جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Carbonate Sequence Stratigraphy - ErSE 390J

Division	Physical Science and Engineering Division
Course Number	ErSE 390J
Course Title	Carbonate Sequence Stratigraphy
Academic Semester	Spring
Academic Year	2017/2018
Semester Start Date	01/28/2018
Semester End Date	05/24/2018
Class Schedule (Days & Time)	01:00 PM - 02:30 PM | Sun Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Volker Christian Vahrenkamp	VOLKER.VAHRENKAMP@KAUST.EDU.SA	+966128087230	3217, 5, Al-Kindi (bldg. 5)	Sundays after class Wednesday 15:00

Teaching Assistant(s)

Name	Email
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Course Information

Comprehensive Course Description	This course will teach on the subject of stratigraphy with a focus on carbonate sequences. It will cover fundamental principles to advanced sequence stratigraphic techniques required to understand depositional rock sequences containing the sources, reservoirs and seals to some of the largest hydrocarbon bearing reservoirs in the world. In the first part of this course the students will learn about the concepts behind time- and sequence stratigraphy with focus on carbonate depositional systems. The second part will apply these concepts to the major carbonate sequences found in Arabia. The focus will be on the hydrocarbon bearing sequences of the Permian, Jurassic and Cretaceous time intervals. Examples from giant carbonate reservoirs will be used to show the impact of these concepts on an improved understanding of hydrocarbon reservoir distribution and performance. A fundamental part of the course are two multiday field excursions to Jurassic outcrops in central Saudi Arabia (4 days) and to Cretaceous sequences in Oman 5 days). The Oman trip will be conducted in during the spring break period in order to avoid undue impact on the acedemic class schedule. The grade will be derived from a class-room assessments and a substantial field excursion project.
Course Description from Program Guide	The course will teach on the subject of stratigraphy. It will cover fundamental principles to advanced sequence stratigraphic techniques required to understand depositional rock sequences containing the sources, reservoirs and seals to some of the largest hydrocarbon bearing reservoirs in the world. In the first part of this course the students will learn the concepts behind time-and sequence stratigraphy with focus on carbonate depositional systems. The second part will apply these concepts to the major carbonate sequences found in Arabia. The focus will be on the hydrocarbon bearing sequences of the Permian, Jurassic and Cretaceous time intervals. Examples from giant carbonate reservoirs will be used to show the impact of these concepts on an improved assessment of hydrocarbon reservoir performance. A fundamental part of the course are two 4-day field excursions to Jurassic outcrops in central Saudi Arabia and Cretaceous sequences in Oman.

Goals and Objectives	At the end of the course students should understand the concepts behind stratigraphy and sequence stratigraphy and the interplay between carbonate platform growth and architecture with tectonism, climate and geologic time. The course uses the Jurassic and Cretaceous carbonate sequences of Arabia as a laboratory to derive and understand the stratigraphic concepts. Hence, students should at the end of the course also have a good understanding of the major source, seal and reservoirs sequences that constitute the giant reservoirs of Arabia and issues that they are facing based on the nature of their architecture.
Required Knowledge	Introduction to Carbonate Geology (ErSE 290B) or an equivalent course at another university.
Reference Texts	1) Schlager, W. (2005) Carbonate sedimentology and sequence stratigraphy. SEPM Concepts in Sedmentology and Paleontology #8. ISBN1-56576-116-2 2) Kerans, C. and Tinker, S. W. (1997) Sequence Stratigraphy and Characterization of Carbonate Reservoirs: SEPM Short Course No. 40. 130 p., Tulsa 3) Peter W. Homewood, Pierre Mauriaud, François Lafont ; with the participation of J. Dumay, P. Sorriaux, and the Predictive Stratigraphy Network of Elf EP., 2000: Best practices in sequence stratigraphy : for explorationists and reservoir engineers = Vade-mecum de stratigraphie séquentielle : pour géologues, géophysiciens et ingénieurs reservoir. Bulletin du Centre de recherches Elf Exploration Production. Mémoire ; 25. 4) ONLINE MATERIALS: https://sepmstrata.org/index.html an excellent compilation of sequence stratigraphic data by Professor Chris Kendall, Univ. South Carolina
Method of evaluation	**10.00**% - Scientific review article presentation **30.00**% - Midterm exam **20.00**% - Homework /Assignments **40.00**% - Course Project(s)
Nature of the assignments	Lectures: assigned readings & homework Scientific review article presentation Field Excursion – illustrated report and presentation
Course Policies	Attendance: Each student is expected to prepare for and attend all of the classes, lab sessions and field excursion during the semester. Punctuality is required. It is the students responsibility to contact the instructor prior to absence, alert him to late assignements and discusss with the instructor how to make up. Documentation is required for excused absences in accordance with university policy. Academic Integrety: As a member of the Kaust community you are required to demonstrate integrity. Lying, cheating or stealing will not be tolerated. Wireless communication systems of all kind must be turned off while in the class room, during labs and field excursions, especially cell phones.
Additional Information	The field trips are an integral part of the course. Participation is a requirement. Students should notice that the second trip will occur during the spring break!

Tentative Course Schedule *(Time, topic/emphasis & resources)*		
Week	**Lectures**	**Topic**
1	Sun 01/28/2018	Course organisation. Carbonate factories, the “organic” factor, and sequence stratigraphy
1	Thu 02/01/2018	Characteristics of carbonate sequences and systems tracts
2	Sun 02/04/2018	no lecture
2	Thu 02/08/2018	Carbonate cyclicity and stratigraphic hierarchies in carbonates
3	Sun 02/11/2018	Application of carbonate cycles , stacking patterns, and sequence architecture in subsurface interpretation
3	Thu 02/15/2018	Milankovitch patterns as seen in carbonate sequence development
4	Sun 02/18/2018	Non-eustatic drivers of carbonate sequences, biotic crisees, climatic input
4	Thu 02/22/2018	The Tectonic Evolution of the Arabian Plate
5	Sun 02/25/2018	The Permian Sequences of the Arabian Plate- Overview - Paleogeography, global sealevel, local tectonism
5	Thu 03/01/2018	no lecture
6	Sun 03/04/2018	The Jurassic Sequences of the Arabian Plate- Overview - Paleogeography, global sealevel, local tectonism
6	Thu 03/08/2018	no lecture
7	Sun 03/11/2018	The Cretaceous Sequences of the Arabian Plate – Paleogeography, global sealevel, local tectonism
7	Thu 03/15/2018	no lecture - fieldtrip to Tuwaiq Mtn escarpment - Central Saudi Arabia; 14 afternoon to17 March.
8	Sun 03/18/2018	no lecture - fieldtrip to Tuwaiq Mtn escarpment - Central Saudi Arabia; 14 afternoon to17 March.
8	Thu 03/22/2018	Fieldtrip review; Preview Cretaceous Fieldtrip
9	Sun 03/25/2018	no lecture
9	Thu 03/29/2018	no lecture
10	Sun 04/01/2018	Field Trip during Spring Break: 3rd April to 7th April - Cretaceous Sequences
10	Thu 04/05/2018	Field Trip during Spring Break: 3rd April to 7th April - Cretaceous Sequences
11	Sun 04/08/2018	no lecture
11	Thu 04/12/2018	Fieldtrip Review
12	Sun 04/15/2018	Applications of concepts to reservoir-scale problems in carbonates
12	Thu 04/19/2018	Modelling and seismic imaging issues in carbonates
13	Sun 04/22/2018	Jurassic reservoirs in shallow water carbonates
13	Thu 04/26/2018	Jurassic reservoirs in basinal carbonates (unconventionals)
14	Sun 04/29/2018	Cretaceous reservoirs in shallow water carbonates
14	Thu 05/03/2018	Cretaceous reservoirs in basinal carbonates (unconventionals)
15	Sun 05/06/2018	Project work
15	Thu 05/10/2018	Project Work
16	Sun 05/13/2018	Project Work
16	Thu 05/17/2018	Field Project Presentations
17	Sun 05/20/2018	Field Projects Presentations
17	Thu 05/24/2018	Course review

Note

The instructor reserves the right to make changes to this syllabus as necessary.