| Course Description Form | |
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| **Course Code and Name** | ME 207-MATERIALS SCIENCE |
| **Course Semester** | 3 |
| **Catalog Content** | 1. Classification of engineering materials<br>2. Atom and crystal structure, crystal defects, microstructural examination of materials<br>3. Diffusion in metals<br>4. Phase diagrams and Iron-Carbon phase diagram<br>5. Material test methods and mechanical properties<br>6. Heat treatments<br>7. Strength hardening mechanisms |
| **Textbook** | Materials Science and Engineering: An Introduction, W.D. Callister, 8th ed., John Wiley, 2007 |
| **Supplementary Textbooks** | The Science and Engineering of Materials, D.R. Askeland |
| **Credit** | 6 |
| **Prerequisites of the Course ( Attendance Requirements)** | Attendance:70% |
| **Type of the Course** | Compulsory |
| **Instruction Language** | English |
| **Course Objectives** | 1.To gain knowledge about engineering materials<br>2. To understand relation between microstructure and mechanical properties of engineering materials<br>3. To analysis the general criteria about the material selection in product design |
| **Course Learning Outcomes** | 1.To gain knowledge about atomic structure, interatomic bonding, crystal structure of materials, diffusion in metals<br>2. Learning the engineering materials and their general properties<br>3. To gain theoretical knowledge and practical experience about mechanical tests of metallic materials<br>4. Gaining ability to analysis the mechanical test results<br>5. To design and control the heat treatment procedures<br>6.To understand the iron-carbon phase diagram and phase transformation in steels<br>7. To understand the relationship between microstructure and mechanical properties of engineering materials<br>8. To learn the general criteria about the material selection in product design |
| **Instruction Methods** | The mode of delivery of this course is face to face and practice laboratories |
| **Weekly Schedule** | 1. Week: Introduction to Engineering Materials: Classissification, Metals, Ceramics, Polymers, Composites<br>2. Week: Interatomic Bonding<br>3. Week: The Structure of Crystalline Solids: Atomic arrangements and crystals, Imperfections in crystals, Microstructural examination of materials<br>4. Week: The Structure of Crystalline Solids: Atomic arrangements and crystals, Imperfections in crystals, Microstructural examination of materials<br>5. Week: Diffusion in metals<br>6. Week: Phase diagrams<br>7. Week: Mechanical Testing and Properties: Tensile test, Hardness test, Fatigue test, Creep test, Impact test, Bending and Shear (Torsion), Wear and Corrosion test methods |

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| | 8. Week: Midterm Exam I: Mechanical Testing and Properties: Tensile test, Hardness test, Fatigue test, Creep test, Impact test, Bending and Shear (Torsion), Wear and Corrosion test methods<br>9. Week: Ferrous and Nonferrous alloys<br>10. Week: Ferrous and Nonferrous alloys<br>11. Week: Iron-carbon phase diagrams and Heat treatments<br>12. Week: Midterm Exam I: Iron-carbon phase diagrams and Heat treatments<br>13. Week: Strengthening mechanisms<br>14. Week: Strengthening mechanisms<br>15. Week: Final Exam |
| **Teaching and Learning Methods**<br><br>*(These are examples. Please fill which activities you use in the course)* | Weekly theoretical course hours :3<br>Weekly practical course hours:1<br>Reading Activities: 2<br>Internet browsing, library work:2<br>Other,Homeworks:4<br>Midterm Exam and Preparation for Midterm Exam:10<br>Final Exam and Preparation for Final Exam:10 |

**Assessment Criteria**

| | Numbers | Total Weighting (%) |
|---|---|---|
| Midterm Exams | 2 | 45 |
| Homework | 8 | 10 |
| Application | 0 | 0 |
| Projects | 0 | 0 |
| Practice | 0 | 0 |
| Quiz | 0 | 0 |
| Percent of In-term Studies (%) | | 60 |
| Percentage of Final Exam to Total Score (%) | | 40 |
| Attendance | | 5 |

**Workload**

| Activity | Total Number of Weeks | Duration (weekly hour) | Total Period Work Load |
|---|---|---|---|
| Weekly Theoretical Course Hours | 14 | 3 | 42 |
| Weekly Practical Course Hours | 14 | 1 | 14 |
| Reading Tasks | 11 | 2 | 22 |
| Internet browsing, library work | 11 | 2 | 22 |
| Material Design and Implementation | 0 | 0 | 0 |
| Preparing Report | 0 | 0 | 0 |
| Preparing a Presentation | 0 | 0 | 0 |
| Presentations | 0 | 0 | 0 |
| Midterm Exam and Preperation for Midterm Exam | 2 | 10 | 20 |
| Final Exam and Preperation for Final Exam | 1 | 10 | 10 |
| Other (homeworks) | 5 | 4 | 20 |
| Total Workload | 150 | | |
| Total Workload / 25 | 6 | | |
| Course Credit (ECTS) | 5 | | |

**Contribution Level Between Course Learning Outcomes and Program Outcomes**

| No | Program Outcomes | 1 | 2 | 3 | 4 | 5 |
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| 1 | Adequate knowledge of subjects specific to mathematics, natural sciences and related engineering disciplines; ability to use theoretical and applied knowledge related to these areas in complex engineering problems. | | | | x | |
| 2 | Ability to identify, define, formulate, and solve complex engineering problems; ability to select and apply appropriate analysis and modeling methods to this end. | | | | x | |
| 3 | Ability to design a complex system, process, device or product under realistic constraints and conditions to meet specific requirements; ability to apply modern design methods for this purpose . | | | x | | |
| 4 | Ability to develop, select and use modern techniques and tools required for the analysis and solution of complex problems encountered in engineering practice; ability to use information technologies effectively. | | | | | |
| 5 | Ability to design and conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics | | | | | |
| 6 | Ability to work effectively in disciplinary and multi-disciplinary teams; ability to work individually. | | | | | |
| 7 | Ability to communicate effectively in Turkish, both orally and in writing; knowledge of at least one foreign language; the ability to write effective reports and understand written reports, to prepare design and production reports, to deliver effective presentations, to give and receive clear and understandable instructions. | | | | | |
| 8 | Awareness of the necessity of lifelong learning; the ability to access information, to follow developments in science and technology, and to renew oneself constantly. | | | | | |
| 9 | Acting in accordance with ethical principles, professional and ethical responsibility; information about standards used in engineering applications. | | | | | |
| 10 | Information about business life practices such as project management, risk management and change management; awareness of entrepreneurship, innovation; | | | | | |

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| | | information about sustainable development. | | | | | | |
| | 11 | Knowledge about the universal and social effects of engineering applications on health, environment and safety and the problems of the age reflected in the engineering field; awareness of the legal consequences of engineering solutions. | | | | | | |
| **The Course's Lecturer(s) and Contact Informations** | 1. Prof. Dr. Rahmi Ünal, runal@gazi.edu.tr<br>2. Doç.Dr. Elmas Salamcı, esalamci@gazi.edu.tr<br>3. Doç. Dr. Gökhan Küçüktürk, gkucukturk@gazi.edu.tr | | | | | | | |