

Odesa I. I. Mechnikov National University
Faculty of Geology and Geography
Department of marine geology, hydrogeology, engineering geology and paleontology

training for a **philosophy doctor**
from the field of knowledge **10 Natural sciences**
in the specialty **103 Earth Sciences**

Course syllabus

Engineering and geological processes of the Azov-Black Sea Basin Coastal Zone.

Amount	3 ECTS credits, 90 hours
Semester, Year	3d semester, 2nd year
Days, Time, Place	according to the class schedule
lecturer	Kadurin S.V., PhD in Geology, associate professor of the department of marine geology, hydrogeology, engineering geology and paleontology
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Consultations	face-to-face consultations: Tuesday, Thursday 11.00-13.00

COMMUNICATION

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COURSE ABSTRACT (place of this discipline in the study program; course goal; topic)

The subject of studying the discipline is to provide specialists with the theoretical knowledge and practical skills necessary for the study and mapping of engineering-geological and geodynamic processes in the coastal zone of the Black and Azov seas.

Course prerequisites The basis for studying the discipline is the standard courses - "General geology", "Geological exploration", "Structural geology and geomapping", "Geomorphology with the basics of Quaternary geology", "Engineering geology", "Geology of seas and oceans". In the future, the knowledge and skills of the discipline will be used to study such educational disciplines as "Modern achievements of Earth sciences", "Geological structures and prospects of the bottom of the Black and Azov seas".

Purpose: to study the factors that determine the course of the creation of engineering-geological conditions on the seabed and in the coastal zone and the methods of marine

engineering-geological research in the water areas and the coastal zone of the Azov-Black Sea basin.

Tasks:

- The subject of marine engineering geology, with its connection with other natural sciences, with the history and current state of marine geological and engineering geological research, with the role of marine engineering geology in complex research and development of sea shelves;
- The main features of the relief and features of the structure of the earth's crust under the seas and oceans;
- General characteristics of the planetary morphostructures of the bottom of the world ocean;
- Geodynamic processes on the shelf and coastal strip of the Black and Azov seas;
- Marine sediments and marine sedimentation processes of the coast of the Black and Azov seas;
- The main regularities of the development of sea shores and the coastal zone of the sea;
- Methods of field work in the coastal zone to study patterns of development of the coastal zone, to study the regime of sediments;
- Peculiarities of engineering and geological research in oceans and seas;
- The composition of engineering and geological studies during the construction of ports, shore fortification structures, offshore oil and gas industry facilities, operational drilling platforms of various types;
- Environmental protection during engineering research in the water area.

As a result of studying the academic discipline, the student must

know:

- Types of the earth's crust under the seas and oceans;
- Planetary morphostructures of the bottom of the world ocean and their characteristics;
- Peculiarities of manifestation of earthquakes, volcanism and gravitational processes in the World Ocean;
- Factors, regularities and features of sediment accumulation on the bottom of oceans and seas, types of sedimentation, formation of physical and mechanical properties of bottom sediments;
- Terminology of the main elements of the coastal zone;
- Methods and technical means of engineering-geological research of bottom soils in natural occurrence;
- Peculiarities of the conditions for engineering and geological surveying in oceans and seas;
- Composition of engineering and geological explorations on the continental shelf;
- Basic requirements for the production of engineering and geological investigations in areas of soil development with special properties.

be able:

- To determine the main and characteristic features of the geomorphological and geological structure of the seas and oceans;
- To use theoretical knowledge during engineering and geological searches in the coastal zone and sea shelf;
- Apply the rules, requirements, methods of engineering and geological research in water areas and the coastal zone of seas and oceans;
- Independently make decisions regarding the optimal location and design of buildings and structures in the coastal zone of the sea;
- Choose sets of measures aimed at ensuring the operational reliability of buildings and structures in the presence of unfavorable engineering and geological processes in the coastal zone;
- Build a relief map of the seabed;
- Build lithological-geological and engineering-geological maps of the selected area of the shelf;
- Perform data processing of physical and mechanical properties of bottom sediments;
- Draw up a program of engineering and geological investigations for the construction of structures in the coastal zone and on the continental shelf;
- Determine the category of complexity of engineering and geological conditions on the shelf.

COURSE DESCRIPTION**Forms and methods of education**

The course will be taught in the form of lectures (16 hours) and practical classes (14 hours), organization of students' independent work (60 hours).

The main training of students is carried out in lectures and practical classes, but to a large extent it relies on independent study of the subject by full-time students during the semester. During the teaching of the discipline, teaching methods are used: verbal (lecture, explanation); face-to-face (Power Point demonstration); practical (practical works); work with the textbook (under the guidance of the teacher, independent work of students).

List of topics (general blocks)

Content module 1. Basic regularities of the development of sea shores and the coastal zone of the sea.

Topic 1. Coastal zone. Terminology of the main elements of the coastal zone. Geomorphological elements of the coastal zone. Dynamic areas of the coastal zone. Elements of hydrodynamics and summer dynamics of the coastal zone. Sediment balance in the coastal zone. Coastal currents. Types of currents. Along coastal sediment flows. Flow parameters. Engineering and geological significance along coastal sediment flows.

Topic 2. Coastal erosion and destruction. Assessment of the threat of coastal erosion. Measures and structures to protect shores from destruction.

Topic 3. Arrival and distribution and differentiation of sedimentary material in the coastal zone of the seas. General remarks about marine sediments and processes of

marine sedimentation. Classification of marine sediments. Arrival of terrigenous, chemogenic, soluble, volcanogenic, biogenic material and cosmic dust. The main types of sedimentation in the coastal zone of the seas.

Content module 2. Engineering and geological research in oceans and seas.

Topic 1. Geological and engineering-geological survey of the seabed. The role of engineering-geological surveying in the performance of marine engineering-geological research. Scales of engineering and geological surveys. Peculiarities of conditions for shooting in oceans and seas. Depth measurement methods. Construction of bathymetric maps. Electrical intelligence. Underwater geological mapping. Seismic profiling. Radiometric measurements. Aerial photography and photography of the seabed.

Topic 2. Exploratory work during engineering and geological research on the shelf. Methods and technical means of engineering and geological research of bottom sediments in a natural setting. Offshore drilling. Geophysical methods during engineering and geological searches in the sea. Sampling and obtaining samples of bottom sediments. Field methods of engineering and geological research of bottom soils.

Topic 3. Engineering and geological surveys for the construction of objects on the continental shelf. General regulations for conducting engineering and geological surveys in marine water areas. Composition of engineering surveys for the construction of objects on the continental shelf. Requirements for geotechnical investigations in the areas of distribution of soils with special properties. Lithodynamic studies. Requirements for the composition and content of a scientific and technical report (conclusion) on engineering and geological research on the continental shelf. Determination of the category of complexity of engineering and geological conditions on the shelf. Environmental protection during engineering and geological research in the water area.

Content module 3. Geological and engineering-geological structure of the coastal zone of the Azov-Black Sea basin.

Topic 1. Geological structure of the Black and Azov seas. Tectonic structure and history of geological formation of the Azov-Black Sea basin. Peculiarities of sediment accumulation on the Black Sea shelf and a series of Pliocene-Quaternary transgressive-regressive cycles in the formation of bottom sediments in the coastal part of the Black and Azov seas.

Topic 2. Geomorphology and types of the shores of the Black and Azov seas. Abrasive, accumulative and transit processes in the coastal strip of the Black and Azov seas. Characteristic morphological forms for each complex of processes. Their spatial distribution within the coastal strip.

Topic 3. Engineering and geodynamic processes in the coastal strip. Formation of an equilibrium underwater coastal slope in different coastal conditions. Processes of erosion and accumulation of bottom sediments. Construction in the coastal regions of the Black and Azov seas. Laying fairways and forming dredging soil dumping zones in the coastal part.

Recommended literature

Basic:

1. Safranov T.A., Chugai A.V., Berlinskyi M.A., Nikipelova O.M., Cherkez E.A., Pedan G.S. and others. (2017) State and quality of the natural environment of the coastal zone of the North-Western Black Sea region: monograph / Kharkiv: FOP Panov A.M., 298 p. (in Ukrainian)
2. Bruun, P., (2004). Coast erosion and the development of beach profiles. Technical Memorandum No. 44, Beach Erosion Board, U.S. Army Corps of Engineers.
3. Work program and syllabus of the course "Engineering and Geological Processes of the Coastal Zone of the Azov-Black Sea Basin". GGF website. Educational materials.
4. Waves, tides and shallow water processes. Second Ed. Oxford: The Open University, Butterworth-Heinemann, 1999. 227 p. <https://doi.org/10.1016/b978-0-08-036372-1.x5000-4>

Additional.

1. Dean, R.G., Dalrymple. R.A., 2004. Coastal Processes with Engineering Applications: Cambridge University Press.
2. Green E.P., Mumby P.J. 2000 Remote Sensing Handbook for Tropical Coastal Management. France, Paris: UNESCO. 316 p.
3. Pedan, G., and Dragomyretska, O. (2019) The spatio-temporal characteristics of dangerous geological processes in the coastal zone of the northwestern Black Sea (Ukraine) // The Third Plenary Meeting and Field Trip of INQUA IFG 1709F POCAS, Tehran and Guilan Province, I.R. Iran, 11-18 October 2019.- P.109-112.
4. Wang, P. and Kraus, N.C., (2005). Beach profile equilibrium and patterns of wave decay and energy dissipation across the surf zone elucidated in a large-scale laboratory experiment. Journal of Coastal Research, 21(3), 522–534.

Evaluation policy

The academic discipline is evaluated on a 100-point scale.

The control of the student's success in the academic discipline is divided into the current control of the performance of practical work (examination and defense of work), control of the theoretical material for credit modules (written control work) and, if necessary, determined by the teacher - final control (credit).

Current performance control is a systematic test of the knowledge of higher education students, which is conducted by a teacher in current classes according to the schedule and in accordance with the work program of the academic discipline.

Final control of the discipline - credit. A credit is given to a student who has completed all the mandatory types of work required by the curriculum of the discipline and scored 60 or more points while mastering the discipline.

For students who scored a total of less points than the minimum for credit (60) during the semester, it is allowed to retake the modular test for which an unsatisfactory grade was received.

On-going testing and individual work										Summ
Content module №1			Content module № 2			Content module № 3			individual work	
T1	T2	T3	T4	T5	T6	T7	T8	T9	20	100
10	10	10	10	10	10	10	5	5		

Policy on deadlines and rewriting: current control works, final written control are carried out in the classroom. In the case of no or low results, all work is rescheduled once within two weeks on the day of the planned consultation. All individual independent tasks must be submitted and defended no later than the penultimate seminar class. In case of violation of deadlines for submission and defense of independent individual tasks, the number of points for their completion is reduced. Final control is carried out in the classroom in the penultimate week.

Academic Integrity Policy: Inadmissible Withdrawals; the acquirer must be fluent in the material.

Attendance and tardiness policy: the applicant must not miss practical classes, the teacher must be informed in advance of absence due to valid reasons, tardiness is not welcome.

Mobile devices: it is not allowed to use a mobile phone, tablet or other mobile devices during the class (except for cases provided by the curriculum and methodical recommendations of the teacher).

Behavior in the audience: creative, businesslike, friendly atmosphere.

Individual work of students.

Students' work consists of individual study from the list of specified topics as well as topics that require in-depth study. Independent work (SR) is monitored in the form of control tests and reports on practical work. Questions on topics assigned to independent study are included in the control measures. The entire volume of SR contains tasks that require systematic independent work from the student.