Academic course description – biostratigraphy and paleoecology. Practical Applications in hydrocarbon research

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| master’s DEGREE**Well geology** 1st YEAR OF STUDY, 1st SEMESTER |

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| **Course title** | **Biostratigraphy and paleoecology. Practical Applications in hydrocarbon research**  |
| Course code | 31120120010PM1211101  |
| Course type | full attendance |
| Course level | 2nd cycle (master’s degree) |
| Year of study, semester | 1st year of study, 1st semester |
| Number of ECTS credits | 8 |
| Number of hours per week | 4 (2 lecture hours + 2 seminar hours) |
| Name of lecture holder | Assistant Professor Paul Țibuleac |
| Name of seminar holder | Assistant Professor Paul Țibuleac  |
| Prerequisites | Paleontology, Structural Geology, Sedimentary Petrology  |
| A | **General and course-specific competences** |
|  | **General competences**:* Effectively using additional sources and assisted learning resources in order to devise a research paper on a topic pertaining to the academic discipline
* Improving teamwork abilities within a research team

**Course-specific competences**:* Using the index taxa from fossil assemblages for the relative dating of deposits from outcrops and wells (age, the identification of discontinuities, hardgrounds); using the faunal particularities of different regions as arguments for the tracing and evolution of paleogeographic provinces
* Inferring the main characteristics of paleoenvironments based on the information provided by fossil assemblages (depth, salinity, currents etc.)
* Correlating the biostratigraphic and paleoecological information with the lithological and technical data available for wells in order to characterize a structural unit (including reservoir rocks or source rocks)
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| B | **Learning outcomes** |
|  |  Upon completing the discipline, students become capable of: * using index taxa for the correlation of deposits from outcrops and wells from structural

units with different tectonic regimes; * suggesting various types of biozones based on the fossil assemblages from outcrops

and wells * using the biostratigraphic and paleoecological significance of fossil assemblages in the

correlation of similar deposits from different structural units/provinces * identifying fossils with paleoecological significance and describing the main

characteristics of a paleoenvironment based on the fossil assemblages encountered * statistically interpreting paleontological samples
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| C | **Lecture content** |
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| Week | Title of lecture | Teaching methods |  Duration  |
| 1 | The appearance of life. Evolutionary theory versus creationism. Biodiversity and extinction in the history of life | Lecture-debate  | 4 hours |
| 4 | The first organisms – Archaebacteria and Eubacteria (Warrawoona –Australia). Snowball Earth, Ediacara fauna | Lecture-debate | 2 hours |
| 5 | Cambrian – Paleogeography. “Small shelly fauna,” the fauna from Chengjiang (China) and the Burgess Shale (Canada). Biozones and subdivisions | Lecture-debate | 4 hours |
| 6 | Ordovician – Paleogeography. The adaptive radiation of the Ordovician. Events in the evolution of life (the Ordovician extinction). Biozones and subdivisions | Lecture | 2 hours |
| 8 | Silurian – Paleogeography. Events in the evolution of life (e.g. the appearance of terrestrial life). Biozones and subdivisions | Lecture. Demonstration | 2 hours |
| 9 | Devonian – Paleogeography. Events in the evolution of life. Biozones and subdivisions | Lecture | 2 hours |
| 10 | Carboniferous – Paleogeography. The development of flora and fauna. Events in the evolution of life. Biozones and subdivisions | Lecture | 2 hours |
| 11 | Permian – Paleogeography. The Permian-Triassic mass extinction. Events in the evolution of life. Biozones and subdivisions | Lecture. Demonstration. | 2 hours |
| 12 | Jurassic – Paleogeography. Events in the evolution of life (minor extinctions). Biozones and subdivisions | Lecture-debate | 2 hours |
| 13 | Cretaceous – Paleogeography. The Cretaceous-Paleogene extinction. Events in the evolution of life (minor extinctions). Biozones and subdivisions  | Lecture-debate | 2 hours |
| 14 | Cenozoic – Paleogeography. Events in the evolution of life (minor extinctions). Biozones and subdivisions | Lecture-debate | 2 hours |

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| D | **Recommended reading for lectures** |
|  | **Main references:**  Salvador. A. ( ed.),1994.International Stratigraphic Guide.  Ţibuleac P. Course Notes. **Additional references:** Benton, M. J. 2001. Biodiversity on land and sea. *Geological Journal,* 36: 211-230.Brenchley, P. J., Harper, D. A. 1998. Palaeoecology: Ecosystems, Environments and Evolution. *Chapman & Hall*, 402 pp. Dhondt A. V., Dieni, I. 1996. Synecology of an unusual Late Cretaceous inoceramid-spondylid association from northern Italy. *Ann. Muz. Civ. Rovereto*, 11(1995): 327-338. Peter, A., A., Bottjer, D., J. (eds.) Taphonomy: Bias a process through time. *Topics in Geology*, vol. 32, chapter I, 17 pp. Twitchett, R. J., Wignall, P. B., Benton, M., J. 2000. Discussion on Lazarus taxa and fossil abundance at times of biotic crisis. *Journal of the Geological Society*, London, 157: 511-512. Wright, N., Zahirovic, S. Müller, R., D., Seton, M. 2013. Towards community-driven paleogeoghraphic reconstructions: Integrating open-access paleogeographic and paleobiology data with plate tectonics. *Biogeosciences*, 10: 1529-1541. |
| E | **Seminar content** |
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| Week  | Title of seminar | Teaching methods | Duration  |
| 1 | The establishing of biostratigraphic units based on fossil assemblages. Index fossils and facies fossils. The International Stratigraphic Guide, 1994. The biostratigraphic description of a sector from a structural unit.  | Demonstration. Application. Problematization  | 4 hours  |
| 2 | The analysis of macro- and micropaleontological samples | Application | 4 hours |
| 3 | Fieldwork (at Frasin, according to the agreement with S.C. Daflog SRL Mediaș or on the deposits of the Moldavian Platform) | Demonstration | 8 hours |
| 5 | Reconstructing paleoenvironments based on benthic foraminifera  | Demonstration. Application.  | 4 hours |
| 6 | Using the planktonic/benthic foraminifera ratio in reconstructing paleoenvironments  | Demonstration. Application. Problematization. | 2 hours |
| 7 | Reconstructing paleoenvironments based on bryozoa  | Demonstration. Application. Problematization. | 2 hours |
| 8 | Reconstructing the sectors of carbonate platform based on fossil assemblages/bioclasts | Demonstration. Application. Problematization. | 4 hours |

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| F | **Recommended reading for seminars** |
|  | Barattolo, F., Pugliese, A., E. 1987. Il Mesozoico dell isola di Capri. *Academmia Pontaniana*, 172 p.Fluegel, E. 2010. Microfacies of carbonate rocks. Springer Heidelberg Dordrecht London New York, 984 p.Jones, R. W., Wonders, A. A. H., 1992. Benthic foraminifers and paleobathymetry of Barrow Group (Berriasian-Valanginian deltaic sequence, sites 76 and 763 Northwest shelf). *Proceedings of the Ocean Drilling Program, Scientific Results*, vol. 122.Moissette P., Dulai, A., Escarguel, G., Kázmér, M., Müller, P., Saint Martin, J.-P., 2007. Mosaic of environments recorded by bryozoan faunas from the Middle Miocene of Hungary. *Paleogeography, Palaeoclimatology, Paleoecology,* 252, 530-556. Salvador. A. (ed.), 1994. International Stratigraphic Guide.  |
| G | **Education style** |
| learning and teaching methods | Lecture-debate, demonstration, application, problematization  |
| assessment methods | Ora assessment and research paper (lecture) – 70%, practical assessment and portfolio (seminar) – 30% |
| Language of instruction | English  |