MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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| **Module Information****معلومات المادة الدراسية** |
| **Module Title** |  Magnetic Method الطريقة المغناطيسية  | **Module Delivery** |
| **Module Type** | Core | * **☒ Theory**
* **☒ Lecture**
* **☒ Lab**
* **☐ Tutorial**
* **☐ Practical**
* **☒ Seminar**
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| **Module Code** | GEO22112 |
| **ECTS Credits**  | 5 |
| **SWL (hr/sem)** | 125 |
| **Module Level** | UGII | UGII | **Semester of Delivery** | Four |
| **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 Magnetic geophysical Method course is aiming to achieve the following:**
* **1- The wide scope of application of Magnetic geophysical method for exploring the Earths crustal characteristics and investigating subsurface geological features and targets by studying the Earth’s natural magnetic field variations.**
* **2- Magnetic data acquisition, processing and Interpretation. This would be helpful in obtaining results which used to detect the subsurface geological structures and studying the basement rocks magnetic susceptibility.**
* **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: studying the natural magnetic field of earth and its variations, Basement crustal rocks magnetic susceptibility investigations, petrol and mineral investigations, Engineering and environmental Investigations , archaeological investigations….etc.**
* **5- Understanding the ambiguity causes which related to the results of geophysical surveying data and looking for its solutions. This includes the assisting with the results of other geophysical 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**
* **Theories on the origin of the Earth’s field**
* **Principle of Magnetization**
* **Magnetic units**
* **Inducing magnetization**
* **The Earth’s geomagnetic field**
* **Mathematical treatment of main field**
* **The International Geomagnetic Reference Field (IGRF)**
* **Secular variations in the main field**
* **Diurnal variations**
* **Magnetic storms**
* **Geological effects**
* **Rock magnetism and Kinds of minerals magnetism**
* **The Curie temperature effect**
* **Types of magnetism in rocks**
* **Induced and remnant magnetism**
* **Rock susceptibility**
* **Common causes of magnetic anomalies**
* **Instruments for Measuring Rocks Magnetism**
* **Types of Magnetic surveys**
* **Examples of Global regional magnetic surveys**
* **Magnetic survey Data display**
* **Aeromagnetic data**
* **Data Processing and interpretation**
* **Noise in ground magnetic surveys**
* **Simple Magnetic Interpretation**
* **Forms of magnetic anomaly**
* **‘Rule-of-thumb’ in depth estimation of magnetized subsurface bodies**
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| **Learning and Teaching Strategies****استراتيجيات التعلم والتعليم** |
| **Strategies** | 1. **Theoretical lecturing which includes educating the scientific material in the topic of magnetic geophysical method. 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 a weekly basis.**
3. **Quizzes in a 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** | 39 |  |  |
| **Total SWL (h/sem)****الحمل الدراسي الكلي للطالب خلال الفصل** | 125 |

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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 Magnetic geophysical method and its applications in geophysical exploration and the methods of measuring Earth’s magnetic field** |
| **Week 2** | **Theories of the origin of Earth’s magnetic field** |
| **Week 3** | **Geomagnetic elements , induced and remnant magnetization** |
| **Week 4** | **The mathematical treatment of Earth’s magnetic field** |
| **Week 5** | **The International Geomagnetic Reference Field (IGRF)** |
| **Week 6** | **Secular and Diurnal variations , magnetic storms and geological effects on the main Earth’s magnetic field** |
| **Week 7** | **Magnetization in rocks and minerals and magnetic Susceptibility**  |
| **Week 8** | **Instruments of Measuring rocks Magnetism** |
| **Week 9** | **Types of Magnetic Surveys** |
| **Week 10** | **Magnetic surveying data display**  |
| **Week 11** | **Magnetic data processing and interpretation** |
| **Week 12** | **Magnetic profiles and forms of magnetic anomaly** |
| **Week 13** | **Depth estimation of subsurface magnetized bodies (part1)** |
| **Week 14** | **Depth estimation of subsurface magnetized bodies (part2)** |
| **Week 15** | **Depth estimation of subsurface magnetized bodies (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** | **Earth’s Magnetic main Intensity field Mapping (part1)** |
| **Week 3-4** | **Earth’s Magnetic main Intensity field Mapping (part2)** |
| **Week 5-6** | **Earth’s Magnetic main Intensity field profiling (part1)** |
| **Week 7-8** | **Earth’s Magnetic main Intensity field profiling (part2)** |
| **Week 9-10** | **Transforming 1D and 2D magnetic anomalies**  |
| **Week 11-12** | **Reduction To Pole and Reduction To Equator Methods** |
| **Week 13-14** | **Residual Magnetic anomaly deduction and quantitative interpretation** |

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| **Learning and Teaching Resources****مصادر التعلم والتدريس** |
|  | **Text** | **Available in the Library?** |
| **Required Texts** | 1. **Foulger G. R. & Peirce C., 2002, Geophysical Methods in Geology.**
2. **2- P. Kearey, M. Brooks and I. Hill*,* 2002, An Introduction to Geophysical Exploration, by, 3rd edition Blackwell Science.**

**3- Calais E.2005, Geomagnetism, Purdue University Department of Earth and Atmospheric Sciences, West Lafayette, IN 47907-1397.****4- Milsom J., 2003, Field Geophysics, 3rd Ed.,The Geological Field Guide Series, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England .** | 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- Dobrin M.B. and Savit C.H., 1988, Introduction to Geophysical prospecting, (4th Ed.), McGraw Hill, New York.** | Yes |
| **Websites** | <https://www.youtube.com/channel/UCnS-i5iT2M2TgRbI0FpS8uQ><https://www.researchgate.net/publication/356616463_Magnetic_Geophysical_Method_Course_Lectures_for_Undergraduate_Students>  |

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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. |