

COURSE CATALOG

| Course Code: CE 203 | | | | Course Name: Engineering Materials | | | |
|--|-----------|---------|--|---|---------------|---------------------|-----------------|
| Semester | T + P + L | Credits | ECTS | Language of Instruction | Course Type | Instruction Methods | Prerequisite(s) |
| 3 | 3 + 0 + 0 | 3 | 5 | English | Required (D1) | Lecture | - |
| Course Objectives | | | Introduction to material science and classification of atomic structures of the materials. Crystal structures and imperfections. Mechanical and physical properties of the engineering materials. Metals and alloys. Plastics. Binders. Portland cements. Aggregates. Concrete: Properties of fresh & hardened concrete, mix design, production of concrete. Durability. | | | | |
| Topics Covered | | | Description of atomic structure. Types of atomic bonding and their characteristics properties. Atomic arrangement and crystal structure. Crystallographic planes and directions in the unit cell. Linear and planar atomic density, atomic packaging factor. Mechanical and physical properties of materials. Metals. Plastics. Lime. Gypsum. Pozzolan. Portland cement. Properties of aggregates. Fresh and hardened concrete properties. Concrete mixture design. Production and curing. Exposure classes. | | | | |
| Learning Outcomes of the Course | | | <p>After successfully completing this course students should gain:</p> <ol style="list-style-type: none"> 1. to learn the structure of engineering materials, and be able to classify them according to their internal structures [1,2,4,13]. 2. to understand the mechanical properties and their testing methods as a tool for material selection and design. Plot a stress-strain diagram and calculate the basic mechanical properties [2,5,6,13]. 3. to understand the basic mechanical and physical properties of engineering materials and be able to interpret the relationship between structure and properties [1,2,4]. 4. to recognize the basic properties of ceramics, concrete, polymer and composite materials, and demonstrate how basic properties change for different materials [1,2,5,13]. 5. learn the properties of binders and their effects on the properties of concrete [4,5]. 6. be able to classify the aggregates and obtain proper grading for concrete [4,5,6]. 7. understand the properties of fresh and hardened concrete properties and the tests needed to determine the properties [1,2,4]. 8. learn mixture proportioning, production and curing of concrete [1,2,4]. 9. learn the deterioration mechanisms affecting the durability of concrete, classify them as environmental exposure classes [2,5,6] <p><i>[Note that the numbers in between the brackets address the bullet numbers in the program outcomes list.]</i></p> | | | | |
| ISCED Category of the Course | | | 52 Engineering | | | | |
| Textbook | | | <ol style="list-style-type: none"> 1. J.M. Illston and P. Domone, "Construction Materials" E&FN SPON., 1994. 2. W.D. Callister, "Materials Science and Engineering an Introduction", 7th Edition, John Wiley & Sons, Inc, 2007. | | | | |
| Recommended Sources | | | <ol style="list-style-type: none"> 1- James F. Shackelford, "Introduction to Materials Science for Engineers", McMillan Pub. Co., 1992. 2- D.R. Askeland, P.P. Phule, "The Science and Engineering of Materials", Thomson Pub. 5th Edition 2006. 3- A.M. Neville, "Properties of Concrete", Pearson Prentice Hall. 2004. 4- S. Mindess and J.F. Young, "Concrete", Prentice Hall, 1981. | | | | |

WEEKLY SCHEDULE

| Week | Theoretical Topic | Applied / Laboratory Topics |
|------|---|-----------------------------|
| 1 | Description of atomic structure, | |
| 2 | Types of atomic bonding and their characteristics properties. | |
| 3 | Atomic arrangement and crystal structure. | |
| 4 | Crystallographic planes and directions in the unit cell. | |
| 5 | Linear and planar atomic density, | |
| 6 | Atomic defections. Atomic packaging factor. | |
| 7 | Mechanical and physical properties of materials. | |
| 8 | Metals. Plastics. | |
| 9 | Lime. Gypsum. Pozzolan. | |
| 10 | Portland cement. Properties of aggregates. | |

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|----|---|--|
| 11 | Fresh and hardened concrete properties. | |
| 12 | Concrete mixture design. | |
| 13 | Production and curing. | |
| 14 | Exposure classes. | |

COURSE ASSESSMENT POLICY

| | Activities | Number | Contribution (%) |
|------------------------------------|-----------------------------------|--------|------------------|
| Studies throughout the term | Quizes | 3 | 05 |
| | Term Homework/ Project | - | - |
| | Reports | - | - |
| | Graduation Thesis/ Project | - | - |
| | Seminar | - | - |
| | Homework | 5 | 10 |
| | Presentations | - | - |
| | Midterm Exams | 2 | 40 |
| | Project | - | - |
| | Laboratory | - | - |
| | Other (derse devam) | 14 | 05 |
| FINAL EXAM | 1 | 40 | |
| Total | | 100 | |

CONTRIBUTION OF THE COURSE TO CIVIL ENGINEERING PROGRAM OUTCOMES

| | Program Outcomes | 1 | 2 | 3 |
|----|--|---|---|---|
| 1 | The ability to apply knowledge of mathematics, science, and engineering | X | | |
| 2 | The ability to identify, formulate, and solve engineering problems | | | X |
| 3 | The ability to design a system or component to meet desired needs with realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability and sustainability | | | X |
| 4 | The ability to analyze and interpret data | | | X |
| 5 | The ability to design and conduct experiments and apply experimental results to improve processes | | | X |
| 6 | The ability to convey technical material through oral presentations and written papers/reports | | | X |
| 7 | The ability to function within multidisciplinary teams | | | X |
| 8 | The understanding of professional and ethical responsibilities | | X | |
| 9 | The understanding of the impact of engineering on society | | X | |
| 10 | The understanding of the necessity to engage in life-long learning | | X | |
| 11 | The understanding of management and leadership principles and techniques | | X | |
| 12 | The appreciation of the role of research in civil engineering problems | | X | |
| 13 | A knowledge of contemporary issues in civil engineering | | | X |
| 14 | The ability to use modern engineering techniques, skills, and tools | | | X |
| 15 | The ability to understand and explain basic concepts in management, business, and leadership | | | X |
| 16 | A commitment to quality, punctuality and continuous improvement | | X | |

Contribution Level: 1 low, 2 medium, 3 high

ECTS-WORKLOAD TABLE

| ACTIVITIES | Number | Duration (Hour) | Workload(Hour) |
|---|--------|-----------------|----------------|
| Lecture Time | 14 | 3 | 40 |
| Final Exam (Including Prepartion Time) | 1 | 3 | 3 |
| Quizes | - | - | - |
| Term Homework / Project | - | - | - |
| Reports | - | - | - |
| Graduation Thesis/Project | - | - | - |
| Seminar | - | - | - |

| | | | |
|---|----|---|-----|
| Study Time Outside the Class | 14 | 3 | 45 |
| Homework | 5 | 5 | 23 |
| Presentations | - | - | - |
| Midterm Exams (Including Preparation Time) | 2 | 6 | 12 |
| Project | - | - | - |
| Laboratory | 1 | 2 | 2 |
| Total Workload | | | 125 |
| ECTS Credits of the Course (Total Workload / 25) | | | 5 |

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| Last update on 19.12.2013 | Coordinator / PREPARED BY Özkan Şengül | APPROVED BY Esin İnan |
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