

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

**Cairo University  
Faculty of Engineering**

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| **Course Specifications** | | | | | | | | | | | | | | | | | |
| **Program(s) on which this course is given:** | | | | | | | Metallurgical Engineering | | | | | | | | | | |
| **Department offering the program:** | | | | | | | Mining, Petroleum and Metallurgical Engineering | | | | | | | | | | |
| **Department offering the course:** | | | | | | | Mining, Petroleum and Metallurgical Engineering | | | | | | | | | | |
| **Academic Level:** | | | | | | | 3rd Year | | | | | | | | | | |
| **Date** | | | | | | | December 2014 | | | | | | | | | | |
| **Semester (based on final exam timing)** | | | | | | | Fall Spring | | | | | | | | | | |
| **A- Basic Information** | | | | | | | | | | | | | | | | | |
| **1. Title:** | Physical Metallurgy | | | | | | | | | **Code:** | | | **MET 301 A** | | | | |
| **2. Units/Credit hours per week:** | | Lectures | | | 4 | | | Tutorial | | | 2 | Practical | | 0 | | Total | 6 |
| **B- Professional Information** | | | | | | | | | | | | | | | | | |
| **1. Course description:** | | | | * Explaining the physical and mechanical aspects of physical metallurgy. | | | | | | | | | | | | | |
| * Indicating the effect of microstructure of metals on their properties. | | | | | | | | | | | | | |
| * Discussing the use of different metals in real life applications. | | | | | | | | | | | | | |
| **2. Intended Learning Outcomes of Course (ILOs):** | | | | **a) Knowledge and Understanding** | | | | | | | | | | | | | |
| 1. Fundamentals of materials science and physical metallurgy their relation to metallurgical and materials related topics. | | | | | | | | | | | | | |
| **b) Intellectual Skills** | | | | | | | | | | | | | |
| 2. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources in topics related to material processing, manufacturing, development and selection. | | | | | | | | | | | | | |
| **c) Professional and Practical Skills** | | | | | | | | | | | | | |
| **d) General and Transferable Skills** | | | | | | | | | | | | | |
| 3. Search for information and engage in life-long self learning discipline to learn ccurrent engineering technologies and contemporary metallurgical engineering topics related to metallurgical engineering. | | | | | | | | | | | | | |
| **3. Contents** | | | | | | | | | | | | | | | | | |
| **Topic** | | | | | | **Total hours** | | | **Lectures hours** | | | | | | **Tutorial/ Practical hours** | | |
| a) Fracture: types, theoretical strength of metals, brittle fracture, ductile fracture, factors affecting fracture, ductile- brittle transition, super plasticity. | | | | | | 6 | | | 3 | | | | | | 2 | | |
| b) Fatigue: Factors affecting fatigue of metals, mechanisms of fatigue, structural changes during fatigue, fatigue limit, methods of increasing fatigue life, corrosion fatigue, fretting. | | | | | | 6 | | | 3 | | | | | | 2 | | |
| c) Creep: creep curve, factors affecting creep of metals, empirical equations for creep, temperature dependence of creep and activation energy, creep theories, structural changes during creep, creep failure. | | | | | | 8 | | | 4 | | | | | | 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 | | | | | | | | | 4th | | | | | | | | |
| -Assessment 3; Presentations | | | | | | | | | 8th | | | | | | | | |
| -Assessment 3; Midterm Exam | | | | | | | | | 5th | | | | | | | | |
| -Assessment 4; Final Exam | | | | | | | | | End of Term | | | | | | | | |
| * **Weighting of Assessments** | | | | | | | | | | | | | | | | | |
| -Mid-Term Examination | | | | | | | | | 10% | | | | | | | | |
| -Final-term Examination | | | | | | | | | 70% | | | | | | | | |
| -Project | | | | | | | | | 5% | | | | | | | | |
| -Class Test | | | | | | | | | 10% | | | | | | | | |
| -Presentation | | | | | | | | | 5% | | | | | | | | |
| -Total | | | | | | | | | 100% | | | | | | | | |
| **6. List of References** | | | | | | | | | | | | | | | | | |
| 6.a. Course Notes | | | | | | | | | | | | | | | | | |
| 6.b. Essential Books (Text Books) | | | | | | | | | | | | | | | | | |
| * Suggested by the Academic Advisor | | | | | | | | | | | | | | | | | |
| 1. Mechanical Behaviour of Materials; by T. H. Courtney, Mc- Graw Hill. | | | | | | | | | | | | | | | | | |
| 2. Mechanical Metallurgy; by G. E. Dieter, Mc- Graw Hill. | | | | | | | | | | | | | | | | | |
| 3. Physical Metallurgy Principles; R. E. Reed Hill, Van Nostrand Co. | | | | | | | | | | | | | | | | | |
| 4. Elements of Physical Metallurgy; by A. G. Guy, Addison- Wesley Co. | | | | | | | | | | | | | | | | | |
| 5. Mechanical Behaviour of Materials, by Keith Bowman, John Wiley & Sons. | | | | | | | | | | | | | | | | | |
| 6. Physical Foundations of Materials Science; by Junter Gottstein, Springer Pub. Co. | | | | | | | | | | | | | | | | | |
| 6.c. Recommended Books. | | | | | | | | | | | | | | | | | |
| * Suggested by the Academic Advisor | | | | | | | | | | | | | | | | | |
| 6.d. Periodicals, Web Sites, … etc: N/A | | | | | | | | | | | | | | | | | |
| **7. Facilities Required for Teaching and Learning** | | | | | | | | | | | | | | | | | |
| - Small group of students. | | | | | | | | | | | | | | | | | |
| - Up-to-date references in library | | | | | | | | | | | | | | | | | |
| **Course Coordinator:** | | | Prof. Dr. Mohamed Mamdouh Ibrahim Ahmed | | | | | | | | | | | | | | |
| **Head of Department:** | | | Prof. Dr. E.M. Elbanna | | | | | | | | | | | | | | |

