MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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| **Module Information****معلومات المادة الدراسية** |
| **Module Title** |  Gravity Method الطريقة الجذبية  | **Module Delivery** |
| **Module Type** | Core | * **☒ Theory**
* **☒ Lecture**
* **☒ Lab**
* **☐ Tutorial**
* **☐ Practical**
* **☒ Seminar**
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| **Module Code** | GEO2117 |
| **ECTS Credits**  | 6 |
| **SWL (hr/sem)** | 150 |
| **Module Level** | UGII | UGII | **Semester of Delivery** | Three |
| **Administering Department** | Department of Geophysics |  **College** | College of Geophysics and Remote Sensing |
| **Module Leader** | Assistant Professor Dr.Wadhah Mahmood Shakir | **e-mail** | wadhah.mah@kus.edu.iq  |
| **Module Leader’s Acad. Title** | Assistant Professor Doctor of Geophysics | **Module Leader’s Qualification** | PhD. In Geology / Geophysics |
| **Module Tutor** | ---- | **e-mail** | ----- |
| **Peer Reviewer Name** | ----- | **e-mail** | ----- |
| **Scientific Committee Approval Date** | Approved | **Version Number** |  |

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| **Relation with other Modules****العلاقة مع المواد الدراسية الأخرى** |
| **Prerequisite module** | Fundamentals of Geophysics | **Semester** | UGI , 2nd Semester  |
| **Co-requisites module** | ------- | **Semester** | ------ |

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| **Module Aims, Learning Outcomes and Indicative Contents****أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية** |
|  **Module Aims****أهداف المادة الدراسية** | * **The gravity geophysical Method course is aiming to achieve the following:**
* **1- The wide scope of application of Gravity geophysical method for exploring the Earths crustal characteristics and investigating subsurface geological features and targets by studying the Earth’s natural gravimetric field variations.**
* **2- Gravity data acquisition, processing and Interpretation. This would be helpful in obtaining results which used to detect the subsurface geological structures.**
* **3- Improving the student’s qualifications through the application of manual, mathematical and computer software skills which related to the processing and interpretation of geophysical data.**
* **4- Improvement of student qualifications as an explorer and detective geophysicist who detects the subsurface geological evidences and to apply this scientific topic precisely in order to exploit it in different goals like: Geodesy , Crustal rocks Isostasy investigations, petrol and mineral investigations, Engineering and environmental Investigations ….etc.**
* **5- Understanding the ambiguity causes which related to the results of geophysical surveying data and looking for its solutions. This includes adopting methods and searching for strong evidences which helps in solving interpretational problems, in order to reach to the best logical, correct and less ambiguous geophysical interpretations.**
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| **Module Learning Outcomes****مخرجات التعلم للمادة الدراسية** | 1. **Attendance of theoretical lectures.**
2. **Attendance of practical part application Laboratories.**
3. **Presenting seminars within the material topic.**
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| **Indicative Contents****المحتويات الإرشادية** | * **Introduction**
* **Gravimetry**
* **Importance and Applications of Gravity Method**
* **Fundamental principles of Gravitation**
* **Gravitational Potential**
* **Gravitational Potential of the Earth**
* **Effect of Earth’s rotation and flattening on Gravity Potential**
* **The Geoid and Ellipsoid**
* **The Reference Ellipsoid**
* **Gravity at the Reference Ellipsoid**
* **Gravity measurement and instrumentation**
* **Absolute Gravity Measurement**
* **Relative Gravity measurements**
* **Stable and unstable gravimeters**
* **Basic Steps of Gravity measurement by using LaCoste and Romberg Device**
* **Types of Gravity Surveys**
* **The Required Steps to Achieve a Gravity Survey:**
* **Ambiguity in gravity method**
* **Corrections of Gravity Readings**
* **The calculation of Bouguer Anomaly value**
* **Gravity Data Processing and Interpretation**
* **Qualitative Interpretation**
* **Separating the residual gravity field from the total Field**
* **Quantitative Interpretation of Gravity Profiles**
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| **Learning and Teaching Strategies****استراتيجيات التعلم والتعليم** |
| **Strategies** | 1. **Theoretical lecturing which includes teaching the scientific material. This includes the explanation of the method principle of application, instrumentation and data acquisition, processing and interpretation.**
2. **A practical part laboratory includes the processing of geophysical data in different methods to obtain the results. The results would be displayed and interpreted, discussed by the student who ought to present his laboratory report in weekly basis.**
3. **Quizzes in weekly basis.**
4. **Midterm examination.**
5. **Final theoretical and practical examination.**
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| **Student Workload (SWL)****الحمل الدراسي للطالب** |
| **Structured SWL (h/sem)****الحمل الدراسي المنتظم للطالب خلال الفصل** | 86 |  |  |
| **Unstructured SWL (h/sem)****الحمل الدراسي غير المنتظم للطالب خلال الفصل** | 64 |  |  |
| **Total SWL (h/sem)****الحمل الدراسي الكلي للطالب خلال الفصل** | 150 |

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| **Module Evaluation****تقييم المادة الدراسية** |
| **As** | **Time/Number** | **Weight (Marks)** | **Week Due** | **Relevant Learning Outcome** |
| **Formative assessment** | **Quizzes** | 2 | 10 | 10 | 10 |
| **Assignments** | 2 | 10 | 10 | 10 |
| **Projects / Lab.** | 1 | 10 | 10 | 10 |
| **Report** | 1 | 10 | ---- | ---- |
| **Summative assessment** | **Midterm Exam** | 2 hr | 10 | 20 | 20 |
| **Final Exam** | 2hr | 50 | 50 | 50 |
| **Total assessment** | 100% (100 Marks) | 100 | 100 |

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| **Delivery Plan (Weekly Syllabus)****المنهاج الاسبوعي النظري** |
| **Week**  | **Material Covered** |
| **Week 1** | **An introduction about the gravity method and its application in geophysical exploration and the methods of measuring Earths gravimetric field** |
| **Week 2** | **The use of the unstable gravimeter instrument to take gravity field ground surface readings** |
| **Week 3** | **Corrections of gravity readings (part1)** |
| **Week 4** | **Corrections of gravity readings (part2)** |
| **Week 5** | **Corrections of gravity readings (part3)** |
| **Week 6** | **Bouguer anomaly value calculation** |
| **Week 7** | **Gravity mapping and profiling (part1)** |
| **Week 8** | **Gravity mapping and profiling (part2)** |
| **Week 9** | **Gravity mapping and profiling (part3)** |
| **Week 10** | **Qualitative interpretation of Gravity maps and profiles (part1)** |
| **Week 11** | **Qualitative interpretation of Gravity maps and profiles (part2)** |
| **Week 12** | **Qualitative interpretation of Gravity maps and profiles (part3)** |
| **Week 13** | **Quantitative interpretation of Bouguer anomaly maps and profiles (part 1)** |
| **Week 14** | **Quantitative interpretation of Bouguer anomaly maps and profiles (part2)** |
| **Week 15** | **Quantitative interpretation of Bouguer anomaly maps and profiles (part3)** |
| **Week 16** | **Preparatory week before the final Exam** |

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| **Delivery Plan (Weekly Lab. Syllabus)****المنهاج الاسبوعي للمختبر** |
| **Week**  | **Material Covered** |
| **Week 1-2** | **Absolute gravity acceleration measurement and gravimeters measurements** |
| **Week 3-4** | **Earth’s Gravity field as compared to other solar system planets gravity fields** |
| **Week 5-6** | **Drift or tidal gravity reading correction** |
| **Week 7-8** | **Free air and Bouguer (Total Elevation correction )** |
| **Week 9-10** | **Theoretical gravity value calculation and latitude correction** |
| **Week 11-12** | **Bouguer anomaly value calculation ,mapping and qualitative interpretation** |
| **Week 13-14** | **Residual Bouguer anomaly deduction and quantitative interpretation** |

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| **Learning and Teaching Resources****مصادر التعلم والتدريس** |
|  | **Text** | **Available in the Library?** |
| **Required Texts** | **1- Kearey P. , Brooks M. , Hill I.,2002,”An Introduction to Geophysical Exploration”, 3rd ed., Blackwell Science Ltd., USA, 281 pages.**2- **Sharma P.V., 1986, “Geophysical Methods in Geology”, 2nd Ed.,Elsevier Science Publishing Co., Inc., Amsterdam, the Netherlands.442 pages.****3- Eric C. , 2015, Gravity and the figure of the Earth, Purdue University, Department of Earth and Atmospheric Sciences, West Lafayette, IN 47907-1397.** | Yes  |
| **Recommended Texts** | **1- Kearey P. , Brooks M. , Hill I.,2002,”An Introduction to Geophysical Exploration”, 3rd ed., Blackwell Science Ltd., USA, 281 pages.**2- **Sharma P.V., 1986, “Geophysical Methods in Geology”, 2nd Ed., Elsevier Science Publishing Co., Inc., Amsterdam, the Netherlands.442 pages.****3- Eric C. , 2015, Gravity and the figure of the Earth, Purdue University, Department of Earth and Atmospheric Sciences, West Lafayette, IN 47907-****1397.** **4-AL-Khafaji W.M.S. and Al-Dabagh H.A. ,2019,” A Geophysical Correlation between Near-Surface Radioactivity and Subsurface Faults Detected By Gravity Method for a Region Located In the Western Desert of Iraq”, IJES, Vol. 11, Issue.2.****5- Dobrin M.B. and Savit C.H., 1988, Introduction to Geophysical prospecting, (4th Ed.), McGraw Hill, New York.****6- AL-Khafaji W.M.S., 2016, Gravity Field Interpretation for Subsurface Faults Detection in A Region Located SW- Iraq, Iraqi Journal of Science**, **Vol.57, No.3C, pp:2270-2279** | Yes |
| **Websites** | <https://www.youtube.com/channel/UCnS-i5iT2M2TgRbI0FpS8uQ><https://www.researchgate.net/publication/347951130_Lectures_in_the_Gravity_Method> |

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|  **Grading Scheme****مخطط الدرجات** |
| **Group** | **Grade** | التقدير | **Marks (%)** | **Definition** |
| **Success Group****(50 - 100)** | **A -** Excellent | **امتياز** | 90 - 100 | Outstanding Performance |
| **B -** Very Good | **جيد جدا**  | 80 - 89 | Above average with some errors |
| **C -** Good | **جيد** | 70 - 79 | Sound work with notable errors |
| **D -** Satisfactory | **متوسط**  | 60 - 69 | Fair but with major shortcomings |
| **E -** Sufficient | **مقبول**  | 50 - 59 | Work meets minimum criteria |
| **Fail Group****(0 – 49)** | **FX –** Fail | **راسب (قيد المعالجة)** | (45-49) | More work required but credit awarded |
| **F –** Fail | **راسب** | (0-44) | Considerable amount of work required |
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| **Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |