| Course Name | | | | | | |
|---|---|---|---|---|---|---|
| **Metallurgy Laboratories III** | | | | | | |
| | | | | **Course Implementation, Hours/Week** | | |
| **Code** | **Semester** | **Local Credits** | **ECTS Credits** | **Theoretical** | **Tutorial** | **Laboratory** |
| MET 433 | 7 | 1.5 | 4.0 | - | - | 3 |

| | | | | |
|---|---|---|---|---|
| **Department/Program** | Metallurgical and Materials Engineering Department | | | |
| **Course Type** | Required | **Course Language** | Turkish | |
| **Course Prerequisites** | - | | | |
| **Course Category by Content, %** | **Basic Sciences** | **Engineering Science** | **Engineering Design** | **General Education** |
| | | % 20 | % 80 | |

| | |
|---|---|
| **Course Description** | Basic principles of electrochemical corrosion and galvanic corrosion, Passivation and cathodic protection, Hardness-Impact-Erichsen tests of metallic materials, Tensile-Compression-Bending tests of metallic materials, Wear-Torsion tests of metallic materials, Stress relaxation-Fatigue-Creep tests of metallic materials, Heat treatment (Tempering, Hardening, Hardening capability, Jominy test), Casting experiments, Determination of humidity amount, Sieve analysis, $CO_2$ sodium silicate method for die production |
| **Course Objectives** | It is primarily targeted in this course to experimentally show the students the subject material they learned theoretically in courses such as materials science and basic principles of electrochemical corrosion, materials mechanical testing, plastic deformation, heat treatment, casting experiments etc. It is also the purpose of this course to direct the students' knowledge to be exploited in the design and applications. Students will gain an understanding about the basic concepts of production processes and the relationships between the parameters and processes, and the correlation between structure, property, and performance of a given material, and ability to analyze the results. Moreover, oral and written communication skills of the students are intended to be improved by the conversations held before, during, and after the experiments for discussing the preparation of experiments and their results, and by preparing a formal written report. |
| **Course Learning Outcomes** | 1. It is the aim of this course to experimentally show the students the subject material they learned theoretically in courses such as materials science and basic principles of electrochemical corrosion, materials mechanical testing, plastic deformation, heat treatment, casting experiments, etc.<br>2. Getting information about materials selection and design according to their manufacturing techniques and applications areas.<br>3. Students will gain an understanding about the various materials, their features and relation between structure-property-performance of the materials<br>4. Teaching of different characterization techniques and approaches applied to materials.<br>5. Moreover, oral and written communication skills of the students are intended to be improved by holding conversations before, during, and after the experiments to discuss the setting up the experiments and their results, and by preparing a formal written report. |
| **Text Book** | Metallurgy Laboratory Pamphlet, and other resources defined for each experiment |
| **Homework & Projects** | |
| **Laboratory Work** | **9 EXPERIMENTS** |
| **Computer Use** | **USE OF WORD AND EXCEL, DATA EVALUATION PROGRAMMS** |
| **Other Activities** | **LABOROTORY ORIENTATION (LAB SECURITY)** |

| | | | |
|---|---|---|---|
| **Assessment Criteria** | | **Quantity** | **Effects on Grading, %** |
| | **Activities** | **-** | **-** |
| | **Midterm Exams** | **-** | **-** |
| | **Quizzes** | **9** | **20** (Quiz / Experiment) |
| | **Homework** | **-** | **-** |
| | **Projects** | **-** | **-** |
| | **Term Paper/Project** | **-** | **-** |
| | **Laboratory Work** | **9** (Exp) | **60** (Written Report / Experiment) |
| | **Other Activities** | | **20** (Participation in the experiments) |
| | **Final Exam** | **-** | **-** |

**COURSE PLAN**

| Weeks | Topics | Course Outcomes |
|---|---|---|
| **1** | Registration | 1 |
| **2** | Introduction to metallurgical laboratories and labratory security. | 1 |
| **3** | Basic principles of electrochemical corrosion and galvanic corrosion | 1-5 |
| **4** | Passivation and cathodic protection | 1-5 |
| **5** | Hardness-Impact-Erichsen tests of metallic materials | 1-5 |
| **6** | Tensile-Compression-Bending tests of metallic materials | 1-5 |
| **7** | Wear-Torsion tests of metallic materials | 1-5 |
| **8** | Stress relaxation-Fatigue-Creep tests of metallic materials | 1-5 |
| **9** | Heat treatment (Tempering, Hardening, Hardening capability, Jominy test) | 1-5 |
| **10** | Casting experiments, Determination of humidity amount | 1-5 |
| **11** | Sieve analysis, $CO_2$ sodium silicate method for die production | 1-5 |
| **12** | Make-up experiments | |
| **13** | Make-up experiments | |
| **14** | Make-up experiments | |

**Relationship between the Course and Metallurgical and Materials Engineering Curriculum**

| | Program Outcomes | Level of Contribution | | |
|---|---|---|---|---|
| | | **1** | **2** | **3** |
| 1 | Ability to apply the knowledge of mathematics, science and engineering principles to solve problems in metallurgical and materials engineering (ABET:a) | X | | |
| 2 | Ability to characterize materials using standard and/or self designed experimental methods and to evaluate the results (ABET:b) | | | X |
| 3 | Ability to design a system or a process, taking into consideration of the desired specifications, quality, ethics and environment. (ABET:c) | | | |
| 4 | Ability to communicate both orally and in the written form and to take part in, and provide leadership of the teams in the elucidation of engineering problems; (ABET:d, g) | | X | |
| 5 | Ability to define, formulate and solve engineering problems in the development, production, processing, protection and usage of engineering materials. (ABET:e) | | | X |
| 6 | An understanding of professional and ethical responsibilities(ABET:f) | X | | |
| 7 | An understanding of current/contemporary issues and impact of engineering solutions in broad cultural, national and global levels;. (ABET:h, j) | | | |
| 8 | A comprehension of the nature of engineering progress closely linked with the development of new materials and production processes. An ability to engage in life-long learning and a recognition of its necessity (ABET:i) | X | | |
| 9 | Ability to use essential tools and techniques of modern engineering in the development, production, processing, protecting and surface treatment of the existing and new engineering materials. (ABET:k) | X | | |

**1: Little, 2. Partial, 3. Full**

**Course relationships with major elements of the field and material classes**

| | | Level of Contribution | | |
|---|---|---|---|---|
| | | **1** | **2** | **3** |
| **MAJOR ELEMENT OF THE FIELDS** | **STRUCTURE** | | | **X** |
| | **PROPERTIES** | | | **X** |
| | **DESIGN EXPERIMENT/ANALYSE DATA** | | | **X** |
| | **PROCESSING** | | **X** | |
| | **COST/PERFORMANCE** | **X** | | |
| | **QUALITY/ENVIRONMENT** | | | **X** |
| | **DESIGN PROCESS OR PRODUCT** | | | **X** |
| **MATERIAL CLASSES** | **METAL** | | | **X** |
| | **CERAMICS** | **X** | | |
| | **POLYMERS** | | | |
| | **COMPOSITES** | | | |

**1: Little, 2. Partial, 3. Full**

| **Prepared by** | Date | **Signature** |
|---|---|---|
| All Faculty Members | 25.12.2009 | |