

Ministry of Higher Education and Scientific research



Department of Earth sciences and petroleum

College of Science

University of Salahaddin

Subject: Gravity and magnetic (Practical)

Course Book – Year 3 / First semester

Lecturer's name: Sirwa Qader Smail Gardi (M.Sc.)

Academic Year: 2023/2024

Course Book

1. Course name	Geopysics (Gravity and magnetic)
2. Lecturer in charge	M. Sc. Sirwa Qader Smail
3. Department/ College	Earth sciences and petroleum / Science
4. Contact	e-mail: sirwa.gardi@su.edu.krd Tel: 07504753127
5. Time (in hours) per week	Theory: 2 Practical: 2
6. Office hours	8 hours per week
7. Course code	
8. Teacher's academic profile	My name is Sirwa Qader Smail; I worked in University of Salahaddin since 2003 as researcher assistance in Department of Earth sciences and petroleum. I got M.Sc. Degree in Geophysics from Salahaddin University/Department of Earth sciences and petroleum in 2010. I have been lecturer since 2017. I participated in studying many subjects such as; practical environmental Geology (Environmental science department), practical Crystallography, practical Rock forming minerals, Practical Clay mineralogy, Industrial geology and geophysics. In addition to these I participated in summer field course and supervised many undergraduate research students. I taught theoretical and practical Clay Mineralogy, Industrial Geology for fourth year class and electrical resistivity method for fourth year class (First course). I have taught Practical Geophysics (Gravity and magnetic) for third year (First course), theoretical and practical seismic and resistivity course (Second course).
9. Keywords	Gravity, force, anomaly, regional, interpretation
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 methods (Gravity and Magnetic) 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.

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.

17. The Topics:

Lecturer's name

18. Practical Topics

Week 1: Newton's law of gravitation

Week 2: Drift correction (*Homework: looping process*)

Week 3: Free Air correction and Bouguer correction

Week 4: Latitude correction and Bouguer anomaly

Ms. Sirwa Qader Smail

8 hrs. per week

(Homework: Theoretical gravity value and absolute Bouguer anomaly)

Week 5: Regional and Residual (profile & map hand smoothing)

(Homework: Calculation of density: (Nettleton's method & Borehole gravity survey)

Week 6: Monthly exam

Week 7: Griffin's method and Second Vertical Derivative (SVD)

Week 8: Interpretation of gravity (sphere and cylinder bodies), (depth determination)

Week 9: Interpretation of gravity (sphere and cylinder bodies), (volume determination)

Week 10: Interpretation of gravity (Fault structure)

Week 11: Monthly exam

Week 12: Magnetic Corrections

Week 13: Interpretation of Magnetic Data (part One)

Week 14: Interpretation of Magnetic Data (part two)

Week 15: Monthly exam

19. Examinations:

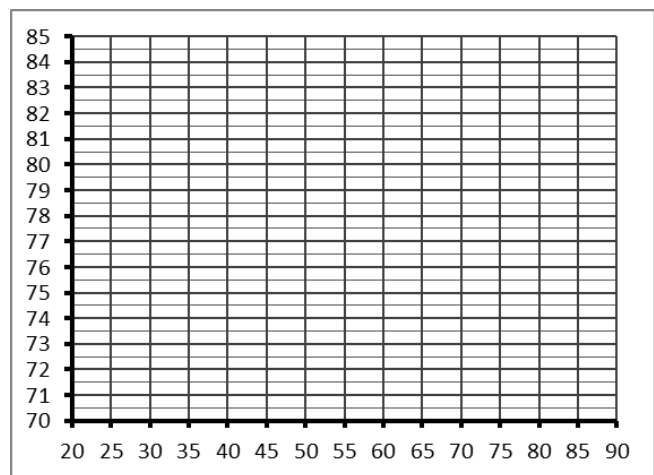
Q1/ Fill the below table if density is 2.4g/cc and BS latitude is 35°N. (6marks)

St. no.	distance (m)	Elevation (m)	Δg (mGal)	Δh (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						

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.	Δg	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)	$\Delta g(\text{mga l})$	FAC	FAA	Densit y
1	0	0.000			
2	-1	0.070			
3	-2	0.138			
4	-3	0.210			
5	-4	0.276			

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-Daody

College of Science / Department of Earth sciences and petroleum