
Host behaviour and the risk of the spread of parasites
Entities responsible for the biological safety of harvested organic natural resources of the environment.

Practicals:

Organic natural resources of animal origin as a potential source of biological agents posing a threat to human health.
The water, soil and air environment as routes of the spread of parasites
Economic losses caused by parasitic infections in people and in wild and domesticated animals.
Control and eradication of dangerous parasites for humans and domesticated animals.
Invasive parasite species and vectors.
The use of GIS in analysis of the distribution of parasites and their vectors.
Programmes for monitoring and eradicating parasitic infections and diseases.

Fieldworks:

Monitoring and control of potentially hazardous biological agents present in organic natural resources. The conduct of institutions, organizations and companies in ensuring the biological safety of harvested organic natural resources.

Educational methods	Multimedia presentation, group work, individual work, laboratory analyses, work with a microscope
Course approval format and condition	The final grade is the arithmetic mean of the grades from lectures and exercises in a 1:1 ratio
Literature	

<table>
<tr><td colspan="4">*Subject*: Diatomological workshops (Warsztaty malakologiczne)</td></tr>
<tr><td colspan="4">*Field of study*: Geology</td></tr>
<tr><td>*Form of classes*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>laboratory</td><td>15</td><td rowspan="2">2</td><td rowspan="2">English</td></tr>
<tr><td></td><td></td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Przemysław Dąbek, PhD.</td></tr>
<tr><td>*Objectives of the subject:*</td><td colspan="3">Acquiring knowledge and skills useful in lithostratigraphic studies and paleoenvironmental reconstruction based on the analysis of the taxonomic composition of diatoms.</td></tr>
<tr><td>*Requirement:*</td><td colspan="3">Basic knowledge on geology, biology and light microscopy. Good written and spoken English skills.</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">1. Principles of work in the diatomological laboratory.
2. Light and electron microscopy.
3. Diatoms as a tool in geological studies. Morphological and biological characteristics of diatoms.
4. Methodology for laboratory preparation of microfossils from sediments.
5. Diatomological analyzes: species identification, qualitative and quantitative analysis.
6. Reconstruction of sedimentation conditions and paleoenvironmental changes based on diatomological analysis.
7. Isolation and culture of live diatoms.</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">Multimedia presentation, group work, performing experiments and analyzes as well as summary reports, working with a microscope and specimens</td></tr>
<tr><td>*Form and conditions of passing the subject*</td><td colspan="3">Performing practical tasks, developing results in the form of a written work (report) and a multimedia presentation.</td></tr>
<tr><td>*Literature*</td><td colspan="3">Smol, J.P., Stoermer, E.F. (2010): The diatoms: applications for the environmental and earth sciences, Cambridge University Press
Bąk, M., Witkowski, A., Żelazna-Wieczorek, J., Wojtal, A.Z., Szczepocka, E., Szulc, K., Szulc, B. (2012): Klucz do oznaczania okrzemek w fitobentosie na potrzeby oceny stanu ekologicznego wód powierzchniowych, Biblioteka Monitoringu Środowiska GIOŚ</td></tr>
</table>

Course: dynamics of the coastal zone			
Field of study: physical geography / oceanography			
Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	3	English
Practicals	15		
Coordinator:	Joanna Dudzińska-Nowak, Ph.D. D.Sc.		
Course objectives:	Understanding the role of geological conditions and hydrological factors in the development of the coastal zone and the dynamics of geomorphological processes and coastal landforms.		
Program content			
1. Types of shores. Analysis of sedimentary forms and structures. 2. Dependence of the shore profile on geological conditions. 3. Factors affecting the coastal zone. Sediment transport and coastal erosion. 4. Methods for studying the dynamics of the coastal zone. 5. Dynamics of the coastal zone in different time scales.			
Educational methods	Multimedia presentations, discussion, independent computer work, lab measurement, work report - presentation		
Course approval format and condition	Lectures: Positive evaluation of the written exam Practicals: passing the presentation of the semester project results		
Literature	Masselink G., Hughes M.G., Knight J. (2011) Introduction to coastal processes and geomorphology. Second edition. Routledge, New York Osadczuk A., Borówka R.K., Dudzińska-Nowak J. (2024) Two Millennia of Natural and Anthropogenic Changes of the Polish Baltic Coast, Oxford Research Encyclopedia. Climate Science. https://doi.org/10.1093/acrefore/9780190228620.013.896		

Course:

Ecological and geographical aspects of parasitism

(Ekologiczne i geograficzne aspekty pasożytnictwa)

Field of study:

Exploatation of natural resources

Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	4	English
Practicals	15		

Coordinator:	Dr hab. Izabella Rząd, prof. US
Course objectives:	Understanding the ecology of parasitic organisms and their geographical distribution on Earth. Recognizing factors influencing the development of populations of various parasite species. Recognition of introduced, expansive and invasive parasite species in various geographical areas. Readiness to assess the population status of various parasite species in various types of ecosystems.

Program content

Lectures:

1. Parasites and parasitism - definitions, history and current state of research - 5 hours
2. Ecology of the parasite-host system – 5 hours
3. Geographical distribution of human and animal parasites – 5 hours

Practicals:

1. Recognition of parasite species and their transmission routes – 5 hours
2. Life cycles of parasites and characteristics of parasite habitats - 5 hours
3. Populations and communities of parasites – 5 hours

Educational methods	Multimedia presentation, group work, individual work, performing laboratory tests, working with a microscope.
Course approval format and condition	The final grade is the arithmetic mean of the grades from lectures and exercises in a 1:1 ratio

Literature	Mandatory: Poulin R. Evolutionary ecology of parasites. Pronceton University Press, Princeton and Oxford, 2007. Lucius R. I in. Biology of parasites. Wiley-VCH Verlag GmbH, 2017 Magurran A.E. Measuring biological diversity. Willey-Blackwell, 2004. Supplementary: Timothy M. Goater Parasitism: The Diversity and Ecology of Animal Parasites. Cambridge University Press Mehlhorn H. Animal Parasites Diagnosis, Treatment, Prevention. Springer, 2016.

<table>
<tr><td colspan="4">*Subject*: Ecological aspects of industrial livestock farming in the Baltic Sea region</td></tr>
<tr><td colspan="4">*Field of study*: exploitation of natural resources, 1st degree, summer semester</td></tr>
<tr><td>*Form of classes*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>lectures</td><td>10</td><td rowspan="2">4</td><td rowspan="2">English</td></tr>
<tr><td>laboratory</td><td>20</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">dr inż. Jakub Skorupski</td></tr>
<tr><td>*Objectives of the subject:*</td><td colspan="3">familiarization with ecological threats and challenges related to industrial farming and possibilities of counteracting them</td></tr>
<tr><td>*Requirement:*</td><td colspan="3">Basics of general ecology and geography</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">1. Introduction – definition, terminology and concepts
2. Conditions determining the impact of industrial livestock farming on the natural environment
3. Characteristics of the industrial livestock production in the Baltic Sea catchment area
4. Risks from large-scale livestock production identified in the Baltic Sea catchment area
5. Preventing negative consequences of intensive livestock production
6. Recommendations for reduction and control of nutrient runoff from industrial animal farms in the baltic sea catchment area</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">• lecture
• multimedia presentation
• work in groups
• problem discussion
• case study analysis</td></tr>
<tr><td>*Form and conditions of passing the subject*</td><td colspan="3">Written exam</td></tr>
<tr><td>*Literature*</td><td colspan="3">1. Skorupski J. et al. 2013. Report on Industrial Livestock Farming in the Baltic Sea Region – Environmental Protection Context. Coalition Clean Baltic. Uppsala
2. Skorupski J. 2012. Industrial Animal Farming in Poland as a major threat to the natural environment of the Baltic Sea. Coastline Reports 20: 45-53
3. HELCOM. 2021. Baltic Sea Action Plan. 2021 update. Baltic Marine Environment Protection Commission. Helsinki</td></tr>
</table>

<table>
<tr><td colspan="4">*Course:* **Fish diseases**</td></tr>
<tr><td colspan="4">*Field of study:* Oceanography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>*Lectures*</td><td>10</td><td rowspan="2">4</td><td rowspan="2">*English*</td></tr>
<tr><td>*Practicals*</td><td>10</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Prof. Wojciech Piasecki, Ph.D., D.Sc.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Learning the basics of fish diseases (ichthyopatology)</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">High-school biology</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">Lectures
1. Physiological vs. pathological processes in fish organisms
2. Introduction to fish immunology
3. Major pathogens in taxonomic arrangement (Bacteria, viruses)
4. Major pathogens in taxonomic arrangement (Protista)
5. Major pathogens in taxonomic arrangement (Flatworms)
6. Major pathogens in taxonomic arrangement (Roundworms)
7. Major pathogens in taxonomic arrangement (Crustacea)
Classes
1. Major pathogens in taxonomic arrangement
2. Fish necropsy.
3. Power points presentations of students</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">Lecture, practical training with fish parasites, microscopic observations</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Single-choice test (lectures)
Individual PowerPoint presentation (classes)</td></tr>
<tr><td>*Required reading*</td><td colspan="3">Noga E. (2010) Fish Disease - Diagnosis and Treatment. 2nd edn. Iowa State University Press, 544 pp.
Smith, S.A. (Ed.). (2019). Fish Diseases and Medicine (1st ed.). CRC Press. https://doi.org/10.1201/9780429195259
Rohde K. (Ed.) (2005): Marine parasitology, CSIRO Publishing, Victoria, Australia.</td></tr>
</table>

Course: **Foundations Of Taxonomy And Biosystematics**			
Field of study: Oceanography			
Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	2	English
Practicals			
Coordinator:	Prof. Wojciech Piasecki, Ph.D., D.Sc.		
Course objectives:	To introduce the principles and concepts of taxonomy and biosystematics. To provide a historical perspective on classification systems and their evolution. To familiarize students with modern approaches, tools, and methodologies used in species identification and phylogenetic analysis.		
Prerequisites:	High-school biology		

Program content

1. Introduction to Taxonomy and Biosystematics (2 hours)
- Definition and scope of taxonomy and biosystematics.
- Historical development: From Aristotle to Linnaeus and beyond.
- Importance in biodiversity conservation and biological research.

2. Principles and Rules of Nomenclature (3 hours)
- International Code of Zoological Nomenclature (ICZN) and botanical codes.
- Principles of priority, validity, and typification.
- Case studies on nomenclatural conflicts and resolutions.

3. Species Concepts and Speciation (3 hours)
- Biological, morphological, phylogenetic, and ecological species concepts.
- Mechanisms of speciation and barriers to gene flow.
- Examples from terrestrial and aquatic organisms.

4. Classification Systems and Phylogenetics (4 hours)
- Hierarchical classification and the tree of life.
- Cladistics vs. phenetics: Methodologies and debates.
- Molecular systematics and the role of DNA barcoding.
- Tools and software for phylogenetic analysis.

5. Modern Approaches and Applications (3 hours)
- Role of taxonomy in conservation biology and ecosystem management.
- Integrative taxonomy: Combining morphology, genetics, and ecology.
- Case studies on newly discovered or reclassified species.

Educational methods	Lecture with MS Power-Point presentations and videos

Course approval format and condition	Single-choice test
Literature	1. Mayr, E. & Ashlock, P.D. (1991). Principles of Systematic Zoology. McGraw-Hill. 2. Wheeler, Q.D. & Meier, R. (2000). Species Concepts and Phylogenetic Theory: A Debate. Columbia University Press. 3. 3. Schuh, R.T. & Brower, A.V.Z. (2009). Biological Systematics: Principles and Applications. Cornell University Press.

<table>
<tr><td colspan="4">*Course*: Genetic Resources</td></tr>
<tr><td colspan="4">*Field of study*: Exploitation of natural resources</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td>15</td><td rowspan="2">2</td><td rowspan="2">English</td></tr>
<tr><td>Practicals</td><td>5</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Jakub Skorupski, PhD, Eng.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">The course aims to provide a theoretical foundation in the valuation and exploitation of genetic resources of economically utilized species, develop practical skills for assessing genetic resources of such species, and foster an appreciation for the importance of scientific knowledge in solving research problems and addressing practical challenges related to genetic resource exploitation.</td></tr>
<tr><td>*Requirements*:</td><td colspan="3">Basic knowledge in genetics and ecology.</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">1. Genetic resources – introduction.
2. The state of genetic resources in plants, fungi, and algae.
3. The state of genetic resources in animals.
4. Factors shaping the gene pools of populations utilized in agriculture, hunting, forestry, fisheries, tourism, and industry.
5. Assessment of genetic resources in economically utilized organisms.
6. Basics of population genetics, landscape genetics, and phylogeography.
7. Gene pool balance and factors determining the exploitation value of genetic resources.
8. Ethical, legal, and economic aspects of genetic resource exploitation.
9. Methods for assessing genetic diversity.
10. Analysis of intra- and inter-population genetic diversity.
11. Elements of breeding genetics and biotechnology in the exploitation of genetic resources.</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">• lecture
• multimedia presentation
• problem discussion
• case study analysis
• critical discussion</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Written test</td></tr>
<tr><td>*Literature*</td><td colspan="3">1. Ramamoorthy S., Buot I., Chandrasekaran R. 2021. Plant Genetic Resources, Inventory, Collection and Conservation. Springer. Berlin</td></tr>
</table>

	2. Allendorf F.W. (ed.). 2022. Conservation and the Genomics of Populations. Oxford University Press. Oxford 3. Oldenbroek K. 2007. Utilisation and Conservation of Farm Animal Genetic Resources. Wageningen Academic Publishers. Wageningen

<table>
<tr><td colspan="4">*Course*: Geographic information systems</td></tr>
<tr><td colspan="4">*Field of study*: geography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Practicals</td><td>15</td><td rowspan="2">1</td><td rowspan="2">English</td></tr>
<tr><td>Lecture</td><td></td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Natalia Sypion-Dutkowska Ph.D.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">To familiarize students with the possibilities of geographical information systems (GIS) in the field of visualization and analysis spatial data and examples of applications in this field of knowledge.
To familiarize students with specialized GIS software and the possibilities of its application</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">Knowledge of using a Windows computer and completed the course of information technologies</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">1. Definitions of Geographic Information Systems. Division criteria
2. Data acquisition, introduction, processing and sharing
3. Data models
4. Features, applications and data sources
5. Spatial analysis and visualization of their results
6. Application of vector and raster models
7. Analysis using GIS tools - logical and spatial queries
8. Data collection for the GIS system
9. Attribute data input and database integration
10. Vector models. Screen vectorization of spatial data broken down into layers
thematic
11. Logical and spatial analysis of geodata using our own geodatabase
12. Raster models. Data interpolation methods
13. Modeling in GIS</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">Individual work at the computer, multimedia presentation, discussion, explanation</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">passing exercises and exam</td></tr>
<tr><td>*Required reading*</td><td colspan="3">Paul A. Longley, Mike Goodchild, et al., 2010, Geographic Information Systems and Science, John Wiley and Sons, USA
Jose Antonio Tenedorio, Rossana Estanqueiro (Eds) 2020, Methods and Applications of Geospatial Technology in Sustainable Urbanism, Business Science Reference.
Ali Mansourian, Petter Pilesjö, Lars Harrie, Ron van Lammeren (Eds) 2020, Geospatial Technologies for All: Selected Papers of the 21st AGILE Conference on Geographic Information Science (Lecture Notes in Geoinformation and Cartography), Springer</td></tr>
</table>

COURSE SYLLABUS AND SPECIFICATION

Curriculum title: **USSPR-Geol-O-I-S-24/25Z**	
Unit: **Moduł: Geologia dna mórz i oceanów [moduł]**	
Course title: **Geology of the seabed and ocean floor (geologia dna mórz i oceanów) (KIERUNKOWE)**	Course code: **SPR81AIJ3446_31S**
Name of field of study: **geologia**	
Mode and cycle of study: **first-degree, full - time**	Profile of study: **general academic** / Specialty:
Course / module status **elective**	Language of instruction: **semester: 3 - english language**

Year	Semester	Form of instruction	No. of hours	including e-learning	Type of credit	ECTS
2	3	discussion classes	15	0	pg	4
		laboratory	15	0	pg	
		lecture	30	0	e	
Total			**60**			**4**

Course / module coordinator	**dr hab. DOMINIK ZAWADZKI**
Course instructor	**dr hab. inż. ANDRZEJ OSADCZUK , dr hab. DOMINIK ZAWADZKI**
Course / module objectives	**Familiarize students with issues related to contemporary marine geology, with particular emphasis on understanding the mechanisms of global processes resulting in the formation and evolution of the oceans and the essence of the differences in the structure of the oceanic crust and continental margins, as well as the environmental conditions of marine sedimentation.**
Prerequisites	**Well-established knowledge in the field of physics, chemistry and physical geography at the secondary school level and the basics of geology**

LEARNING OUTCOMES

Category	No.	Code	Description	Ref. to programme benchmarks
knowledge	1	EP1	**The student understands the influence of endogenous factors and the processes shaping the oceanic crust.**	**K_W01 K_W02**
	2	EP2	**Student knows the basic structural forms of the ocean floor.**	**K_W02**
	3	EP3	**Student has knowledge about the processes and mechanisms determining the environmental conditions of marine sedimentation.**	**K_W06**
	4	EP4	**Student knows the basic terms in the field of marine geology, including those relating to the research methods used.**	**K_W03**
	5	EP5	**The student knows the direct and indirect methods of geological research of the seabed and contemporary methods techniques of research and exploration of marine mineral resources.**	**K_W07**
skills	1	EP6	**Using specialized software, he is able to perform spatial analyzes relating to the ocean floor.**	**K_U04**
	2	EP7	**Student is able to graphically visualize various data in order to identify geological events and phenomena occurring in the marine environment.**	**K_U06**
	3	EP8	**Student is able to use the acquired knowledge, geological data and research results to prepare maps and geological sections of the ocean floor.**	**K_U07**

social competences	**1**	**EP9**	**Student is ready to critically assess his knowledge and received content, as well as fulfill social obligations, including co-organizing and initiating activities for the common good, in particular the importance and protection of the marine environment**	**K_K01**
	2	**EP10**	**Student Is ready to cooperate and work in a group, especially at sea and in the laboratory, showing openness, responsibility and rationality in teamwork and observing the principles of ethics and partnership**	**K_K06**

CONTENT	Semester	No. of hours	including e-learning
Subject title: **Geology of the seabed and ocean floor (geologia dna mórz i oceanów)**			
Format of instruction: **lecture**			
1. **null**	3	3	0
2. **null**	3	4	0
3. **null**	3	3	0
4. **null**	3	4	0
5. **null**	3	4	0
6. **null**	3	4	0
7. **null**	3	4	0
8. **null**	3	4	0
Format of instruction: **discussion classes**			
1. **null**	3	2	0
2. **null**	3	2	0
3. **null**	3	4	0
4. **null**	3	3	0
5. **null**	3	4	0
Format of instruction: **laboratory**			
1. **null**	3	3	0
2. **null**	3	3	0
3. **null**	3	3	0
4. **null**	3	3	0
5. **null**	3	3	0

Modes of delivery	**Multimedia presentation lecture. Practical classes involving work with geological cartographic materials and analysis of geological data using databases and specialized software.**
	The course teacher shall specify how artificial intelligence should be used as part of implementation of the course according to University of Szczecin best practices and standards. The course teacher shall inform students in their first class about the scope and possibilities of using AI and shall present a catalogue of tools and applications adjusted to relevant learning outcomes and teaching needs and possibilities within a given course.

Assessment methods		No. of learning outcome from the syllabus
	EGZAMIN PISEMNY	**EP1,EP2,EP3,EP4,EP5**
	PROJEKT	**EP6,EP7,EP8**
	ZAJĘCIA PRAKTYCZNE (WERYFIKACJA POPRZEZ OBSERWACJĘ)	**EP10,EP6,EP9**
	Metody i formy weryfikacji efektów uczenia się mogą zostać zmienione dla studentów ze szczególnymi potrzebami na warunkach i zasadach określonych w Regulaminie Studiów Uniwersytetu Szczecińskiego.	
Grading criteria	**Positive assessment of the exam and positive assessment of activity and completed tasks (maps, reports, etc.) performed as part of practical classes.**	
	Grade calculation principles	
	The course grade is determined by the course coordinator on the basis of component grades (exam, practicals, laboratory). **Written exam: partial grade from lectures.** **Project: partial grade from exercises.** **Practical classes (verification by observation): arithmetic average of grades for completed laboratory tasks.** **Final grade: arithmetic average of the exam, project and practical classes.**	

Final grade calculation method	Sem.	Course	Type of credit	Grade calc. method	Weight for the average
	3	Geology of the seabed and ocean floor (geologia dna mórz i oceanów)		Arytmetyczna	
	3	Geology of the seabed and ocean floor (geologia dna mórz i oceanów) [wykład]	egzamin		
	3	Geology of the seabed and ocean floor (geologia dna mórz i oceanów) [laboratorium]	zaliczenie z oceną		
	3	Geology of the seabed and ocean floor (geologia dna mórz i oceanów) [ćwiczenia]	zaliczenie z oceną		

Basic reading	Depowski S., Kotlinski R., Rühle E., Szamałek K. (1998): Surowce mineralne mórz i oceanów, Wyd. Nauk. Scholar
	Duxbury A.O., Duxbury A.B., Sverdrup K.A. (2002): Oceany Świata, PWN Warszawa
	Mizerski W., Szamałek K. (2009): Geologia i surowce mineralne oceanów, PWN Warszawa
Supplementary reading	Edward Tarbuck E., Lutgens F., Tasa D. (2017): Earth An Introduction to Physical Geology, Pearson Education Limited
	Erickson J., (2002): Marine Geology: Exploring the New Frontiers of the Ocean. , The Living Earth
	Frisch, Meschede, Blakey, (2011): Plate Tectonics Continental Drift and Mountain Building
	Kotlinski R. (2012): Mapa geodynamiczna oceanów Ziemi 1:25 000 000, IOM, Szczecin
	Kotlinski R. (2012): Mapa makroform rzeźby dna oceanów 1:40 000 000,, IOM, Szczecin
	Kotlinski R. (2012): Mapa osadów oceanicznych 1:40 000 000,, IOM, Szczecin
	MacDougall J.D. (1998): Krótka historia Ziemi, Prószyński i S-ka, Warszawa
	Praca zbiorowa (1995): Atlas Geologiczny Bałtyku Południowego, Panstwowy Instytut Geologiczny, Sopot-Warszawa
	Radomski A., Gasinski N.A. (2004): Elementy oceanologii. Wprowadzenie do środowisk morskich, Wyd. Uniw. Jagielonskiego, Kraków
	Schopf T.J.M. (1987): Paleooceanografia, PWN, Warszawa
	Seibold E., Berger W.H. (1996): The Sea Floor; An Introduction to Marine Geology (3 Edition), Springer- Verlag
	Stanley S.M. (2005): Historia Ziemi, PWN, Warszawa

STUDENT WORKLOAD

	No. of hours	
		including e-learning
Contact hours	**60**	**0**
Participation in test / exam	**4**	**0**
Preparation for contact hours	**3**	**0**
Private reading and studying	**10**	**0**

Participation in tutorials	**2**	**0**
Preparation of project / essay / etc.	**15**	**0**
Preparation for test / exam	**6**	**0**
TOTAL workload	**100**	
ECTS credits	**4**	

Course: Geomorphology			
Field of study: Geography			
Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	4	English
Practicals	30		
Coordinator:	Labuz T.A., prof US		
Course objectives:	1. Presentation important processes shaping land forms 2. Description of main land forms and morphological landscapes 3. Explanation of relief form changes 4. Presentation of the methods and problems in geomorphology		
Program content			
1.Objectives and principles of geomorphology 2.Geomorphology research methods 3.The role of endogenous and exogenous processes in formation of Earth's landforms 4.Weathering. Denudation processes and landforms, weathering 5. Slope development, type of slopes 6.Fluvial geomorphology and forms 7.Karst processes and landforms 8.Glacial and periglacial geomorphology 9.Aeolian processes and desert landforms 10.Coastal forms 11. Anthropogenic forms and human impact in landforms, morphological threats			
Educational methods	Lectures, presentations and practical exercises		
Course approval format and condition	Report based on lectures subject. One selected from proposed. Prepared exercises based on practical lectures. Single marks and average evaluation		
Literature	Summerfield M.A., 1991, Global geomorphology Shroder J., 2013. *Treatise on Geomorphology.* Academic Press Bierman P.R; Montgomery D.R., 2020. *Key Concepts in Geomorphology* And other Overview in geomorphology, https://www.thoughtco.com/overview-of-geomorphology-1435326		

Course: Geosystem of coastal dunes (bio- and geodiversity)			
Field of study: Oceanography			
Class format	*Class hours*	*ECTS*	*Language*
Lectures	20	4	English
Practicals	15		
Coordinator:	Labuz T.A., prof US		
Course objectives:	1. Knowledge about coastal dunes morphology and dynamics 2. Knowledge about biodiversity of dunes in different climate zones 3. Significance and utility of coastal dunes		
Program content			
1. Morphology and types of coastal dunes 2. Biodiversity and habitats 3. Species important for dune dynamics 4. Coastal dunes dynamics and development 5. Coastal dunes in different climate 6. Management, utility and protection of coastal dune systems 7. Coastal dunes as important environment in coastal areas (for human and nature)			
Educational methods	Lectures, presentations and practical exercises		
Course approval format and condition	Report based on lectures subject. One selected from proposed. Prepared exercises based on practical lectures. Single marks and average evaluation		
Literature	1.Davidson-Arnott R., 2010, Introduction to coastal processes & geomorphology 2.Łabuz T.A., 2016, Coastal dunes: changes of their perception and environmental management. In: Finkl Ch.W., Makowski Ch., Environmental management and Governance, Springer 3.McLachlan A., Brown A., 2006, The ecology of sandy shores, Academic Press 4. Łabuz T.A., 2016, A review of field methods to survey coastal dunes - experience based on research from South Baltic coast. Journal of Coastal Conservation 20(2), pp. 175-190 5. Coastal wiki: http://www.coastalwiki.org/wiki/Main_Page		

<table>
<tr><td colspan="4">*Course*: **Global biosphere changes**</td></tr>
<tr><td colspan="4">*Field of study*: geography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>seminar</td><td>17</td><td rowspan="2">3</td><td rowspan="2">English</td></tr>
<tr><td>field classes</td><td>8</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Przemysław Śmietana, Ph.D., D.Sc.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Acquiring knowledge about the causes and effects of global changes and their impact on the formation of the biosphere. Acquiring the skill to conduct data analysis on global biosphere changes and to initiate and co-organize activities related to limiting these changes caused by anthropogenic impact.</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">Basic knowledge in the field of biology and geology</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">1. Evolution of the natural environment in the view of long-term processes and large-scale geological processes
2. Climate changes in the past and their impact on the biosphere
3. Causes of global natural and anthropogenic changes and their impact on changes in the biosphere
4. The impact of human activity on the depletion of the biosphere</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">seminar lecture with multimedia presentation, study case, analysis of texts with discussion, work in teams.</td></tr>
<tr><td>*Course approval format and conditions*</td><td colspan="3">Course credited on the basis of written work on the issues covered in class</td></tr>
<tr><td>*Required reading*</td><td colspan="3">Poulopoulos S., Inglezakis, V. (Editors) 2016. Environment and Development: Basic Principles, Human Activities, and Environmental Implications. Imprint: Elsevier
Malik A., Grohmann E. (Editors) 2012. Environmental Protection Strategies for Sustainable Development. Imprint: Springer, https://link.springer.com/content/pdf/10.1007%2F978-94-007-1591-2.pdf
Stern P.C., Young O.R., Druckman D. 1992. Global Environmental Change: Understanding the Human Dimensions. The National Academies Press.
Internet, websites</td></tr>
</table>

Course:

Health quality of natural resources of animal origin
(Jakość zdrowotna zasobów naturalnych pochodzenia zwierzęcego)

Field of study:

Exploatation of natural resources

Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	3	English
Practicals	15		
Fieldworks	15		

Coordinator:	Dr hab. Izabella Rząd, prof. US
Course objectives:	To learn the important environmental factors for the health quality of natural resources of animal origin. To recognize threats reducing the health quality of natural resources of animal origin. Readiness to assess the health quality of natural resources of animal origin.

Program content

Lectures:

Health quality of natural resources of animal origin - its sources, characteristics and indicators
Role of geographic factors in assessment of the health quality of natural resources of animal
Role of ecological factors in assessment of the health quality of natural resources of animal origin
Role of zoological factors in assessment of the health quality of natural resources of animal origin
Protection of the health of animals harvested by humans for economic purposes
Health safety of organic natural resources of animal origin

Practicals:

Biotic environmental factors influencing the health quality of animal species exploited by humans
Abiotic environmental factors influencing the health quality of animal species exploited by humans
Methods of assessing the health quality of food of animal origin harvested as a result of exploitation
Parasites of animals harvested by humans for economic purposes, an overview of species
Parasitic zoonoses
Planning and coordination of measures for maintaining and assessing the health quality of natural resources of animal origin
Preventive measures for protecting the health safety of natural resources of animal origin

Fieldworks:

Conduct of institutions, organizations and companies in ensuring the biological safety of harvested organic natural resources.

Educational methods	Multimedia presentation, group work, individual work, laboratory analyses, work with a microscope
Course approval format and condition	The final grade is the arithmetic mean of the grades from lectures and exercises in a 1:1 ratio
Literature	

Course: **Hydrobiology**			
Field of study: Oceanography			
Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	4	English
Practicals	20+10 fieldworks		
Coordinator:	Agnieszka Szlauer-Łukaszewska, Ph.D., D.Sc.		
Course objectives:	Understanding the specifics of different aquatic environments, familiarizing with groups of organisms living in different types of waters, problems of degradation, protection, testing of water quality and economic use of water.		
Prerequisites:	Completed biology and chemistry course in Oceanography		

Course content matter

Lectures:
1. Specificity of living conditions in water
2. Impact of physical and edaphic factors on biotic phenomena
3. Biology of aquatic organisms
4. Anatomical adaptation to life in water
5. Ecological formations
6. Biological characteristics of the aquatic environment: lakes, dam reservoirs, ponds, rivers, sources and estuaries
7. Productivity of ecosystems, habitat diversity
8. Taxonomic composition of selected aquatic ecosystems
9. Applied hydrobiology: eutrophication, saprobization, acidification

Practical:
1. Methods for biological characterization of aquatic environments
2. Methods of collecting biological data in aquatic environments
3. Taxonomic identification of aquatic organisms

Instruction methods	Presentation based on the author's scenario of lectures, practical exercises in a biological laboratory, field classes
Course approval format and condition	Written exam - mixed test with open and multiple choice questions, Passing practical classes on the basis of correctly completed practical tasks.
Required reading	Krebs, Ch.J. 2009. Ecology: The Experimental Analysis of Distribution and Abundance. University of British Columbia, Vancouver Cain, S. 2018. Freshwater Biology. Larsen and Keller Education

Course: Hydrobotany			
Field of study: Oceanography			
Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	4	English
Laboratories	30		
Fieldwork	-		
Coordinator:	dr hab. Helena Więcław, prof. US		
Course objectives:	To acquaint students with the diversity of aquatic and semi-aquatic plant species, emphasizing their important role in the biosphere. To acquire practical skills in identifying plant species.		
Requirement:	None		
Program content			
Lectures: Plants in freshwater and marine environments and their classification. Adaptations of plants to aquatic and semi-aquatic environments. An overview of selected groups of algae, aquatic ferns, and aquatic and semi-aquatic flowering plants, focusing on their morphological and anatomical characteristics. Aquatic and wetland plant communities, principles of plant association classification, and key diagnostic species. The role of aquatic and semi-aquatic plants in biodiversity, their significance in the food chain, and their role in the biosphere. **Laboratories:** Observation of morphological and anatomical traits of selected groups of algae and aquatic and semi-aquatic plant species. Identification of species based on diagnostic traits.			
Educational methods	Lectures with multimedia presentations. Demonstrations of herbarium sheets. Individual and group work with plant materials, microscopes, and identification keys.		
Course approval format and condition	Written exam		
Literature	Schou J. Ch., Moeslund B., Van de Weyer K., Wiegleb G., Lansdown R. V., Holm P., Baastrup-Spohr L., Sand-Jensen K. 2023. Aquatic Plants of Northern and Central Europe Including Britain and Ireland. Princeton University Press, Princeton, New Jersey. Janauer G. Dokulil M. 2006. Macrophytes and Algae in Running Waters**.** In: Ziglio G., Siligardi M., Flaim G. (eds.), Biological Monitoring of Rivers. John Wiley & Sons, 89–109.		

<table>
<tr><td colspan="4">*Course*: Hydrochemistry</td></tr>
<tr><td colspan="4">*Field of study*: Oceanography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>*Lectures*</td><td>15</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>*Practicals*</td><td>30</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Roman Marks, Ph.D, D.Sc.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Students will gain knowledge on: chemical composition of sea water configuration of ionic features, pH and relater ionic balance, chemical composition of surface microlayer, pollution loads and dispersion in sea water, fate of organic pollution in marine ecosystems, mercury fate in sea water and air, general chemical reactions in oceanic system</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">Basic knowledge in chemistry, hydrochemistry, physics, biology and ecology</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">Lectures:
1. Chemical and physical properties of sea water
2. Unique properties of oceanic water
3. Features of transport and exchange of water
4. Oceanic processes of sedimentation
5. Density of sea water. Stratification od water due to density, concept of pycnoclyne. Salinity of water
6. Thermal properties of sea and oceanic waters
7.Geses dissolved in sea water
8. Biogenic matter in oceanic waters
9. Circulatory patterns of ions. Secondary constituents in sea water. Microelements in sea water.
10. Carbonate system of sea water. Sedimentation of carbonaceous matter.
Exercises:
1. Conductivity measurements in sea water
2. Experimental measurements of dissolved oxygen in sea water
3. Experimental measurements of oxygen concentration in air
3. pH measurements
4. Surface microlayer formation and properties
5. Experiments at Coastal Station in Międzyzdroje</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">Lectures, exercises, field and laboratory experiments</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Oral exam</td></tr>
<tr><td>*Required reading*</td><td colspan="3">Millero F. J. 2013: Chemical Oceanography, 591.
Marks R., Bełdowska M., 2001: Air-Sea Exchange of Mercury Vapour over the Gulf of Gdańsk and southern Baltic Sea. J. Marine Systems, 27(4), 315-324.</td></tr>
</table>

	Marks R., 2002: Preliminary investigation of mercury saturation in the Baltic Sea winter surface water. The Science of the Total Environment, 229, 227-236. Schneider B., Ceburnis D., Marks R., Munthe J., Petersen G., Sofiev M., 2000: Atmospheric Pb and Cd input into the Baltic Sea: A new estimate based on measurements. Marine Chemistry, Vol. 71, 3-4, 297-307. Urba, A., Kvietkus K., Marks R., 2000: Gas-phase mercury in the atmosphere over the southern Baltic Sea coast. The Science of the Total Environment. Vol. 259, 203-210. Nadstazik A., Marks R., and M., Schulz, 2000: Nitrogen species and macroelements in aerosol over the southern Baltic Sea. Oceanologia, 42(4), 411-424.

<table>
<tr><td colspan="4">*Course*: Introduction to Phylogenetics</td></tr>
<tr><td colspan="4">*Field of study*: Oceanography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td>-</td><td rowspan="2">2</td><td rowspan="2">English</td></tr>
<tr><td>Practicals</td><td>20</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Przemysław Dąbek, PhD</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Acquiring knowledge and skills in phylogenetics will enable students to analyze evolutionary relationships among species using modern computational tools and molecular data. This foundational understanding will equip them to critically evaluate phylogenetic studies and contribute to the advancement of research in systematics and evolutionary biology. Through hands-on practice students will gain a solid grasp of phylogenetic methodologies and their applications in various biological fields.</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">1. Introduction to Phylogenetics (foundations of phylogenetics, including the concepts of evolutionary trees, clades, and common ancestry).
2. Molecular Data and its Application – molecular data types (DNA, RNA, and protein sequences) and their role in phylogenetic reconstruction.
3. Methods of Phylogenetic Tree Construction (exploration of various phylogenetic methods: distance-based, character-based, maximum likelihood, and Bayesian inference).
4. Evaluating Phylogenetic Trees – approaches to assessing the reliability and accuracy of phylogenetic trees (e.g., bootstrapping, posterior probabilities).</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">Practical sessions using phylogenetic software, group discussions, and case study analyses to reinforce theoretical concepts and enhance practical skills, with a strong emphasis on using specialized programs and genetic databases for data analysis and tree construction.</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Performing practical tasks, developing results in the form of a written work (report).</td></tr>
<tr><td>*Literature*</td><td colspan="3">Wiley, E.O. & Lieberman B.S., Phylogenetics: Theory and Practice of Phylogenetic Systematics, 2011, 2nd Edition, Wiley-Blackwell,
Lesk A.M., Introduction to Bioinformatics, 2019, Oxford University Press, 5th Edition, Londyn.</td></tr>
</table>

Course: **Land and marine sedimentation environments**			
Field of study: Geology			
Class format	*Class hours*	*ECTS*	*Language*
Seminars	20	3	English
Practicals			
Coordinator:	Agnieszka Strzelecka PhD		
Course objectives:	(1) Presenting the methods and sources of data used in sedimentology analysis. (2) Presenting the diversity of marine and terrestrial sedimentary environments and processes occurring in them.		
Prerequisites:	Basic understanding of geology, oceanography, sedimentology, mineralogy, petrography, geomorphology.		
Course content matter			
(1) Types of syn-and post-depositional structures sedimentation. (2) Textural properties of the sediments. (3) Characteristic of marine sedimentary basins (littoral, sublitoral, hemipelagic, eupelagic) (4) Characteristic of terrestrial sedimentary basins (fluvial, glacial, aeolian, lacustrine) (5) Characteristic of transitional sedimentary basins (estuary, delta, lagoon) (6) Advanced sedimentological software. (7) Basics of facies analysis and sequential stratigraphy.			
Instruction methods	Lecture, laboratory		
Course approval format and condition	Written examination for completing the course.		
Required reading	Huneke H., Mulder T., 2010. *Deep-Sea Sediments* Elsevier Science. Miall A.D., 2010. *Principles of Sedimentary Basin Analysis* Springer Miall, A.D., 2016. *The Geology of Fluvial Deposits* Springer Miall, A.D., 2016. *Stratigraphy. A modern synthesis*. Springer.		

<table>
<tr><td colspan="4">*Subject*: Landscape genetics</td></tr>
<tr><td colspan="4">*Field of study*: geography, 1st degree, winter semester</td></tr>
<tr><td>*Form of classes*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td>10</td><td rowspan="3">4</td><td rowspan="3">English</td></tr>
<tr><td>Laboratory</td><td>20</td></tr>
<tr><td>field trip</td><td>15</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">dr inż. Jakub Skorupski</td></tr>
<tr><td>*Objectives of the subject:*</td><td colspan="3">familiarization with the theoretical and practical foundations of study on how landscape modification and habitat fragmentation affect organism dispersal and gene flow across the landscape</td></tr>
<tr><td>*Requirement:*</td><td colspan="3">Basics of genetics and ecology</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">1. Basics of landscape genetics – terminology and methodology
2. Basics of population genetics. Gene pool vs. population
3. Landscape ecology
4. Metapopulation
5. Linking landscape and genetic data for landscape genetic studies
6. Ecological connectivity
7. Applications of landscape genetics to connectivity research
8. Applications of landscape genetics to nature conservation
9. Application of *in silico* analyses, simulations and modelling in landscape genetics
10. Planning *ex situ* and *in situ* conservation activities based on landscape genetics
11. Current status, future opportunities, and remaining challenges in landscape genetics
12. Guided field trip to a conservation breeding centre for endangered species</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">• lecture
• multimedia presentation
• *in silico* analyses/specialized software
• work in groups
• problem discussion
• case study analysis</td></tr>
<tr><td>*Form and conditions of passing the subject*</td><td colspan="3">Written exam</td></tr>
<tr><td>*Literature*</td><td colspan="3">1. Balkenhol N., Cushman S.A., Storfer A.T., Waits L.P. 2016. Landscape Genetics. John Wiley & Sons Ltd. Hoboken
2. Holderegger R., Gugerli F., Scheidegger C., Taberlet P. 2007. Integrating Population Genetics with Landscape Ecology to Infer Spatio-temporal Processes. In: Kienast F., Wildi O., Ghosh S. (eds). A Changing World. Landscape Series. Vol 8. Springer. Dordrecht
3. Allendorf F.W. 2022 (or previous editions). Conservation and the Genomics of Populations. Oxford University Press. Oxford
4. Frankham R. 2010. Introduction to Conservation Genetics. Cambridge University Press. Cambridge</td></tr>
</table>

	5. Ballou J.D., Briscoe D.A., Frankham R. 2009. A Primer of Conservation Genetics. Cambridge University Press. Cambridge 6. Skorupski J. (ed.) et al. 2017. Conservation genetics in Poland – theory and practice. Polish Society for Conservation Genetics LUTREOLA. Szczecin

<table>
<tr><td colspan="4">*Course*: Lichenoindication of air pollution</td></tr>
<tr><td colspan="4">*Field of study*: Exploitation of natural resources</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td>15</td><td rowspan="3">3</td><td rowspan="3">English</td></tr>
<tr><td>Laboratories</td><td>15</td></tr>
<tr><td>Fieldwork</td><td>5</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">dr Edyta Stępień-Zawal</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">To learn about the importance and use of lichens in the indication of air pollution. To learn about their structure, biology, diversity, ecological role and threats. Acquiring the ability to identify lichens and practical application of various methods of lichenoindication.</td></tr>
<tr><td>*Requirement:*</td><td colspan="3">None</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">**Lectures:** Characteristics of lichens. Specificity of lichen symbiosis. Anatomical and morphological structure and ways of reproduction. Secondary metabolites. Selected elements of physiology. Ecological groups. Classification of lichens. Biology of lichens in terms of their sensitivity to air pollution. Influence of air pollution and the other factors on lichens condition, threats and protection of lichens. Methods of lichenoidication.
Laboratories: Observation of anatomical and morphological features of the structure of lichens; growth forms; overview of selected groups of lichens – diagnostic features, ecology, use in indication of air pollution
Fieldwork: Identification of lichen species in the field. Practical use of methods to assess air pollution with lichens</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">Lectures with multimedia presentations. Individual work with herbarium specimens and microscopes. Fieldwork. Individual project.</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Written exam, positive evaluation of the completed project</td></tr>
<tr><td>*Literature*</td><td colspan="3">T. H. Nash. Lichen Biology. 2008. Cambridge University Press
T. H. Nash., C. Gries. 1991. Lichens as indicators of air pollution. In: O. Hutzinger (Ed.) Air pollution. The Handbook of Environmental Chemistry 4, C. Springer-Verlag Berlin Heidelberg GmbH</td></tr>
</table>

<table>
<tr><td colspan="4">*Course*: Marine Environment Protection</td></tr>
<tr><td colspan="4">*Field of study*: Oceanography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td>15</td><td rowspan="2">4</td><td rowspan="2">English</td></tr>
<tr><td>Practicals</td><td>15</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Teresa Radziejewska, Ph.D., D.Sc.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Raising awareness of natural and anthropogenic hazards and threats to the marine environment
Knowledge of methods and techniques applied to prevent, counteract and mitigate adverse anthropogenic effects in the marine environment</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">- Good command of English
- Knowledge of basic ecology
- Knowledge of basic oceanography
- Knowledge of basic principles of environmental management</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">1. Natural and anthropogenic hazards and threats to the marine environment
2. Retroactive methods and techniques in the marine environment protection
3. Proactive methods and techniques in the marine environment protection
4. Monitoring of the marine environment
5. Environmental Impact Assessment in the marine environment
6. Marine environment protection in the maritime spatial planning</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">Lectures, interactive class meetings with students' presentations, data mining-based individual assignments</td></tr>
<tr><td>*Course approval format and conditions*</td><td colspan="3">In-class activity; approval of presentations and individual assignments; passing grade at written examination</td></tr>
<tr><td>*Required reading*</td><td colspan="3">- Markus S., Markus T. (eds), 2018. Handbook on Marine Environment Protection. Science, Impacts and Sustainable Management. Springer, Cham
- Snoeijs Leijonmalm, P., Schubert, H., Radziejewska, T. (eds), 2017. Biological Oceanography of the Baltic Sea. Springer, Dordrecht
- Journal articles recommended by the instructor</td></tr>
</table>

<table>
<tr><td colspan="4">*Course*: Marine geology</td></tr>
<tr><td colspan="4">*Field of study*: Geology</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td>30</td><td rowspan="2">5</td><td rowspan="2">English</td></tr>
<tr><td>Practicals</td><td>15+15 fieldworks</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Dominik Zawadzki, Ph.D.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">(1) Presenting the methods and sources of data used in marine geology
(2) Presenting the geological history and the evolution of the oceans.
(3) Presenting the structure and composition of the oceanic crust</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">Basic understanding of geology, oceanography.</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">(1) Objectives and principles of marine geology;
(2) Methods used in marine geology
(3) Structure of the Earth
(4) Structure and Composition of the Oceanic Crust
(5) Distribution of the marine sediments
(6) Origin and evolution of the ocean basins through time
(7) Provinces of the Ocean Floor
(8) Active and passive continental margins
(9) Plate tectonics
(10) Plate boundaries (divergent, convergent, transform fault boundaries)
(11) Ophiolite complexes
(12) Oceanic mineral resources in the light of the UNCLOS.</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">Lecture, laboratory</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Written examination for completing the course.</td></tr>
<tr><td>*Required reading*</td><td colspan="3">Seibold, E., Berger, W.H. 2017. *The Sea Floor - an introduction to marine geology.* Springer
Edward Tarbuck E., Lutgens F., Tasa D.,: *Earth An Introduction to Physical Geology* (any edition)
Frisch, Meschede, Blakey, 2011. *Plate Tectonics Continental Drift and Mountain Building*
Erickson J., 2002: *Marine Geology: Exploring the New Frontiers of the Ocean.* The Living Earth</td></tr>
</table>

COURSE SYLLABUS AND SPECIFICATION

Curriculum title: **USSPR-O-O-I-S-23/24Z-OB**	
Unit: **Ichtiologia i parazytologia morska [moduł]**	
Course title: **marine ichthyology and parasitology (SPECJALNOŚCI / SPECJALIZACJE / MODUŁY SPECJALNOŚCIOWE)**	Course code: **SPR38AIJ3446_49S**
Name of field of study: **oceanografia**	
Mode and cycle of study: **first-degree, full - time**	Profile of study: **general academic** / Specialty: **oceanografia biologiczna**
Course / module status **elective**	Language of instruction: **semester: 5 - english language polish language**

Year	Semester	Form of instruction	No. of hours	including e-learning	Type of credit	ECTS
3	5	discussion classes	15	0	pg	4
		lecture	15	0	pg	
Total			**30**			**4**

Course / module coordinator	**prof. dr hab. inż. WOJCIECH PIASECKI**
Course instructor	**prof. dr hab. inż. WOJCIECH PIASECKI**
Course / module objectives	**Acquiring by students the knowledge, skills and social competencies related to ichthyology and marine parasitology**
Prerequisites	**Knowledge included in the Biology curricula of high school**

LEARNING OUTCOMES

Category	No.	Code	Description	Ref. to programme benchmarks
knowledge	**1**	**EP1**	**Knows and comprehends basic issues of ichthyology and marine parasitology**	**K_W02 K_W04**
skills	**1**	**EP2**	**Can identify the most common marine fish species and parasite species of marine organisms that are potentially affect human health**	**K_U05**
social competences	**1**	**EP3**	**Understands the need for perpetual learning of ichthyology**	**K_K01 K_K02**

CONTENT	Semester	No. of hours	including e-learning
Subject title: **marine ichthyology and parasitology**			
Format of instruction: **lecture**			
1. **null**	5	2	0
2. **null**	5	2	0
3. **null**	5	2	0
4. **null**	5	7	0
5. **null**	5	2	0
Format of instruction: **discussion classes**			
1. **null**	5	3	0
2. **null**	5	12	0

Modes of delivery	**Lecture based on PowerPoint presenatation and film., Class exercise based on internet and live or preserved biological specimens.**	
	The course teacher shall specify how artificial intelligence should be used as part of implementation of the course according to University of Szczecin best practices and standards. The course teacher shall inform students in their first class about the scope and possibilities of using AI and shall present a catalogue of tools and applications adjusted to relevant learning outcomes and teaching needs and possibilities within a given course.	
Assessment methods		No. of learning outcome from the syllabus
	KOLOKWIUM	**EP1,EP2,EP3**
	PREZENTACJA	**EP1,EP2,EP3**
	Metody i formy weryfikacji efektów uczenia się mogą zostać zmienione dla studentów ze szczególnymi potrzebami na warunkach i zasadach określonych w Regulaminie Studiów Uniwersytetu Szczecińskiego.	
Grading criteria	**Positive grades from the test and presentation**	
	Grade calculation principles	
	Final evaluation - arithmetic mean of the test marks and individual presentations	

Final grade calculation method	Sem.	Course	Type of credit	Grade calc. method	Weight for the average
	5	marine ichthyology and parasitology		Arytmetyczna	
	5	marine ichthyology and parasitology [wykład]	zaliczenie z oceną		
	5	marine ichthyology and parasitology [ćwiczenia]	zaliczenie z oceną		

Basic reading	Helfman G., Collette B.B., Facey D.E., Bowen B.W. (2007): The diversity of fishes: Biology, evolution, and ecology 2nd edition, Willey-Blackwell, Wielka Brytania
	Moyle P.B., Cech J.J.jr. (2004): Fishes: An introduction to ichthyology (5th edition), Pearson
	Rohde K. (red.) (2005): Marine parasitology, CSIRO Publishing , Victoria, Australia
Supplementary reading	

STUDENT WORKLOAD

	No. of hours	
		including e-learning
Contact hours	**30**	**0**
Participation in test / exam	**2**	**0**
Preparation for contact hours	**20**	**0**
Private reading and studying	**20**	**0**
Participation in tutorials	**12**	**0**
Preparation of project / essay / etc.	**8**	**0**
Preparation for test / exam	**8**	**0**
TOTAL workload	**100**	
ECTS credits	**4**	

<table>
<tr><td colspan="4">*Course*: Methodology of Scientific Reporting</td></tr>
<tr><td colspan="4">*Field of study*: Geology</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td>10</td><td rowspan="2">4</td><td rowspan="2">English</td></tr>
<tr><td>Practicals</td><td>15</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Dr hab. Inż. Przemysław Śmietana, prof. US</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">The efficiency and effectiveness of efforts related to research work are inextricably linked to the ability to convey information both accurately and communicatively in the form of a scientific report, i.e., a presentation or scientific publication. To achieve this, it is essential to master the entire process of developing a scientific report. This process begins with defining the topic of the study, followed by the formulation of the research problem and thesis statements, conducting proper verification of hypotheses, and formulating conclusions based on correctly presented and discussed results. The aim of this course is to acquire and master the knowledge and skills necessary for creating effective outcomes of scientific work in the form of a scientifically robust and aesthetically appealing research report suitable for publication.</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">Here are several aspects that may be pertinent during such a course:
• **Report Structure:** Learning how to properly organize a scientific report, including the introduction, methodology, results, discussion, and conclusions.
• **Writing and Style:** Understanding how to write clearly, concisely, and logically to effectively communicate findings.
• **Charts and Tables:** The ability to create clear and informative charts and tables that support data presentation.
• **Source Citation:** Properly referencing literature, which is crucial for the credibility and reliability of scientific work.
• **Editing and Proofreading:** Skills related to revising and improving the text to ensure its highest quality.
• **Publication:** Knowledge about the publication process, including selecting appropriate journals or platforms and preparing a manuscript for review.
• **Presentation of Results:** Techniques for effectively presenting research findings orally or through posters at scientific conferences.</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">• work in groups,
• individual work,
• multimedia presentation,
• work with computers.</td></tr>
</table>

Course approval format and condition	Written exam
Literature	Day R.A., Gastel B. (2017) How to Write and Publish a Scientific Paper, Cambridge University Press, Cambridge. Stępień B. (2016) Zasady pisania tekstów naukowych. Prace doktorskie i artykuły. PWN, Warszawa. Siuda P., Wasylczyk P. (2019) Publikacje naukowe. Poradnik praktyczny dla studentów, doktorantów i nie tylko. PWN. Warszawa. Steven P. (2015) Sense of Style: the thinking person's guide to writing in the 21st century. Penguin. New York.

<table>
<tr><td colspan="4">*Course*: Micropaleontology workshops</td></tr>
<tr><td colspan="4">*Field of study*: Oceanography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td>-</td><td rowspan="2">2</td><td rowspan="2">English</td></tr>
<tr><td>Practicals</td><td>20</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Przemysław Dąbek, PhD</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">By the end of this course, students will be able to identify and classify key marine microfossil groups, such as foraminifera, diatoms, and coccolithophores, using both morphological and functional characteristics. They will gain hands-on experience in preparing and analyzing microfossil samples under a microscope, with a focus on practical techniques for fossil extraction and preservation.</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">Introduction: microorganisms as a component of marine sediments.
Phosphatic microfossils: conodonts.
Carbonate microfossils: foraminifera and calcareous nanoplankton.
Organic microfossils: dinoflagellates, chitinozoans.
Siliceous microfossils: radiolarians, diatoms, silicoflagellates, Ebridea, sponge spicules.</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">The course will focus on practical laboratory sessions, where students will learn how to prepare samples, including fossil extraction and mounting, and will observe microfossils using binocular and light microscopes.</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">The course will be approved based on the successful recognition and identification of microorganisms, including their taxonomic and morphological descriptions. Students must demonstrate an understanding of the key features and significance of microfossils in micropaleontology through practical exercises.</td></tr>
<tr><td>*Literature*</td><td colspan="3">Haq. B.U & Boresma, A. (Ed.). 1978. Introduction to marine micropaleontology. Elsevier
Bolli, H.M., Saunders, J.B., Perch-Nielsen, K., Fancett, K.E. 1989. Plakton stratigraphy volume 1: Planktic foraminifer, calcareous nannofossils and calpionellids. Cambridge
Plankton Stratigraphy: Volume 2, Radiolaria, Diatoms, Silicoflagellates, Dinoflagellates and Ichthyoliths
Selley R.C., Cocks R.,Plimer I. (Ed.) (2005): Encyclopedia of Geology, Elsevier</td></tr>
</table>

Course: Natural Resources - Plants			
Field of study: Exploitation of natural resources			
Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	5	English
Laboratories	30		
Fieldwork	15		
Coordinator:	dr hab. Monika Myśliwy		
Course objectives:	This course introduces students to the diversity of plant species found in various ecosystems, emphasizing their economic importance and ecological roles. Students will acquire practical skills in identifying, collecting, and preserving plant species.		
Requirement:	None		
Program content			
Lectures: Plants as a natural resource of the Earth. Climatic and vegetation zones, and the floristic division of the Earth. Fundamental principles of plant classification and nomenclature. Morphological structure and basic plant biology. Overview of selected groups of wild-growing plant species and algae that are valuable for human use and ecosystem quality. Threats associated with the overexploitation of plant resources from natural habitats. **Laboratories:** Diagnostic features and an overview of selected groups of algae, mosses, clubmosses, horsetails, ferns, gymnosperms, and angiosperms. Identification of species based on diagnostic features. Importance of these species in ecosystems and their economic significance. **Fieldwork:** Practical identification of plant species in various types of ecosystems. Principles of collecting herbarium materials in the field.			
Educational methods	Lectures with multimedia presentations. Demonstrations of herbarium sheets. Individual and group work with plant materials, microscopes, and identification keys. Fieldwork and observation.		
Course approval format and condition	Written exam		
Literature	Simpson Michael G. 2019. Plant Systematics. 3rd Edition, Academic Press, Elsevier. Loidi J., Vynokurov D. 2024. The biogeographical kingdoms and regions of the world. Mediterranean Botany 45(2), e92333. https://doi.org/10.5209/mbot.92333		

COURSE SYLLABUS AND SPECIFICATION

Curriculum title: **USSPR-O-O-I-S-23/24Z-OF**	
Unit: **System ocean-atmosfera [moduł]**	
Course title: **ocean-atmosphere system (SPECJALNOŚCI / SPECJALIZACJE / MODUŁY SPECJALNOŚCIOWE)**	Course code: **SPR38AIJ3446_57S**
Name of field of study: **oceanografia**	
Mode and cycle of study: **first-degree, full - time**	Profile of study: **general academic**
Specialty: **oceanografia fizyczna**	
Course / module status **elective**	Language of instruction: **semester: 5 - english language polish language**

Year	Semester	Form of instruction	No. of hours	including e-learning	Type of credit	ECTS
3	5	discussion classes	10	0	pg	4
		lecture	15	0	pg	
		zajęcia terenowe	5	0	pg	
Total			**30**			**4**

Course / module coordinator	**dr hab. ROMAN MARKS**
Course instructor	**dr hab. ROMAN MARKS**
Course / module objectives	**Przekazanie wiedzy w zakresie przestrzennej i czasowej zmienności procesów współoddziaływania między Oceanem i Atmosferą, ze szczególnym uwzględnieniem procesów gromadzenia i obiegu energii oraz selekcji i wymiany materii hydrofobowej, ukształtowanie umiejętności dotyczących stosowania podstawowych metod pomiarów oceanograficznych oraz postaw związanych z gotowością podejmowania działań zmierzających do ochrony systemu ocean-atmosfera**
Prerequisites	**Podstawy wiedzy z zakresu fizyki, chemii, biologii i meteorologii**

LEARNING OUTCOMES

Category	No.	Code	Description	Ref. to programme benchmarks
knowledge	1	EP1	Rozumie znaczenia systemu ocean-atmosfera dla obiegu materii oraz ciepła na Ziemi	K_W02
	2	EP2	Rozumie genezę zjawisk i związki między procesami oceanicznymi i atmosferycznymi	K_W01
	3	EP3	Rozumie fizyczne i chemiczne mechanizmy regulujące aktywność biologiczną na Ziemi	K_W05
	4	EP4	Rozumie powiązania wpływające na zachowanie różnorodności środowiska morskiego	K_W04
skills	1	EP5	Przygotowuje, asystuje i wykonuje proste pomiary i eksperymenty	K_U04
	2	EP6	Posługuje sie terminologią stosowaną w oceanografii, hydrologii i meteorologii	K_U08
social competences	1	EP7	Jest gotów do krytycznej oceny swej wiedzy oraz poszukiwania nowych źródeł wiedzy oceanograficznej przez całe życie	K_K01
	2	EP8	Rozumie potrzebę ochroną środowiska wodnego i atmosfery	K_K04
	3	EP9	Rozumie potrzebę równowagi między ochroną i eksploatacją środowiska morskiego i atmosfery	K_K03

CONTENT	Semester	No. of hours	including e-learning

Subject title: **ocean-atmosphere system**			
Format of instruction: **lecture**			
1. **null**	5	2	0
2. **null**	5	1	0
3. **null**	5	1	0
4. **null**	5	2	0
5. **null**	5	2	0
6. **null**	5	2	0
7. **null**	5	2	0
8. **null**	5	1	0
9. **null**	5	1	0
10. **null**	5	1	0
Format of instruction: **discussion classes**			
1. **null**	5	1	0
2. **null**	5	1	0
3. **null**	5	1	0
4. **null**	5	1	0
5. **null**	5	1	0
6. **null**	5	1	0
7. **null**	5	1	0
8. **null**	5	1	0
9. **null**	5	1	0
10. **null**	5	1	0
Format of instruction: **zajęcia terenowe**			
1. **Thermal processes in the coastal zone**	5	1	0
2. **Water to air oxygen transport**	5	2	0
3. **Bubbles in seawater**	5	2	0

Modes of delivery	**Prezentacje multimedialne; omówienie wyników wybranych ekspedycji oceanicznych i polarnych; wykonywanie prostych doświadczeń**	
	The course teacher shall specify how artificial intelligence should be used as part of implementation of the course according to University of Szczecin best practices and standards. The course teacher shall inform students in their first class about the scope and possibilities of using AI and shall present a catalogue of tools and applications adjusted to relevant learning outcomes and teaching needs and possibilities within a given course.	
Assessment methods		No. of learning outcome from the syllabus
	KOLOKWIUM	**EP1,EP2,EP3,EP4**
	PRACA PISEMNA/ ESEJ/ RECENZJA	**EP1,EP2,EP3,EP4,EP5,EP6,EP7,EP8,EP9**
	ZAJĘCIA PRAKTYCZNE (WERYFIKACJA POPRZEZ OBSERWACJĘ)	**EP5,EP6,EP7,EP8,EP9**
	Metody i formy weryfikacji efektów uczenia się mogą zostać zmienione dla studentów ze szczególnymi potrzebami na warunkach i zasadach określonych w Regulaminie Studiów Uniwersytetu Szczecińskiego.	

Grading criteria	**Lecture: oral test on the lecture content** **Exercises and field activities: partial grades of the performance of individual tasks**
	Grade calculation principles
	Arithmetic mean of grades from the lecture, exercises and field classes

Final grade calculation method	Sem.	Course	Type of credit	Grade calc. method	Weight for the average
	5	ocean-atmosphere system		Arytmetyczna	
	5	ocean-atmosphere system [ćwiczenia]	zaliczenie z oceną		
	5	ocean-atmosphere system [wykład]	zaliczenie z oceną		
	5	ocean-atmosphere system [zajęcia terenowe]	zaliczenie z oceną		

Basic reading	Perry A.H., Walker J.M. (1982): System ocean-atmosfera, PWN
	Trzeciak S. (2004): Meteorologia morska z oceanografią, PWN
Supplementary reading	Marks R. (2014): Bubble Rotational Features - Preliminary Investigations , Oceanography: Open Access, 2:128
	Marks R. (2008): Dissolved oxygen supersaturation and its impact on bubble formation in the southern Baltic Sea coastal waters, Hydrology Resear, Vol. 39, No 3ch
	Marks R. (2002): Preliminary investigation of mercury saturation in the Baltic Sea winter surface water, The Science of the Total Environment
	Marks R. (1990): Preliminary investigations on the influence of rain on the production, concentration and vertical distribution of sea salt aerosols, JGR

STUDENT WORKLOAD

	No. of hours	
		including e-learning
Contact hours	**30**	**0**
Participation in test / exam	**5**	**0**
Preparation for contact hours	**15**	**0**
Private reading and studying	**15**	**0**
Participation in tutorials	**5**	**0**
Preparation of project / essay / etc.	**10**	**0**
Preparation for test / exam	**20**	**0**
TOTAL workload	**100**	
ECTS credits	**4**	

<table>
<tr><td colspan="4">*Course:* Paleooceanography</td></tr>
<tr><td colspan="4">*Field of study*: Geology</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>*Seminars*</td><td>45</td><td rowspan="2">4</td><td rowspan="2">English</td></tr>
<tr><td>*Practicals*</td><td>15</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Przemysław Dąbek, PhD.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Familiarize students with the formation and evolution of the oceans, present history and function of the ocean-atmosphere system in the geological past and the role of oceans in regulating the Earth's climate in the past and nowadays.</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">Basic knowledge and skills related to geology, marine geology, geochemistry, biostratigraphy. Good spoken and written English skills.</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">1. The aim of the paleoceanography. Ocean in the Earth system.
2. Sampling, dating and analyzing marine sediments.
3. Origin and evolution of the oceans.
4. Selected geochemical cycles. Application of isotopes of selected elements in paleoceanography.
5. Environmental reconstructions of paleotemperature, paleosalinity, biological production, paleotides, paleodepths.
6. Overview on marine micro and macro fossils.</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">Multimedia lecture and scientific papers for discussion and expanding the lectures' content. Laboratory work with scientific equipment.</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Passing test from the lectures' contents (60%) and making project from the laboratory work (40%).</td></tr>
<tr><td>*Required reading*</td><td colspan="3">Selley, R.C., Cocks, R.,Plimer, I. (Ed.). 2005. Encyclopedia of Geology. Elsevier
Hillaire-Marcel, C. & de Vernal, A. (Ed.). 2007. Proxies in late Cenozoic paleoceanography. Elsevier
Fisher, G. & Wefer, G. (Ed.). 1999. Use of proxies in paleoceanography: Examples from the South Atlantic. Springer
Seibold, E. & Berger, W. (Ed.). 2017. The sea floor: an introduction to marine geology. Springer
Haq. B.U & Boresma, A. (Ed.). 1978. Introduction to marine micropaleontology. Elsevier</td></tr>
</table>

Course: **Physical Oceanography**			
Field of study: Oceanography			
Class format	*Class hours*	*ECTS*	*Language*
Lectures	30	7	English
Practicals	30 + 15 *Fieldworks*		
Coordinator:	Roman Marks, Ph.D., D.Sc.		
Course objectives:	Students will learn about: basic rules and processes in maritime and oceanic compartments, interpretation of experimental data related to changes in oceanic system		
Prerequisites:	Basic knowledge in physics and chemistry		

Course content matter

Lectures:

1. Physical properties of sea water: molecular features of sea water, salinity, temperature, density
2. Thermodynamics of oceanic water
3. Features of transport and exchange of water
4. Oceanic processes of sedimentation
5. Density of sea water. Stratification od water due to density, concept of pycnoclyne. Salinity of water
6. Thermal properties of sea and oceanic waters
7. Geses dissolved in sea water
8. Biogenic matter in oceanic waters
9. Circulatory patterns of ions; secondary constituents in sea water; microelements in sea water
10. Carbonate system of sea water; sedimentation of carbonaceous matter

Exercises:

1. Experimental measurements of a thermal features of surface microlayer
2. Experimental observations of electrical and magnetic features of distil and sea water
3. Methods to investigate rising bubbles and their physical properties
4. Experimental observations of marine aerosol formation and physical properties
5. TriOS and WetLab experimental instrumentation
6. Set of experiments conducted at coastal Station in Międzyzdroje

Instruction methods	Lectures, exercises, field and laboratory experiments
Course approval format and condition	Oral exam
Required reading	Knauss J.A.: 2005: Introduction to Physical Oceanography, Waveland Pr Inc. Krüger O., Marks R., Graßl, 2004: H. Influence of pollution on cloud reflectance. J. Geophysical Res. Vol. 109, D24210, doi:10.1029/2004JD004625. Marks R., Suwalski G., 2006: Remotely operated ship used for measurements in coastal waters. Pol. J. of Environ. Stud. Vol. 15, No. 3, 437-440.

	Marks R., 2008: Dissolved oxygen supersaturation and its impact on bubble formation in the southern Baltic Sea coastal waters. Hydrology Research. Vol. 39, No 3, 229-236, doi:10.2166/nh.2008.021. Marks R., 2014: Bubble Rotational Features – Preliminary Investigations. Oceanography: Open Access, 2: 128, doi: 10.4172/2332-2632.1000128. Kowalewska-Kalkowska H., Marks R., 2015: Estuary, Estuarine Hydrodynamics. Encyklopedia of Marine Geosciences, doi: 10.1007/978-94-007-6644-0_164-1. Dordrecht, 235-238. Marks R., 2015: Sub-bubble Bi-pirouette Splicing of Cationic and Anionic Bases as a Process of RNA/DNA Creation. Oceanography: Open Access, 2: 128, doi: 10.4172/2332-2632.1000135. Marks R., Górecka E., McCartney K., Borkowski W., 2019: Rising bubbles as mechanism for scavenging and aerosolization of diatoms. Journal of Aerosol Science, Vol. 128, 79-88. Marks R., 2019: Water Vapor Induced Airborne Rotational Features. Meteorology Hydrology and Water Management, 7, 2, 29-47, DOI: https://doi.org/10.26491/mhwm/104634.

<table>
<tr><td colspan="4">*Course:* Regional and local development</td></tr>
<tr><td colspan="4">*Field of study:* geography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>*Lectures*</td><td>*10*</td><td rowspan="2">*2*</td><td rowspan="2">*English*</td></tr>
<tr><td>*Seminar*</td><td>*15*</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Jakub Skorupski, PhD, Eng.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">*1*. Getting to know the terminology of regional and local development
2. Getting to know the main theories of regional and local development - its determinants and factors
3. Understanding the economic, social and spatial effects of the diversification of regional and local development processes
4. Acquiring the ability to analyze and interpret phenomena and processes of regional and local development in spatial terms
5. Acquiring the ability to carry out a regional or local development analysis in a case study</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">Basic knowledge of the economy, society, and basic skills in the subject of geography and statistics at the secondary school level.</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">1. Regional and local development - definition and characteristics of the phenomenon
2. Theories of regional and local development
3. Regional and local development - a synthetic approach
4. Methods of analysis and interpretation of spatial differentiation of regional and local development
5. 5. Methods of analysis and interpretation of socio-economic development in the scale of a region, city or commune.</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">1. Seminar lecture (10 hours).
2. Own desktop work under the guidance of the course instructor (20 hours).</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">1. Preparation of two essays: (1) on the spatial differentiation of development processes on a national or regional scale, (2) on the conditions and factors of the course of socio-economic development for the winning region, city or commune (5 points to obtain for each essay: analysis – 2; interpretation – 2; style, editing, charts and maps, literature).
2. Pass a 10-question multiple choice test (10 points to obtain).
3. The final grade is based on the number of points obtained according to the rule: 20-19 points - 5.0; 17-18 points - 4.5; 15-16</td></tr>
</table>

	points - 4.0; 13-14 points - 3.5; 11-12 points - 3.0. Less than 11 points - 2.0 failure to pass the course.
Required reading	Pike A., Rodríguez-Pose A., Tomaney J., 2016, Local and Regional Development, Routledge. *Other literature, mainly digital, will be provided or indicated by the course instructor.*

COURSE SYLLABUS AND SPECIFICATION

Curriculum title: **USSPR-O-O-I-S-23/24Z-OF**	
Unit: **Teledetekcja środowiska morskiego [moduł]**	
Course title: **remote sensing of marine environment (SPECJALNOŚCI / SPECJALIZACJE / MODUŁY SPECJALNOŚCIOWE)**	Course code: **SPR38AIJ3446_59S**
Name of field of study: **oceanografia**	
Mode and cycle of study: **first-degree, full - time**	Profile of study: **general academic** / Specialty: **oceanografia fizyczna**
Course / module status **elective**	Language of instruction: **semester: 6 - english language polish language**

Year	Semester	Form of instruction	No. of hours	including e-learning	Type of credit	ECTS
3	6	laboratory	20	0	pg	5
		lecture	15	0	e	
Total			**35**			**5**

Course / module coordinator	**dr hab. JOANNA DUDZIŃSKA-NOWAK**
Course instructor	**dr hab. JOANNA DUDZIŃSKA-NOWAK**
Course / module objectives	**Acquiring by students of knowledge, skills and social competences related to the selected application of the remote sensing methods for the marine and coastal study**
Prerequisites	**Completed basics remote sensing course**

LEARNING OUTCOMES

Category	No.	Code	Description	Ref. to programme benchmarks
knowledge	**1**	**EP1**	**He knows the basic statistical and mathematical methods and uses them for the interpretation of marine environment phenomena and processes**	**K_W08**
	2	**EP2**	**In the interpretation marine environment phenomena and processes, is based on the remote sensing data, fully understanding the importance of statistical and mathematical methods**	**K_W09**
	3	**EP3**	**Has knowledge of statistics and computer science at a level that allows to describe the marine environment phenomena and processes as a result of the remote sensing data interpretation**	**K_W06**
skills	**1**	**EP4**	**Is able to reach the necessary marine environment remote sensing data, using available sources, including the Internet**	**K_U07**
	2	**EP5**	**Uses mathematical methods in the description and interpretation of oceanographic phenomena, applies algorithms and IT techniques for remote sensing analyzes of the marine environment**	**K_U07**
	3	**EP6**	**In the interpretation marine environment phenomena, demonstrates the ability to draw conclusions based on the analysis of remote sensing data in combination with data obtained from other sources**	**K_U09**
social competences	**1**	**EP7**	**Understands the need to constantly extend knowledge both in the field of new methods of obtaining remote sensing data, as well as the method of its processing and interpretation**	**K_K02**

CONTENT	Semester	No. of hours	including e-learning
Subject title: **remote sensing of marine environment**			
Format of instruction: **lecture**			
1. **Earth's satellite systems overview**	6	2	0
2. **Characteristics of satellite marine remote sensing sensors and equipment**	6	2	0
3. **Characteristics of aerial marine and coastal remote sensing equipment**	6	2	0
4. **Selection of remote sensing methods and systems of the marine environment depending on the studied phenomena**	6	3	0
5. **Examples of marine remote sensing applications**	6	3	0
6. **Examples of the coastal zone remote sensing applications**	6	3	0
Format of instruction: **laboratory**			
1. **Characteristics of the satellite sensors and equipment used in the marine and coastal remote sensing study**	6	2	0
2. **Satellite data sources and their availability**	6	2	0
3. **Pre- and postprocessing of satellite and aerial data**	6	6	0
4. **Analysis of the spatial and temporal distribution of selected parameters of the marine environment on satellite images**	6	2	0
5. **Ice phenomena in the coastal zone on satellite and aerial photographs**	6	2	0
6. **Bottom morphology of the coastal zone on aerial photographs**	6	2	0
7. **Oil spills in aerial and satellite photos**	6	2	0
8. **Waves in the coastal zone on aerial photos**	6	2	0

Modes of delivery	**Multimedia presentation, exercises related to the discussion, independent work at the computer, written work, lecture**
	The course teacher shall specify how artificial intelligence should be used as part of implementation of the course according to University of Szczecin best practices and standards. The course teacher shall inform students in their first class about the scope and possibilities of using AI and shall present a catalogue of tools and applications adjusted to relevant learning outcomes and teaching needs and possibilities within a given course.

Assessment methods		No. of learning outcome from the syllabus
	EGZAMIN PISEMNY	**EP1,EP2,EP3**
	KOLOKWIUM	**EP6,EP7**
	PRACA PISEMNA/ ESEJ/ RECENZJA	**EP2,EP4,EP6**
	ZAJĘCIA PRAKTYCZNE (WERYFIKACJA POPRZEZ OBSERWACJĘ)	**EP4,EP5**
	Metody i formy weryfikacji efektów uczenia się mogą zostać zmienione dla studentów ze szczególnymi potrzebami na warunkach i zasadach określonych w Regulaminie Studiów Uniwersytetu Szczecińskiego.	

Grading criteria	
	Lectures: Positive grade for the written exam in the field of lecture content and recommended literature. Laboratory: pass with a positive grade on the basis of active participation in classes, partial grades for the performance of individual tasks, assigned written work and grades from the test.
	Grade calculation principles
	The grade for the course is the arithmetic mean of grades in the lecture and laboratory.

Final grade calculation method	Sem.	Course	Type of credit	Grade calc. method	Weight for the average
	6	remote sensing of marine environment		Arytmetyczna	
	6	remote sensing of marine environment [wykład]	egzamin		
	6	remote sensing of marine environment [laboratorium]	zaliczenie z oceną		

Basic reading	Furmańczyk, K. (1994): Współczesny rozwój strefy brzegowej morza bezpływowego w świetle badań teledetekcyjnych południowych wybrzeży Bałtyku, Wyd. Uniwersytetu Szczecińskiego
	Robinson, I.S. (1985): Satellite oceanography, Ellis Horwood
	Sabins F.F. (1987): Remote Sensing - Principles and Applications, Jon Wiley and Sons
Supplementary reading	Meidment, D.R. (2002): Arc Hydro: GIS for Water Resources, Esri Press
	Seelye, M. (2004): An introduction to Ocean Remote Sensing, Cambridge University Press

STUDENT WORKLOAD

	No. of hours	
		including e-learning
Contact hours	**35**	**0**
Participation in test / exam	**2**	**0**
Preparation for contact hours	**15**	**0**
Private reading and studying	**20**	**0**
Participation in tutorials	**18**	**0**
Preparation of project / essay / etc.	**20**	**0**
Preparation for test / exam	**15**	**0**
TOTAL workload	**125**	
ECTS credits	**5**	

<table>
<tr><td colspan="4">*Subject*: Restoration ecology</td></tr>
<tr><td colspan="4">*Field of study*: exploitation of natural resources, 1st degree, winter semester</td></tr>
<tr><td>*Form of classes*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>lectures</td><td>10</td><td rowspan="3">4</td><td rowspan="3">English</td></tr>
<tr><td>laboratory</td><td>20</td></tr>
<tr><td>field trip</td><td>15</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">dr inż. Jakub Skorupski</td></tr>
<tr><td>*Objectives of the subject:*</td><td colspan="3">familiarization with theories, methods and concepts of scientific foundations of ecological restoration</td></tr>
<tr><td>*Requirement:*</td><td colspan="3">Basics of general biology and ecology</td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">1. Introduction to restoration ecology – definition, terminology, methods and concepts
2. Scientific basis of restoration – recultivation, renaturization, renaturalization, revitalisation, restitution, reintroduction and rewilding
3. Restoration ecology in action – erosion control, daylighting streams, counteracting to eutrophication
4. Restoration ecology in action – revegetation and reforestation
5. Restoration ecology in action – native species reintroduction
6. Restoration ecology in action – management of non-indigenous species' populations
7. Restoration ecology in action – habitats restoration
8. Green and blue infrastructure. "Betonosis". Ecological connectivity
9. Restoration ecology and sustainable development concept. Socio-economic aspects of ecological restoration
10. Guided field trip – restoration in action</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">• lecture
• multimedia presentation
• work in groups
• problem discussion
• case study analysis</td></tr>
<tr><td>*Form and conditions of passing the subject*</td><td colspan="3">Written exam</td></tr>
<tr><td>*Literature*</td><td colspan="3">1. Fryxell J.M., Sinclair A.R.E., Caughley G. 2014 (or previous editions). Wildlife Ecology, Conservation, and Management. Wiley-Blackwell. Hoboken
2. Lovejoy T.E., Hannah L., Wilson E.O. 2019. Biodiversity and Climate Change: Transforming the Biosphere. Yale University Press. London
3. Holl K. 2020. Primer of Ecological Restoration. Island Press. Washington</td></tr>
</table>

	4. Skorupski J. (ed.) et al. 2017. Invasive Alien Species – identification of threats to protect biodiversity. Polish Society for Conservation Genetics LUTREOLA. Szczecin 5. Restoration Ecology (Wiley) 6. Global Ecology and Conservation (Elsevier)

COURSE SYLLABUS AND SPECIFICATION

Curriculum title: **USSPR-Geol-O-I-S-24/25Z**	
Unit: **Moduł: Sedymentologia [moduł]**	
Course title: **Sedimentology (sedymentologia) (KIERUNKOWE)**	Course code: **SPR81AIJ3446_29S**
Name of field of study: **geologia**	
Mode and cycle of study: **first-degree, full - time**	Profile of study: **general academic**
Specialty:	
Course / module status **elective**	Language of instruction: **semester: 3 - english language**

Year	Semester	Form of instruction	No. of hours	including e-learning	Type of credit	ECTS
2	3	discussion classes	10	0	pg	4
		laboratory	15	0	pg	
		lecture	30	0	e	
Total			**55**			**4**

Course / module coordinator	**dr hab. DOMINIK ZAWADZKI**
Course instructor	**dr inż. KRYSTYNA OSADCZUK , dr hab. DOMINIK ZAWADZKI**
Course / module objectives	**To familiarize students with the knowledge of: the origin and diversity of sediments and sedimentary rocks, sedimentation processes in marine and land sedimentary environments and research methods used in sedimentology. Teaching to recognize types of sediments and describe their structural and textural features and to draw environmental conclusions based on this information.**
Prerequisites	**Advanced knowledge of physics and chemistry as well as physical geology, mineralogy and petrography acquired during the earlier years of study.**

LEARNING OUTCOMES

Category	No.	Code	Description	Ref. to programme benchmarks
knowledge	**1**	**EP1**	**The student understands the essence of physicochemical processes related to sedimentation processes.**	**K_W06**
	2	**EP2**	**The student has knowledge of the environmental conditions of sedimentation processes, including the importance of climate, local meteorological and hydrological conditions.**	**K_W04**
	3	**EP3**	**The student knows the terminology used in sedimentology and the types of sediments formed in various marine and land environments.**	**K_W03**
	4	**EP4**	**The student knows the advanced methods used in the study of sedimentary rocks.**	**K_W07**
	5	**EP9**	**The student knows and understands rules of health and safety at work during field work and in laboratory.**	**K_W13**

skills	**1**	**EP5**	**The student is able to gain core description, sampling and perform basic laboratory analysis of sediments.**	**K_U05**
	2	**EP6**	**Student recognizes the types of sediments and their structural and textural features.**	**K_U05**
	3	**EP7**	**Student is able to prepare sedimentological profiles based on its data.**	**K_U06**
	4	**EP8**	**Student is able to draw conclusions about the sedimentary environment based on the results of research on the structural and textural features of the sediments.**	**K_U08**
social competences	**1**	**EP10**	**Student is ready to recognize the importance of knowledge in solving cognitive and practical problems and updating knowledge in the field of sedimentology.**	**K_K02**

CONTENT	Semester	No. of hours	including e-learning
Subject title: **Sedimentology (sedymentologia)**			
Format of instruction: **lecture**			
1. **Physicochemical and environmental conditions of the sedimentation process and mechanisms of transport and sedimentation.**	3	3	0
2. **Textural features of sediments: determining the size of components, graphical presentation of the results of grain size analysis, grain size parameters and their interpretation, morphological features of sediment components.**	3	3	0
3. **Types of sedimentary structures**	3	3	0
4. **Post-sedimentary transformations of sediments.**	3	2	0
5. **Characteristics of land sedimentation environments: fluvial, limnic, glacial, aeolian.**	3	5	0
6. **Characteristics of marine sedimentation environments: littoral, sublittoral, hemipelagic, eupelagic.**	3	5	0
7. **Characteristics of transitional sedimentation environments: beach, sandy barriers and lagoons, tidal flats, estuaries, deltas.**	3	5	0
8. **Introduction to facies analysis and sequence stratigraphy.**	3	4	0
Format of instruction: **discussion classes**			
1. **Methodology of facies analysis with elements of sequence stratigraphy.**	3	4	0
2. **Sedimentological profiles.**	3	2	0
3. **Interpretation of sedimentary environments based on information on physicochemical, structural, textural and geochemical features of sediments.**	3	4	0
Format of instruction: **laboratory**			
1. **Familiarization with the methodology of field work and sedimentological documentation: macroscopic observations and description of sediment samples, sampling for lab work.**	3	5	0
2. **Grain size analysis by various methods.**	3	5	0
3. **Calculation of statistical grain size parameters and interpretation of the results of grain size analyses.**	3	5	0

Modes of delivery	**Multimedia presentation (lecture). Practical classes in the laboratory. Interpretation of sedimentological research results.**
	The course teacher shall specify how artificial intelligence should be used as part of implementation of the course according to University of Szczecin best practices and standards. The course teacher shall inform students in their first class about the scope and possibilities of using AI and shall present a catalogue of tools and applications adjusted to relevant learning outcomes and teaching needs and possibilities within a given course.

Assessment methods		No. of learning outcome from the syllabus
	EGZAMIN PISEMNY	**EP1,EP2,EP3,EP4**
	PRACA PISEMNA/ ESEJ/ RECENZJA	**EP5,EP6,EP7,EP8**
	ZAJĘCIA PRAKTYCZNE (WERYFIKACJA POPRZEZ OBSERWACJĘ)	**EP10,EP9**
	Metody i formy weryfikacji efektów uczenia się mogą zostać zmienione dla studentów ze szczególnymi potrzebami na warunkach i zasadach określonych w Regulaminie Studiów Uniwersytetu Szczecińskiego.	

Grading criteria	**Positive assessment of the written exam and correct performance of all practical exercises.**
	Grade calculation principles
	Course grade: arithmetic mean of exam grades, written work and practical classes.

Final grade calculation method	Sem.	Course	Type of credit	Grade calc. method	Weight for the average
	3	Sedimentology (sedymentologia)		Arytmetyczna	
	3	Sedimentology (sedymentologia) [ćwiczenia]	zaliczenie z oceną		
	3	Sedimentology (sedymentologia) [wykład]	egzamin		
	3	Sedimentology (sedymentologia) [laboratorium]	zaliczenie z oceną		

Basic reading	Gradziński R., Kostecka, A., Radomski, A., Unrug, R. (1986): Zarys sedymentologii, Wyd. Geologiczne, Warszawa
	Jaroszewski W. (red.) (1986): Przewodnik do ćwiczeń z geologii dynamicznej, Wyd. Geologiczne, Warszawa
Supplementary reading	Allen P.A. (2000): Procesy kształtujące powierzchnię Ziemi, PWN, Warszawa
	Allen R.L. (1977): Fizyczne procesy sedymentacji, PWN Warszawa
	Ciesielczyk J., Jabłońska M., Kozłowski K. (2006): Geologia dla studentów geografii (Rozdział 7: Skały osadowe), Wyd. Uniwersytetu Śląskiego, Katowice
	Huneke H., Mulder T. (2010): Deep-Sea Sediments, Elsevier Science
	Książkiewicz M. (1979): Geologia dynamiczna, Wyd. Geologiczne, Warszawa
	Miall A. D. (1990): Principles of sedimentary basin analysis, Springer - Verlag, Berlin
	Mycielska-Dowgiałło E. (red.) (1998): Struktury sedymentacyjne i postsedymentacyjne w osadach czwartorzędowych i ich wartość interpretacyjna, Wyd. Uniwersytetu Warszawskiego
	Nicols, G. (2009): Sedimentology and stratigraphy, Wiley
	Osadczuk K. (2004): Geneza i rozwój wałów piaszczystych Bramy Świny w świetle badań morfometrycznych i sedymentologicznych, 211 s., Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin
	Racinowski R., Szczypek T., Wach J. (2001): Prezentacja i interpretacja wyników badań uziarnienia osadów czwartorzędowych, Wyd. Uniwersytetu Śląskiego
	Reineck H. E, Singh I. B. (1973): Depositional sedimentary environments, Springer - Verlag, Berlin

STUDENT WORKLOAD

	No. of hours	
		including e-learning
Contact hours	**55**	**0**
Participation in test / exam	**2**	**0**
Preparation for contact hours	**10**	**0**
Private reading and studying	**12**	**0**
Participation in tutorials	**10**	**0**
Preparation of project / essay / etc.	**6**	**0**
Preparation for test / exam	**5**	**0**

TOTAL workload	**100**
ECTS credits	**4**

Course: **SMALL VESSEL NAVIGATION AND PILOTING**

Field of study: Oceanography

Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	4	English
Practicals	15		

Coordinator:	Prof. Wojciech Piasecki, Ph.D., D.Sc.
Course objectives:	To provide students with a foundational understanding of navigation principles and techniques specific to small vessels. To equip students with practical skills in piloting, chart reading, and the use of modern navigational aids. To enhance safety awareness and decision-making in various maritime environments.
Prerequisites:	High-school science courses

Program content

Lecture Content:

1. Introduction to Small Vessel Navigation (2 hours)
- Definition and classification of small vessels
- Basic maritime terminology
- Regulatory framework and safety standards

2. Principles of Marine Navigation (3 hours)
- Understanding latitude, longitude, and time zones
- Types of charts and nautical publications
- Plotting positions and dead reckoning

3. Tides, Currents, and Weather (3 hours)
- Effects of tides and currents on navigation
- Weather patterns and forecasting
- Impact on small vessel handling

4. Navigational Instruments and Technology (2 hours)
- Magnetic and gyro compasses
- GPS and electronic chart systems
- Radar and Automatic Identification System (AIS)

5. Rules of the Road (COLREGS) (2 hours)
- International Regulations for Preventing Collisions at Sea
- Navigation lights and sound signals
- Responsibilities and conduct in narrow channels and restricted visibility

6. Piloting and Coastal Navigation (3 hours)
- Visual navigation and use of landmarks
- Buoyage systems and aids to navigation
- Course shaping and speed management

Practical Class Content:

1. Chart Work and Plotting (5 hours)

• Chart reading and interpretation • Plotting courses and determining positions • Use of parallel rulers and dividers 2. Compass Work and Bearings (5 hours) • Taking and applying compass bearings • Correcting for variation and deviation • Converting compass courses to true courses 3. GPS and Electronic Navigation (5 hours) • Setting waypoints and route planning • Using GPS for real-time tracking • Integrating electronic charts with traditional methods	
Educational methods	Lecture with MS Power-Point presentations and videos Classes with practical usage of navigation equipment
Course approval format and condition	Single-choice test (lectures) Individual PowerPoint presentation (classes)
Literature	1. Bowditch, N. (2021). American Practical Navigator: An Epitome of Navigation. National Geospatial-Intelligence Agency. 2. Calder, N. (2015). Boatowner's Mechanical and Electrical Manual: How to Maintain, Repair, and Improve Your Boat's Essential Systems. McGraw-Hill Education. 3. 3. Maloney, E. V. (2003). Chapman Piloting & Seamanship. Hearst Books.

<table>
<tr><td colspan="4">*Course*: **Socio-economic effects of threats**</td></tr>
<tr><td colspan="4">*Field of study*: geography</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>*Lectures*</td><td>10</td><td rowspan="2">2</td><td rowspan="2">English</td></tr>
<tr><td>*Practicals*</td><td>10</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Jakub Skorupski, PhD, Eng.</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Getting to know the effects of natural disasters and natural disasters arising from the occurring geohazards.
Understanding how to prevent and minimize their negative socio-economic effects</td></tr>
<tr><td>*Prerequisites:*</td><td colspan="3">Basic knowledge about the types of geohazards. Completion of subjects: physical geography and geography socio-economic and natural disasters and environmental crises in the history of the earth</td></tr>
<tr><td colspan="4">*Course content matter*</td></tr>
<tr><td colspan="4">1. Areas of occurrence of the largest geohazards and the level of socio-economic development
and development of individual regions
2. Economic consequences of natural and natural disasters
3. Natural disasters and economic losses caused by them in Poland
4. Counteracting and minimizing the effects of natural disasters
5. Crisis management and actions taken in the event of natural disasters and
natural disasters
6. Analysis of the development of areas exposed to various types of natural disasters and catastrophes
natural in Poland and grade
7. Condition of flood protection in Poland? selected examples
8. Examples of adaptation to natural conditions to minimize the effects
potential natural disasters</td></tr>
<tr><td>*Instruction methods*</td><td colspan="3">informative and problem lecture, discussion, case study, work with the map, documents analysis</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Written exam covering knowledge of lectures and recommended basic literature.
Completing exercises based on class attendance and activity, as well as partial grades received during the semester for the correct performance of all tasks.</td></tr>
<tr><td>*Required reading*</td><td colspan="3">O. Kjekstad, L. Highland 2009, Economic and social impacts of landslides, in K. Sassa P. Canuti (Eds.) Landslides – Disaster Risk Reduction (pp 573-587) Springer, Berlin.
Herlander Mata-LimaI; Andreilcy Alvino-BorbaII; Adilson PinheiroIII; Abel Mata-LimaV; José António Almeida 2013, Impacts of natural disasters on environmental and socio-economic systems: what makes the difference? http://www.scielo.br/scielo.php?pid=S1414-753X2013000300004&script=sci_arttext&tlng=en</td></tr>
</table>

<table>
<tr><td colspan="4">*Course*: Software in geology</td></tr>
<tr><td colspan="4">*Field of study*: Geology</td></tr>
<tr><td>*Class format*</td><td>*Class hours*</td><td>*ECTS*</td><td>*Language*</td></tr>
<tr><td>Lectures</td><td></td><td rowspan="2">3</td><td rowspan="2">English</td></tr>
<tr><td>Practicals</td><td>45</td></tr>
<tr><td>*Coordinator:*</td><td colspan="3">Agnieszka Strzelecka PhD</td></tr>
<tr><td>*Course objectives:*</td><td colspan="3">Student will gain knowledge in mathematical, statistical and computer methods in geological data analysis by learning how to gather, extract, visualize and analyze data, using specified software dedicated to geologists and geoscientists.</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td colspan="4">*Program content*</td></tr>
<tr><td colspan="4">(1) Introduction to software in geology
(2) Generation of borehole data sheets
(3) Graphic design of geological maps
(4) Computer tools in geological data analysis
(5) Modeling of geological proxies
(6) Geological databases</td></tr>
<tr><td>*Educational methods*</td><td colspan="3">Practical classes</td></tr>
<tr><td>*Course approval format and condition*</td><td colspan="3">Report submission</td></tr>
<tr><td>*Literature*</td><td colspan="3">*Surfer User's Guide*, Golden Software (https://downloads.goldensoftware.com/guides/Surfer17UserGuide.pdf)
Grapher User's Guide, Golden Software (https://downloads.goldensoftware.com/guides/Grapher17UsersGuide.pdf)
Pourgasemi H.R., 2019, *Spatial Modeling in GIS and R for Earth and Environmental Sciences*, Elsevier
Petrelli M., 2021. *Introduction to Python in Earth Science Data Analysis: From Descriptive Statistics to Machine Learning*, Springer Nature</td></tr>
</table>

Course: **UNDERGRADUATE BIOGEOGRAPHY**

Field of study: Oceanography

Class format	*Class hours*	*ECTS*	*Language*
Lectures	20	3	English
Practicals			

Coordinator:	Prof. Wojciech Piasecki, Ph.D., D.Sc.
Course objectives:	• To introduce students to the fundamental concepts and principles of biogeography. • To explore the historical and ecological factors influencing the distribution of species. • To develop analytical skills for understanding patterns of biodiversity across spatial and temporal scales.
Prerequisites:	High-school biology and geography

Program content

Unit 1: Fundamentals of Biogeography
- Definition and scope of biogeography.
- Historical vs. ecological biogeography.
- Key concepts: species range, endemism, dispersal, and vicariance.

Unit 2: Historical and Ecological Perspectives
- Plate tectonics and continental drift.
- Pleistocene glaciations and species distribution.
- Environmental gradients and species niches.
- Island biogeography theory.
- Case studies: Gondwanan distribution and Wallace's Line.

Unit 3: Patterns and Processes of Biodiversity
- Global biodiversity hotspots.
- Latitudinal diversity gradient.
- Endemism and extinction.
- Mechanisms of dispersal: wind, water, and animals.
- Barriers to dispersal and species migration.
- Case studies: island colonization and invasive species.

Unit 4: Evolutionary and Genetic Dimensions
- Speciation and adaptive radiation.
- Role of natural selection and genetic drift.
- Phylogeography and molecular tools.

Unit 5: Human Impact and Conservation Biogeography
- Habitat fragmentation and urbanization.

• Climate change and shifting species ranges. • Conservation biogeography. • Integrating historical and ecological perspectives. • Practical applications in conservation and policy. • Student presentations and discussion.	
Educational methods	Lecture with MS Power-Point presentations and videos
Course approval format and condition	Single-choice test Individual PowerPoint presentation
Literature	1. Lomolino, M. V., Riddle, B. R., & Whittaker, R. J. (2017). Biogeography (5th ed.). Sinauer Associates. 2. Cox, C. B. & Moore, P. D. (2010). Biogeography: An Ecological and Evolutionary Approach (8th ed.). Wiley-Blackwell. 3. 3. MacArthur, R. H. & Wilson, E. O. (1967). The Theory of Island Biogeography. Princeton University Press.

Course: water resources			
Field of study: Geography			
Class format	*Class hours*	*ECTS*	*Language*
Lectures	15	4	English
Practicals	15		
Coordinator:	Małgorzata Świątek, Ph.D.		
Course objectives:	Familiarizing students with forms of the water occurrence on the Earth, the size of their resources, spatial distribution and threats.		
Program content			
Lecture: water balance; spatial distribution of precipitation and evaporation; resources of oceans, seas and lakes; ice sheets and alpine ice; wetlands; supply of flowing waters; groundwater; artificial water reservoirs and other forms of controlled retention; pollution and other threats to water resources; quantitative and qualitative protection of water resources. Practicals: water balance comparison in different climate zones; Walter diagram; a cross-section through the lake basin and calculating the morphometric parameters of the lake; analysis of the vertical profile of the lake water temperature, river flow fluctuations and groundwater level fluctuations.			
Educational methods	Lecture with multimedia presentations Writing papers, mainly using a spreadsheet		
Course approval format and condition	Each exercise must be passed positively. The aggregate grade for the exercises is the arithmetic mean of the written exercises. Lectures are passed based on a positive result from the written test. The grade for the subject is the arithmetic mean of the average from the exercises (practical) and lectures.		
Literature	T. Davie and N. Quinn, 2019, Fundaments of hydrology, Routlege, London and New York – available on-line		