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Department of Metallurgical and Materials Engineering **MATE 201 Fundamentals of Materials Engineering** Course Description and Practice					
Code	**Course Name**	**Term**	**Theory + Recit. + Lab.**	**Credits**	**ECTS**
MATE 201	Fundamentals of Materials Engineering	3	3 + 0 + 0	3	5
Pre-requisite Course(s)		MATE 103, consent of the department			
Course Type	Compulsory	**Language of the Course**		English	

Course Catalogue Description
Classification of materials, atomic bonding in solids, structure of crystalline materials, types of structures in crystalline solids, introduction to metals, metal alloys, ceramics and polymers, imperfections in solids, introduction to diffusion in solids and thermal properties, phase equilibria in unary and binary systems, introduction to phase transformations, introduction to heat treatment of metallic alloys.

Course Objectives	▪ To teach students the classification of materials. ▪ To introduce common crystal structures. ▪ To get students familiar with the types of defects in crystalline solids. ▪ To teach diffusion phenomena. ▪ To get students familiar with unary and binary phase diagrams. ▪ To introduce students to phase transformations in metallic alloys.

Course Book	*Materials Science & Engineering*, 9E (SI version), W.D. Callister and D.G. Rethwisch, John Wiley & Sons, 2015.
Other Sources	▪ *Foundations of Materials Science and Engineering*, 5E, W.F. Smith, McGraw - Hill, 2010. ▪ *The Science & Engineering of Materials*, 6E, D.R. Askeland and P.P. Fulay, Thomson, 2010. ▪ *Elements of Materials Science & Engineering*, 6E, L.V. Vlack, Addison-Wesley, 1989.

Covered Topics

- Introduction to Materials Sci. and Eng. (2 h)
- Atomic Structure and Interatomic Bonding (3 h)
- Structure of Crystalline Solids (8 h)
- Imperfections in Solids (3 h)
- Introduction to Ceramics (2 h)
- Introduction to Polymers (2 h)
- ***Midterm I***
- Thermal Properties of Materials (2 h)
- Diffusion (4 h)
- Phase Diagrams (5 h)
- Fe–C Alloy System (3 h)
- ***Midterm II***
- Phase Transformations in Metals and Alloys (5 h)
- Metal Alloys and Thermal Processing (3 h)

Grading Policy
Two Midterms (20% each), Final Exam (35%), Assignments & Quizzes (15%), Attendance (10%)

Contribution to Professional Component	
Mathematics and Basic Sciences	
Basic Occupational Courses (Engineering)	**X**
Expertise/Field Courses (Engineering Design)	
Courses on Communication and Management Skills (Social Sciences)	

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Course Learning Outcomes vs. Program Outcomes Correlation Table

Scale: "5"=very strong; "4"= strong; "3"= medium; "2"=some; "1"= poor; "-"= NA

MATE 201 Course Learning Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CLO1	Understanding of the classification and fundamental characteristics of materials; metals, ceramics and polymers.	5	5	1	1	1	1	1	2	1	1	1	4
CLO2	Understanding of the structure of crystalline solids and types of defects in solids.	5	5	1	1	2	1	1	2	1	1	1	1
CLO3	Understanding of the thermal properties and diffusion phenomena in solids.	5	5	1	2	1	1	1	2	1	1	1	1
CLO4	Understanding of the unary and binary phase diagrams	5	5	1	1	1	1	1	2	1	1	1	1
CLO5	Knowledge of the phase transformations in metallic alloys.	5	5	1	4	1	1	1	1	1	3	1	2

Metallurgical and Materials Engineering Program Outcomes

PO1	Knowledge in mathematics, science, and Metallurgical and Materials Engineering, and an ability to apply the theoretical and applied knowledge gained in these areas to model and solve complex engineering problems and material systems.
PO2	Understanding of the science and engineering principles regarding the structure, properties, processing, and performance of material systems.
PO3	Ability to detect, identify, formulate, and solve complex engineering problems; ability to select and use appropriate analysis and modeling methods for this purpose.
PO4	Ability to design and select material for a system, component, product or a process under realistic conditions and constraints to meet desired needs; ability to apply modern design and material selection methods for this purpose.
PO5	Ability to select, use and improve the techniques, skills, and modern engineering tools necessary for Metallurgical and Materials Engineering practice; ability to effectively use information technology.
PO6	Ability to design and conduct experiments, collect data, and use statistical and computer methods to analyze and interpret results for the investigation of complex engineering problems or Metallurgical and Materials Engineering specific research subjects.
PO7	Ability to function effectively in self-disciplinary and multidisciplinary teams; ability to work alone.
PO8	Ability to use Turkish to communicate effectively in oral and written means; knowledge of at least one foreign language, ability for effective report writing and understanding written reports, ability to prepare design and production reports, make effective presentations, give and take clear and understandable orders/directions.
PO9	Recognition of the need for, and an ability to engage in, life-long learning; ability to access information, follow developments in science and technology
PO10	Awareness of acting according to ethical principles, awareness of professional and ethical responsibilities; knowledge of standards used in engineering applications.
PO11	Knowledge on business life practices such as project management, risk management, change management; awareness of entrepreneurship, innovation, and sustainable development.
PO12	Recognition of the impact of metallurgical and materials engineering solutions on health, environment and security in global and societal context, recognition of the legal consequences of engineering solutions.