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**Department of: Earth Sciences and Petroleum**

**College of ……Science… ……**

**Salahaddin University-Erbil**

**Subject: Practical Sedimentology**

**Course Book – (3rd class)**

**Lecturer's name: Dr. Dilshad Omer Ali**

**Academic Year: 2022/2023**

**Course Book**

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| **1. Course name** | **Sedimentology**  |
| **2. Lecturer in charge** | **Dr. Dilshad Omer Ali** |
| **3. Department/ College** | **Earth Sciences and Petroleum /Science College** |
| **4. Contact** | **e-mail:** **dilshad\_umer@yahoo.com****dilshad.ali@su.edu.krd****Tel: (optional): 009647504568311** |
| **5. Time (in hours) per week**  | **2 hours 3groups Total=6 hours** |
| **6. Office hours** | **Availability of the lecturer to the student during the week** |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **Academic Qualification:**B.Sc of Geology at at Salahaddin university-Erbil 2005. -M.Sc of Sedimentology and stratigraphy at Salahaddin university-Erbil 2010Ph.D. of Sequence stratigraphy and Basin Analysis at Royal Holloway University of London. |
| **9. Keywords** | **Siliciclastic, Sandstone, grain size, porosity, Sedimentary structures**  |
| **10. Course overview:** 1-Textures of sedimentary rocks. 7-Fluivial environments.2-Grain size. 8- Deltaic environments. 3-Roundness and sorting. 9-Tidal Flat environments.4-Sedimentary structures 10- Facies Anaalysis. 5-Biogenic sedimentary structures. 11- Paloecurrent Analysis 6-Transportation & Sedimentation 12-Application of sedimentology.**Sedimentary rocks may have** **1. Clastic (fragmental) texture*** **Grains are stuck together.**
* **Characteristic of clastic sedimentary rocks.**
* **Examples: sandstone and conglomerate.**

**2. Non-clastic (crystalline) texture*** **Interlocking crystals.**
* **Characteristic of chemical sedimentary rocks.**

**Examples: limestone, dolomite, and chert** **Grain sizes can be determined by:** * **Direct measurement with calipers or meter sticks.**

 **For particles larger than several centimeters.** * **Screening and petrographic microscope.**

 **For particles from 2 mm to about 1/16 mm.*** **Pipette or hydrometer (settling rates in water)**

 **For particles less than 1/16 mm*** **MaturityDepends on how many cycles of erosion and redeposition the components of a rock have undergone.**
* **There are two types of maturity:**

**1. Compositional maturity****Compositional maturity = quartz + chert / feldspars + rock fragments.****2. Textural maturity****Textural (structural) maturity = sorting and roundness of sand-sized grains.****Mineral compostions:-*** **The most common minerals in sedimentary rocks are:**
1. **Quartz**
2. **Clay minerals**
3. **Feldspars**
4. **Carbonates (calcite and dolomite)**
5. **Rock fragments**
* **Small amounts of amphibole, pyroxene, and mica.**
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| **11. Course objective:**The objectives of this course can be summarizing by:--The importance to studying this subject in 1st semester is to understanding the relationships between grains and texture and provenance of sedimentary rocks. Also in this semester will study the methods of studying sedimentary rocks in addition to diagenetic processes. Sedimentology is the study of the processes of formation, transport and deposition of material that accumulates as sediment in continental and marine environments and eventually forms sedimentary rocks. Most sedimentary deposits are the result of transport of material as particles. Moreover of detritus may be purely due to gravity but more commonly it is the result of flow in water, air, or dense mixtures of sediment and water. The methodology of analyzing sedimentary rocks, recording data and interpreting them in terms of processes and environments. The character of sediment in any depositional environment will be determined by the physical, chemical and biological processes that have occurred during the formation, transport and deposition of the sediment.  |
| **12. Student's obligation** -In this part the lecturer have responsibility to teach the students in a best method to understanding the subject Sedimentology Theory. Also it can be summarizing in to these points:-1-Construction report about field trip.2- Every two weeks there is Quiz.3- End of Semester there is an examination theory.4-Activity of the student. |
| **13. Forms of teaching**-In this part the main forms of teaching in the practical sedimentary petrography are:-1-White Board.2-Data show.3-Power point. |
| **14. Assessment scheme**-The scores of theory sedimentary petrography 1st Semester are subdivision into: **Theory Examination: 5%** **Quiz 1%** **Report 1%** **Activity of student 0.5%.** |
| **15. Student learning outcome:**This should not be less than 100 words-The main outcome of this course are:-1-How the students after graduation will be understand a main objective of the subject  Sedimentology and application. 2-The main point about field is being able to observe and record accurately what you see.3-Distingush between different sedimentary structures in field and significant importance.4-A min difference shallowing and deeping upwards facies. 5-The main differences between fluvial and deltaic environments based on lithofacies and Economic importance of them. 6-Important and significant of the Paleocurrent Analysis and their applications. 7-Porosity in sedimentary rocks and relationships with reservoir rocks. |
| **16. Course Reading List and References‌:**-The student during 2nd semester it’s necessary to burrow one of the text books below from Central library or College library as a good reference.**Text Book Theory Sedimentology 3rd Year 2020-2021**1-1- Blatt, H., Middleton, G., Murray, R., 1980, Origin of Sedimentary Rocks, 2nd ed., *Prentice-Hall*, Englewood Cliffs, 634P.2- Boggs, S. J, 2006, Principles of Sedimentology and Stratigraphy.4th ed., *Prentice-Hall*, 662P.3- Folk, R. L., 1974, Petrology of Sedimentary Rocks, *Hemphill Publication Company,* Texas, 170P.4- Nichols, G., 1990, Sedimentology and stratigraphy, *Black Well Science*, 355P.5- Pettijohn, F. J., Potter, P. E., and Seiver, R., 1987, Sand and sandstone, *Springer-Verlag*, New York, 553P.6- Selley, R. C., 2000, Applied Sedimentology, *Academic Press*, 521P.7- Tucker, M.E., 1981, Sedimentary petrology an introduction, Volume 3, *Blackwell scientific Publications*, 252P.**International Journals related to Sedimentary Petrography**:1- Basu, A., Young, A. W., Suttner, L. J., James, W. C., and Mack, G. H., 1975, Re-evaluation of the use of undulatory extinction and polycrystalline in detrital quartz for provenance interpretation: *Jour.Sedi.Petrol*., Vol.45, pp.873-882.2-Bernet, M., Bassett, K., 2005. Provenance analysis by single quartz grain SEM-CL/  Optical microscopy, Journal of Sedimentary Research, 75, 496-504.3- Flügel, E., 1982. Microfacies Analysis of Limestones. Springer-Verlag, Berlin, Heidelberg, New York, 633 pp.4- Folk, R.L., 1962. Spectral subdivision of limestone types. In: Ham, W.E. (Ed.), Classification of Carbonates Rocks – A Symposium, vol. 1. American Association of Petroleum Geologists Memoir, pp. 62–84. |
| **17. The Topics:** | **Lecturer's name** |
| In this section the lecturer shall write titles of all topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture -The importance of studying the topic subject is to**1-** Learn student identification of grain size analysis and their  Applications.**2-** Learn student an main concept and fundamental aspects of  the transportation & sedimentation and consequence of these processes. Each term should include not less than 16 weeks  | Dr.Muhamed F.OmerAssistant Professor of Sedimentology |
| **18. A. Theory Topics (If there is any)** |  |
| In this section The lecturer shall write titles of all theory topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture **1st Lec. Introduction about Sedimentology and** **Procedure of sampling in a field.****2nd Lec. Grain Properties.****3rd Lec. Sedimentary Structures concept and classifications part 1.****4th Lec. Sedimentary Structures part 2.****5th Lec. Biogenic Sedimentary Structures part 3.** **6th Lec. Paleoucrrent Analysis and applications.****7h Lec. Transportation & Sedimentation.****8th Lec. Facies Analysis and lithofacies.****9th Lec.** **Depositional system fluvial environments.****10th Lec. Depositional system deltaic environments.****11th Lec. Depositional system tidal flat.****12th Lec. Depositional system shallow marine environments.****13thLec. Deep marine environments.****14th Lec. Models of depositional environments.****15th Lec. Basin Analysis.****18. B. Practical Topics**In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture  **1st Lab. Introduction and the purpose of studying this subject** **&Procedure of sampling in a field. (Study details about**  **kinds of sampling in field and significant).** **2nd Lab. Texture of Sediments Particle Morphology.**  **(Factors controlling morphology of the grains.)****3rd Lab. Texture of Sediments Particle Morphology.****4th Lab. Paleocurrent Analysis.** **( A significant and importance of paleocurrent analysis)****5th Lab. Application of Paleoucrrent Analysis.**  **( Application of paleocurrent in field and measuring dip**  **and strike and paleoslope).** **6th Lab. Grain Size Analysis.** **( finning and coarsening upwards cycles)** **7h Lab. Statistical Parameters of grain size analysis.** **( Measuring sorting and skewness and mode).****8th Lab.** **Statistical Grain-Size Parameters of recent**  **Depositional Environments.****9th Lab. Bed form and Sedimentary Structures.** **( stages of generating sedimentary structures according**  **to flow and grain size)** **10th Lab. Porosity and effects in sedimentary rocks.** **( Factors controlling porosity in sedimentary rocks**  **and types).****11th Lab. Fulviatile & Deltaic Environments.** **( A main diffrences between fluvial and deltaic**  **Environments and their economic application.)** **12thLab. Basin Mapping Methods.** **(Sedimentary basins according to Wilson Models).****13th Lab. Structure Contour Maps.** **( Determination source rocks and reservoir rocks).**   | Lecturer's name;-Dr.Muhamed Fakhri Omerex: (2 hrs)Lecturer's name: Dr.Dilshad Omer Aliex: (2 hrs) |
| **19. Examinations:*****1. Compositional:*** In this type of exam the questions usually starts with Explain how, What are the reasons for…?, Why…?, How….? **Quiz** With their typical answers Examples should be provided***2.******True or false type of exams:***In this type of exam a short sentence about a specific subject will be provided, and then students will comment on the trueness or falseness of this particular sentence. Examples should be provided***3. Multiple choices:***In this type of exam there will be a number of phrases next or below a statement, students will match the correct phrase. Examples should be provided.

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| Name: |  |
| 1-Paleocurrent analysis |  |
| 2- Modes |  |
| 3-Models |  |
| 4-Rose diagram |  |
| 5-Application |  |
| 6-Grain size analysis |  |
| 7-Type of models |  |
| 8- Type of frequency Curve.  |  |
| 9-Determine type of sorting  |  |
| 10-Determine type of Skewness |  |

Quiz 2.5% Practical Sedimentology 2021 (**Sample of Quiz**)

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| Name: |  |
| **1-Determine type of roundness**  **according to zing Diagram.** |  |
| **1-Determine spheresity** |  |
| **2-Grain size table** |  |
| **3-Types of models.** |  |
| **4-Shape of frequency curve.** |  |
| **5- Value of sorting according to Folk** **( 1974)** |  |
| **6- Value of Skewness according to**  **Folk ( 1974).** |  |
| **7-Determine type of porosity.** |  |
| **8-Realtionships between IVG and** **cement.** |  |
| **9-Determine type of contacts** |  |
| **10- A common contacts.** |  |

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| **20. Extra notes:**- As am I a lecturer of the subject ” Sedimentology” I suggest that:1- The laboratory needs more and new geo software.2- A sufficient funding to go field trip every 3 weeks.3- Provide our laboratory with new instrument e.g. SEM and XRD .  |
| **21. Peer review** ‌‌  |