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**Department of Geology**

**College of Science**

**University of Salahaddin**

**Subject: Geophysics**

**Course Book – Year 3 / first semester**

**Lecturer's name: Muhammad Ali Ahmad (M.Sc.)**

**Academic Year: 2021/2022**

**Course Book**

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| **1. Course name** | Gravity Geophysics |
| **2. Lecturer in charge** | M. Sc. Muhammed Ali Ahmad |
| **3. Department/ College** | Earth Sciences and Petroleum / Science |
| **4. Contact** | e-mail: Muhammed.ahmad@su.edu.krdTel: 07504823997 |
| **5. Time (in hours) per week**  | Theory: 0 Practical: 2  |
| **6. Office hours** | 12 hours per week |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | My name is Muhammad Ali ahmad; I worked in University of Salahaddin since 2008 as researcher assistance in Department of Geology. I got M.Sc. Degree in Geophysics from Salahaddin University/Department of geology in 2015. I participated in studying many subjects such as; practical Geophysics, practical Crystallography, Practical General geology and Industrial geology. In addition to these I participated in summer field course and supervised many undergraduate research students. Now I teach practical Geophysics for third year class. |
| **9. Keywords** | Nonmetallic, Features, Classification, Industrial rocks, Industrial minerals, Uses. |
| **10. Course overview:** Geophysics are the science that deals with the subsurface of the earth, it is the study of the subsurface layers from its physical properties such as: density and velocity of waves in the rocks. Geophysics are important because it can give a valuable information of the subsurface structures without drilling any wells, so it is environmentally safe. Geophysical methods are also economically important as they use for hydrocarbon exploration, mineral deposits, archaeological sites, ground water…..etc. |
| **11. Course objective:**The essential objective of the practical course is to give an overview for students on the geophysical method (Gravity as they use by many companies for predict the occurrence of natural resources.  |
| **12. Student's obligation**Throughout this course, the students contribute in the lectures by asking and answering. Also they assign by homework during each lecture. Most of the students attend to the laboratory. All of the students are committed in their exams and instructions.  |
| **13. Forms of teaching**Different forms of teaching are used during the course, like:* White board and power point presentation for the titles, sub-titles and conclusions, in addition to figures and plates, in both theory and practical parts.
* Homework is given for students during course in practical part.
* Determine a discussion time at the last of every laboratory.
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| **14. Assessment scheme****Grading:** There are one theoretical exam at the mid, practical exam at the end of the semester, in addition to quiz exams during course. - The final mark of semester is **50%**, and divided to: **15%** for theoretical part, and **35%** for practical part; also the practical mark is divided to two marks: exam and reports.- The final exam is from **50% (**on theory only).So the total mark will be **100%**. |
| **15. Student learning outcome:**Students learn the geophysical data acquisition, processing and interpreting the data in geological terms and constructing a reliable subsurface geological model according to the geophysical data. |
| **16. Course Reading List and References‌:*** Dobrin M. B. and Savit C. H. (1988): Introduction to Geophysical Prospecting. 4th edition. New York: McGraw-Hill.
* Griffin, W.R. (1949): Residual gravity in theory and practice. Geophysics, Vol. 14, P. 39-56.
* Reynolds J. M. (1997): An Introduction to Applied and Environmental Geophysics. John Wiley and Sons. England. 798p
* Lectures notes and internet preview.
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| **17. The Topics:** | **Lecturer's name** |
|  |  |
| **18. Practical Topics (If there is any)** |  |
| Weak 1:Newton’s law of gravitation.Weak 2:Drift correctionWeak 3:looping processWeak 4:Free Air correction and Bouguer correctionWeak 5:Latitude correction and Bouguer anomalyWeak 6:Theoretical gravity value and absolute Bouguer anomalyWeak 7:Average density of rocks (Nettleton’s method)Weak 8:Borehole gravity survey (density determination)Weak 9:Regional and Residual (profile hand smoothing)Weak 10:Regional and Residual (map hand smoothing)Weak 11:Griffin’s method and Second Vertical Derivative (SVD)Weak 12:Interpretation of gravity (sphere and cylinder bodies), (depth determination)Weak 13:Interpretation of gravity (sphere and cylinder bodies), (volume determination) | Mr. Muhammad Ali Ahmad9 hrs. per week |
| **19. Examinations:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **St. no.** | **distance (m)** | **Elevation (m)** | **∆g (mGal)** | **∆h (mGal)** | **F.A.C (mGal)** | **F.A.A. (mGal)** | **B.C. (mGal)** | **L.C. (mGal)** | **B.A. (mGal)** |
| **(BS) S** | **0** | **300** | **0.00** |  |  |  |  |  |  |
| **S1** | **500** | **150** | **7.19** |  |  |  |  |  |  |
| **S2 N** | **1000** | **500** | **8.22** |  |  |  |  |  |  |

**Q1/ Fill the below table if density is 2.4g/cc and BS latitude is 35°N. (6marks)****Q2/ Find the absolute gravity value of (BS.) and station (S1) by looping process, if you know the absolute value of station (Sp) is (979750.55 mGal) (8marks)**

|  |  |  |
| --- | --- | --- |
| **St. no.** | **∆g** | **g absolute** |
| **(BS)**  | **0.00** |  |
| **S1** | **-16.50** |  |

|  |  |  |
| --- | --- | --- |
| **St.no.** | **T (m)** | **g (mGal)** |
| **BS.** | **25** | **80** |
| **Sp** | **35** | **75** |
| **BS.** | **75** | **82** |
| **Sp** | **85** | **77** |

**Q3/ The gravity reading for a borehole is given below, find the average density of a layer:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **st. no.** | **z(m)** | **∆g(mgal)** | **FAC** | **FAA** | **Density** |
| **1** | **0** | **0.000** |  |  |  |
| **2** | **-1** | **0.070** |  |  |  |
| **3** | **-2** | **0.138** |  |  |  |
| **4** | **-3** | **0.210** |  |  |  |
| **5** | **-4** | **0.276** |  |  |  |

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| **20. Extra notes:**The course book lacks to the problems which affect the educational process. These problems include the large number of students in each stage, diminution of instruments, and absence of appropriate rooms for lecturers to develop themselves. Finally, about the department of geology absence of financial support to carry out scientific trips and field course in a typical situation. |
| **21. Peer review** Dr. Fadhil Ali Ghaib Mr. Abdulwahab N. Al-DaoodyCollege of Science / Department of Geology  |