**COURSE/MODULE DESCRIPTION (SYLLABUS)**

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|  | Course/module  **Applications of mineral sciences** | | |
|  | University department  Faculty of Earth Sciences and Environmental Management, Institute of Geological Science,  Department of Experimental Petrology, Department of Mineralogy and Petrology | | |
|  | Course/module code | | |
|  | Course/module type – mandatory (compulsory) or elective (optional)  Mandatory | | |
|  | University subject (programme/major)  Geology (spec. Applied Geoscience) | | |
|  | Degree: *(master, bachelor)*  Master | | |
|  | Year  I | | |
|  | Semester *(autumn, spring)*  Spring | | |
|  | Form of tuition and number of hours  Lecture: 14 h  Laboratory: 24 h | | |
|  | Name, Surname, academic title  Dr hab. Jakub Kierczak, Dr Wojciech Bartz, Dr Krzysztof Turniak | | |
|  | Initial requirements (knowledge, skills, social competences) regarding the course/module and its completion  General knowledge and skills acquired during bachelor degree studies in geology or related fields. | | |
|  | Objectives  The main aim of the course is to present the analytical techniques used in applied mineralogy and petrology for the planning and controlling the technological processes aiming at processing of natural resources, taking into account both the properties of the raw material and the desired physical and mechanical properties of the resulting product. Furthermore, students will also acquire information on the phase composition of anthropogenic materials, (products of various technological processes; e.g., smelting slags, waste incineration wastes, etc.). Additionally, students will learn about the relationships between the phase composition of the various materials (waste rocks and other industrial wastes containing potentially hazardous components) and its impact on the environment. | | |
|  | Learning outcomes  P\_W01 Student knows the methods for assessment of natural resource parameters and possibilities of its processing for the industry.  P\_W02 Student has knowledge about the application of legal acts and standard procedures related to the assessment of the quality and suitability of raw materials for industry.  P\_W03 Student knows the processes occurring at the contact of building materials and/or industrial waste with the surrounding environment.  P\_U01 Student has the ability to plan and carry out studies of natural resources and anthropogenic substances, including applications of modern methods used in mineralogical sciences.  P\_U02 Student can independently search and use scientific literature in English.  P\_K01 Student knows the effects and impacts of industrial activity (mining, mineral processing) on the environment.  P\_K02 Student understands the relationship between different disciplines of science and economic development | Outcome symbols, *e.g.: K\_W01\*, K\_U05, K\_K03*  K2\_W03, K2\_W06, K2\_07  K2\_W08, K2\_W10  K2\_W01, K2\_W03  K2\_U03, K2\_U04  K2\_U02, K2\_U06  K2\_K04, K2\_K05  K2\_K06 | |
|  | Content  Lecture:  Review of methods used in applied mineralogy (optical microscopy, scanning electron microcopy, X-ray diffraction, thermal methods, X-ray fluorescence XRF spectroscopy, infrared spectroscopy). Material engineering and related economic aspects, legal guidelines of national and European standardization bodies.  Characteristics of materials of anthropogenic origin (slag, fly ash, cement and mortar, building stone, ceramics, metals and alloys, polymers, synthetic and natural glasses, biominerls and biomineralization): basic classification, testing methods and production technology, physical and chemical properties.  Aeromineralogy. Mineral composition and origin of atmospheric dusts. Asbestos in environment.  Laboratory exercises:  The planning, praparation and interpretation of research results concerning various materials, in order to determine their phase composition, properties, conditions of processing leading to their formation.  Sampling procedures and equipment in aeromineralogy. Analytical methods for determination of particulate contamination. Optical microscope and SEM particle counting. Particle identification. Results calculation, presentation and interpretation to show sources of air pollution. | | |
|  | Recommended literature  De Vivo B., Belkin H.E., Lima A., Eds. Environmental Geochemistry. Site Characterization, Data Analysis and Case Histories. Elsevier. Amsterdam, 2008.  Vaughan D.J. and Wogelius R.A. Eds., 2013, Environmental Mineralogy II. Mineralogical Society, 489 pp.  Chung D. L., Composite Materials. Science and Applications. Springer-Verlag London Limited, 2010.  Mukherjee S., Applied Mineralogy. Applications in Industry and Environment. Dordrecht; New York : New Delhi, India, Springer 2011. | | |
|  | Ways of earning credits for the completion of a course /particular component, methods of assessing academic progress:  lecture:  Exam -Written test, a positive result after 50% of the points (P\_W01, P\_W02, P\_W03, P\_K01, P\_K02)  laboratory: preparation of a set of written reports describing tasks given on classes (P\_W02, P\_U01, P\_U02) | | |
|  | Language of instruction  English | | |
|  | Student’s workload | | |
| Activity | | Average number of hours for the activity |
| Hours of instruction (as stipulated in study programme) :  - lecture: 14  - classes:  - laboratory: 24  - other:  - consultations: 12 | | 50 |
| student’s own work, e.g.:  - preparation before class (lecture, etc.)10  - research outcomes: 10  - reading set literature: 5  - writing course report: 10  - preparing for exam: 15 | | 50 |
| Hours | | 100 |
| Number of ECTS | | 4 |