



King Saud University



College of Science

Geology and Geophysics Department.

Advanced Carbonates and Evaporites (GEO 534)

First Semester

Academic Year 1437- 1438H (2016 – 2017)

Instructor: Dr. Osama Elsayed Ahmed Attia.

Room #: 1A7/3 Office Telephone: 4679325

Office Hours: All Working days from 9 am to 2 pm

Contributor:

Course contact hours per week

Lectures: TWO hours /week - Class Room: 2B80/2 - Building 4

Laboratory: **ONE hour**/week – Class Room: B70 - Geol. & Geoph. Dept.

Schedule of Assessment Tasks for Students During the Semester

| Assessment | Assessment task (eg. essay, test, examination etc.) | lecture due | Proportion of Final Assessment |
|---------------------|--|-------------|--------------------------------|
| 1 | 1 st exam – Monday 8/1/1435H (11/11/2013) | 7 | 10 |
| 2 | 2 nd exam – Monday 20/2/1435H (22/12/2013) | 13 | 10 |
| 3 | 12 lab reports | 12 | 5 |
| 4 | 1 st lab exam – Arrange date with the contributor | 7 | 5 |
| 5 | 2 nd lab exam- Arrange date with the contributor | 13 | 5 |
| 6 | Final lab exam- Arrange date with the contributor | 15 | 15 |
| 7 | Semester work | Every week | 10 |
| 8 | Final exam – According to the Faculty schedule | 15 | 40 |
| Total Degree | | | 100 |

Course components (total contact hours per semester):

- Lectures: 30 hours/semesters; (2 hrs/ week);
- Laboratory: 15 hrs /semester (one hr/week).
- 2 days field trip (If possible).

Grade scale: 95% and up = A⁺, 90-94 = A; 85-89 = B⁺; 80-84 = B;
75-79 = C⁺; 70-74 = C; 65-69 = D⁺; 60-64 =D; <60% = F;

Absence 25% or more from both Lectures & Lab. = DN.

ATTENDANCE

Attendance is required. Please feel free to ask questions at any time, including during lecture or lab.; however, *disruptive behavior, including talking during lecture & text messaging, is not acceptable* and **will result in a lower course grade**. If you have a valid excuse and must miss an exam, contact me **BEFORE** the exam date. If you have a valid excuse, you may take a makeup exam.

Course Objectives:

- The purpose of this course is to give you a broad understanding of how sedimentary rocks form and its classification (especially carbonates and evaporites). Acquaint students with carbonates and evaporites rocks and the extent of their economic importance (oil, minerals and water).
- Describe different rocks and identify their depositional environments.
- Classification of carbonate rocks and evaporite rocks.

- Demonstrate the importance of diagenesis of these rocks and afford natural economic importance.
- Their importance in building and construction and humans (evaporite) where you must know evaporite minerals extracted for human service such as salt and sodium carbonate for industrial cleaners and many other industries.
- Study the process in the lab, in addition to field trips (If possible).

LECTURES:

| Week No. | Topics to be Covered (Lecture) | Theoretical | Practical |
|-----------------|---|--------------------|------------------|
| 1 | Introduction- Theories- Controls | 2 | 1 |
| 2 | Carbonate (origin and sources): 1- Inorganic 2- Biogenic | 2 | 1 |
| 3 | Carbonate (sources and facies distribution): Examples- facies- Mineralogy- Techniques in recent researches | 2 | 1 |
| 4 | Sulfates origin and sources: - Primary - Secondary - Transformations and controlling factors | 2 | 1 |
| 5 | Sulfates sources and facies distribution: Examples- facies variations and transformations- Mineralogy- Techniques in recent researches | 2 | 1 |
| 6 | Discussions and seminars | 2 | 1 |
| 7 | Sodium Chloride (origin and sources): 1- Marine and Non-Marine 2- Salt diapers and doming | 2 | 1 |
| 8 | Sodium chloride sources and facies distribution: Examples- facies variations and replacements- Mineralogy- Techniques in recent researches | 2 | 1 |
| 9 | Discussions and seminars (field applications) | 2 | 1 |
| 10 | Bitter salts (origin and sources): 1- Magnesium 2- Potassium 3-Complex salts | 2 | 1 |
| 11 | Bitter salts sources and facies distribution: Examples- facies variations and replacements- Mineralogy- Techniques in recent researches | 2 | 1 |
| 12 | Discussions and seminars (field applications) | 2 | 1 |
| 13 | Evaporites and Hydrocarbons (Theory and Synopsis) | 2 | 1 |
| 14 | Studied Examples (field applications) | 2 | 1 |
| 15 | Salt production versus industry and Economic Potentialities | 2 | 1 |
| 16 | World Production (Review and Future Prospectus) | 2 | 1 |

Recommended Readings:

- 1- Tucker, M.E., Carbonate sedimentology, 2002, Blackwell Publishing Company, 473 p.
- 2- Selley, R.C., 2000, Applied Sedimentology (Second Edition), Elsevier Inc. ISBN: 978-0-12-636375-3
- 3- Seawater (Second Edition) Its Composition, Properties and Behaviour, 1995, Elsevier Ltd. All rights reserved. *Edited by: Mark A. Suckow, Steven H. Weisbroth and Craig L. Franklin.* ISBN: 978-0-7506-3715-2
- 4- Sedimentary Basins of the World, African Basins (Volume 3), 1997, Edited by: R.C. Selley, Pages 3-394, ISBN: 9780444825711
- 5- Sedimentary Basins of the World, The Sedimentary Basins of the United States and Canada, (Volume 5), 2008, Edited by: Andrew D. Miall, Pages 1-610 , ISBN: 9780444504258
- 6- Sodium Sulfate, Handbook of Deposits, Processing, Properties, and Use, 2001, *Author(s): Donald E. Garrett*, Copyright © 2001 Elsevier Inc., ISBN: 978-0-12-276151-5
- 7- Developments in Marine Geology, Shore Processes and their Palaeoenvironmental Applications, 2008, Edited by: Edward J. Anthony, Elsevier B.V, ISBN: 9780444527332. 4 volumes.
- 8- Developments in Sedimentology, Diagenesis, IV, 1994, Edited by: K.H. Wolf and G.V. Chilingarian, Elsevier B.V., ISBN: 9780444885173, Pages: 1-529.

Important Instructions:

1. Continuous interaction between the student and professor is a strong foundation to build confidence during and after the course.
2. Do not hesitate to contact professor, for a substance (Geo 534), my room is No. 1A7/3 No. 4 building.
3. Numbers of research topics for each student will be determined and so provided in the Seminar with discussion by the professor and colleagues.
4. The evaluation depends on the evaluation of the list of postgraduate (Masters) as well as the foundations of the degree distribution of the decision, and will allocate part of the discussions and serious research and preparation methods.

إرشادات هامة:

١. التفاعل المستمر بين الطالب و أستاذ المادة أساس قوي لبناء الثقة أثناء تدريس المقرر وبعده.
٢. لا تتردد في الاتصال بأستاذ المادة، بالنسبة لمادة (جيو ٥٣٤) فأن غرفتي هي رقم ٣/٧١١ بمبنى رقم ٤.
٣. سيتم تحديد عدد من الموضوعات البحثية لكل طالب بحيث يقدمها في السيمينار مع مناقشة من قبل أستاذ المقرر والزملاء.
٤. التقييم يعتمد على لائحة الدراسات العليا (الماجستير) وكذلك أسس توزيع درجة المقرر، وسوف يخصص جزء للمناقشات وجدية وطرق إعداد البحوث.