

Application of seismic data in sedimentary basin analysis and tectonics
– COURSE SYLLABUS

1.	Course title: <i>Application of seismic data in sedimentary basin analysis and tectonics</i>
2.	Lecturer: <i>dr hab. inż. Piotr Krzywiec</i>
3.	Field, type and level of studies, year of study: <i>geology, geophysics, full-time doctoral studies</i>
4.	Course character: <i>Workshop, elective-compulsory lecture, monographic lecture</i>
5.	Teaching method: <i>traditional (personal contact with the lecturer). The workshop will be held at the Institute of Geological Science at Warsaw.</i>
6.	Language: <i>Polish, English, depending on the audience</i>
7.	Course type and number of hours: <i>Workshop (12 h), discussions (3 h)</i>
8.	Estimated load of student's independent work: <i>10 h</i>
9.	Total workload and number of ECTS points: <i>25 h, 1 ECTS</i>
10.	Short description and main focus of the course: <i>Main goal of this course is to provide students with basic skills of interpretation of seismic data that image sedimentary basins and various tectonic structures. First part will be devoted to basics of seismic reflection surveying but without complex background in mathematics and physics necessary in order to fully understand details of seismic data acquisition and processing. Main emphasis will be put on geological aspects of seismic studies especially, in particular for studies of sedimentary basins and tectonic processes. Important part will be devoted to application of seismic data in oil & gas exploration. Main topics will include:</i> <ol style="list-style-type: none"> <i>a. introduction to seismic reflection methods</i> <i>b. regional seismic studies of Earth's crust</i> <i>c. seismic stratigraphy (clastic and carbonate systems)</i> <i>d. structural interpretation of seismic data:</i> <ul style="list-style-type: none"> <i>• extension basins</i> <i>• inversion of sedimentary basins</i> <i>• compressional domains – fold-and-thrust belts</i>

- *strike-slip tectonic zones and associated sedimentary basins*
- *salt tectonics*

Lectures will be richly illustrated by seismic examples of geological structures from various sedimentary basins. Lectures will be supplemented by practical exercises in interpretation of seismic profiles.

11. References:

Allen, P.A., Allen, P.R. 1990. Basin Analysis. Principles & Applications. Oxford.
Einsele G., 2000. Sedimentary Basins. Evolution, Facies and Sediment Budget. Berlin.
Hancock, P.L. (Ed.), 1994, Continental Deformation. Pergamon Press.
Veeken P.C.H., van Moerkerken B., 2013, Seismic Stratigraphy and Depositional Facies Models. EAGE, ISBN 9789073834439
Holdsworth R.E., Turner J.P., 2002, Extensional Tectonics: Regional-scale processes. Geological Society of London, London.
MA Cooper, GD Williams, 1989, Inversion tectonics. Geological Society of London, London.
Nemcok M., Schamel S., Gayer R., 2009, Thrustbelts: Structural architecture, thermal regimes and petroleum systems. Cambridge Univ. Press, Cambridge.
Nemcok M., 2017, Rifts and Passive Margins : Structural Architecture, Thermal Regimes, and Petroleum Systems. Cambridge Univ. Press, Cambridge.
Hudec M., Jackson M., 2011, The Salt Mine. AAPG, Tulsa.
Alsop G.I., Archer S.G., Hartley A.J., Grant N.T., Hodgkinson R. 2012, Salt Tectonics, Sediments and Prospectivity. Geological Society of London, London.
Jackson M., Hudec M., 2017, Salt Tectonics. Principles and Practice”, Cambridge University Press, 498 str, ISBN 978-1-107-01331-5
Storti F., Holdsworth R.E., Salvini F., 2001, Intraplate Strike-Slip Deformation Belts. Geological Society of London, London.
Buchanan, J.G., Buchanan, P.G., 1995. Basin Inversion. Geological Society of London, London

12. Prerequisites:

Knowledge of tectonics, structural geology, sedimentology, facies analysis at undergraduate level

13. Educational outcomes:

Knowledge: *student knows basic features of seismic reflection data that are necessary for correct stratigraphic and structural interpretation, knows how to use seismic data in sedimentary basin analysis and oil & gas exploration.*

PQF level 8 codes:

P8S_WG

Practical Skills: *student knows how to interpret seismic data from passive continental margins (seismic / sequence stratigraphy) and carbonate depositional environments; knows how to use seismic data in order to interpret various structures related to extension, basin inversion, compression, strike-slip movements and salt tectonics; knows how to use seismic data in order to reconstruct scenarios of evolution of geological structures; knows how to identify basic traps for hydrocarbons.*

P8S_UW, P8S_UU

Social Skills: *student is able to critically apprehend presented material, and to understand importance of team work in professional endeavors.*

P8S_KK

14. Evaluation of the educational outcomes:	<i>written task, observation of student's commitment during the classes</i>
15. Criteria to complete the course:	<i>at least 80% attendance, final grade depends on the evaluation of the written task and the student's commitment during the classes</i>
16. Contact with the lecturer:	<i><u>piotr.krzywiec@twarda.pan.pl</u> (no major time restrictions), meetings on zoom or F2F in Warsaw (Institute of Geological Sciences, Polish Academy of Sciences, 51/55 Twarda street, Warsaw) are possible upon earlier agreement</i>