Annex No. 5

to Ordinance No. 21/2019

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

|  |  |
| --- | --- |
|  | Course/module name in Polish and EnglishAnaliza strukturalna/ Structural analysis |
|  | DisciplineEarth and Environmental Science |
|  | Language of instructionEnglish |
|  | Teaching unitFaculty of Earth Science and Environmental Management, Institute of Geological Sciences |
|  | Course/module codeUSOS |
|  | Type of course/module *(mandatory or optional)*optional |
|  | Field of studies (major, if applicable)Geology |
|  | Level of higher educationMaster’s (II cycle) |
|  | Year of studies *(if applicable*)I/II |
|  | Semester *(winter or summer)*winter/summer |
|  | Form of classes and number of hoursLectures: 20Classes: 20Teaching methodsMultimedia lecture, presentation, discussion, practical exercises, individual work, group work. |
|  | Name, title/degree of the teacher/instructorCoordinator: prof. dr hab. Paweł AleksandrowskiLecturer: prof. dr hab. Paweł Aleksandrowski Classes instructor: prof. dr hab. Paweł Aleksandrowski |
|  | Course/module prerequisites, in terms of knowledge, skills, social competences Knowledge and skills covered by programme of lectures and classes of physical geology, physics and mathematics as well as of structural geology and tectonics of 1st cycle studies (basic knowledge on and skills concerning tectonic structures, stereographic projection techniques and geological map interpretation) |
|  | Course objectivesThe course acquaints students with the theoretical basis and practical application of selected up-to-date research methods of structural geology. It is also intended to prepare and train students to undertake self-studies in this domain in case it should be necessary in their future professional activities  |
|  | Course contentLectures: Methods of morphological and geometrical analysis of folds. Basics of balanced cross-sections contruction. Structural analysis of metamorphic terranes. Kinematic and dynamic analysis of faults and joints. Basics of strain analysis. Geometrical analysis of folds. Elements of analysis of large-scale structures (tectonic analysis). Classes: Analysis of morphological elements and of orientation of folds using stereographic projection methods. Folds – important notions, definitions, morphology, folding mechanisms. Geometry and classification of folds. Delineating fold axial surfaces on map and in outcrop. Restoring the geometry of major folds based on assymetry of lower-order folds. Fold classification using Hudlestone and Ramsay’s methods– theoretical basis and practical applications. Arc (Busk) method, dip izogon (Ramsay) and kink fold (Suppe) methods. Determination of strain and of palaeostresses form patterns of kink bands. Development of thrust systems and application in balanced-cross sections. Foliations and lineations and their attitude with respect to the axes of strain ellipsoid. Superposition of deformation structures in time and space. Progressive deformation. Analysis of faults, determination of stress tensor for fault populations. Coaxial and non-coaxial deformation. Basic methods of strain analysis. Descriptive and dynamical analysis of joints. Interpretation of large-scale tectonic structures.  |
|  | Intended learning outcomes W\_1 shows knowledge on current problems of Earth and environmental sciences and their contemporary research methods.W\_2 in his/her research and practice consistently applies principles of rigorous interpreting tectonic phenomena and processes, based on empirical data.W\_3 shows knowledge on statistics that enables him/her forecasting (modelling) geological phenomena and processes.W\_4 knows general principles of planning research activities, using techniques and research tools specific of geological sciences.W\_5 shows advanced knowledge of structural geology and tectonics.W\_6 shows deepened knowledge of English-language terminology of structural geology and tectonics.U\_1 is able to apply selected advanced techniques and research tools of structural geology.U\_2 employs Polish- and English-language geoscience literature in their learning activities.U\_3 is able to employ statistical methods and specialist techniques and informatic tools in description of structural phenomena and data analysis, as well as to collect empirical data coming from various sources.K\_1 understands the need of continuous learning and improving professional competencies, as well as of inspiring others in undertaking those tasks.K\_2 is able to work in a team as well as to manage the works of a team.  | Symbols of learning outcomes for particular fields of studies:K2\_W03K2\_W04K2\_W05K2\_W06K2\_W08K2\_W09K2\_U01K2\_U02K2\_U05K2\_K01K2\_K02 |
|  | Required and recommended reading *(sources, studies, manuals, etc.)*Required reading:S.M. Rowlands & E.M. Duebendorfer, 2007, Structural Analysis and Synthesis, 3rd Ed, Blackwell, Oxford.J.G. Ramsay & M. Huber, 1983, 1987, The Techniques of Modern Structural Geology, Vol. 1 i 2, Academic Press, London.Recommended reading:S. Marshak & G. Mitra, 1988, Basic Methods of Structural Geology, Prentice Hall, Englewood Cliffs, New JerseyGroshong S.H., 2006. 3-D Structural Geology. Springer, Berlin - Heidelberg.Ragan D.M., 2009, Structural Geology - an introduction to geometrical techniques, 4th Ed, Cambridge University Press.Fossen H., 2010, Structural Geology, Cambridge University Press.Twiss R.J. & Moores E.M., 2006, Structural Geology, 2nd Ed., Freeman & Co., New YorkPrice N.J. & Cosgrove J.W, 1990, Analysis of Geological Structures, Cambridge University Press. |
|  | Assessment methods for the intended learning outcomes:- written examination: K2\_W03 K2\_W04 K2\_W05 K2\_W06 K2\_W08 K2\_W09 K2\_K02- assessment of successive tasks results: K2\_W03 K2\_W04 K2\_W05 K2\_W06 K2\_W08 K2\_W09 K2\_U01 K2\_U02 K2\_U05 K2\_K01 K2\_K02- assessment of individual oral presentations: K2\_K01, K2\_W03 K2\_W04 K2\_W08 K2\_W09 K2\_U02 K2\_K01. |
|  | Credit requirements for individual components of the course/module:- exam – written. Positive result – after aquisition of minimum 60% score.- at least 85% of required structural analysis tasks completed  |
|  | 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: 22- classes: 22- consulting: 6 | 50 |
| student's own work (including group-work) such as:- preparing for classes: 10- completing structural tasks: 10- reading the suggested literature: 10- preparing presentations: 10- preparing for exam: 10 | 50 |
| Total number of hours | 100 |
| Number of ECTS credits | 4 |