

**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 Structure  Texture  Analysis Phase Diagrams  Ordering-Disordering  Chemical 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** | | | | | | | | | | | | | | | | | |
| -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”. | | | | | | | | | | | | | | | | | |
| **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** | | | | | | | | | | | | | | |

