ADVANCED THERMODYNAMICS

1	Course Title:	ADVANCED THERMODYNAMICS
2	Course Code:	MAK6213
3	Type of Course:	Optional
4	Level of Course:	Third Cycle
5	Year of Study:	1
6	Semester:	1
7	ECTS Credits Allocated:	6.00
8	Theoretical (hour/week):	3.00
9	Practice (hour/week):	0.00
10	Laboratory (hour/week):	0
11	Prerequisites:	None
12	Language:	Turkish
13	Mode of Delivery:	Face to face
14	Course Coordinator:	Prof. Dr. RECEP YAMANKARADENİZ
15	Course Lecturers:	Prof. Dr. Recep Yamankaradeniz
16	Contact information of the Course Coordinator:	pulat@uludag.edu.tr , 0 224 2941982 Uludağ Üniversitesi, Makina Mühendisliği Bölümü, Oda No: 217, Görükle, 16059, Bursa.
17	Website:	
18	Objective of the Course:	The objectives of this course are - to reinforce the students grasp of classical thermodynamics, - to present topics in classical thermodynamics that are often not adequately covered in undergraduate courses such as availability analysis and 2nd law efficiency.
19	Contribution of the Course to Professional Development:	
20	Learning Outcomes:	

		1	Understanding of the basic thermodynamic definitions and concepts.
		2	Evaluation of the thermodynamic state and properties for pure substances and ideal gases.
		3	Evaluation of the work and heat transfer of processes.
		4	Application of the principles of conservation of mass and the 1st Law of Thermodynamics to closed and open systems.
		5	Application of the 2nd Law of Thermodynamics to determine ultimate cycle performance and efficiency limitations. The availability (exergy) analysis.
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21	Course Content:	

Course Content:		
Week	Theoretical	Practice

1	Review of basic thermodynamic definitions and concepts.			
2	Temperature, thermal equilibrium and zeroth law of thermodynamics.			
3	Thermodynamic state and properties of pure substance and ideal gases. Principles of corresponding states.			
4	Properties of ideal gases. Equations of state such as Van der Waals, Redlich-Kwong, and Benedect-Webb-Rubin.			
5	Work and heat. Moving boundary work and other work types. First law of thermodynamics, internal energy and enthalpy.			
6	Open systems, first law and work types in open systems.			
7	Application of first law to ideal gases. Variable specific heats of ideal gases.			
8	Course Review and Midterm exam			
9	Second law and Carnot cycle. Heat engine, refrigeration machine and heat pumps.			
10	Entropy. Internal and external irreversibilities. TdS relations.			
11	Reversible work, actual work, usefull work and lost work.			
12	Availability (Exergy) analysis. Second law			

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	3.00	42.00
Homeworks	6	12.00	72.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	5	18.00	18.00
Others	0	0.00	0.00
Final Exams	1	22.00	22.00
Total Work Load			196.00
Total work load/ 30 hr			6.53
ECTS Credit of the Course			6.00

22	Textbooks, References and/or Other	1. K. Work. Advanced Thermodynamics for Engineers 2. A. Bejan. Advanced Engineering Thermodynamics. John Wiley and Sons Inc., 1988. Engineers. Arnold, 1997. 4. R. Yamankaradeniz. Fundamentals of Engineering 5. Y. A. Çengel and M. Boles. Thermodynamics, An Engineering Approach, 5th Ed., Güven Yayınevi

TERM LEARNING ACTIVITIES	NUMBER	WEIGHT
Quiz	0	0.00
Home work-project	6	25.00
Final Exam	1	50.00
Total	8	100.00
Contribution of Term (Year) Learning Activities to Success Grade		50.00
Contribution of Final Exam to Success Grade		50.00
Total		100.00
Measurement and Evaluation Techniques Used in the Course		

24	ECTS / WORK LOAD TABLE

25	CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS															
	PQ1	PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ10	PQ11	PQ12	PQ13	PQ14	PQ15	PQ16
ÖK1	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK2	5	5	4	3	0	0	0	0	0	0	0	0	0	0	0	0
ÖK3	4	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK4	4	4	3	0	0	0	0	0	0	0	0	0	0	3	0	0
ÖK5	4	5	4	0	0	0	0	0	0	0	0	0	0	3	0	0
	LO: Learning Objectives PQ: Program Qualifications															
Contribution Level:	1 very low			2 low			3 Medium			4 High			5 Very High			