MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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| **Module Information****معلومات المادة الدراسية** |
| **Module Title** | Mineralogy | **Module Delivery** |
| **Module Type** | Core | * **☒ Theory**
* **☒ Lecture**
* **☒ Lab**
* **☐ Tutorial**
* **☐ Practical**
* **☐ Seminar**
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| **Module Code** | GEO1203 |
| **ECTS Credits**  | 6 |
| **SWL (hr/sem)** | 150 |
| **Module Level** | 1st  | **Semester of Delivery** | 2nd  |
| **Administering Department** | Geophysics |  **College** | Remote sensing and Geophysics |
| **Module Leader** | Dr. Aws Khalid |  **e-mail** |  |
| **Module Leader’s Acad. Title** | Lecturer | **Module Leader’s Qualification** | Minerals  |
| **Module Tutor** | None  |  **e-mail** |  |
| **Peer Reviewer Name** | None  |  **e-mail** |  |
| **Scientific Committee Approval Date** |  | **Version Number** |  |

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| **Relation with other Modules****العلاقة مع المواد الدراسية الأخرى** |
| **Prerequisite module** | None  | **Semester** |  |
| **Co-requisites module** | None  | **Semester** |  |

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| **Module Aims, Learning Outcomes and Indicative Contents****أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية** |
|  **Module Aims****أهداف المادة الدراسية** | Learn about the most important naturally occurring minerals Identify the physical properties of minerals with the naked eye. Knowledge of the chemical composition of the most important mineral aggregates. Know the types of chemical bonds in minerals and how their atoms relate to each other A comprehensive classification study of the minerals that make up the rocks of the earth's crust Identify the most important common mineral aggregates in the earth's crust in terms of their origin, origin and different characteristics. |
| **Module Learning Outcomes****مخرجات التعلم للمادة الدراسية** | The learning outcomes of a mineralogy module typically include: 1. Understanding the basic concepts and principles of mineralogy, including crystallography, mineral identification, and classification. 2. Developing skills in the use of optical microscopy and other analytical techniques for mineral identification and characterization. 3. Gaining knowledge of the physical and chemical properties of minerals, including their formation, occurrence, and geological significance. 4. Acquiring an understanding of the relationships between minerals and rocks, as well as their role in geological processes such as metamorphism and ore formation. 5. Developing critical thinking skills to analyze and interpret mineralogical data, such as mineral assemblages, textures, and geochemical compositions. 6. Enhancing laboratory skills through hands-on experience with mineral specimens, thin section preparation, and mineralogical analysis techniques. 7. Cultivating an appreciation for the diversity and beauty of minerals found in nature. 8. Applying acquired knowledge to practical applications in fields such as geology, environmental science, materials science, or mining exploration. Overall, the learning outcomes aim to provide students with a solid foundation in mineralogy that can be applied to various scientific disciplines related to Earth sciences. |
| **Indicative Contents****المحتويات الإرشادية** | Mineralogy is the study of minerals, which are naturally occurring inorganic substances with a specific chemical composition and crystal structure. The indicative contents of mineralogy typically include: 1. Introduction to minerals: Definition, characteristics, and classification of minerals. 2. Crystallography: Study of crystal systems, crystal forms, and symmetry. 3. Mineral chemistry: Composition and chemical properties of minerals. 4. Physical properties of minerals: Color, luster, hardness, cleavage, fracture, and specific gravity. 5. Optical properties: Study of light behavior in minerals, including transparency, refractive index, and pleochroism. 6. Mineral identification techniques: Use of physical and optical properties to identify minerals. 7. Mineral associations: Study of the occurrence and distribution of minerals in different geological environments. 8. Mineral genesis: Processes involved in the formation of minerals. 9. Economic mineral deposits: Exploration and exploitation of valuable mineral resources. 10. Mineral uses: Industrial applications and cultural significance of different minerals. These are some indicative contents that are commonly covered in a mineralogy course or textbook. |

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| **Learning and Teaching Strategies****استراتيجيات التعلم والتعليم** |
| **Strategies** | Mineralogy strategies refer to the approaches and techniques used in the study of minerals. Here are some strategies commonly employed in mineralogy: 1. Sample collection and preparation: This involves selecting appropriate samples from various geological settings and preparing them for analysis, such as grinding, polishing, and thin sectioning. 2. Optical microscopy: This strategy involves using a polarizing microscope to examine mineral samples under transmitted or reflected light. It helps identify minerals based on their optical properties like color, birefringence, and pleochroism. 3. X-ray diffraction (XRD): XRD is a powerful technique used to determine the crystal structure of minerals by analyzing the diffraction pattern produced when X-rays interact with a crystalline sample. 4. Electron microscopy: Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) are used to study mineral samples at high magnification. These techniques provide detailed information about crystal morphology, composition, and microstructures. 5. Spectroscopy: Techniques such as infrared spectroscopy (IR), Raman spectroscopy, and energy-dispersive X-ray spectroscopy (EDS) are employed to identify minerals based on their characteristic absorption or emission spectra. 6. Chemical analysis: Chemical methods like wet chemical analysis or instrumental techniques such as atomic absorption spectroscopy (AAS) or inductively coupled plasma mass spectrometry (ICP-MS) are used to determine the elemental composition of minerals. 7. Mineral classification and identification: Various classification schemes exist for categorizing minerals based on their chemical composition, crystal structure, or physical properties. These schemes help in identifying unknown minerals by comparing their characteristics with established mineralogical databases. 8. Fieldwork and mapping: Fieldwork involves visiting geological sites to observe mineral occurrences in their natural settings, collecting samples for further analysis, and mapping mineral distributions within a given area. 9. Experimental methods: High-pressure/high-temperature experiments or other laboratory techniques can be employed to simulate natural conditions and investigate the formation processes of specific minerals. 10. Data analysis and interpretation: Once data is collected from various analytical techniques, statistical analysis or modeling may be applied to interpret the results and draw conclusions about mineral formation mechanisms, geologic history, or economic potential. These strategies are not exhaustive but provide an overview of common approaches used in mineralogy research and exploration. |

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| **Student Workload (SWL)****الحمل الدراسي للطالب** |
| **Structured SWL (h/sem)****الحمل الدراسي المنتظم للطالب خلال الفصل** | 114 |  |  |
| **Unstructured SWL (h/sem)****الحمل الدراسي غير المنتظم للطالب خلال الفصل** | 86 |  |  |
| **Total SWL (h/sem)****الحمل الدراسي الكلي للطالب خلال الفصل** | 200 |

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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) |  |  |
| **Assignments** | 2 | 10% (10) |  |  |
| **Projects / Lab.** | 1 | 10% (10) |  |  |
| **Report** | 1 | 10% (10) |  |  |
| **Summative assessment** | **Midterm Exam** | 2 hr | 10% (10) |  |  |
| **Final Exam** | 2hr | 50% (50) |  |  |
| **Total assessment** | 100% (100 Marks) |  |  |

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| **Delivery Plan (Weekly Syllabus)****المنهاج الاسبوعي النظري** |
| **Week**  | **Material Covered** |
| **Week 1** | Introduction to Mineralogy |
| **Week 2** | Minerals Formation |
| **Week 3** | Mineral Classification |
| **Week 4** | Physical Properties of Minerals |
| **Week 5** | Optical properties of Minerals: Overview |
| **Week 6** | Observations using plane polarized light (PPL) mode |
| **Week 7** | Observations using crossed polarized light (XPL) mode –part1- |
| **Week 8** | Observations using crossed polarized light (XPL) mode –part2- |
| **Week 9** | Native Elements Minerals |
| **Week 10** | Oxide Minerals |
| **Week 11** | Halide Minerals |
| **Week 12** | Sulfide Minerals |
| **Week 13** | Carbonate mineral group |
| **Week 14** | Sulfates |
| **Week 15** | Phosphate Minerals |
| **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** | Calculation of physical properties of minerals |
| **Week 2** | Wavelength & energy of light spectrum |
| **Week 3** | Petrographic Microscope: Parts & Principle of operation |
| **Week 4** | Petrographic Microscope: mineral specimen tests |
| **Week 5** | Tests by plane polarized light (PPL) mode |
| **Week 6** | Tests by crossed polarized light (XPL) mode |
| **Week 7** | Analyzing tests of petrographic slides |

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| **Learning and Teaching Resources****مصادرالتعلم والتدريس** |
|  | **Text** | **Available in the Library?** |
| **Required Texts** | Introduction to Mineralogy and Petrology, Swapan Kumar Haldar, 20210. |  |
| **Recommended Texts** | Introduction to Optical Mineralogy, William D. Nesse, 2013. |  |
| **Websites** | http://www.mindat.org |

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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. |