

İTÜ
DERS KATALOG FORMU
(COURSE CATALOGUE FORM)

Dersin Adı		Course Name				
		Energy Materials				
Kodu (Code)	Yarıyılı (Semester)	Kredisi (Local Credits)	AKTS Kredisi (ECTS Credits)	Ders Uygulaması, Saat/Hafta (Course Implementation, Hours/Week)		
				Ders (Theoretical)	Uygulama (Tutorial)	Laboratuvar (Laboratory)
MET 366E	6	2	3	2	0	0
Bölüm / Program (Department/Program)	Metalurji ve Malzeme Mühendisliği (Metallurgical and Materials Engineering)					
Dersin Türü (Course Type)	Seçmeli Elective			Dersin Dili (Course Language)	İngilizce (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)		
	-	40	40	20		
Dersin İçeriği (Course Description)	<p>Introduction to Energy and its use and importance in Metallurgy and Materials Engineering, History of Energy: from Aristotle to Einstein, Introduction to different forms of energy. Materials for Energy Harvesting (solar energy materials, photovoltaic materials, materials for wind and nuclear power, thermoelectric materials, materials used in fuel cell technology and their manufacturing methods). Materials used in energy storage (batteries, capacitors, hydrogen storage and their applications). Materials Enabling Energy- Efficient Transportation. Materials for housing (lighting, heating and cooling). Materials used for energy efficiency in industry. Novel Materials for Energy Applications and R&D trends for energy materials. Energetic Materials (basic principles, manufacturing processes, applications).</p>					
Dersin Amacı (Course Objectives)	<p>1.To describe materials used in various energy harvesting and storage industries and teach their manufacturing processes.</p> <p>2.To explain the importance of energy efficiency, introduce the materials providing energy efficiency both in everyday life and industry and teach the novel studies for energy efficient materials.</p>					
Dersin Öğrenme Çıktıları (Course Learning Outcomes)						

Students who pass the course will be able to:

1. Identify the importance of energy for Metallurgical and Materials Engineering, learn the historical developments behalf of energy and are informed of different forms of energy.
2. Learn the materials used in various energy harvesting industries such as solar, wind, nuclear and thermoelectric and manufacturing processes of these materials.
3. Know the materials utilized in energy transformation technologies such as fuel cells.
4. Learn the materials which are used in batteries, capacitors and hydrogen storage and properties required for their applications.
5. Comprehend materials enabling energy- efficient transportation.
6. Learn the materials which prevent serious consumptions of energy in everyday life such as lighting, cooling and heating.
7. Know which materials are used for energy efficiency in industrial processes.
8. Identify the novel materials and technologies used in energy applications and are informed of latest developments made for energy saving in materials science.
9. Comprehend basic principles, manufacturing processes and applications of the materials with high formation enthalpies.

Ders Kitabı (Textbook)	Kreith F. ve Goswami D. Y., Handbook of Energy Efficiency and Renewable Energy, Taylor & Francis, 2007.		
Diğer Kaynaklar (Other References)	Martin F., Materials for Energy Systems, Concise Encyclopedia of Materials for Energy Systems, Elsevier, 2008. Mezzane D., Luk'yanchuk I., Smart Materials for Energy, Communications and Security, Springer, 2008. Agrawal J. P., High Energy Materials Propellants, Explosives and Pyrotechnics, Wiley- Vch, 2010.		
Ödevler ve Projeler (Homework & Projects)	-		
Laboratuvar Uygulamaları (Laboratory Work)	-		
Bilgisayar Kullanımı (Computer Use)	-		
Diğer Uygulamalar (Other Activities)	-		
Başarı Değerlendirme Sistemi (Assessment Criteria)	Faaliyetler (Activities)	Adedi (Quantity)	Değerlendirmedeki Katkısı, (Effects on Grading, %)
	Yıl İçi Sınavları (Midterm Exams)	2	60
	Kısa Sınavlar (Quizzes)		
	Ödevler (Homework)		
	Projeler (Projects)		
	Dönem Ödevi/Projesi (Term Paper/Project)		
	Laboratuvar Uygulaması (Laboratory Work)		
	Diğer Uygulamalar (Other Activities)		
	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 Energy and its use in Metallurgy and Materials Engineering, History of Energy: from Aristotle to Einstein, Introduction to different forms of energy	I
2	Materials for Energy Harvesting (Solar Energy Materials and Photovoltaic Materials)	I
3	Materials for Energy Harvesting (Materials for Wind and Nuclear Power)	I
4	Materials for Energy Harvesting (Thermoelectric Materials)	II
5	Materials for Energy Transformation (Fuel Cell Materials and Components)	II
6	Materials for Energy Transformation (Fuel Cell Materials and Components) MID – TERM EXAM	II
7	Materials for Energy Storage (Materials for Batteries and Capacitors)	III
8	Materials for Energy Storage (Hydrogen Storage Materials)	III
9	Materials Enabling Energy- Efficient Transportation	IV
10	Materials for Lighting and Cooling	IV
11	Materials for Industrial Energy Efficiency	V
12	Novel Materials for Energy Applications	V
13	Novel Materials for Energy Applications MID – TERM EXAM	VI
14	Energetic Materials and their applications	VI

Dersin Metalurji ve Malzeme Mühendisliği Programıyla İlişkisi

	Programın mezuna kazandıracığı 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		X	
d	Çok disiplinli takım çalışması yürütebilme becerisi			
e	Mühendislik problemlerini belirleme, formüle etme ve çözme becerisi			X
f	Mesleki ve etik sorumlulukları kavrama		X	
g	Çok etkin sözlü ve yazılı iletişim kurabilme becerisi			
h	Mühendislik çözümlerinin küresel ve toplumsal bağlamda etkisinin kavranması için gereken geniş kapsamlı bir eğitim			X
i	Yaşam boyu öğrenim gereğini algılamış ve bu beceriyi kazanmış olmaları			X
j	Güncel/çağdaş konulara ilişkin bilgi sahibi olmaları			X
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		X	
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		X	
g	An ability to communicate effectively			
h	The broad education necessary to understand the impact of engineering solutions in a global and societal context			X
i	A recognition of the need for, and an ability to engage in life-long learning			X
j	A knowledge of contemporary issues			X
k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice			X

1: Little, 2. Partial, 3. Full

<u>Düzenleyen (Prepared by)</u>	<u>Tarih (Date)</u> Mart / March 2013	<u>İmza (Signature)</u>
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