Stratigraphic methods and paleomagnetic applications in Geosciences

– COURSE SYLLABUS

1.	**Course title:**	
	Stratigraphic methods and paleomagnetic applications in Geosciences	
2.	**Lecturers:**	
	Prof. dr hab. Jacek Grabowski (PGI-NRI, Warsaw) – course leader *Prof. dr hab. Jerzy Nawrocki (PGI-NRI, Warsaw)* *Dr Damian G. Lodowski (PGI-NRI, Warsaw)* *Dr Martin Chadima (AGICO, Brno)*	
3.	**Field, type and level of studies, year of study:**	
	Stratigraphy, geochemistry, paleomagnetism – full-time doctoral studies, all years	
4.	**Course character:**	
	Monographic lectures	
5.	**Teaching method:**	
	ONLINE *(interactive contact with lecturers in real time)*	
6.	**Language:**	*English, Polish* *depending on the audience*
7.	**Course type and number of hours:**	
	Lecture (16h), The lectures will take place on Tuesday from 9:30 to 11:00 AM, starting on March 10th, 2026. Detailed schedule in point 10.	
8.	**Estimated load of student's independent work:**	**10 h**
9.	**Total workload and number of ECTS points:**	**1 ECTS**
10.	**Short description and main focus of the course:**	
	The lecture aims to familiarize students with general aspects of stratigraphy and paleomagnetism, and application of specific methods in long-distance correlations and paleoenvironmental reconstructions, and paleotectonic reconstructions. *Stratigraphy is the scientific discipline which studies the organization of geological formations and of the events in space and time, in order to reconstruct the history of the Earth and its evolution through time. The lectures would cover the principles of basic stratigraphic methods such as: lithostratigraphy, biostratigraphy, chemostratigraphy (including stable isotope stratigraphy), magnetostratigraphy, and cyclostratigraphy, with*	

	emphasis on integration of multiple stratigraphic methods in long-distance correlations, and paleoenvironemntal (e.g. paleoclimatic and paleoceaongraphic) reconstructions. Paleomagnetic methods would be presented in more detail, fundamentals of rock magnetism and tectonic applications of paleomagnetism in fold-and-thrust belts, including anisotropy of magnetic susceptibility (AMS). *The proposed lecture will cover the following areas and issues:* *1) General introduction to stratigraphy – Damian G. Lodowski and Jacek Grabowski 10.03* *2) Stable Isotope stratigraphy and geochemistry – Damian G. Lodowski 17.03* *3) Magnetostratigraphy and paleomagnetism – Jacek Grabowski 24.03* *4) Cyclostratigraphy and astrochronology – Damian G. Lodowski 31.03* *5) Anisotropy of magnetic susceptibility – sedimentary and tectonic applications. Martin Chadima 14.04* *6) Sedimentology and geochemistry vs. environmental processes – Jacek Grabowski & Damian G. Lodowski 21.04* *7) Paleomagnetism and radiometric dating of the Cenozoic glacial and periglacial deposits - Jerzy Nawrocki 5.05* *8) Integrated stratigraphy approach – case study of the J/K boundary – Jacek Grabowski & Damian G. Lodowski 12.05*
11.	**References:** • *Bradley, R.S., 2015. Paleoclimatology: Reconstructing Climates of the Quarternary. Academic Press. 675 p* • *Butler, R.F. 2004. PALEOMAGNETISM. Magnetic domains to Geologic Terranes. Electronic Edition, September 2004.* • *Calvert, S.E., Pedersen, T.F. 2007. Elemental proxies for palaeoclimatic and palaeoceanographic variability in marine sediments: interpretation and application. Developments in Marine Geology, 1, 567–644, https://doi.org/10.1016/S1572-5480(07)01019-6.* • *Florindo F., Siegert M., De Santis L., Naish T. (eds.) 2022. Antarctic climate evolution. Elsevier, 786 pp.* • *Gradstein, F.M., Ogg, J.G., Schmitz, M.D., Ogg, G.M., (eds), 2020. Geologic Time Scale 2020. Elsevier BV.* • *Lanza, R., Meloni, A. 2006. The Earth's Magnetism. Introduction for geologists. Springer* • *Miall, A.D., 2016. Stratigraphy: A Modern Synthesis. Springer Verlag. 454 p* • *Nawrocki J., Pańczyk M., Wójcik K. and Tatur A. 2021. U-Pb isotopic ages and provenance of some far-travelled exotic pebbles from glaciogenic sediments of the Polonez Cove Formation (Oligocene, King George Island). Journal of the Geological Society, London 178: jgs2020-113, doi: 10.1144/jgs2020-113.* • *Opdyke N.D., Channell J.E.T. 1996. Magnetic stratigraphy. International Geophysics Series 64, 364 pp.* • *Pares, J.M., 2015. Sixty years of anisotropy of magnetic susceptibility in deformed rocks. Frontiers in Earth Science, 3, 4, http://www.frontiersin.org/Earth_Science/editorialboard* • *Rey, J., Galeotti, S. (eds). 2008. Stratigraphy. Terminology and Practice. Editions Technip, Paris, 163 pp.* • *Soto, R., Casa-Sainz, A.M., Oliva-Urcia, B., Roman-Berdiel, T. 2022. A short guide for the study of anisotropy of magnetic susceptibility (AMS) in deformed rocks. Revista de la Sociedad Geológica de España 35 (1). https://doi.org/10.55407/rsge.94884* • *Trujillo, A.P., Thurman, H.V., 2014. Essentials of Oceanography. Prentice Hall. 551 p.*
12.	**Prerequisites:**

	Knowledge of general geology and fundamentals of paleontology and climatology	
13.	**Educational outcomes:**	**PQF level 8 codes:**
	Knowledge: *After completing the course the student:* *- has in-depth and world-leading knowledge of the principles of stratigraphy of sedimentary rocks and the frontiers of stable isotope and magnetic stratigraphy* *- has comprehensive knowledge in the area of geochemistry of sedimentary rocks and understands the complex interactions in geochemical cycling* *- has fundamental knowledge about rock and mineral magnetism, understands magnetic fabric of sedimentary and igneous rocks* *- knows the fundamentals of climatic stratigraphy and orbital records in sedimentary rocks*	*P8S_WG*
	Practical Skills: *After completing the course a student:* *- is able to design a sampling campaign of sedimentary sections for bio-, magneto- and chemostratigraphic analyses* *- knows how to interpret the magnetic anisotropy of rocks: principal stress axes and deformation mechanisms* *-is able to perform a long distance correlation of sedimentary successions* *- is able to design basic research with application of bio-, magneto- and chemostratigraphic methods in the field of paleoenvironmental studies*	*P8S_UW, P8S_UO*
	Social Skills: *After completing the course a student:* *- is aware of the potential and limitations of integrated stratigraphic methods in reconstruction of paleoclimatic, paleoceanographic variations* *- is able to cooperate in a multidisciplinary team, and communicating with specialists in different fields* *- understands the deformation mechanisms of sedimentary rocks and its influence on rock-fabric*	*P8S_KK, P8S_UU*
14.	**Evaluation of the educational outcomes:**	
	attendance at lectures; student's commitment during the classes, discussions during lecture	
15.	**Criteria to complete the course:**	
	At least 7 out of 8 lectures attended (passed / failed)	
16.	**Contact with the course leader/lecturer:**	
	jacek.grabowski@pgi.gov.pl; jerzy.nawrocki@pgi.gov.pl; damian.lodowski@pgi.gov.pl; chadima@agico.cz; personal meeting (Polish Geological Institute – National Research Institute, 00-975 Warsaw, Rakowiecka 4) are possible upon earlier agreements;	