

**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**  | 2014 |
| **Semester (based on final exam timing)** |  Fall Spring |
| **A- Basic Information** |
| **1. Title:** | Metallurgical Thermodynamics And Corrosion | **Code:** | **MET 302** |
| **2. Units/Credit hours per week:**  | Lectures | 4 | Tutorial | 1 | Practical | 1 | Total | 6 |
| **B- Professional Information** |
| **1. Course description:** | * Heat of chemical reactions.
 |
| * Statistical interpretation of entropy.
 |
| * Applications of second law of thermodynamics.
 |
| * Change of entropy. Free energy. Chemical equilibria.
 |
| * Equilibrium of gas-solid reactions.
 |
| * Equilibrium of gas reactions. Behavior of solutions.
 |
| * Electrochemistry of corrosion. Types of corrosion. Kinetics of corrosion and effect of various factors. Corrosion control. Corrosion testing.
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| **2. Intended Learning Outcomes of Course (ILOs):** | **a) Knowledge and Understanding** |
| 1. Physical and electrochemistry and their relation to corrosion and extraction, purification and processing of metals and alloys. |
| 2. Metallurgical thermodynamics and relation to metallurgical processes. |
| **b) Intellectual Skills** |
| 3. 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** |
| 4. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve metallurgical engineering problems. |
| 5. Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services. |
| 6. Use appropriate mechanical testing, corrosion testing, optical, X-ray, and electron metallographic, and chemical analysis methods for metals and alloys. |
| **d) General and Transferable Skills** |
| 7. 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** |
| * Heat of chemical reactions.
 | 6 | 4 | 2 |
| * Statistical interpretation of entropy.
 | 6 | 4 | 2 |
| * Applications of second law of thermodynamics.
 | 6 | 4 | 2 |
| * Change of entropy. Free energy. Chemical equilibria.
 | 6 | 4 | 2 |
| * Equilibrium of gas-solid reactions.
 | 6 | 4 | 2 |
| * Equilibrium of gas reactions. Behaviour of solutions.
 | 2 | 2 |  |
| * Electrochemistry of corrosion. Types of corrosion. Kinetics of corrosion and effect of various factors. Corrosion control. Corrosion testing.
 | 6 | 4 | 2 |
| **4. Teaching and Learning Methods** | Lectures (🗸)  | Practical Training/ Laboratory (🗸)  | Seminar/Workshop ( )  |
| Class Activity ( )  | Case Study ( )  | Projects ( )  |
| E-learning ( )  | Assignments /Homework (🗸)  | Other: Discussions |
| **5. Student Assessment Methods** |
| * **.Assessment Schedule**
 | **Week** |
| -Assessment 1; Class test  |  |
| -Assessment 2; Project Assignment  |  |
| -Assessment 3; Presentations  |  |
| -Assessment 3; Midterm Exam | Week 6, 10 |
| -Assessment 4; Final Exam |  |
| * **Weighting of Assessments**
 |
| -Mid-Term Examination | 20 % |
| -Final-term Examination  | 66 %  |
| -Project |  |
| -Class Test |  |
| -Presentation |  |
| -Total | 100 % |
| **6. List of References** |
| 6.1- Course Notes |
| 6.2- Essential Books (Text Books) |
| * Gaskel, D. Introduction to Metallurgical Thermodynamics.
 |
| * Zemansky, Mark, and Richard Dittman. Heat and Thermodynamics. 7th ed. McGraw-Hill Publishers
 |
| 6.3- Recommended Books |
| --------------- |
| 6.4- Periodicals, Web Sites, … etc |
| ----------------- |
| **7. Facilities Required for Teaching and Learning** |
| Board  |
| data show |
| lab top |
| **Course Coordinator:** | Prof. Dr. Hafez Abd El Azeem, Prof. Dr. Randa Abd El Kreem |
| **Head of Department:**  | Prof. Dr. E.M. Elbanna |

