Annex No. 5

to Ordinance No. 21/2019

**COURSE/MODULE SYLLABUS FOR UNIVERSITY COURSES/PhD STUDIES**

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|  | Course/module name in Polish and English  Isotope geology and geochemistry/Geologia i geochemia izotopowa | | |
|  | Discipline  Earth and Environmental Science | | |
|  | Language of instruction  English | | |
|  | Teaching unit  Faculty of Earth Science and Environmental Management, Institute of Geological Sciences, Department of Experimental Petrology, Department of Isotopic and Applied Geology | | |
|  | Course/module code  USOS | | |
|  | Type of course/module *(mandatory or optional)*  mandatory | | |
|  | Field of studies (major, if applicable)  Geology (Applied Geoscience) | | |
|  | Level of higher education *(undergraduate (I cycle), Master’s (II cycle), 5 year uniform Master’s studies)*  Master’s (II cycle) | | |
|  | Year of studies *(if applicable*)  II | | |
|  | Semester *(winter or summer)*  winter | | |
|  | Form of classes and number of hours  Lectures: 28  Classes: 14  Teaching methods  Multimedia lecture, practical exercises, individual work, group work, preparation of reports. | | |
|  | Name, title/degree of the teacher/instructor  Coordinator: Dr hab. Anna Pietranik, Prof. UWr  Lecturer: Dr hab. Anna Pietranik, Prof. UWr, Dr hab. Maciej Górka, Prof. UWr  Classes instructor: Dr hab. Anna Pietranik, Prof. UWr, Dr hab. Maciej Górka, Prof. UWr, Dr Marta Jakubiak | | |
|  | Course/module prerequisites, in terms of knowledge, skills, social competences  Basic knowledge and skills in the field of mineralogy, petrology, geology, chemistry and geochemistry | | |
|  | Course objectives  Students are familiarized with:   1. the basic rules of the distribution and fractionation of different isotopes within the major parts of the Earth (mantle , crust, hydrosphere , biosphere , atmosphere) , 2. methods of dating of rocks, minerals and artefacts 3. isotope geothermometry | | |
|  | Course content  Lectures   1. Basic knowledge of isotopes and application of isotopes in Earth sciences (MG). 2. Analytical methods used in isotope measurements (MG). 3. Formation of isotopically distinct materials: Mass Dependent and Mass Independent Isotope Effects (AP). 4. Isotope diversity of the Earth: mantle, crust (AP). 5. Isotope diversity of the Earth: weathering, soil (AP). 6. Isotope diversity of the Earth: hydrosphere (MG). 7. Isotope diversity of the Earth: atmosphere (MG). 8. Isotope diversity of the Earth: biosphere (MG). 9. Isotope geothermometry (MG). 10. Dating: isochrone method(AP). 11. Dating: U-Pb method (AP). 12. Dating: Young samples by U series and cores by 210Pb (AP). 13. Dating: geological and biological samples, 14C method, OSL/TSL and surface exposure dating (MG).   Classes   1. Introduction to isotopes, basic calculations. 2. Introduction to analytical methods: mass interference. 3. Using and interpreting data from GEOROC database (GEOchemistry of Rocks of the Oceans and Continents). 4. Dating – age calculations and interpretations. 5. Geothermometry – how to use Alpha-Delta base, basic calculations. 6. Isotopic mass balance (2 and 3 sources). 7. Binary mixing model – Keeling plot. | | |
|  | Intended learning outcomes  P\_W01 Has up-tu-date knowledge of chemical and isotope composition of Earth and its components.  P\_W02 Knows how to use isotope techniques to solve problems related to geological problems, dating and environmental investigations.  P\_U01 Knows how to perform a basic calculation / normalization applied in isotope geology and geochemistry.  P\_K01 Is aware of the role and importance of modern analytical techniques in the geological and geochemical sciences.  P\_K02 understands the social responsibility resulting from chemical and isotopic data interpretation. | Symbols of learning outcomes for particular fields of studies, *e.g. K\_W01\**, *K\_U05,K\_K03*  K\_W02, K\_W03, K\_W06, K\_W08, K\_W09  K\_W02, K\_W03, K\_W06  K\_W08, K\_W09  K\_U02, K\_U05  K\_K01, K\_K06  K\_K01, K\_K06 | |
|  | Required and recommended reading *(sources, studies, manuals, etc.)*  Required reading  White W.M., 2015, Isotope Geochemistry. Wiley-Blackwell. – available on-line at the University Library  Hoefs J., Stable Isotope Geochemistry, Springer-Verlag, Berlin Heidelberg, 2018 – available on-line at the University Library  Allègre, Claude J., Isotope Geology, Cambridge University Press, Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, 2008 - – available on-line at the University Library  Recommended reading:  Barker J., Mass spectrometry (Second edition), John Wiley & Sons, Chichester New York Brisbane Singapore Toronto, 1999  Traldi P., Magno F., Lavagnini I., Seraglia R., Quantitative Applications of Mass Spectrometry, John Wiley & Sons Ltd, 2006  De Groot P.A., Handbook of Stable Isotope Analytical Techniques, Elsevier, 2004  Dickin A.P., Radiogenic Isotope Geology, Cambridge University Press, 1995  Sergei V. Rasskazov S.V., Brandt S.B., Brandt I.S., Radiogenic Isotopes in Geologic Processes, Springer-Verlag, NewYork, 2010  Geyh, M. A. & Schleicher H., Absolute age determination. Physical and chemical dating methods and their application, Springer-Verlag, Berlin 1990  Wada E., Yoneyama T., Minagawa M., Ando T., Fry B.D., Stable Isotopes in the biosphere, Kyoto University Press Japan, 1995  Michener R., Lajtha K., Stable Isotopes in Ecology and Environmental Science, Blackwell Publishing Ltd., 2007 | | |
|  | Assessment methods for the intended learning outcomes:  Lecture: written test. K\_W02, K\_W03, K\_W06, K\_W08, K\_W09, K\_K01, K\_K06.  Classes: written reports from classes. K\_U02, K\_U05. | | |
|  | Credit requirements for individual components of the course/module:  Lectures:  - 1-hour test (in English): 60% of possible points for note 3.0.  Classes:  - 2 reports from classes: 60% of possible points for note 3.0,  - attendance in classes is obligatory, if absent student can participate in consultations, | | |
|  | Total student effort | | |
| form of student activities | | number of hours for the implementation of activities |
| classes (according to the plan of studies) with a teacher/instructor:  - lectures: 28  - classes: 14 | | 42 |
| student's own work (including group-work) such as:  - consultations: 13  - being prepared for classes:5  - reading the suggested literature:10  - writing a class report:10  - preparing for tests:20 | | 58 |
| Total number of hours | | 100 |
| Number of ECTS credits | | 4 |