EK-1

DERS BİLGİ FORMU

ENSTİTÜ/FAKÜLTE/YÜKSEKOKUL ve PROGRAM: Fen Bilimleri Enstitüsü Makine Mühendisliği ABD							
DERS BİLGİLERİ							
Adı	**Kodu**	**Dili**	**Türü** Zorunlu/ Seçmeli	**Yarıyılı**	**T+U Saati**	**Kredisi**	**AKTS**
Enerji Sistemlerinde Ekserji Analizi	**MAK 750**	**Türkçe**	**Seçmeli**		**3+0**	**3**	**7,5**

Ön Koşul Dersleri	-

Ders Sorumluları	**Yrd. Doç. Dr. Ali Etem GÜREL**
Ders Sorumlu Yardımcıları	-

Dersin Amacı	Enerji sistemlerini meydana getiren tüm elemanların ayrı ayrı ekserji kayıplarını hesaplayarak tüm sistemin ekserji analizi yapabilmek.

Dersin Öğrenme Çıktıları	*1) Termodinamiğin temel tanımlarını ve termodinamik kanunlarını bilir.* *2) Otto, Diesel, Brayton çevrimlerini öğrenir.* *3) Entropinin tanımını ve ideal gazların entropi değişimlerini bilir.* *4) Ekserji ve tersinmezlik kavramlarını öğrenir.* *5) Enerji sistemlerde kkserji ve uygulamaları ile ilgili temel kavram ve prensipleri öğrenir.* *6) Soğutma ve ısı makinası sistemlerinde ekserji analizi yapar.* *7) Enerji sistemlerde ekserji uygulamaları yapar.*

DERS PLANI			
Hafta	**Ön Hazırlık**	**Konular/Uygulamalar**	**Metot**
1		Ekserji ve enerjinin tanımı	Anlatım/Soru-cevap
2		Ekserji ve enerjinin tanımı, ekserji dengesi ve ekserji kayıpları, termal sistemlerin ekserji verimi, ekserji analizinin temel termodinamik uygulamaları	Anlatım/Soru-cevap
3		Ekserji ve enerjinin tanımı, ekserji dengesi ve ekserji kayıpları, termal sistemlerin ekserji verimi, ekserji analizinin temel termodinamik uygulamaları	Anlatım/Soru-cevap
4		Ekserji hesabı, açık sistemlerde ekserji hesabı, fiziksel ekserjinin hesabı, kimyasal ekserjinin hesabı, termal radyasyonun ekserjisinin hesabı	Anlatım/Soru-cevap
5		Ekserji hesabı, açık sistemlerde ekserji hesabı, fiziksel ekserjinin hesabı, kimyasal ekserjinin hesabı, termal radyasyonun ekserjisinin hesabı	Anlatım/Soru-cevap
6		Ekserji hesabı, açık sistemlerde ekserji hesabı, fiziksel ekserjinin hesabı, kimyasal ekserjinin hesabı, termal radyasyonun ekserjisinin hesabı	Anlatım/Soru-cevap
7		Tipik termal sistemlerin ekserji analizi, ısı eşanşörlerinin ekserji analizi, akım makinelerinin ekserji analizi, yanma proseslerinin ekserji analizi	Anlatım/Soru-cevap
8		Tipik termal sistemlerin ekserji analizi, ısı eşanşörlerinin ekserji analizi, akım makinelerinin ekserji analizi, yanma proseslerinin ekserji analizi	Anlatım/Soru-ceva

9		Tipik termal sistemlerin ekserji analizi, ısı eşanşörlerinin ekserji analizi, akım makinelerinin ekserji analizi, yanma proseslerinin ekserji analizi	Anlatım/Soru-cevap
10		Buhar üreticilerinin ve ısıtma fırınlarının ekserji analizi. buhar güç sistemlerinin ekserji analizi	Anlatım/Soru-cevap
11		Buhar sıkıştırmalı soğutma sistemleri ve ısı pompalarının ekserji analizi	Anlatım/Soru-cevap
12		Buhar sıkıştırmalı soğutma sistemleri ve ısı pompalarının ekserji analizi	Anlatım/Soru-cevap
13		Isı dönüştürücülerinin ekserji analizi	Anlatım/Soru-cevap
14		Kombine proseslerin ekserji analizi, güneş kolektörlerinin ekserji analizi	Anlatım/Soru-cevap
15		Final sınavı	Sınav uygulaması

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COURSE INFORMATION FORM

INSTITUTE/FACULTY/SCHOOL and PROGRAMME: School of Natural and Applied Sciences/Mechanical Engineering							
COURSE INFORMATION							
Name	**Code**	**Medium of Instruction**	**Type** Required/ Optional	**Semester**	**T+P Hour**	**Local Credit**	**ECTS**
Exergy Analysis of Energy Systems		**Turkish**	**Elective**		**3+0**	**3**	**7,5**

Pre-requisites	

Course Instructor	**Assist. Prof. Dr. Ali Etem GÜREL**
Instructor Assistants	

Course Objective	Determination of exergy loses of equipments, are construct the energy systems, seperately and one by one, and also complete exergy analyses of the system.

Course Learning Outcomes	*1) Tell basic definitions of thermodynamics and laws of thermodynamics.* *2) Recognize Otto, Diesel and Brayton cycles.* *3) Explain the definition of entropy and knows entropy change of ideal gases.* *4) Identify the terms of exergy and irreversibility.* *5) Define the usage of exergy to the energy systems and applications.* *6) Perform exergy analyses on heat pump and refrigeration systems.* *7) Apply exergy on energy systems.*

COURSE PLAN			
Week	**Course Preparation**	**Subjects/Applications**	**Method**
1		Definition of exergy and efficiency	Lecture/Question-answer
2		Definition of exergy and efficiency, exergy balance and exergy loses, thermal systems exergy efficiency and exergy analyses base thermodynamical appliances	Lecture/Question-answer
3		Definition of exergy and efficiency, exergy balance and exergy loses, thermal systems exergy efficiency and exergy analyses base thermodynamical appliances	Lecture/Question-answer
4		Exergy calculation, open system exergy calculation, physical exergy calculations, chemical exergy calculations, thermal radiation exergy calculation	Lecture/Question-answer
5		Exergy calculation, open system exergy calculation, physical exergy calculations, chemical exergy calculations, thermal radiation exergy calculation	Lecture/Question-answer
6		Exergy calculation, open system exergy calculation, physical exergy calculations, chemical exergy calculations, thermal radiation exergy calculation	Lecture/Question-answer
7		Typical thermal systems exergy analyses, heat exchangers exergy analyses, machine exergy analyses, combustion process exergy analyses	Lecture/Question-answer
8		Typical thermal systems exergy analyses, heat exchangers exergy analyses, machine exergy analyses, combustion	Lecture/Question-answer

		process exergy analyses	
9		Typical thermal systems exergy analyses, heat exchangers exergy analyses, machine exergy analyses, combustion process exergy analyses	Lecture/Question-answer
10		Steam generator and heating furnace exergy analyses, steam power systems exergy analyses	Lecture/Question-answer
11		Steam compression cooling systems and heat pumps exergy analyses	Lecture/Question-answer
12		Steam compression cooling systems and heat pumps exergy analyses	Lecture/Question-answer
13		Heat convertor exergy analyses	Lecture/Question-answer
14		Combine processes exergy analyses, solar collector exergy analyses	Lecture/Question-answer
15		Final Exam	Final Exam

COURSE RESOURCES	
Coursebook /Notes	1) 1. Mühendislik Yaklaşımıyla Termodinamik, Y.A. Çengel, M.A. Boles, McGraw-Hill, 6 ed., Türkçe Çeviri Editörü, Ali Pınarbaşı, Güven Yayınevi, 2008. 2) Dincer, I., & Rosen, M. A. (2012). Exergy: energy, environment and sustainable development. Newnes.
Other Resources	

ASSESSMENT SYSTEM	
Activity Types	**Contribution Percentage**
Midte m(s)	**%30**
Quizzes	**-**
Assignments/ Projects	**%20**
Final	**%50**
Total	**%100**

THE CONTRIBUTION OF THE COURSE OUTCOMES TO PROGRAMME OUTCOMES						
No	**Programme Outcomes**	**Contribution Level**				
		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, modeling 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					
6	Ability of identifying the potential resources for information or knowledge regarding a given engineering issue					**x**

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					

ECTS / WORKLOAD TABLE		**Workload (hour)**
In-Class	Class Hours (15 x Weekly Class Hours)	45
Out of-Class	Assignments	40
	Research	50
	Class Preparation and After Class Study	50
	Other Activities	
Examinations	Midterms (Number of Midterms x Duration of Midterms)	3
	Final	3

Total Workload	191
Total Workload / 25,5 (h)	
Course ECTS Credit	7,5