

MM 207E Materials Science				DEPARTMENT of MECHANICAL ENGINEERING					
Semester	Methods of Education							Credits	
	Lecture	Recit.	Lab.	Project/Field Study	Homework	Other	Total	Credit	ECTS Credit
3	42	14	22	-	30	30	138	4	5.0
Language	English								
Compulsory / Elective	Compulsory								
Prerequisites	None								
Course Contents	Introduction to material science, historical perspective, classification of engineering materials. Atomic bonding and interatomic forces, crystal structures; close packing, stacking faults, crystals imperfections, solubility and solid solutions, atomic diffusion. Precipitation hardening, dispersion hardening, work hardening and aging. Mechanical testing methods; tensile testing, compression test, bending, torsion, fatigue and impact tests. Metal alloys; phase components, Gibbs phase rule, cooling curves, Fe-Fe ₃ C phase diagrams. Isothermal transformation diagrams, continuous cooling transformation diagrams.								
Course Objectives	Understanding of basic principles relating to engineering materials								
Learning Outcomes and Competences	To gain the knowledge about atomic and crystal structures, diffusion in metals, alloys and phase diagrams, materials test methods and mechanical properties, heat treatments, material standards, classification of engineering materials								
Textbook and /or Reference	1) Materials Science and Engineering: An Introduction, W.D. Callister, 7th ed., John Wiley, 2007. 2) The Science and Engineering of Materials, D.R. Askeland, P.P. Phule, 4th ed., Thomson Brooks/Cole, 2003. 3) Foundations of Materials Science and Engineering, W.F. Smith, J. Hashemi, 4th ed. McGraw-Hill, 2006. 4) Engineering Metallurgy and Materials, Süleyman Santaş, Gazi University, 1995.								
Assessment Criteria						If any, mark as (x)		Percentage (%)	
	Midterm Exams					X		50	
	Quizzes								
	Homeworks								
	Projects								
	Term Paper								
	Laboratory Work					X		10	
	Other								
	Final Exam					X		40	
Instructors	Assoc.Prof. Dr. Ibrahim USLAN, Assist.Prof. Dr. Elmas SALAMCI								
Week	Subject								
1	Classification of engineering materials: Metals, polymers and ceramics. Steels and cast irons, non-ferrous metals and their industrial alloys								
2	Classification of engineering materials: Metals, polymers and ceramics. Steels and cast irons, non-ferrous metals and their industrial alloys								
3	Classification of engineering materials: Metals, polymers and ceramics. Steels and cast irons, non-ferrous metals and their industrial alloys								
4	Atomic structure, crystal structure, crystal defects, microstructural examination of materials								
5	Atomic structure, crystal structure, crystal defects, microstructural examination of materials								
6	Atomic structure, crystal structure, crystal defects, microstructural examination of materials								
7	Diffusion in metals								
8	Phase diagrams, iron-carbon phase diagram								
9	Phase diagrams, iron-carbon phase diagram								
10	Material test methods and mechanical properties: Tensile, hardness, bending, shear, torsion, impact, fatigue, creep, friction-wear, corrosion tests								
11	Material test methods and mechanical properties: Tensile, hardness, bending, shear, torsion, impact, fatigue, creep, friction-wear, corrosion tests								
12	Material test methods and mechanical properties: Tensile, hardness, bending, shear, torsion, impact, fatigue, creep, friction-wear, corrosion tests								
13	Strengthening mechanisms: Grain refinement, cold working, dispersion hardening, aging, quench hardening and other heat treatments								
14	Strengthening mechanisms: Grain refinement, cold working, dispersion hardening, aging, quench hardening and other heat treatments								