

**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.
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| * Indicating the effect of microstructure of metals on their properties.
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| * Discussing the use of different metals in real life applications.
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| **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**
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| -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
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| 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
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| 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 |

