

İTÜ
DERS KATALOG FORMU
(COURSE CATALOGUE FORM)

Dersin Adı		Course Name				
		MASS AND ENERGY BALANCE				
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 248 MET 248E	4	2	4	2	-	-
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)		MET 215E MIN DD veya MET 215 MIN DD				
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)	
		-	80 %	20 %	-	
Dersin İçeriği (Course Description)		Dimensions, System of Units and Conversion Factors; molar units, density, concentration. Stoichiometry; atomic and molecular mass, chemical equations, excess and limiting reactants, oxidation and reduction. Sampling and Measurements Procedures; description of error, precision, accuracy and repeatability, measurement of weight, pressure, flow rate, etc. Material Balances; conservation of mass, mass balance analyses, systems with or without chemical reaction, recycling & by-pass circuits, Energy Balances; heat balance, electrometallurgical and electrothermic energy balances, staged heat balances, simultaneous material and energy balances, process analysis. Examples of materials and energy balances for metallurgical reactors.				
Dersin Amacı (Course Objectives)		This course covers the fundamental concepts in the field of Metallurgical Engineering, along with numerical examples from the existing industrial applications. Almost all processes, utilized in metal production Technologies are covered within the framework of this course, which eventually outlines the background of the more technological courses offered in the following semesters.				
Dersin Öğrenme Çıktıları (Course Learning Outcomes)		1. Ability to apply knowledge of mathematics, science and engineering. 2. Ability to design a system, a product component and process with all desired requirements. 3. Ability to decide, formulize and solve engineering problems. 4. An extensive education for understanding engineering solutions globally and socially. 5. Aim for students to understand the importance of life-time learning and learn that ability. 6. Aim for students to be aware of recent and modern subjects. 7. Ability of students to use necessary techniques, skills and modern engineering equipments for engineering applications. Ability to design and process a system, a product and/or a process for the benefit of humanity, protection of the nature and for considering resources in the most efficient way while meeting				

the recent necessities in quality and environmental issues.

Ders Kitabı (Textbook)	- H.A. Fine and G.H. Geiger, <u>Handbook on Material and Energy Balance Calculations in Metallurgical Processes</u> , A publication of TMS, 1993.		
Diğer Kaynaklar (Other References)	<ul style="list-style-type: none">- J.C. Whitwell and R.K. Toner, <u>Conservation of Mass and Energy</u>, McGraw-Hill Book Company.- Butts, <u>Metallurgical Problems</u>, McGraw-Hill, 1943.- V. Aytakin, <u>Metallurji Problemleri</u>, İTÜ Matbaası, 1978.- R. Schuhmann, <u>Metallurgical Engineering</u>, Vol.1, Engineering Principles, Addison Wesley Pub. Co., 1952.		
Ödevler ve Projeler (Homework & Projects)	-		
	- All homework problems are to be handed-in a week after they are assigned. Homework problems may be used as a source for exams.		
Laboratuvar Uygulamaları (Laboratory Work)	-		
	-		
Bilgisayar Kullanımı (Computer Use)	-		
	- Being able to work with computer programs MS Word and MS Excel		
Diğer Uygulamalar (Other Activities)	-		
	-		
Başarı Değerlendirme Sistemi (Assessment Criteria)	Faaliyetler (Activities)	Adedi (Quantity)	Değerlendirmedeki Katkısı, % (Effects on Grading, %)
	Yıl İçi Sınavları (Midterm Exams)	1	25 %
	Kısa Sınavlar (Quizzes)	3	15 %
	Ödevler (Homework)	3	15 %
	Projeler (Projects)	-	-
	Dönem Ödevi/Projesi (Term Paper/Project)		-
	Laboratuvar Uygulaması (Laboratory Work)	-	-
	Diğer Uygulamalar (Other Activities)	-	-
	Final Sınavı (Final Exam)	1	45 %

DERS PLANI

Hafta	Konular	Dersin Çıktıları
1		
2		
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4		
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7		
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14		

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Dimensions, System of Units and Conversion Factors; molar units, density, concentration.	1
2	Stoichiometry; atomic and molecular mass, chemical equations	1
3	Excess and limiting reactants, oxidation and reduction	1
4	Sampling and Measurements Procedures; description of error, precision, accuracy and repeatability, measurement of weight, pressure, flow rate, etc	1-5
5	Sampling and Measurements Procedures; description of error, precision, accuracy and repeatability, measurement of weight, pressure, flow rate, etc	1-5
6	Material Balances; conservation of mass, mass balance analyses	1-3
7	Material Balances; conservation of mass, mass balance analyses	1-3
8	Mass balance analyses, systems with or without chemical reaction	1-3
9	Recycling & by-pass circuits	1-8
10	Recycling & by-pass circuits	1-8
11	Energy Balances; heat balance, electrometallurgical and electrothermic energy balances	1-8
12	Energy Balances; heat balance, electrometallurgical and electrothermic energy balances	1-8
13	Differential Heat balances, simultaneous material and energy balances, process analysis.	1-8
14	Examples of materials and energy balances for metallurgical reactors	1-8

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			
b	Deney tasarlayıp yürütebilme ve sonuçları analiz edip yorumlama becerisi			
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			
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			
j	Güncel/çağdaş konulara ilişkin bilgi sahibi olmaları			
k	Mühendislik uygulamaları için gerekli olan teknikleri, becerileri ve modern mühendislik donanımlarını kullanabilme becerisi			

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	Ability to apply the knowledge of mathematics, science, and engineering principles to solve problems in metallurgical and materials engineering (ABET:a)			X
b	Ability to characterize materials using standard and/or self designed experimental methods and to evaluate the results (ABET:b)			
c	Ability to design a system or a process, taking into consideration of the desired specifications, quality, ethics and environment (ABET:c)			
d	Ability to communicate both orally and in the written form and to take part in, and provide leadership of the teams in the elucidation of engineering problems (ABET:d, g)			
e	Ability to define, formulate and solve engineering problems in the development, production, processing, protection and usage of engineering materials (ABET:e)			X
f	An understanding of professional and ethical responsibilities (ABET:f)			
g	An understanding of current/contemporary issues and impact of engineering solutions in broad cultural, national and global levels (ABET:h, j)			
h	A comprehension of the nature of engineering progress closely linked with the development of new materials and production processes. An ability to engage in life-long learning and a recognition of its necessity (ABET:i)			
i	Ability to use essential tools and techniques of modern engineering in the development, production, processing, protecting of the existing and new engineering materials (ABET:k)	X		
j				
k				

1: Little, 2. Partial, 3. Full

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