

Course Name						
DEFORMATION PROCESSES OF MATERIALS						
Code	Semester	Local Credits	ECTS Credits	Course Implementation, Hours/Week		
				Theoretical	Tutorial	Laboratory
MET 487E	7	2	3	2	-	-
Department/Program	Metallurgical and Materials Engineering Department					
Course Type	Elective		Course Language	English		
Course Prerequisites	None					
Course Category by Content, %	Basic Sciences	Engineering Science	Engineering Design	General Education		
	-	50	50	-		
Course Description	Description of plastic forming processes, Relationships between stress and strain, Mohr circle and yield criteria. Plastic deformation mechanisms and strain hardening. Factors affecting plastic deformation. Annealing furnaces employed in plastic forming operations. Forging, rolling, extrusion. Wire drawing and tube forming. Sheet forming operations.					
Course Objectives	<ol style="list-style-type: none"> 1. To define plastic forming processes and their basic principles. 2. To define microstructural changes of materials with the effect of plastic forming processes and the effect of these changes on mechanical properties. 3. To give an ability to apply knowledge to decide convenient plastic forming process for engineering materials 					
Course Learning Outcomes	<p>Students who pass the course will be able to:</p> <ol style="list-style-type: none"> 1. Understand the basic principles of elastic deformations and the elastic constants, 2. Use the Holloman equation, Tresca and Von Mises yielding criteria, 3. Interpret of the relationships between mechanical properties of a material subjected to different strengthening mechanisms, 4. Understand the basic principles of forging, rolling, extrusion, wire drawing and tube forming processes and calculate the required force for these processes to perform for a particular material, 5. Understand the basic principles of sheet forming and sketch of forming limit diagrams. 					
Textbook	Kayalı, E.S. Ensari, C., Metallere Plastik Şekil Verme İlke ve Uygulamaları, İTÜ Kimya Metalurji Fakültesi, Ofset Atölyesi, İstanbul 1991.					
Other References	<ol style="list-style-type: none"> 1. Dieter, G.E., Mechanical Metallurgy, McGraw Hill Book Company, London, 1988. 2. Kayalı, E.S., Çimenoğlu, H., Plastik Şekil Verme İlke ve Uygulamaları Problemleri ve Çözümleri, Bilim Teknik Yayınevi, İstanbul, 1985. 3. Schey, J.A., Introduction to Manufacturing Processes, McGraw Hill Book Company, New York, 1987. 					
Homework & Projects	Students will be given a subject and this will be presented in the class. Presentation subjects may be used as a source for exams.					
Laboratory Work	-					
Computer Use	-					
Other Activities	-					
Assessment Criteria	Activities	Quantity		Effects on Grading, %		
	Midterm Exams	2		30		
	Quizzes					
	Homework					
	Projects					
	Term Paper/Project					
	Laboratory Work					
	Other Activities	1		20		
Final Exam	1		50			

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Introduction	1
2	Stress-strain relationships	1
3	Stress-strain relationships	1
4	Basic principles of plastic deformation	2
5	Strengthening mechanisms	3
6	Strengthening mechanisms	3
7	Factors affecting plastic deformation	3
8	Annealing furnaces employed in plastic deformation	4
9	Forging	4
10	Rolling	4
11	Extrusion	4
12	Wire drawing	4
13	Tube forming	4
14	Sheet forming methods	5

Relationship between the Course and Metallurgical and Materials Engineering Curriculum

	Student Outcomes	Level of Contribution		
		1	2	3
1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering science and mathematics	X		
2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare as well as global, cultural, social, environmental and economic factors		X	
3	an ability to communicate effectively with a range of audiences	X		
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts		X	
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	X		
6	an ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgement to draw conclusions		X	
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies			X

1: Little, 2: Partial, 3: Full

Course relationships with major elements of the field and material classes

		Level of Contribution		
		1	2	3
MAJOR ELEMENT OF THE FIELDS	STRUCTURE			X
	PROPERTIES			X
	DESIGN EXPERIMENT/ANALYSE DATA		X	
	PROCESSING			X
	COST/PERFORMANCE	X		
	QUALITY/ENVIRONMENT		X	
	DESIGN PROCESS OR PRODUCT			X
MATERIAL CLASSES	METAL			X
	CERAMICS AND GLASS	X		
	POLYMER	X		
	COMPOSITES	X		
	BIOMATERIALS			

1: Little, 2: Partial, 3: Full

Prepared by PROF.DR. HÜSEYİN ÇİMENOĞLU PROF. DR. MURAT BAYDOĞAN	Date December 2020	Revision #	Signature
--	------------------------------	-------------------	------------------