Level of higher education	Bachelor
Specialty	103 Earth Sciences
Educational program	Geology
Duration of instruction	1st semester
Classes:	Autumn semester
Lectures:	2 hours per week
Laboratory classes:	2 hours per week
	Spring semester
Lectures:	1 hour per week
Laboratory classes:	1 hour per week
Language of instruction	Ukrainian

Course page on distance education platform of NTUDP:
https://do.nmu.org.ua/course/view.php?id=1047

Teaching department: Department of Geology and Mineral Prospecting
Information about teachers:

Lecture:
Ishkov Valerii Valeriiovich
Associate Professor, Candidate of Geological and Mineralogical Sciences (PhD), Associate Professor of the Department

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Practical training:
Kozii Yevhen Serhiiovych
Candidate of Geological Sciences (PhD), Associate Professor of the Department

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1. Annotation to the course

Petrography is a geological science that studies igneous, metamorphic and sedimentary rocks. The Petrography course is dedicated to igneous and metamorphic rocks and consists of two parts - lecture and laboratory. During the lectures you will learn about the processes that

occur in magma, and they lead to the formation of various igneous rocks. Also, you will gain knowledge about metamorphic processes and the corresponding rocks, you will know the classification of igneous and metamorphic rocks, their practical significance. During laboratory classes you will learn to identify and describe igneous and metamorphic rocks in samples (macroscopically) and using an optical microscope. Since rocks are mineral aggregates, the Petrography course is based on the knowledge gained in the study of the Mineralogy discipline.

2. The purpose and objectives of the discipline

The purpose of the discipline is to form higher education students competencies regarding the study of rocks of igneous, metamorphic and sedimentary origin and their complexes and the use of the revealed patterns in geological activities.

Course objectives:

– provide knowledge about geological and physicochemical processes that lead to the formation of igneous and metamorphic rocks;

– provide knowledge about petrographic methods of studying igneous and metamorphic rocks;

– provide knowledge about the classification of igneous and metamorphic rocks;

– provide knowledge about minerals associated with igneous and metamorphic rocks;

– teach students to identify and describe the main petrographic types of igneous and metamorphic rocks;

– teach students to analyze the composition and structure of igneous and metamorphic rocks and draw conclusions about their genesis and associated minerals.

3. Learning outcomes

As a result of studying the course, students will:

– know the theoretical foundations of the study of igneous and metamorphic rocks;

– be able to identify and describe the main petrographic types of igneous and metamorphic rocks;

– know the petrographic methods of studying igneous and metamorphic rocks;

– be able to apply petrographic methods of studying igneous and metamorphic rocks;

– know the processes of formation and classification of igneous and metamorphic rocks for the analysis of natural complexes of the lithosphere;

– know the possible minerals associated with igneous and metamorphic rocks;

– be able to analyze the composition and structure of igneous and metamorphic rocks for conclusions about their genesis, place in the classification and associated minerals.

4. Course structure

Lectures

1. Petrography of igneous and metamorphic rocks. Subject and tasks of petrography, its place among other sciences. Main methods of studying rocks. Petrography of igneous rocks. Substance composition of igneous rocks.

2. Forms of bedding and structure of igneous rocks. Forms of bedding of igneous rocks. Texture and structure as characteristics of rocks structure. Textures of igneous rocks. Structures of igneous rocks.

3. Classification and nomenclature of igneous rocks. Classification according to conditions of bedding and structures. Classifications according to chemical composition. Classifications according to mineral composition. Petrographic (chemical-mineralogical) classifications.

4. Mafic and ultramafic igneous rocks. General information. Mafic rocks of normal alkalinity. Mafic rocks of the subalkaline and alkaline series. Ultramafic rocks of normal alkalinity. Ultrabasic rocks of the subalkaline and alkaline series. Ultrabasic rocks of non-silicate composition (carbonatites).

5. Intermediate igneous rocks. General information. Intermediate igneous rocks of normal alkalinity. Intermediate rocks of the subalkaline series. Intermediate rocks of the alkaline series.

6. Felsic igneous rocks. General information. Felsic igneous rocks of normal alkalinity. Felsic rocks of the subalkaline series. Felsic rocks of the alkaline series.

7. Processes of formation of igneous rocks. Composition and physical properties of magma. Laws of crystallization of magmatic melts. Occurrence and evolution of magmas. Concept of associations, formations and complexes of igneous rocks.

8. Metamorphic rocks. Factors of metamorphism. Classification of metamorphic processes. Material composition of metamorphic rocks. Textures and structures of metamorphic rocks.

9. Classification and typification of metamorphic rocks, their facies affiliation. Systematics and classification of metamorphic rocks. The concept of metamorphic facies. Nomenclature of metamorphic rocks.

10. Contact-thermal and regional metamorphism and their products. Conditions of formation and features of contact-thermal metamorphic rocks. Mineral paragenesis of regional metamorphism. Regional-metamorphic rocks of moderate-pressure facies. Regional-metamorphic rocks of elevated-pressure facies.

11. Metasomatic rocks and products of autometasomatosis. Conditions of formation of rocks and their classification. Products of alkaline metasomatosis. Products of neutral metasomatosis and autometamorphism. Rocks of acid metasomatosis.

12. Cataclastic and impact metamorphism and ultrametamorphism. Metamorphic rocks of dynamic metamorphism. Ultrametamorphic rocks. Impact metamorphic rocks.

13. Lithology is the science of sedimentary rocks. The subject and tasks of lithology, its place among other sciences. Sedimentary rocks are the main object of lithology. The main methods of studying sedimentary rocks. Composition and classification of sedimentary rocks. Mineral composition of sedimentary rocks. Chemical composition of sedimentary rocks. Classification of sedimentary rocks.

14. Structure and properties of sedimentary rocks. Textures of sedimentary rocks. Structures of sedimentary rocks. Physical properties of sedimentary rocks. Theory of lithogenesis. Stages of formation of sedimentary rocks. Types of lithogenesis. Stage of hypergenesis. Transportation of sedimentary material. Sedimentogenesis and sedimentary differentiation. Stage of diagenesis. Catagenesis and metagenesis.

15. Clastic and volcanic-clastic sedimentary rocks. General characteristics. Cement of clastic sedimentary rocks. Classification of clastic sedimentary rocks. Characteristics of the main representatives of the class. Practical significance of clastic and volcanic-clastic sedimentary rocks.

16. Clay sedimentary rocks. General information. Composition and classification of clay sedimentary rocks. Structure and properties of clay sedimentary rocks. Conditions for the formation of clay sedimentary rocks.

17. Aluminous, ferruginous and manganese sedimentary rocks. General information. Characteristics of aluminous sedimentary rocks. Characteristics of ferruginous sedimentary rocks. Characteristics of manganese sedimentary rocks.

18. Carbonate sedimentary rocks. General characteristics and classification. Characteristics of the main representatives of the class. Genesis of carbonate rocks. Siliceous sedimentary rocks (silicites). General characteristics and classification. Silica minerals of siliceous sedimentary rocks. Characteristics of silicites.

19. Phosphate sedimentary rocks. General characteristics and classification. Mineral composition and methods of studying phosphate rocks. Characteristics of the main representatives of the class. Genesis of phosphate sedimentary rocks.

20. Salt sedimentary rocks (evaporites). General characteristics and classification. Characteristics of the main representatives of the class. Conditions for the formation of salt sedimentary rocks.

21. Solid caustobiolites. Oil shales and coals are solid caustobiolites. The source material of caustobiolites and the processes of their formation. Principles of classification and the material composition of caustobiolites. Characteristics of the main representatives of the class.

22. Sedimentary facies and facies analysis The concept of facies and genetic types of sedimentary formations. Facies groups. Characteristics of marine facies. Characteristics of transitional facies from continental to marine. Characteristics of continental facies. Facies analysis. Sedimentary formations. The concept of "formation" and the main features of formations. Evolution and cyclicity of the sedimentary process. Regularities of the placement of the main types of sedimentary rocks.

Laboratory classes

1 Study of the composition of igneous rocks.
2 Study of the structure of igneous rocks.
3 Study of mafic and ultramafic igneous rocks.
4 Study of intermediate igneous rocks
5 Study of felsic igneous rocks
6 Study of the composition of metamorphic rocks.
7 Study of the structure of metamorphic rocks.
8 Study of metamorphic rocks of contact-thermal and regional metamorphism
9 Study of metasomatic rocks and products of autometasomatosis
10 Study of rocks of dynamic metamorphism and ultrametamorphism.
11 Study of the composition of sedimentary rocks.
12 Study of the structure of sedimentary rocks.
13 Study of clastic sedimentary rocks.
14 Study of clay sedimentary rocks.
15 Study of aluminous, ferruginous and manganese sedimentary rocks.
16 Study of carbonate sedimentary rocks.
17 Study of siliceous sedimentary rocks.
18 Study of phosphate sedimentary rocks.

19 Study of salt sedimentary rocks.
20 Study of solid caustobiolites.
21 Lithological-facies analysis of sedimentary rocks.

5. Hardware and / or software

Technical training aids: multimedia equipment, departmental educational and control collections of rocks. It is desirable to have gadgets with Internet during lectures. Remote MOODLE platform.

6. Evaluation system and requirements

6.1. The academic achievements of higher education applicants based on the results of the course will be evaluated according to the scale given below:

Rating scale	Institutional scale
90 – 100	Excellent
75-89	Good
60-74	Satisfactory
0-59	Failed

6.2. Higher education applicants may receive **a final grade** in the academic discipline based on the current assessment of knowledge, provided that the number of points scored in the current testing and independent work will be at least 60 points. The current success rate consists of grades for laboratory work and grades for current tests. During the course, two tests are conducted, each of which is estimated at 23 points. Laboratory work is mandatory.

Maximum assessment:

Theoretical part	The practical part		Bonus	**Together**
	In case of timely submission	In case of untimely submission		
46	50	46	4	**100**

The theoretical part of the course can also be assessed during the examination session based on the results of a comprehensive control work.

6.3. Laboratory work evaluation criteria

To receive the maximum score, a higher education applicant must correctly answer three questions from the list of control questions.

7. Course Policy

7.1. Academic Integrity Policy

Academic integrity of higher education applicants is an important condition for mastering the results of training in the discipline and obtaining a satisfactory grade from the current and final tests. Academic integrity is based on the condemnation of the practices of copying (performing written work involving external sources of information, other than those permitted

for use), plagiarism (reproduction of published texts by other authors without indicating authorship), fabrication (fabrication of data or facts used in the educational process). The policy on academic integrity is regulated by the Regulation "Regulations on the system of prevention and detection of plagiarism at the Dnipro University of Technology "http://www.nmu.org.ua/ua/content/activity/us_documents/System_of_prevention_and_detection_of_plagiarism.pdf.

In case of violation of academic integrity by the higher education applicant (copying, plagiarism, fabrication), the work is evaluated unsatisfactorily and must be repeated. The teacher reserves the right to change the topic of the task.

7.2.Communication policy

Higher education applicants must have an activated university email. All written questions to teachers regarding the course should be sent to the university e-mail (student.i.p.@nmu.one).

It is the responsibility of the higher education student to check their mailbox on Office365 once a week.

During the weeks of independent work, it is the responsibility of the higher education student to work with the distance learning course of the academic discipline (www.do.nmu.org.ua).

All written questions to teachers regarding the course should be sent to the university email.

7.3. Exam retake policy

Works that are submitted in violation of deadlines without good reason are evaluated at a lower grade. Reassignment takes place with the permission of the Dean's Office if there are good reasons (for example, sick leave).

7.4. Attending classes

For full-time higher education applicants, attending classes is mandatory. Good reasons for not attending classes are illness, participation in university events, business trips, which must be confirmed by documents in case of a long (two weeks) absence. The higher education applicants must inform the teacher either in person or through the group leader about the absence from classes and the reasons for absence. If a higher education student falls ill, he is recommended to stay home and study using a distance learning platform. A higher education student whose health condition is unsatisfactory and may affect the health of other higher education applicants will be offered to leave the class (such absence will be considered an absence due to illness). For objective reasons (for example, international mobility), training may take place remotely - in an online form, in agreement with the teacher.

7.5 Assessment Appeal Policy

If a higher education applicants disagrees with the assessment of his knowledge, he may appeal the assessment given by the teacher in accordance with the established procedure.

7.6. Bonuses

Higher education students who participate in conferences or Olympiads on the topic of the course receive a bonus - an additional 4 points to the assessment results before the final grade.

8. Recommended sources of information

Basic

1. Петрографія та літологія. Матеріали методичного забезпечення для виконання лабораторних робіт студентам напряму підготовки 103 Науки про Землю / Сливна О.В. – Д.: Національний технічний університет «ДП», 2018. – 33 с.

2. Павлов Г.Г. Петрографія : підручник / Г.Г. Павлов. – К. : Видавничополіграфічний центр "Київський університет", 2014. - 527 с.

3. Хмелевський В.О. Літологія : Літогенез : Осадові породи : навч. посібник / В.О. Хмелевський, О.В. Хмелевська. - Львів : ЛНУ імені Івана Франка, 2015. – 536 с.

4. Методи вивчення осадових порід: методичні рекомендації до лабораторних занять і самостійної роботи студентів напряму підготовки 6.04.01.03 – геологія / укл.: В.Б. Степанов, І.В. Побережська, О. Костюк, І.Г. Гнатів – Львів: Львівський національний університет імені Івана Франка, 2014. – 64 с.

5. Павлова О.О. Базові терміни та поняття в літології. Довідковий посібник з «Основ літології» для студентів 2 курсу за спеціальністю «Науки про Землю» / Павлова О.О., Павлов Г.Г. – К. : http://www.geol.univ.kiev.ua/ua/lib/, 2018. – 37 с.

6. Павлова О.О. Петрографічне вивчення порід-колекторів нафти і газу : електронний навчально-наочний посібник у 6 частинах. – К. : Київський університет ім. Т.Г. Шевченка, 2018. Режим доступу: http://www.geol.univ.kiev.ua/ua/lib/index.php?id=2

Additional

7. Сахно С.В., Ішков В.В., Сахно А.І. Мінерал дикіт в осадових вуглевміщуючих породах Донбасу. Наукові праці ДонНТУ. Серія Гірничо-геологічна, 2019. – №1(21) – 2(22). С. 7 – 13.

8. A. Murovska, O. Gintov, V. Alokhin, V. Ishkov, A. Boiarska, S. Mychak. Features of the composition and deformation of rock within the Marmarosh massif (in Ukraine). Geoinformatics. 2021. 21082. Anniversary XXth International Conference ― Geoinformatics: Theoretical and Applied Aspects‖, 10?14 May 2021 in Kyiv, Ukraine.

EarthDoc.org (Scopus). https://eage.in.ua/?page_id=1971 9. HE MAIN RESULTS OF MINERALOGICAL AND PETROGRAPHIC STUDIES OF LIMESTONES FROM NOVOSELYTSKE DEPOSIT (UKRAINE) /Ішков В., Козій Ю., Дрешпак О., Березняк О., Чечель П. - Науковий збірник «ІнтерКонф», 2022 г. №120. 195-206. https://scholar.google.ru/citations?view_op=view_citation&hl=ru&user=SQaOesAAAAJ&cstart=20&pagesize=80&citation_for_view=SQaOesAAAAJ:k_IJM867U9cC