



Module name: Sequence Stratigraphy

Academic year: 2019/2020 Code: ZSDA-3-0227-s ECTS credits: 3

Faculty of: Szkoła Doktorska AGH

Field of study: Szkoła Doktorska AGH Specialty: —

Study level: Third-cycle studies Form and type of study: Full-time studies

Lecture language: English Profile of education: Academic (A) Semester: 0

Course homepage: —

Responsible teacher: prof. dr hab. Porębski Szczepan (spor@agh.edu.pl)

### Module summary

Sequence stratigraphy is a multidisciplinary methodology serving for the subdivision of a sedimentary succession into stratal packages (sequences) bounded by unconformities. The module highlights sequence typology, the role of relative sea-level and sediment supply in sequence generation and the significance of such generic approach for successful predictions of hydrocarbon reservoirs.

### Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Social competence: is able to			
M_K001	Student is able to interpret stratigraphic correlations and carry out their quality check.	SDA3A_K01	Execution of exercises
M_K002	Student is able to co-operate within a group of specialists representing different disciplines of Earth Sciences.	SDA3A_K01	Execution of laboratory classes
Skills: he can			
M_U001	Student is capable for integrating sedimentological, core and well log data in order to perform chronostratigraphic correlation and to carry out stratigraphic breakdown of a sedimentary succession into depositional sequences.	SDA3A_U01	Execution of exercises
M_U002	Student is capable for predicting the distribution of reservoir and seal rocks on the basis of own stratigraphic correlations and stratigraphic subdivisions.	SDA3A_U01	Execution of exercises

Knowledge: he knows and understands			
M_W001	Student knows the range of crucial factors and processes controlling stratigraphic architecture in sedimentary basins.	SDA3A_W03, SDA3A_W01	Execution of exercises
M_W002	Student knows the methodology of sequence stratigraphy, its position among other stratigraphic classifications, and recognizes its significance for making powerful facies predictions in frontier areas.	SDA3A_W03, SDA3A_W02, SDA3A_W01	Execution of exercises

## Number of hours for each form of classes

Suma	Form of classes										
	Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
30	15	15	0	0	0	0	0	0	0	0	0

## FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
Social competence: is able to												
M_K001	Student is able to interpret stratigraphic correlations and carry out their quality check.	-	+	-	-	-	-	-	-	-	-	-
M_K002	Student is able to co-operate within a group of specialists representing different disciplines of Earth Sciences.	-	-	-	-	-	-	-	-	-	-	-
Skills: he can												
M_U001	Student is capable for integrating sedimentological, core and well log data in order to perform chronostratigraphic correlation and to carry out stratigraphic breakdown of a sedimentary succession into depositional sequences.	-	+	-	-	-	-	-	-	-	-	-

M_U002	Student is capable for predicting the distribution of reservoir and seal rocks on the basis of own stratigraphic correlations and stratigraphic subdivisions.	+	+	-	-	-	-	-	-	-	-	-
Knowledge: he knows and understands												
M_W001	Student knows the range of crucial factors and processes controlling stratigraphic architecture in sedimentary basins.	+	+	-	-	-	-	-	-	-	-	-
M_W002	Student knows the methodology of sequence stratigraphy, its position among other stratigraphic classifications, and recognizes its significance for making powerful facies predictions in frontier areas.	+	+	-	-	-	-	-	-	-	-	-

## Student workload (ECTS credits balance)

Student activity form	Student workload
Udział w zajęciach dydaktycznych/praktyka	30 h
Preparation for classes	5 h
przygotowanie projektu, prezentacji, pracy pisemnej, sprawozdania	38 h
Realization of independently performed tasks	5 h
Contact hours	2 h
Summary student workload	80 h
Module ECTS credits	3 ECTS

## Additional information

### Module content

#### Lectures

Sources of sequence stratigraphy and its relationship to other, major stratigraphic nomenclature systems. Basic definitions, base level, accommodation space, relative sea level (3 h).

Walther Law of facies succession, transgression, normal and forced regression. Stratigraphic architecture as the product of accommodation fluctuations and sedimentary flux (3 h).

Aspects of correlation – depositional strike and dip, diachronism, seismic clinoforms. Types of unconformities, their geological and seismic expressions, seismostratigraphic nomenclature (3 h).

Parasequence, parasequence set, key stratigraphic surfaces, depositional systems tracts. Well log and seismic signatures of key correlation surfaces and systems tracts (3 h).

Sequence typology, depositional, genetic and TR sequences. Hierarchy of relative sea-level cycles, time scale of depositional sequences (3 h).

#### **Auditorium classes**

Lithostratigraphic versus chronostratigraphic correlation of a well log section calibrated with lithofacies (3 h).

Lateral persistence of reservoir units based on litho- and chronostratigraphic correlations of a well section calibrated with lithofacies (3 h).

Construction of Wheeler's chronostratigraphic chart (3 h).

Identification of unconformities and key correlation surfaces on a seismic section (3 h).

Well log correlation, picking-up of key surfaces and the definition of systems tracts and depositional sequences, facies and reservoir predictions (3 h).

#### **Teaching methods and techniques:**

Lectures: Audiovisual presentations accompanied by a classical blackboard approach.

Auditorium classes: Instructor guides the student solving a given stratigraphic problem. Following the completion of each exercise proper solutions and potential analytical pitfalls are discussed with the group.

#### **Warunki i sposób zaliczenia poszczególnych form zajęć, w tym zasady zaliczeń poprawkowych, a także warunki dopuszczenia do egzaminu:**

Course is credited following the successful completion of all stratigraphic exercises.

Three absences in the auditorium class result in a course failure.

#### **Zasady udziału w poszczególnych zajęciach, ze wskazaniem, czy obecność studenta na zajęciach jest obowiązkowa:**

Lectures:

- Attendance is mandatory: Yes

- Participation rules in classes: Analytical fundamentals will be highlighted during lectures. Students are expected to interrupt the flow of a lecture whenever they feel that additional explanation are desirable.

Auditorium classes:

- Attendance is mandatory: Yes

- Participation rules in classes: Students are expected to provide graphic solutions to a series of stratigraphic exercises provided by the instructor. Each student should be equipped with drafting tools and crayons.

#### **Method of calculating the final grade**

Each correlation exercise is evaluated separately. The final evaluation grade is an average of all marks obtained in the auditorium classes. The final grade can be elevated based on overall student's performance during the course.

#### **Sposób i tryb wyrównywania zaległości powstałych wskutek nieobecności studenta na zajęciach:**

Missing stratigraphic exercises caused by absence in the class must be completed during homework.

#### **Prerequisites and additional requirements**

Students are expected to know the basics of clastic sedimentology, stratigraphy and basin analysis.

#### **Recommended literature and teaching resources**

Catuneanu, O., 2006, Principles of Sequence Stratigraphy. Elsevier, 386 pp.

Porębski, S., 1996. Podstawy stratygrafii sekwencji w sukcesjach klastycznych. Przegląd Geologiczny 44, 995-1006.

Posamentier, H.W., Allen, G.P., 1999, Siliciclastic sequence stratigraphy: concepts and applications: SEPM Concepts in Sedimentology and Paleontology, v. 9, 210 pp.

Catuneanu, O., 2019. Scale in sequence stratigraphy. Marine and Petroleum Geology, 106, 128-159.

### **Scientific publications of module course instructors related to the topic of the module**

Porębski, S., 1996. Podstawy stratygrafii sekwencji w sukcesjach klastycznych. Przegląd Geologiczny 44, 995-1006.

Porębski, S.J., Pietsch, K., Hodiak, R., Steel, R.J., 2003. Origin and sequential development of Badenian-Sarmatian clinofolds in the Carpathian foreland basin (SE Poland). Geologia Carpathica 54, 119-136.

Porębski, S.J., Steel, R.J., 2003. Shelf-margin deltas: their stratigraphic significance and relation to deepwater sands. Earth-Sciences Reviews 62, 283-326.

Porębski, S.J., Steel, R.J., 2006. Deltas and sea-level change. Journal of Sedimentary Research 76, 390-403.

### **Additional information**

None