MATERIALS SCIENCE

1	Course Title:	MATERIALS SCIENCE
2	Course Code:	MAK2005
3	Type of Course:	Compulsory
4	Level of Course:	First Cycle
5	Year of Study:	2
6	Semester:	3
7	ECTS Credits Allocated:	4.00
8	Theoretical (hour/week):	3.00
9	Practice (hour/week):	0.00
10	Laboratory (hour/week):	0
11	Prerequisites:	None
12	Language:	Turkish
13	Mode of Delivery:	Face to face
14	Course Coordinator:	Prof. Dr. Hakan AYDIN
15	Course Lecturers:	
16	Contact information of the Course Coordinator:	e-mail: hakanay@uludag.edu.tr Tel: + 90 (224) 294 06 52 Adres: Uludağ Üniversitesi, Mühendislik Fakültesi, Makine Mühendisliği Bölümü, 16059, Görükle-Bursa, Türkiye.
17	Website:	
18	Objective of the Course:	The aim is to gain knowledge and skills about the basic phase diagrams, structure, and mechanical properties of materials used in engineering applications.
19	Contribution of the Course to Professional Development:	1. Knows the inter-atomic bonding structures of engineering materials. 2. Knows crystal structure the materials used in engineering applications. 3. Relates between the existence of crystal faults and mechanical-metallurgical events. 4. Learns that technological applications such as phase transformations, cementation, nitriding, boronization, coating, welding, and brazing are realized by diffusion. 5. Via the equilibrium diagram of any binary alloy system, determines which phases can be found in a certain composition and temperature and calculate the percentage ratios of these phases. 6. Have theoretical knowledge about the mechanical examination of materials such as tensile strength and hardness measurement and can calculate ductility, section narrowing, yield and tensile strength by using tensile test results.
20	Learning Outcomes:	
	1	Knows the inter-atomic bonding structures of engineering materials.
	2	Knows crystal structure the materials used in engineering applications.
	3	Relates between the existence of crystal faults and mechanical-metallurgical events.
	4	Learns that technological applications such as phase transformations, cementation, nitriding, boronization, coating, welding, and brazing are realized by diffusion.

	5	Via the equilibrium diagram of any binary alloy system, determines which phases can be found in a certain composition and temperature and calculate the percentage ratios of these phases.
	6	Have theoretical knowledge about the mechanical examination of materials such as tensile strength and hardness measurement and can calculate ductility, section narrowing, yield and tensile strength by using tensile test results.
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21	Course Content:	
	Course Content:	
Week	Theoretical	Practice
1	Explanation of the term of material and transition stages from element to material.	
2	General structure and classification of technical materials, atomic structure and atomic bonds.	
3	Concepts of bond energy between atoms, the distance between atoms, and atom diameter. Crystal structure and types. Lattice structures, coordination number, and atomic occupancy.	
4	Crystal structures	
5	Explanation of the polymorphism. Directions, planes and related densities in crystal geometry.	
6	Problem solving about crystal structures.	
7	Crystal structure defects and Hall-Petch equation.	
8	Atomic motion in materials (diffusion) and industrial applications.	
9	Structure of alloys. Obtaining phase diagrams from cooling curves. Liquid and solid soluble systems and equilibrium diagrams.	
10	Systems that never melt each other in solid state. Systems with limited melting of each other in solid state. Systems involving interphase.	
11	Comparison of phase diagrams. Problem solutions related to phase diagrams.	
12	Classification of mechanical inspections in materials. Tensile and hardness test.	
13	Charpy impact, fatigue, and creep tests.	
14	Introduction of tensile, hardness, Charpy impact, and fatigue test devices in the Materials and Metallurgy Laboratory.	

22	Textbooks, References and/or Other Materials:	1. Materials Science and Engineering William D. Callister Jr., John Wiley & Sons, Inc., 2007. 2. Introduction to Materials Science for Engineers James F. Shackelford, Prentice Hall International Inc., 1996. 3. Materials Science and Materials Inspection A. Halim Demirci, Alfa Publisher, 2004. 4. Materials Science I-II Translation. Şefik Güleç, Ahmet Aran, MBEAE Press, 1987.

23	Assesment

TERM LEARNING ACTIVITIES	NUMBER	WEIGHT
Midterm Exam	1	40.00
Quiz	0	0.00
Home work-project	0	0.00
Final Exam	1	60.00
Total	2	100.00
Contribution of Term (Year) Learning Activities to Success Grade		40.00
Contribution of Final Exam to Success Grade		60.00
Total		100.00
Measurement and Evaluation Techniques Used in the Course		Achievement in a course during the undergraduate program is determined by the Relative Evaluation method.

24 ECTS / WORK LOAD TABLE

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	15	5.00	75.00
Homeworks	0	0.00	0.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	1	2.00	2.00
Others	0	0.00	0.00
Final Exams	1	2.00	2.00
Total Work Load			123.00
Total work load/ 30 hr			4.03
ECTS Credit of the Course			4.00

25 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS

	PQ1	PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ10	PQ11	PQ12	PQ13	PQ14	PQ15	PQ16
ÖK1	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0
ÖK2	4	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0
ÖK3	5	3	4	3	0	0	0	0	0	0	0	0	0	0	0	0
ÖK4	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK5	5	4	3	4	0	0	0	0	0	0	0	0	0	0	0	0
ÖK6	5	3	4	3	0	0	0	0	0	0	0	0	0	0	0	0

LO: Learning Objectives PQ: Program Qualifications

Contribution Level:	1 very low	2 low	3 Medium	4 High	5 Very High