İTÜ
DERS KATALOG FORMU
(COURSE CATALOGUE FORM)

Dersin Adı	**Course Name**
	Mechanical Properties Of Materials

Kodu (Code)	**Yarıyılı (Semester)**	**Kredisi (Local Credits)**	**AKTS Kredisi (ECTS Credits)**	**Ders Uygulaması, Saat/Hafta (Course Implementation, Hours/Week)**		
				Ders (Theoretical)	**Uygulama (Tutorial)**	**Laboratuar (Laboratory)**
MET 344 MET 344E	6	2	4	2	0	0

Bölüm / Program (Department/Program)	Metalurji ve Malzeme Mühendisliği (Metallurgical and Materials Engineering)		
Dersin Türü (Course Type)	Zorunlu Compulsory	**Dersin Dili (Course Language)**	Türkçe/İngilizce (Turkish/English)
Dersin Önkoşulları (Course Prerequisites)	Yok None		

Dersin mesleki bileşene katkısı, % (Course Category by Content, %)	**Temel Bilim (Basic Sciences)**	**Temel Mühendislik (Engineering Science)**	**Mühendislik Tasarım (Engineering Design)**	**İnsan ve Toplum Bilim (General Education)**
	-	60	40	-

Dersin İçeriği

(Course Description)

Stress and strain concept. Elastic and plastic deformation. Mechanical tests. Plastic deformation mechanisms and Plastic forming processes,. Strengthening mechanisms, solid solution, strain hardening, strain aging, diffusionless transformation, dispersion and precipitation hardening. Metallurgical failures. Linear Elastic Fracture Mechanics. Fatigue types. Factors affecting fatigue strength. Crack initiation and propagation. Creep and stress rupture. Mechanical behaviours of ceramics polymers and composites. Mechanical properties of nanomaterials.

Dersin Amacı

(Course Objectives)

1. To introduce basic stres-strain concepts and correlations between them,
2. To introduce which mechanical properties are used to determine mechanical behavours of materials under load,
3. To introduce loading conditions leading failure and failure criteria,
4. To correlate mechanical properties with internal structure

Dersin Öğrenme Çıktıları

(Course Learning Outcomes)

Students who pass the course will be able to:

1. Stress – strain concept and correlations between them,
2. Mechanical properties and how to use them to determine mechanical behaviors of materials,
3. Knowledge on strengthening mechanisms,
4. Loading conditions on materials working under dynamic condition,
5. Effect of internal structure on performance of materials
6. Material behavior and failure mechanisms at elevated temperature.
7. Mechanical properties of ceramic, polymer, composite and nanomaterials.

Ders Kitabı (Textbook)	Kayalı, E.S., Çimenoğlu, H., Malzemelerin yapısı ve mekanik davranışları, İTÜ Kimya-Metalurji Fakültesi, Ofset Atölyesi, İstanbul 1986.		
Diğer Kaynaklar (Other References)	1. Ashby, M.F., Jones, D.R.H., Engineering Materials, An Introduction to their Properties and Applications, Pergamon Press, Oxford, 1983. 2. Dieter, G.E. Mechanical Metallurgy, McGraw Hill Book Company, London, 1988. 3. Meyers, M.A., Chawla, K.K., Mechanical Metallurgy, Prentice-Hall, Englewood Cliffs, New Jersey, 1984. 4. Courney, T.H., Mechanical Behaviour of Materials, McGraw Hill Publishing Company, Singapour, 1990.		
Ödevler ve Projeler	-		
(Homework & Projects	Students will be given a homework assignment and a subject to be presented in the class. Homework assignments and presentation subjects may be used as a source for exams.		
Laboratuar Uygulamaları	-		
(Laboratory Work)	-		
Bilgisayar Kullanımı	-		
(Computer Use)	-		
Diğer Uygulamalar	-		
(Other Activities)	-		
Başarı Değerlendirme Sistemi	**Faaliyetler (Activities)**	**Adedi (Quantity)**	**Değerlendirmedeki Katkısı, % (Effects on Grading, %)**
(Assessment Criteria)	**Yıl İçi Sınavları (Midterm Exams)**	2	40
	Kısa Sınavlar (Quizzes)		
	Ödevler (Homework)	1	10
	Projeler (Projects)		
	Dönem Ödevi/Projesi (Term Paper/Project)		
	Laboratuar Uygulaması (Laboratory Work)		
	Diğer Uygulamalar (Other Activities)	**1**	**10**
	Final Sınavı (Final Exam)	1	40

DERS PLANI

Hafta	Konular	Dersin Çıktıları
1		
2		
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COURSE PLAN

Weeks	Topics	Course Outcomes
1	Introduction to stress and strain concept, elastic and plastic deformation	1
2	Introduction to Mechanical tests. Hardness, tensile and impact tests	1,2
3	Plastic deformation mechanisms and yielding criteria	1,2
4	Plastic forming processes	2,3
5	Strengthening mechanisms and their effects to mechanical properties	2,3
6	Fatigue types. High and low cycle fatigue	2,4
7	Failures related to fatigue	2,4,5
8	Introduction to fracture mechanics and fracture tests	2,4,5
9	Plain strain fracture toughness, fatigue crack growth	2,4,5
10	Creep, stress rupture and stress relaxation concepts	2,6
11	Creep mechanism maps	2,6
12	Mechanical properties of ceramics and polymers	2,7
13	Mechanical properties of composites	2,7
14	Mechanical properties of nanomaterials	2,7

Dersin Metalurji ve Malzeme Mühendisliği Programıyla İlişkisi

	Programın mezuna kazandıracağı bilgi ve beceriler (programa ait çıktılar)	Katkı Seviyesi		
		1	2	3
a	Matematik, Fen ve Mühendislik bilgilerini uygulama becerisi			X
b	Deney tasarlayıp yürütebilme ve sonuçları analiz edip yorumlama becerisi		X	
c	Bir sistemi, ürün bileşenini veya prosesi istenilen gereksinimleri karşılayacak şekilde tasarlama becerisi			
d	Çok disiplinli takım çalışması yürütebilme becerisi			
e	Mühendislik problemlerini belirleme, formüle etme ve çözme becerisi			X
f	Mesleki ve etik sorumlulukları kavrama			
g	Çok etkin sözlü ve yazılı iletişim kurabilme becerisi			
h	Mühendislik çözümlerinin küresel ve toplumsal bağlamda etkisinin kavranması için gereken geniş kapsamlı bir eğitim			
i	Yaşam boyu öğrenim gereğini algılamış ve bu beceriyi kazanmış olmaları		X	
j	Güncel/çağdaş konulara ilişkin bilgi sahibi olmaları			
k	Mühendislik uygulamaları için gerekli olan teknikleri, becerileri ve modern mühendislik donanımlarını kullanabilme becerisi		X	

1: Az, 2. Kısmi, 3. Tam

Relationship between the Course and Metallurgical And Materials Engineering Curriculum

	Program Outcomes	Level of Contribution		
		1	2	3
a	An ability to apply knowledge of mathematics, science, and engineering			X
b	An ability to design and conduct experiments, as well as to analyze and interpret data		X	
c	An ability to design a system, component or process to meet desired needs			
d	Ability to function on multi-disciplinary teams			
e	An ability to identify, formulate, and solve engineering problems			X
f	An understanding of professional and ethical responsibility			
g	An ability to communicate effectively			
h	The broad education necessary to understand the impact of engineering solutions in a global and societal context			
i	A recognition of the need for, and an ability to engage in life-long learning		X	
j	A knowledge of contemporary issues			
k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice		X	

1: Little, 2. Partial, 3. Full

Düzenleyen (Prepared by)	***Tarih (Date)***	***İmza (Signature)***
	Mart 2013 March 2013	