Academic course description – METAMORPHIC PETROLOGY

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| BACHELOR’s DEGREE**Geochemistry** 3rd YEAR OF STUDY, 1st SEMESTER |

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| **Course title** | **Metamorphic petrology** |
| Course code | 31020030020SL1113131  |
| Course type | full attendance |
| Course level | 1st cycle (bachelor’s degree) |
| Year of study, semester | 3rd year of study, 1st semester |
| Number of ECTS credits | 6 |
| Number of hours per week | 4 (2 lecture hours + 2 seminar hours) |
| Name of lecture holder | Professor Ovidiu Gabriel Iancu  |
| Name of seminar holder | Assistant Lecturer Iuliana Buliga  |
| Prerequisites | Mineralogy, Igneous Petrology  |
| A | **General and course-specific competences** |
|  | **General competences**:* Developing students’ interest for consulting relevant national and international sources in order to devise a research paper on a topic pertaining to the academic discipline

**Course-specific competences**:* Defining the main types of metamorphic rocks
* Corroborating geological knowledge with information from related fields so as to identify metamorphic rocks and explain the geological phenomena through which they are generated
* Knowing the methodology required in the complete investigation of metamorphic terrains
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| B | **Learning outcomes** |
|  | Upon successfully completing the discipline, students become capable of:* describing the main types of metamorphic rocks and their mineralogy
* explaining the genesis of metamorphic rocks
* using petrogenetic diagrams
* analyzing metamorphic rocks both macroscopically and microscopically
* calculating the ACF, A’KF and AFM parameters based on chemical analyses of major elements, so as to use ternary diagrams
* understanding P-T-t paths and their role in the study of metamorphic rocks
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| C | **Lecture content** |
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| Week | Title of lecture | Teaching methods |  Duration  |
| 1 | Units of measurement used in Petrology. Metamorphism – definition and types |  Lecture based on video projection  | 2 hours |
| 2 | Nomenclature and classification of metamorphic rocks | Lecture based on video projection | 2 hours |
| 3 | Rock deformation. Structural elements in metamorphic rocks. The structures of metamorphic rocks. The microstructures of metamorphic rocks. | Lecture based on video projection | 2 hours |
| 4 | The physico-chemical agents of metamorphism. The limits of metamorphism. Fluid phases in metamorphism. Chemical reactions in metamorphic rocks. Petrogenetic grids.  | Lecture based on video projection | 2 hours |
| 5 | Metamorphic facies. Index minerals. Metamorphic facies series. Contact metamorphism.  | Lecture based on video projection | 2 hours |
| 6 | Cataclastic metamorphism. Shock metamorphism. Regional metamorphism. Occurrences, general characteristics, gradients of prograde metamorphism.  | Lecture based on video projection | 2 hours |
| 7 | The regional metamorphism of ultramafic rocks. The regional metamorphism of granitoids. The regional metamorphism of limestones and dolomites. The regional metamorphism of arenaceous rocks  | Lecture based on video projection | 2 hours |
| 8 | The regional metamorphism of pelites. Migmatites; Granulites.  | Lecture based on video projection | 2 hours |
| 9 | The regional metamorphism of mafic rocks. Eclogites. High-pressure metamorphism. Seafloor metamorphism.  | Lecture based on video projection | 2 hours |
| 10  | The geothermometry and geobarometry of metamorphic rocks  | Lecture based on video projection | 2 hours |
| 11 | The geochronology and thermochronology of metamorphic rocks  | Lecture based on video projection | 2 hours |
| 12 |  P-T-t metamorphic paths  | Lecture based on video projection | 2 hours |
| 13 | Metamorphic rock occurrences in Romania | Lecture based on video projection | 2 hours |
| 14 | The economic significance of metamorphic rocks and minerals  | Lecture based on video projection | 2 hours  |

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| D | **Recommended reading for lectures** |
|  | **Main references:** 1. BUCHER K. & GRAPES R. (2011) Petrogenesis of metamorphic rocks. (8th edition). Springer-Verlag, Berlin, 428 p.; 2. KORNPROBST J. (2003) Metamorphic rocks and their geodynamic significance. A petrological handbook, Kluwer Academic Publisher, 208 p.;3. IANCU.O.G. (2007) Petrologie metamorfică. Ed. Sedcom Libris Iași, 190 p.;4. MIYASHIRO A. (1994) Metamorphic petrology. UCL press, London.**Additional references:** 1. RĂDULESCU D. (1981) Petrologie magmatică şi metamorfică. Ed. Did. şi Pedag. Bucureşti.; 2. SPEAR F.S. (1993) Metamorphic phase equilibria and pressure-temperature-time paths. Mineralogical Soc. of America, Monograph, Washington, D.C., 799 p.;3. YARDLEY B. W. D. (1989) An introduction to metamorphic petrology. Longman, New York, 248 p. |
| E | **Seminar content** |
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| Week | Title of seminar | Teaching methods | Duration  |
| 1 | Minerals in the composition of metamorphic rocks | Video projection, observation/analysis of thin sections | 2 hours; electron microscope |
| 2 | The fabric of metamorphic rocks | Video projection, observation/analysis of thin sections  | 2 hours; electron microscope |
| 3 | Rocks typical for regional metamorphism from the sanidinite facies, the zeolite facies and the facies of corneans with pyroxenes | Video projection, observation/analysis of thin sections and samples | 2 hours; electron microscope and samples |
| 4  | Rocks typical for regional metamorphism: slate, phyllite | Video projection, observation/analysis of thin sections and samples | 2 hours; electron microscope and samples |
| 5 | Rocks typical for regional metamorphism: schist, mica schist  | Video projection, observation/analysis of thin sections and samples | 2 hours; electron microscope and samples |
| 6  | Synthesis of the rocks and facies studied | Assessment based on thin sections and samples | 2 hours; electron microscope and samples |
| 7  | Rocks typical for regional metamorphism: gneiss, quartzite, marble | Video projection, observation/analysis of thin sections and samples | 2 hours; electron microscope and samples |
| 8  | Rocks typical for regional metamorphism: amphibolite, granulite | Video projection, observation/analysis of thin sections and samples | 2 hours; electron microscope and samples |
| 9  | Rocks typical for regional metamorphism: glaucophane schist, eclogite | Video projection, observation/analysis of thin sections and samples | 2 hours; electron microscope and samples |
| 10 | Rocks typical for contact metamorphism: limestone, skarn | Video projection, observation/analysis of thin sections and samples | 2 hours; electron microscope and samples |
| 11 | Calculating the ACF parameters based on chemical analyses of major elements so as to use ternary diagrams  | Lecture; case studies  | 2 hours; geochemical diagrams |
| 12 | Calculating the A’KF parameters based on chemical analyses of major elements so as to use ternary diagrams  | Lecture; case studies  | 2 hours; geochemical diagrams |
| 13 | Calculating the AFM parameters based on chemical analyses of major elements so as to use ternary diagrams | Lecture; case studies  | 2 hours; geochemical diagrams |
| 14 | Oral exam | Assessment of the studied rocks based on thin sections, samples and ternary diagrams | 2 hours, geochemical diagrams, thin sections and samples  |

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| F | **Recommended reading for seminars** |
|  | 1. BARD J.P. (1986) Microstructures of igneous and metamorphic rocks. Reidel Publ.Comp., Dordrecht, 264 p.;2. YARDLEY B. W. D. (1990) Atlas of metamorphic rocks and their textures. Longman, New York, 120 p. |
| G | **Education style** |
| learning and teaching methods | Lecture based on video projection; observation/analysis of thin sections and samples; case studies |
| assessment methods | Written examination and continuous assessment (lecture) – 57.5%; research paper and tests (seminar) – 42.5% |
| Language of instruction | English  |