

TARAS SHEVCHENKO NATIONAL UNIVERSITY OF KYIV
INSTITUTE OF GEOLOGY ESI
Department of Mineralogy, Geochemistry and Petrography

“APPROVED”

Deputy director on academic work


“ 26 ” 08 2022

WORK PROGRAMME OF DISCIPLINE

Advanced Petrology

For students

Branch of knowledge **10 Natural Sciences**
Training direction **103 Earth Sciences**
(Speciality)
Educational level **Master**
Educational program **Geochemistry and Mineralogy**
Type of discipline **Obligatory**

Teaching mode *full-time studies*
Academic year *2022/2023*
Semester *3*
Number of credits ECTS *4*
Language of teaching,
learning and evaluation *English*
Form of final control *Exam*

Lecturer: **Olena Pavlova** (PhD in Geology Science, Assistant Professor, Department of Mineralogy, Geochemistry and Petrography)

To be continued

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Kyiv -2022

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APPROVED

Head of the Department of Mineralogy,
Geochemistry and Petrography


(Sergey Shnyukov)

Record of the Department meeting
Protocol № 1 22.08.22

Approved by Scientific-methodical Commission of Institute of Geology
Protocol № 1

Head of the Scientific-Methodical Commission V. Demidov (Vsevolod Demidov)

" 26 " 08 2022

The aim of the discipline — is designed to form in students the ability to understand, analyze and investigate the processes of formation of the entire endogenous substrate conditioned by the internal life of planet Earth - associations of igneous, metamorphic, metasomatic rocks, their relationship with global geodynamic regimes and other geological phenomena that have arisen in the lithosphere of the Earth from the moment of its formation to the present day. Creating and using phase equations and phase diagrams to model processes and determine pressure, temperature, and fluid conditions in igneous and metamorphic systems.

1. Preliminary requirements:

1. Students must have skills and knowledge of the theoretical foundation of mineralogy, basics petrology, basics chemistry and physics.

2. Annotation of teaching discipline / reference:

The discipline is a basic course in geology and is a part of education and professional training program for the education level "master" branch of knowledge 10 - Natural Science of specialty 103 - Earth Sciences, educational program - geochemistry and mineralogy. This discipline is a required discipline for educational program "geochemistry and mineralogy" and focuses primarily on igneous petrology with limited metamorphic petrology content.

The discipline is finished by an exam.

3. The tasks of the discipline – to highlight the following issues:

- Define petrological basic concepts of modern research methods in petrology.
- Learn the principles of constructing phase diagrams, “composition-paragenesis” diagrams, learn to read them and formulate conclusions;
- The main types of phase diagrams and their interpretation;
- Students should be able to interpret structure and crystallization history using appropriate phase diagrams.
- The study of basic properties of rock-forming minerals;
- The main trends and current state of petrological research in the world.

The results of study:

<i>Learning results (1. to know; 2. be able to)</i>		<i>Methods of teaching and learning</i>	<i>Assessment methods</i>	<i>Percentage in the final assessment of the discipline</i>
Code	Learning results			
1.1	modern approaches and concepts of petrology	<i>lecture</i>	<i>presentation</i>	<i>up to 10%</i>
1.2	features of crystallization from the magma and classification and nomenclature of igneous rocks	<i>lecture, self-study</i>	<i>paperwork</i>	<i>up to 20%</i>
1.3	the basic of thermodynamics	<i>lecture, self-study</i>	<i>oral reports</i>	<i>up to 15%</i>
2.1	to explain how magma is generated in the Earth's mantle	<i>lecture, self-study</i>	<i>paperwork</i>	<i>up to 10%</i>
2.2	define petrological basic concepts of modern research methods in Petrology	<i>Lecture, self-study</i>	<i>paperwork</i>	<i>up to 10%</i>

2.3	interpret phase diagrams to find out the conditions of formation and crystallization of magmatic melt To explain how magma is generated in the Earth's mantle	<i>Lecture, self-study</i>	<i>oral reports</i>	<i>up to 25%</i>
2.4	interpret the geologic history of igneous rocks based on mineral assemblage and structures	<i>Lecture, self-study</i>	<i>presentation</i>	<i>up to 10%</i>

Structure of discipline : lectures, seminars, self-studying work of student

Correlation of discipline learning Outcomes and scheduled results of tuition:

Outcome	Learning	1.1	1.2	1.3	2.1	2.2	2.3	2.4
Program Learning Outcomes								
PO 1. Modern methods of research of the upper part of the Earth's crust and sedimentary layer, their application in production and research activities		+	+		+	+	+	
PO 2. Apply your knowledge and skills for the identification and solving of challenging problems and undertaking informed decisions in the questions related to stratigraphy, structural geology, geological interpretation of geophysical data, and geological risks management					+	+		
PO 6. Assess geological risks, including their environmental impact, predict the evolution of hazardous geological processes in the context of natural systems and man-made infrastructure, provide expert conclusions for the geological exploration and production licensing and certification of natural reserve								+
PO 7. Know modern methods of research of the upper part of the Earth's crust and sedimentary layer, their application in production and research activities Ability to work in an		+	+	+	+	+		

Scheme of grading forms :

Form of student evaluation:

1. Semester grading

- 1) Modul 1 - (min - 6, max - 10 grades)
- 2) Modul 2 - (min - 6, max - 10 grades)
- 3) Oral reports - (min - 24, max - 40 grades)

2. **Final assessment(exam)** in form of the written test (min - 24, max - 40grades)/

Final evaluation is in the form of a Exam (total score of discipline (maximum 100 grades) is defined as the sum for the systematic work during the semester). Final evaluation based on the results of the student's work throughout the semester.

Procedure and evaluation system

	Semesters grades	Modular test	Exam Final grade
Min	36	24	60
Max	60	40	100

For students who have obtained total grades less than critically-calculated minimum of 40 grades repeated control test is obligatory for taking the test.

Grading:

For admission to the final grading it is obligatory: 1) to pass two modul ; 2) to prepare 5 oral reports, which can be presented in the form of presentations and abstracts. The final grading is carried out in the form of exam (written test).

Assessment:

Scale of Exam

National scale	100 points scale
Excellent	90 – 100
Good	75 – 89
Satisfactorily	60 – 74
Failed	0 – 59

STRUCTURE OF THE DISCIPLINE

PLAN OF LECTURES AND PRACTICAL CLASSES

	Theme	Hours		
		Lecture	Seminars	Self-studing work
Modules 1.				
1	Theme 1. An introduction to magmas and magmatic rocks	2	-	6
2	Theme 2. Igneous rocks: magma sources and whole-rock petrological analysis	6	-	20
3	Theme 3. Physico-chemical foundations of petrology Basics of thermodynamics (the Gibbs Phase Rule and phase diagrams)	6	-	20
4	Module 1			2

Module 2				
5	Theme 4. Rock-forming minerals of igneous rocks	6	-	12
6	Theme 5. Structure and mineral chemistry of the rock-forming minerals	4	-	12
7	Theme 6. The main types of igneous rocks	4	-	12
8	Modul 2			2
9	Exam (written Exam)			
10	Total	28	-	86

Themes for self-studying work:

1. *Magma and Magma Formation*
2. *Crystallization from Magma*
3. *QAPF modal classification of plutonic rocks*
4. *The Gibbs Phase Rule*
5. *Phase diagrams: Binary systems with complete solid solution at 1 bar, Binary peritectic systems,*
6. *Alkali igneous rocks.*

Total hours of the discipline: - 120, That include:

Lectures – 28 hrs,
 Consultations – 6 hrs
 Self-studying work –86 hrs.

RECOMMENDED LITERATURE:

1. *Robin Gill. Department of Earth Sciences Royal Holloway University of London, Igneous rocks and processes : a practical guide / Robin Gill.-472. © 2010 by Robin Gill.*
2. *R.W. Le Maitre & International Union of Geological Sciences 2002. IGNEOUS ROCKS: A CLASSIFICATION AND GLOSSARY OF TERM Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo.*
3. *Best, Myron G. Igneous and metamorphic petrology / Myron G. Best.—2nd ed.*
4. *Greenwood, H. J. (ed) (1977) Short Course In Application of Thermodynamics to Petrology and Ore Deposits. Mineralogical Association of Canada, 230 p.*
5. *Nordstrom, D.K. (2006) Geochemical Thermodynamics. Blackburn Press. 504 p.*