

Sakarya University
Engineering Faculty, Dept. of Metallurgy and Materials Engineering

Mechanical Properties of Materials

COURSE INFORMATION					
Course Title	Code	Semester	L+P Hour	Credits	ECTS
Mechanical Properties of Materials	MMM 220	4	3 + 0	3	5

Prerequisites	-
Language of Instruction	English
Course Level	Bachelor's Degree (First Cycle Programmes)
Course Type	
Course Coordinator	Assist.Prof. Yıldız YARALI ÖZBEK
Instructors	Ali Osman KURT , Assoc.Prof.Dr.
Assistants	
Goals	The aim of this course is to provide undergraduate students with knowledge on the mechanical properties of materials and standard test methods to determine them.
Content	The concept of stress-strain relationship of deformation processes. Elastic and plastic deformation. The mechanical testing methods. The methods for strengthening mechanism in materials.

Learning Outcomes	Teaching Methods	Assessment Methods
1) Comprehend stress-strain relationship of elastic and plastic deformation.	1,15	A,C
2) Comprehend elastic and plastic deformation properties of materials.	1,4,15	A
3) Comprehend the effect of dislocation on the mechanical properties of materials.	1,15	A,C
4) Comprehend plastic deformation mechanisms.	1,4	A
5) Comprehend mechanical tests applied on the materials and evaluates the obtained results.	1,3,4,15	A,C
6) Comprehend methods for strengthening mechanism of materials.	1,15	A,C

Teaching Methods:	1: Lecture, 3: Discussion, 4: Practice, 15: Problem Solving
Assessment Methods:	A: Testing, C: Homework

COURSE CONTENT		
Week	Topics	Study Materials
1	The concept of stress-strain, stress-strain relationship of elastic and plastic deformation	[1] 5-12; [3] Chapter 3; Video ; Intro .
2	The basis of elastic deformation	[2] 29-53; [3] Chapter 4
3	Anisotropic linear elasticity	URL
4	Plastic deformation mechanisms	[3] Chap. 5
5	Dislocations and plastic deformation	[3] Chap. 6 & 7
6	Affecting factors of plastic deformation	[3] Chap. 7 & 8
7	Strengthening processes	[3] Chap. 8; [2] Chap.10
8	Tensile test and its application in engineering	[2] Chap. 8; Video
9	Compression, hardness, torsion and impact tests	Source for I. VIII. IX. X. XI. XII. and XIII. week topics; test methods (ppt) ; hadness virtual test
10	Bending test, forming of metallic materials	

11	Fracture and fracture toughness of metals	
12	Fatigue and fatigue types	Formulas
13	Determination of high temperature mechanical properties of materials	Creep
14	Wear and friction	pdf ~3.7Mb, Examp. ~22Mb

RECOMMENDED SOURCES

Textbook	
Additional Resources	<ol style="list-style-type: none"> 1. Dieter, George E. Mechanical Metallurgy, SI Metric Edi. 1988. (620.1/D565) 2. Ashby, M. F. ; Michael F. Ashby, David R.H. Jones., Engineering Materials 1 - An Introduction to Properties, Applications, and Design (4th Edition), 2012. ISBN-ISSN: 9780080966663. (e-book) 3. Soboyejo, W. O. ; Wolâe Soboyejo, Mechanical properties of engineered materials, ISBN-ISSN: 9780203910399, Marcel Dekker , 2003. (e-book) 4. Metals Handbook Vol. 8, Mechanical Testing, 1997. 5. Chawla K.K., Meyer M.A., Mechanical Behaviour of Materials 6. Courtney T., Mechanical Behaviour of Materials 7. Kayalı E.S., Ensari C., Dikeç F. Metalik Malzemelerin Mekanik Deneylemleri, İTÜ Kimya-Metalurji Fakültesi 8. Kayalı E.S., Çimennoğlu H. Malzeme Yapısı ve Mekanik Davranışları, İTÜ Kimya-Metalurji Fakültesi.

ASSESSMENT

IN-TERM STUDIES	QUANTITY	PERCENTAGE
Mid-terms	1	60
Quizzes	2	26
Assignment	1	14
Total		100
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		100

COURSE CATEGORY	
Engineering	% 100

	COURSE'S CONTRIBUTION TO PROGRAM	Contribution				
		1	2	3	4	5
1	Engineering graduates with sufficient theoretical and practical background for a successful profession and with application skills of fundamental scientific knowledge in the engineering practice			x		
2	Engineering graduates with skills and professional background in describing, formulating, modelling and analyzing the engineering problem, with a consideration for appropriate analytical solutions in all necessary situations					x
3	Engineering graduates with the necessary technical, academic and practical knowledge and application confidence in the design and assessment of machines or mechanical systems or industrial processes with considerations of productivity, feasibility and environmental and social aspects.	x				
4	Engineering graduates with the practice of selecting and using appropriate technical and engineering tools in engineering problems, and ability of effective usage of information science technologies					
5	Ability of designing and conducting experiments, conduction data acquisition and analysis and making conclusions			x		
6	Ability of identifying the potential resources for information or knowledge regarding a given engineering issue					
7	The abilities and performance to participate multi-disciplinary groups together with the effective oral and official communication skills and personal confidence					
8	Ability for effective oral and official communication skills in Turkish Language and, at minimum, one foreign language					
9	Engineering graduates with motivation to life-long learning and having known significance of continuous education beyond undergraduate studies for science and technology					
10	Engineering graduates with well-structured responsibilities in profession and ethics					
11	Engineering graduates who are aware of the importance of safety and healthiness in the project management, workshop environment as well as related legal issues					
12	Consciousness for the results and effects of engineering solutions on the society and universe, awareness for the developmental considerations with contemporary problems of humanity					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Including the exam week: 16x Total course hours)	16	3	48
Hours for off-the-classroom study (Pre-study, practice)	16	3	48
Mid-terms	1	10	10
Term assignment	1	10	10
Final examination	1	10	10
Total Work Load			126
Total Work Load / 25 (h)			5.04
ECTS Credit of the Course			5