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| **جامعة بنهاBenha University** **Faculty of Science****Department of Geology** |
| **Course Specification****431 G: Ore microscopy and petrology** |
| **A. Affiliation** |
| **Relevant program:** |  **B.Sc. in Geology**  |
| **Department offering the program:** | **Department of Geology** |
| **Department offering the course:** | **Department of Geology** |
| **Academic year/level:**  | **Fourth level** |
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| B. Basic information |
| **Title: Ore microscopy and petrology**  | **Code:** **431** **G** | **Year/level: Fourth level** |
| **Teaching Hours:** | **Lectures:** 2 | **Tutorial:** 0 |
|  | **Practical:** 2 | **Total:** 4 h/week |
| C. Professional information |
|  **1. Course Learning Objectives:** |
| This course is designed to introduce students to definiation and classification of ore deposits. Investigation of the charactersitcs, genesis and distinctions of ore minerals, their optical properties and genetic associations is a prime purpose. The students are to be trained on identification of ores in the field, and the global distribution of the ore deposits and its controls and chronology. |

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| **2. Intended Learning Outcomes (ILOS)** |
| **a. Knowledge and understanding:**On successful completion of the course, the student should be able to:**a1.** explain the major ore deposit types and industrial minerals and predict how these will affect exploration, evaluation and exploitation,**a2.** investigate the role of ore bearing fluids in the genesis of ore deposits and identify and explain the major controls to mineralisation for a variety of deposit types,**a3.** recognize the mineralogical and petrological signatures of major ore deposits and industrial mineral types, identify and analyse their assemblages, textural relationships and parageneses and relate these to the mode and timing of formation,**a4.** demonstrate the importance of making scientific observations, recognizing similarities between these and stated models and using these observations to determine or support complex geological interpretations. |
| **b. Intellectual skills:**On successful completion of the course, the student should be able to.**b1.** analyze the geologic and tectonic setting of the different ore deposits,**b2.** assess mineral paragensis and textures and reconstruct the ore genesis, **b3.** apply mineral association criteria to the setting and genesis of ore textures and their evolution,**b4.** investigate the distribution of ores and industrial materials in the various rock assemblages,**b5.** inspect examples of the Egyptian ores. |
| **c. Practical and professional skills:**Successful students should be professionally able to:**c1.** indentify the ore minerals and the associated criteria in the field and in hand speciemen,**c2.** acquire the basic concepts of ore petrography is given, which forms the base for an integrated study of an ore deposit,**c3.** characterize each type of the ore deposits, occurrence, setting and mineralogy,**c4.** detect the paragenetic and evolutionary relationships using the microscopic features. |
| **d. General skills:**On successful completion of the course, the student should be able to:**d1.** review available literature from text books, published maps, publications and other resources, **d2.** interpret the various types of data and observations into information using software and formulate the results in a readable final form, **d3.** contribute significantly to the scientific skills and attitudes of his/her peers.**d4.** cooperate and work in team smoothly and manage the time while going to the targeted goals. |

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| **3. Contents** |
| **Topic** | **Lecture hours** | **Tutorial hours** | **Practical hours** |
| 1. Introduction to ore microscopy
 | 2 |  | 2 |
| 1. Ore minerals
 | 2 |  | 2 |
| 1. Classification of the ore deposits
 | 2 |  | 2 |
| 1. Ore deposits in a global tectonic context
 | 2 |  | 2 |
| 1. Ore-forming processes
 | 2 |  | 2 |
| 1. Syngenetic ore deposits
 | 2 |  | 2 |
| 1. Epigenetic ore deposits
 | 2 |  | 2 |
| 1. Surficial and supergene ore-forming processes
 | 2 |  | 2 |
| 1. Exploration vectors for ore deposits
 | 2 |  | 2 |
| 1. Genetic studies of the ore deposits
 | 2 |  | 2 |
| 1. Controls of ore deposit formation and distribution
 | 2 |  | 2 |
| 1. Hydrothermal alteration
 | 2 |  | 2 |
| 1. Examples from the Egyptian ore deposits
 | 4 |  | 4 |
| 1. Revision and evaluation session
 | 2 |  | 2 |
| **Total hours** | **28** |  | **28** |

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| **4 - Teaching and Learning methods:** |

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| **Intended Learning Outcomes** | **Lecture** | **Presentations & Movies** | **Discussions & Seminars** | **Practical** | **Problem solving** | **Brain storming** |
| **Knowledge & Understanding** | a1. | explain the major ore deposit types and industrial minerals and predict how these will affect exploration, evaluation and exploitation, | 🗸 |  |  |  |  |  |
| a2. | investigate the role of ore bearing fluids in the genesis of ore deposits and identify and explain the major controls to mineralisation for a variety of deposit types, | 🗸 | 🗸 |  | 🗸 |  |  |
| a3. | recognize the mineralogical and petrological signatures of major ore deposits and industrial mineral types, identify and analyse their assemblages, textural relationships and parageneses and relate these to the mode and timing of formation, | 🗸 |  | 🗸 |  |  | 🗸 |
| a4. | demonstrate the importance of making scientific observations, recognizing similarities between these and stated models and using these observations to determine or support complex geological interpretations |  | 🗸 |  | 🗸 |  |  |
| **Intellectual Skills** | b1. | analyze the geologic and tectonic setting of the different ore deposits | 🗸 |  | 🗸 | 🗸 | 🗸 |  |
| b2. | assess mineral paragensis and textures and reconstruct the ore genesis |  | 🗸 |  | 🗸 | 🗸 |  |
| b3. | apply mineral association criteria to the setting and genesis of ore textures and their evolution | 🗸 |  |  | 🗸 |  |  |
| b4. | investigate the distribution of ores and industrial materials in the various rock assemblages |  | 🗸 | 🗸 | 🗸 |  |  |
| b5. | inspect examples of the Egyptian ores | 🗸 |  |  | 🗸 | 🗸 | 🗸 |
| **Practical and professional skills** | c1. | indentify the ore minerals and the associated criteria in the field and in hand speciemen | 🗸 |  | 🗸 |  |  |  |
| c2. | acquire the basic concepts of ore petrography is given, which forms the base for an integrated study of an ore deposit, | 🗸 | 🗸 |  | 🗸 |  |  |
| c3. | characterize each type of the ore deposits, occurrence, setting and mineralogy, | 🗸 |  | 🗸 | 🗸 |  | 🗸 |
| c4. | detect the paragenetic and evolutionary relationships using the microscopic features. |  | 🗸 |  | 🗸 |  |  |
| **General Skills** | d1. | review available literature from text books, published maps, publications and other resources,  | 🗸 |  | 🗸 |  |  | 🗸 |
| d2. | interpret the various types of data and observations into information using software for a readable final form, | 🗸 |  |  |  |  |  |
| d3.. | contribute significantly to the scientific skills and attitudes of his/her peers. | 🗸 | 🗸 |  | 🗸 |  |  |
| d4. | cooperate and work in team smoothly and manage the time while going to the targeted goals. |  |  | 🗸 |  |  | 🗸 |

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| **5. Students’ Assessment Methods and Grading:** |

**5.1.** Discussion, class activites and quizzes to assess the student progress and personal attitude,

**5.2.** Assignments to assess the student independen work,

**5.3.** Written mid-term exam to ensure the student progress and discover the shortage,

**5.4.** Final written and oral exam to evaluate students and promote for other consequent courses.

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| **Tools** | **To Measure** | **Time schedule** | **Grading** |
| Semester work | ILOs a, b, d  | Semester course | 8 % |
| Mid-Term exam | First ½ of ILOs a, b, c  | Seventh week | 6 % |
| Practical exam | ILOs c, b | Thirteenth week | 24 % |
| Oral exam | ILOs c, b | Thirteenth week | 14 % |
| Final written exam | ILOs a, b, c  | Fourteenth week | 48 % |
| Total | 100 % |

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| **6. List of references:** |
| **6.1. Course notes**Course notes prepared by the course instructor(s) and approved by the department council**6.2. Required books** None**6.3. Recommended books**Ore Microscopy and Ore Petrography Author: James R. Craig and David J. Vaughan Publisher: John Wiley and Sons (WIE); 2nd edition (May 31, 1995), 448 pages Robb, L. (2005) Introduction to Ore-Forming Processes. Blackwell Publishing <http://www.smenet.org/opaque-ore/IX_t_0.htm>**6.4. Periodicals, Web sites, etc.**Economic Geology Ore Geology ReviewsMineralium Deposita |
| **7. Facilities required for teaching and learning:** |
| Data show: Power point presentations Sound system to ensure the ease listening Polished and thin sections of ore depositsReflected-light microscopes  |
| **Course coordinator:** | Prof. Basem ZoheirDr. Amr Abdelnasser |  |
| **Head of the Department:** | Prof. Dr. Mohamed El-Fakharany |
| **Date:** | 2016-2017 |  |