Załącznik Nr 5
do Zasad

COURSE/MODULE DESCRIPTION (SYLLABUS)

1.	Course/module **Interpretation of isotopic data in applied geosciences**	
2.	Language of instruction **English**	
3.	University department **Faculty of Earth Sciences and Environmental Management, Institute of Geological Science, Department of Experimental Petrology.**	
4.	Course/module code **USOS**	
5.	Course/module type – mandatory (compulsory) or elective (optional) **Elective**	
6.	University subject (programme/major) **Geologic Engineery**	
7.	Degree: *(master, bachelor)* **Master**	
8.	Year **I**	
9.	Semester *(autumn, spring)* **Autumn**	
10.	Form of tuition and number of hours **Lecture: 18 h** **Classes: 12 h**	
11.	Name, Surname, academic title **dr hab. prof. Maciej Górka, dr hab. Anna Pietranik**	
12.	Initial requirements (knowledge, skills, social competences) regarding the course/module and its completion **Basic knowledge and skills in the field of mineralogy, petrology, geology, chemistry and geochemistry**	
13.	Objectives **Students are familiarized with:** **- the basic rules of the distribution and fractionation of different isotopes within the major parts of the Earth (mantle , crust, hydrosphere , biosphere , atmosphere) ,** **- methods of dating of rocks, minerals and artefacts** **- isotope geothermometry**	
14.	Learning outcomes **P_W01** Knows the basic methods and techniques of measurement of stable and radioactive isotopes of	Outcome symbols, *e.g.:* **K2_W01, K2_W03, K2_W05**

	geological and environmental samples. **P_W02** Knows how to use isotope techniques to solve problems related to geological problems, dating and environmental investigations. **P_U01** Uses the technique of mass spectrometry in geological sciences, geochemistry and environmental studies. **P_U02** 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** Is capable of reliable sample preparation of geological and environmental isotopic analyzes and understands the social responsibility resulting from presented on the basis of the results, reports and conclusions.	**K2_W03, K2_W05, InżK2_W02** **K2_U01, K2_U04** **K2_U02, K2_U04** **InżK2_U01** **K2_K01** **K2_K01, K2_K02**
15.	Content **Lectures** Basic knowledge of isotopes and application of isotopes in Earth sciences (MG). Analytical methods used in isotope measurements (MG). Formation of isotopically distinct materials: Mass Dependent and Mass Independent Isotope Effects (AP). Isotope diversity of the Earth: mantle, crust (AP). Isotope diversity of the Earth: weathering, soil (AP). Isotope diversity of the Earth: hydrosphere (MG). Isotope diversity of the Earth: atmosphere (MG). Isotope diversity of the Earth: biosphere (MG). Isotope geothermometry (MG). Dating: isochrone method(AP). Dating: U-Pb method (AP). Dating: Young samples by U series and cores by ^{210}Pb (AP). Dating: geological and biological samples, ^{14}C method, OSL/TSL and surface exposure dating (MG). **Classes** Introduction to isotopes, basic calculations. Introduction to analytical methods: mass interference. Using and interpreting data from GEOROC database (GEOchemistry of Rocks of the Oceans and Continents). Dating – age calculations and interpretations. Geothermometry – how to use Alpha-Delta base, basic calculations.	
16.	**Recommended literature** 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	

<table>
<tr><td></td><td>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
Allegre C. J., Isotope Geology, Cambridge University Press, Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, 2008
Hoefs J., Stable Isotope Geochemistry, Springer-Verlag, Berlin Heidelberg, 2009
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</td></tr>
<tr><td>17.</td><td>Methods of verification of learning outcomes:

lecture: test
class: reports and test</td></tr>
<tr><td>18.</td><td>Ways of earning credits for the completion of a course /particular component, methods of assessing academic progress:

lecture: 1-hour test (in English): 60% (P_W01, P_W02, P_U01, P_U02)

class: 1-hour computational test (in English): 60% (P_W01, P_W02, P_U01, P_U02, P_K01, P_K02)

reports: U_01, U_02, K_01, K_02</td></tr>
<tr><td>19.</td><td>Student’s workload
<table>
<tr><td>Activity</td><td>Average number of hours for the activity</td></tr>
<tr><td>Hours of instruction (as stipulated in study programme) :
- lecture:18
- classes:12
- exam: 1
- consultations:8</td><td>39</td></tr>
<tr><td>student’s own work, e.g.:
- preparation before class (lecture, etc.): 6
- reading set literature:10
- writing course report:10
- preparing for exam:10</td><td>36</td></tr>
<tr><td>Hours</td><td>75</td></tr>
<tr><td>Number of ECTS</td><td>3</td></tr>
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