

**Department of Mining, Petroleum and Metallurgical Engineering**

**Cairo University  
Faculty of Engineering**

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| **Course Specifications** | | | | | | | | | | | | | | | | | |
| **Program(s) on which this course is given:** | | | | | | | Materials and Metallurgical Engineering | | | | | | | | | | |
| **Department offering the program:** | | | | | | | Department of Mining, Petroleum and Metallurgical Engineering | | | | | | | | | | |
| **Department offering the course:** | | | | | | | Department of Mining, Petroleum and Metallurgical Engineering | | | | | | | | | | |
| **Academic Level:** | | | | | | | Year | | | | | | | | | | |
| **Date** | | | | | | | 2007 | | | | | | | | | | |
| **Semester (based on final exam timing)** | | | | | | | Fall Spring | | | | | | | | | | |
| **A- Basic Information** | | | | | | | | | | | | | | | | | |
| **1. Title:** | Physical Metallurgy 1 | | | | | | | | | **Code:** | | | MET 202A | | | | |
| **2. Units/Credit hours per week:** | | Lectures | | | 4 | | | Tutorial | | | 2 | Practical | | **----** | | Total | 6 |
| **B- Professional Information** | | | | | | | | | | | | | | | | | |
| **1. Course description:** | | | |  | | | | | | | | | | | | | |
| **2. Intended Learning Outcomes of Course (ILOs):** | | | | **a) Knowledge and Understanding** | | | | | | | | | | | | | |
| 1. Engineering principles and Basic topics related with metals and alloys.  2. Current engineering technologies and contemporary metallurgical engineering topics related to metallurgical engineering. | | | | | | | | | | | | | |
| **b) Intellectual Skills** | | | | | | | | | | | | | |
| 3. Select and identify the appropriate material and manufacturing aspects of design of a component  4. Think in a creative and innovative way in problem solving and design considering quality assurance systems, codes of practice and standards, health and safety requirements, professional ethics and impacts of engineering solutions on society and environmen | | | | | | | | | | | | | |
| **c) Professional and Practical Skills** | | | | | | | | | | | | | |
| 5. Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services | | | | | | | | | | | | | |
| **d) General and Transferable Skills** | | | | | | | | | | | | | |
| 6. Communicate effectively | | | | | | | | | | | | | |
| **3. Contents** | | | | | | | | | | | | | | | | | |
| **Topic** | | | | | | **Total hours** | | | **Lectures hours** | | | | | | **Tutorial/ Practical hours** | | |
| 1. Metallic crystal structures {BCC-FCC-HCP} (coordination number, no. of atoms per unit cell, relation between atomic radius and lattice constant, atomic packing factor). | | | | | | 12 | | | 8 | | | | | | 4 | | |
| 1. Miller and direction indices, closed packed structures, linear density, planar density, slip direction, slip plane, and density computations. | | | | | | 16 | | | 8 | | | | | | 8 | | |
| 1. Point defects (vacancies, impurities,…), linear defects (edge, screw, and mixed dislocations), dislocation sources. | | | | | | 6 | | | 5 | | | | | | 1 | | |
| 1. Planar defects (twin boundaries, grain boundaries, stacking faults,….), volume defects (pores, cracks, ….). | | | | | | 5 | | | 5 | | | | | | --- | | |
| 1. Diffusion mechanisms. | | | | | | 4 | | | 4 | | | | | | --- | | |
| 1. Modelling diffusion (steady and unsteady state diffusion). | | | | | | 15 | | | 8 | | | | | | 7 | | |
| 1. Factors influencing diffusion and diffusion paths. | | | | | | 2 | | | 2 | | | | | | --- | | |
| 1. Homogeneous and heterogeneous nucleations. | | | | | | 6 | | | 4 | | | | | | 2 | | |
| 1. Energies involved in solidification of a pure metal, types of grains. | | | | | | 8 | | | 4 | | | | | | 4 | | |
| 1. Classification of engineering materials. | | | | | | 10 | | | 8 | | | | | | 2 | | |
| **4. Teaching and Learning Methods** | | | | | | Lectures ( ) | | | Practical Training/ Laboratory ( ) | | | | | | Seminar/Workshop ( ) | | |
| Class Activity ( ) | | | Case Study ( ) | | | | | | Projects ( ) | | |
| E-learning ( ) | | | Assignments /Homework ( ) | | | | | | Other: | | |
| **5. Student Assessment Methods** | | | | | | | | | | | | | | | | | |
| * **.Assessment Schedule** | | | | | | | | | **Week** | | | | | | | | |
| -Assessment 1; Class test | | | | | | | | |  | | | | | | | | |
| -Assessment 2; Project Assignment | | | | | | | | |  | | | | | | | | |
| -Assessment 3; Presentations | | | | | | | | |  | | | | | | | | |
| -Assessment 3; Midterm Exam | | | | | | | | |  | | | | | | | | |
| -Assessment 4; Final Exam | | | | | | | | |  | | | | | | | | |
| * **Weighting of Assessments** | | | | | | | | | | | | | | | | | |
| -Mid-Term Examination | | | | | | | | |  | | | | | | | | |
| -Final-term Examination | | | | | | | | |  | | | | | | | | |
| -Project | | | | | | | | |  | | | | | | | | |
| -Class Test | | | | | | | | |  | | | | | | | | |
| -Presentation | | | | | | | | |  | | | | | | | | |
| -Total | | | | | | | | |  | | | | | | | | |
| **6. List of References** | | | | | | | | | | | | | | | | | |
| * Course Notes | | | | | | | | | | | | | | | | | |
| * Essential Books (Text Books) | | | | | | | | | | | | | | | | | |
| * William D. Callister, Jr., "Materials science and engineering-An introduction", John Willey & Sons, Inc., 2007. * Michael F.Ashby & David R.H. Jones, "Engineering materials – An introduction to microstructures, processing and design", Pergamon press, 1986. | | | | | | | | | | | | | | | | | |
| * Recommended Books. --------- | | | | | | | | | | | | | | | | | |
| * Periodicals, Web Sites, … etc: N/A | | | | | | | | | | | | | | | | | |
| **7. Facilities Required for Teaching and Learning** | | | | | | | | | | | | | | | | | |
| * Small group of students. | | | | | | | | | | | | | | | | | |
| **Course Coordinator:** | | | Prof. Dr. Ahmed Mohamed El-Sheikh  Dr. Moetaz Mohamed Nabil Mohamed Mohamed Ahmed | | | | | | | | | | | | | | |
| **Head of Department:** | | | Prof. Dr. Nahed Ahmed Abd El-Reheem | | | | | | | | | | | | | | |

