

**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:** | Metallurgical Engineering |
| **Department offering the program:** | Department of Mining, Petroleum and Metallurgical Engineering |
| **Department offering the course:** | Metallurgical Engineering |
| **Academic Level:** | Third year |
| **Date**  | 2014 |
| **Semester (based on final exam timing)** |  Fall Spring |
| **A- Basic Information** |
| **1. Title:** | X-ray  | **Code:** | MET 309 |
| **2. Units/Credit hours per week:**  | Lectures | 3 | Tutorial | 1 | Practical | **0** | Total | 4 |
| **B- Professional Information** |
| **1. Course description:** | The course introduces the principles of x-ray diffraction and their applications in physical metallurgy. |
| **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. Assess and evaluate the characteristics, performance and failure of components, systems and processes. |
| **c) Professional and Practical Skills** |
| 3. Use appropriate mechanical testing, corrosion testing, optical, X-ray, and electron metallographic, and chemical analysis methods for metals and alloys.  |
| 4. Prepare and present technical reports observing ethical aspects, using proper referencing, and citation. |
| **d) General and Transferable Skills** |
| 5. Communicate and collaborate effectively within a multidisciplinary team. |
| **3. Contents** |
| **Topic** | **Total hours** | **Lectures hours** | **Tutorial/ Practical hours** |
| Applications of x-ray diffraction Properties of x-rays and principles of x-ray diffraction | 14 | 10 | 4 |
| Determination of Crystal StructureTextureAnalysis Phase DiagramsOrdering-DisorderingChemical analysis, Phase Quantities and Residual Stresses | 30 | 20 | 10 |
| Introduction to transmission and scanning microscopy applications in studies dislocations microstructure and fractography | 8 | 6 | 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  | 2,4,6,9,11 and 13 |
| -Assessment 2; Project Assignment  | 5th |
| -Assessment 3; Presentations  | 12 |
| -Assessment 3; Midterm Exam | 8th |
| -Assessment 4; Final Exam | End of the term |
| * **Weighting of Assessments**
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| -Mid-Term Examination | 15% |
| -Final-term Examination  | 60% |
| -Project | 5% |
| -Class Test | 5% |
| -Presentation | 15% |
| -Total | 100% |
| **6. List of References** |
| 6.1 Course Notes  |
| 6.2- Essential Books (Text Books)1. H.Lipson, H.Steeple; “Interpretation of x-ray powder diffraction patterns”, (1970).
2. Barbra L. Gabriel; “A user’s Manual for Materials Science”, (1985).
3. R.E. Smallman, K.H.G.Ashbee; “Modern Metallurgy”.
4. G.N.Maniar, Albert Szirmae; “Manual on Electron Metallography Techniques”.
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| **7. Facilities Required for Teaching and Learning** |
| .- overhead projector - Data Show- Laptop. |
| **Course Coordinator:** | **Prof.Dr/ El-Sayed Mahmoud El-Banna** |
| **Head of Department:**  | **Prof.Dr/ El-Sayed Mahmoud El-Banna** |

