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  Trace fossils/Skamieniałości śladowe | | |
|  | Discipline  Earth and Environmental Science | | |
|  | Language of instruction  English | | |
|  | Teaching unit  Faculty of Earth Science and Environmental Management, Institute of Geological Sciences, Department of Stratigraphical Geology | | |
|  | Course/module code  USOS | | |
|  | Type of course/module *(mandatory or optional)*  Optional | | |
|  | Field of studies (major, if applicable)  Geology (spec. 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*)  I | | |
|  | Semester *(winter or summer)*  Winter | | |
|  | Form of classes and number of hours  Lectures: 14  Classes: 14  Teaching methods  presentation, discussion, practical exercises, individual work, group work, preparation of reports | | |
|  | Name, title/degree of the teacher/instructor  Coordinator: Dr Alina Chrząstek  Lecturer: Dr Alina Chrząstek  Classes instructor: Dr Alina Chrząstek | | |
|  | Course/module prerequisites, in terms of knowledge, skills, social competences  Knowledge concerning general geology (dynamic geology), historical geology and sedimentology. Completed course historical geology. | | |
|  | Course objectives  The aim of the lecture and classes is presentation of the main trace fossil ichnotaxa and their usefulness for the palaeoenvironmental analysis. | | |
|  | Course content  Lectures:  Definition and ethologic division (categories) of the trace fossils. History of ichnological reserach (the historical background of ichnology).  Presentation of the main trace fossil ichnofacies (Seilacherian ichnofacies): marginal-marine, shallow-marine, deep-marine, continental.  Usefulnes of the trace fossils for interpretation the sedimentary conditions (bathymetry, oxygenation and salinity of water, consistency of the substrates, energy of water, sedimentation rate).  Ichnostratigraphy – the application of the invertebrates and vertebrates trace fossils to biostratigraphy. Definition of the systems boundaries (Neoproterozoic-Cambrian boundary).  Sedimentological-ichnological models for environmental reconstructions.  Colonization of the Continental, shallow-marine, deep-marine settings by the tracemakers. Phanerozoic history of the trace fossils (changes of ichnotaxonomical diversity in time).  Changes in the trace fossil assemblages during 5 main mass-extinction episodes (latest Ordovician, Late Devonian, End-Permian, End-Triassic, End-Cretaceous Mass extinction).  Vertebrate ichnology, neoichnology.  Trace fossils in well core.  Classes:  Characteristic, description and recognition of the common trace fossil ichnotaxa, within different environments. The main tracemakers (producers) of the trace fossils.  Characteristic of the different environments and typical trace fossil assemblages.  Examples of ichnological analysis from different regions of Poland and world. Reconstruction of the palaeoenvironments, based on trace fossils from the Sudety Mountains (North Sudetic Synclinorium, Intra-Sudetic Synclinorium, Upper Nysa Kłodzka Graben) – practical exercises. | | |
|  | Intended learning outcomes  P\_W01 Student has an extensive knowledge about trace fossils and their usefulness for the palaeoenvironmental reconstructions. Student knows English terminology connecting with trace fossil analysis.  P\_W02 Student has knowledge of the current problems connecting with trace fossils and can apply modern research methods (modern ichnological analysis), based on the sedimentological-ichnological models, in case to interpret the palaeoenvironments.  P\_W03 Student has knowledge of the regional geology of the world (examples of ichnological analysis from different regions of the world) and extensive knowledge of the Polish area geology, in particular Sudety Mountains.  P\_U01 Student can applied advanced techniques and research tools (ichnological models and trace fossils) for palaeoenvironmental reconstructions.  P\_U02 Student can used in English scientific literature in the the field of ichnological sciences.  P\_U03 Student has the ability to write scientific papers and reports in English. Student can refer the results of the ichnological analysis and take a scientific discussion.  P\_K01 Student understands the need for continuous learning. He understand the need to know the latest knowledge concerning trace fossils.  P\_K02 Student can appropriately prioritize for implementation palaeoenvironmental reconstructions based on trace fossils. | Symbols of learning outcomes for particular fields of studies, *e.g. K\_W01\**, *K\_U05,K\_K03*  K2\_W01; K2\_W09  K2\_W03; K2\_W04; K2\_W06  K2\_W07  K2\_U01; K2\_U03; K2\_U04  K2\_U02  K2\_U06; K2\_U07  K2\_K01; K2\_K06  K2\_K03 | |
|  | Required and recommended reading *(sources, studies, manuals, etc.)*  Required reading  Bromley, R.G., 1996. Trace Fossils. Biology, Taphonomy and applications, 347 pp. Chapman and Hall, London.  Buatois, L. and Mángano, M.G., 2011. Ichnology, Organism-Substrate Interactions in Space and Time. Cambridge University Press, 358 pp.  Curran, H.A., 1985. Biogenic structures: their use in interpreting depositional environments. SEPM, Special Publication, 35, 347 pp.  Knaust, D., 2017. Atlas of Trace Fossils in Well Core. Appearance, Taxonomy and Interpretation. Springer, 271 pp.  Knaust, D. and Bromley, R.G., 2012. Trace fossils as indicators of sedimentary environments, Developments in Sedimentology, 64, 924 pp.  McIlroy, D., 2004. The application of ichnology to palaeoenvironmental and stratigraphic analysis. Geological Society, Special Publication, 228, 490 pp.  Miller, W., III, 2007. Trace fossils. Concepts. Problems. Prospects. Elsevier, 661 pp.  Seilacher, A., 2007. Trace fossil analysis, 226 pp. Springer-Verlag, Berlin-Heilderberg-New York.  Pemberton, S.G., Spila, M., Pulham, A.J., Saunders, T., MacEachern, J.A., Robbins, D. and Sinclair, I.K., 2001. Ichnology and sedimentology of shallow to marginal marine systems. Ben Nevis & Avalon Reservoirs, Jeanne d’Arc Basin. Geological Association of Canada, Short Course Notes, 15, 343 pp.  Recommended reading  Bromley, R.G., Buatois, L.A., Mángano, M.G., Genise, J.F. and Melchor, R.N., 2007. Sediment-Organism Interactions; A Multifaceted Ichnology. SEPM, Special Publication, 88, 393 pp.  Frey, R.W. and Seilacher, A. 1980. Uniformity in marine invertebrate ichnology. Lethaia, 13, 183-207.  Frey, R.W., Howard, J.D. and Pryor, W.A., 1978. Ophiomorpha: its morphologic, taxonomic, and environmental significance. Palaeogeography, Palaeoclimatology, Palaeoecology, 23, 199-229.  Frey, R.W., Pemberton, S.G. and Saunders, T.D.A., 1990. Ichnofacies and bathymetry; a passive relationship. Journal of Paleontology, 64, 155-158. | | |
|  | Assessment methods for the intended learning outcomes:  Lectures: final test. K2\_W01, K2\_W02, K2\_W03, K2\_W04, K2\_W06, K2\_W07, K2\_W09, K2\_K01, K2\_K03, K2\_K06.  Classes: writing course report, oral presentation (individual or group). K2\_U01, K2\_U02, K2\_U03, K2\_U04, K2\_U06, K2\_U07. | | |
|  | Credit requirements for individual components of the course/module:  Lecture:  - final test (written),  Classes:  - monitoring attendance and progress on the course subject matter,  - oral presentation (individual or group),  - writing a class report. | | |
|  | 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: 14  - classes: 14  - consultations: 12 | | 40 |
| student's own work (including group-work) such as:  - being prepared for classes: 5  - reading the suggested literature: 5  - preparing presentations: 5  - writing a class report: 5  - preparing for final test: 15 | | 35 |
| Total number of hours | | 75 |
| Number of ECTS credits | | 3 |