DEPARTMENT OF ENERGY SCIENCE AND TECHNOLOGIES
COURSE SYLLABUS

Course Details				
Code	**Academic Year**			**Semester**
EBT322	3			5
Title	**T**	**A**	**L**	**ECTS**
Refrigeration Technology	2	2	0	6

Language	German					
Level	**Undergraduate**	**X**	**Graduate**		**Postgraduate**	
Department / Program	Energy Science and Technology					
Forms of Teaching and Learning	Face-to-face					
Course Type	**Compulsory**		**Elective**	**X**		
Objectives	This course aims to teach the fundamental principles of refrigeration machines and heat pumps, analyze and calculate refrigeration processes from a thermodynamic perspective. Additionally, it aims to evaluate the optimization of these systems, the design of components and parameters, control options, and applications of absorption coolers.					
Content	This course covers the fundamental principles of thermodynamics, the first and second laws, cycle processes, and state diagrams. It also includes the properties of binary mixtures, mixing enthalpy, enthalpy-concentration diagrams, phase transitions, and azeotropic mixtures with limited miscibility. The course examines the working process of compression refrigeration machines, methods to improve the coefficient of performance, staged connections, and the working principles of cooling pumps. The ideal comparison process of humid air and absorption coolers, energy balances, and methods for improving the performance factor are also included in the course content. The working principles of steam jet coolers, jet apparatus, propellant steam consumption, and application areas are discussed. The types and properties of refrigerants, different types of cooling systems, component design, compressors, evaporators, condensers, control valves, and the arrangement of cooling systems are examined.					
Prerequisites	-					
Coordinator	Asst. Prof. Dr. Osman Sinan Süslü					
Lecturer(s)	Asst. Prof. Dr. Osman Sinan Süslü					
Assistant(s)						
Work Placement	None					

Recommended or Required Reading	
Books / Lecture Notes	Maurer, T.: Mühendisler için soğutma teknolojisi Urbaneck, T.: Soğuk hava deposu: temel bilgiler, teknoloji, uygulama
Other Sources	Plank R., .: Soğuk teknoloji el kitabı Cube, HL: Soğuk teknoloji ders kitabı, Cilt 1 ve 2 Verlag CF Müller, Karlsruhe 1975 Kalide W.: Soğutma ve soğutma sistemlerinin termodinamiği. Carl Hanser Verlag Münih, Viyana 1976

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Additional Course Material		
Documents		
Assignments		
Exams		

Course Composition		
Mathematics und Basic Sciences	20	%
Engineering	20	%
Engineering Design		%
Social Sciences		%
Educational Sciences		%
Natural Sciences	20	%
Health Sciences		%
Expert Knowledge	40	%

Assessment		
Activity	Count	Percentage (%)
Midterm Exam	1	30
Quiz		
Assignments	1	10
Presentation	1	10
Recitations		
Projects		
Final Exam	1	50
	Total	100

ECTS Points and Work Load			
Activity	Count	Duration	Work Load (Hours)
Lectures	14	2	28
Self-Study	14	6	84
Assignments	1	7	7
Presentation / Seminar Preparation	1	7	7
Midterm Exam	1	3	3
Recitations	14	2	28
Laboratory			
Projects	1	8	8
Final Exam	1	3	3
		Total Work Load	168

DEPARTMENT OF ENERGY SCIENCE AND TECHNOLOGIES
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ECTS Points (Total Work Load / Hours)	**6**

Learning Outcomes	
1	The student can understand, compare, and analyze different refrigeration cycles.
2	The student can calculate, evaluate, and optimize the parameters of different refrigeration cycles according to operating conditions.
3	The student understands, explains, and evaluates energy storage methods using refrigeration cycles.
4	The student can select, design, and optimize appropriate refrigeration cycles to utilize waste heat.
5	The student can design combined heating, cooling, and power-generating trigeneration systems, analyze their operating parameters, and optimize them.
Weekly Content	
1	Introduction and compression refrigeration units, two-stage and multi-stage refrigeration units, staged connection
2	Components of compression cycle refrigeration systems
3	Calculation principles
4	Steam jet refrigeration system, efficiency calculation, control, and operating behavior
5	Binary mixtures, properties, phase diagrams, phase transitions
6	Absorption cooling process, circuit, dephlegmator, heat exchanger, calculation
7	Control and operation of absorption cooling systems
8	Midterm Exam
9	Adsorption cooling systems
10	Calculation and optimization of adsorption cooling systems
11	Peltier cooling machine
12	Philips Stirling cooling machine and its calculation
13	LNG, gas liquefaction
14	Energy recovery through the evaporation of liquid gas
15	Energy storage via gas liquefaction
16	Final Exam

Contribution of Learning Outcomes to Program Objectives (1-5)

	P1	P2	P3	P4	P5	P6	P7	P8	P9
1			3			4			2
2			4			2			3
3			3			2			5
4			2			4			3
5			3			3			4

Contribution Level	1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High

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Compiled by:	
Date of Compilation:	