EXERGY APPLICATIONS OF THERMAL SYSTEMS

1	Course Title:	EXERGY APPLICATIONS OF THERMAL SYSTEMS
2	Course Code:	MAK6239
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:	Doç. Dr. Ayşe Fidan ALTUN
15	Course Lecturers:	
16	Contact information of the Course Coordinator:	Doç. Dr. Ayşe Fidan Altun aysealtun@uludag.edu.tr
17	Website:	
18	Objective of the Course:	The aim of the course is to teach the physical foundations and engineering applications of heat and work relations and energy conversions, which is one of the main areas of interest of engineering. Exergy analysis will be introduced, and the design and analysis of thermal systems will be carried out by using the principles of conservation of mass and energy and the second law of thermodynamics.
19	Contribution of the Course to Professional Development:	To make advanced thermodynamic analyzes of heat and work generating systems and to analyze the most suitable working conditions by interpreting the results of these analyzes.
20	Learning Outcomes:	
	1	To understand the importance of exergy analysis in mechanical engineering,
	2	Establishing mass, energy and exergy balances during exergy analysis applications, ensuring that the use of tables and graphics required for solution in design is learned,
	3	To be able to determine the necessary improvements to operate the system in the most efficient conditions by making energy and exergy analyzes of thermodynamic cycles.
	4	To learn exergy based system performance analysis methods.
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21	Course Content:	
	Course Content:	

Week	Theoretical	Practice
1	Introduction to the concepts of design, synthesis, analysis, optimum and near-optimal solutions; understanding the problem	
2	Review of basic concepts- Zeroth law, First law, Second law, Entropy and its formation, reversibility and irreversibility, maximum work	
3	Control volume concept, mass, energy and entropy balances	
4	Exergy Analysis, environment and dead state, exergy components; physical exergy-applications on closed and open systems, exergy balances	
5	Exergy losses and destruction, exergy efficiency, thermodynamic efficiency, evaluation and improvement of processes	
6	Performance evaluation, Exergy evaluation graphs (Grossmann diagram, pi diagram), overview of other exergy-based graphs	
7	Thermodynamic feasibility, applications in new and existing plants	
8	Exergy analysis of Heat Pumps	
9	Exergy Analysis in Heating Systems	
10	Exergy Analysis in Thermal Power Plants, Cogeneration Systems	
11	Exergy Analysis in Geothermal Systems	
12	Exergy Analysis in Solar Energy Systems	
13	Exergy Analysis in Wind Energy Systems	
14	Exergy Analysis in Hydrogen Energy Systems	

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical and Modeling	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	12	6.00	72.00
Homeworks	8	8.00	64.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	0	0.00	0.00
Others	0	0.00	0.00
Final Exams	1	2.00	2.00
Total Work Load			180.00
Total work load/ 30 hr	0	0.00	6.00
ECTS Credit of the Course			6.00

TERM LEARNING ACTIVITIES	NUMBER	WEIGHT
Quiz	0	0.00
Final Exam	1	60.00
Total	2	100.00
Contribution of Term (Year) Learning Activities to Success Grade		40.00
Contribution of Final Exam to Success Grade		60.00
Total		100.00

22 Textbooks; References and/or Other	1. A. Bejan, G. Tsatsaronis, M. Moran, "Thermal Design and Modeling", John Wiley & Sons, Inc. 2. T.J. Kotas, "The Exergy Method of Thermal Plant Analysis", 2nd edition, Krieger Publishing Company.
23 Assesment	
Measurement and Evaluation Techniques Used in the Course	Measurement and evaluation is carried out according to the priciples of Bursa uludag University Associate and Postgraduate Education Regulation.
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	5	5	2	2	1	1	1	1	1	1	1	1	1	1
ÖK2	5	5	4	4	2	1	1	1	0	0	0	0	0	0	0	0
ÖK3	4	5	5	3	0	0	1	0	2	0	0	0	0	0	0	0
ÖK4	4	5	5	5	5	2	3	1	1	2	2	2	2	2	1	1
LO: Learning Objectives PQ: Program Qualifications																
Contribution Level:	**1 very low**		**2 low**			**3 Medium**				**4 High**			**5 Very High**			