AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Geothermal Energy and Bases For Electricity Production								
Course Code	MME531		Couse Level	Second Cycle (Master's Degree)					
ECTS Credit	8	Workload	195 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	To equip the students for the application of Geothermal Energy among the renewable energy resources, the importance of it in Turkey and the world, the related design bases and standards for choosing the plant type, pressure vessels and piping.								
Course Content	The Geothermal Energy Characteristics, The situation of Geothermal Energy in Turkey and the world, Drilling Wells, Control Methods, Transfer, Power Plant Types with respect to its source, sustainability issues for reservoir and reinjection, The thermodynamics and Fluid Mechanics for Geothermal Energy Application, Safety and Fire fighting Measures.								
Work Placement	N/A								
Planned Learning Activities and Teaching Methods	Explanation (Presentation), Demonstration, Discussion, Project Based Study, Individual Study, Problem Solving								
Name of Lecturer(s)									

Assessment Methods and Criteria

Method	Quantity	Percentage (%)
Midterm Examination	1	15
Final Examination	1	60
Quiz	4	15
Assignment	5	5
Term Assignment	1	5

Recommended or Required Reading

1	Ronald DiPippo, Geothermal Power Plants, Second Edition: Principles, Applications, Case Studies and Environmental Impact, 2008.

Week	Weekly Detailed Course Contents	
1	Theoretical	Characterization of Geothermal Energy, Definitions in general, Natural Hydrothermal Systems, Geopressurized Systems, Hot dry rocks, Magma, Ultra low grade systems.
2	Theoretical	Geothermal Energy markets, The development in Geothermal Energy, Applications, Environmental effects.
3	Theoretical	Thermodynamics for Geothermal Energy, Elongations and compensation methods
4	Theoretical	Power Plant types, Plant Equipment, Design bases for Well Heads, and Well head equipment.
5	Theoretical	Fluid Mechanics, Laminar-Turbulant Flows, Reynold Number, Moody diagram, Bernouilli Applications.
6	Theoretical	Fluid Dynamics, Pipe stresses, Pipe Loads, Static and dynamic forces on foundations.
7	Theoretical	Piping Standards, Introduction to B31.1
8	Theoretical	Pressure Vessel Design. (ASME VIII)
9	Theoretical	Calculation for Pump Choice.
10	Intermediate Exam	Mid Term Exam
11	Theoretical	Reinjection Wells, Reinjection Pipes, Calculation methods for underground pipes.
12	Theoretical	Corrosion problems, Surface preparation, Importance of painting, galvanize coating, Cathodic Protection
13	Theoretical	Pressized Air Production and distribution principals
14	Theoretical	Binary Media Storage, transfer and Protection Methods
15	Theoretical	Safety and Fire Fighting Measures
16	Final Exam	Final Exam

Workload Calculation

Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	16	2	4	96
Assignment	5	0	2	10

Term Project	1	15	10	25
Quiz	4	4	1	20
Midterm Examination	1	20	2	22
Final Examination	1	20	2	22
			Total Workload (Hours)	195
			[Total Workload (Hours) / 25*] = **ECTS**	8
**25 hour workload is accepted as 1 ECTS*				

Learning Outcomes	
1	Production activities for undergroung researches, well drilling and well head management under inspected controls.
2	Management for reservoir and reinjection for sustainability
3	The basic design bases for well heads which are the main sources for geothermal energy
4	The design bases to transfer the geothermal fluid to the power plant
5	The design principals for power plant and its type.

Programme Outcomes *(Mechanical Engineering Master's Without Thesis)*	
1	To be able to access wide and deep information with scientific researches in the field of Engineering, evaluate, interpret and implement the knowledge gained in his/her field of study
2	To be able to complete and implement “limited or incomplete data” by using the scientific methods
3	To be able to consolidate engineering problems, develop proper method(s) to solve and apply the innovative solutions to them
4	To be able to develop new and original ideas and method(s), to develop new innovative solutions at design of system, component or process
5	To be able to gain comprehensive information on modern techniques, methods and their borders which are being applied to engineering
6	To be able to design and apply analytical, modeling and experimental based research, analyze and interpret the faced complex issues during the design and apply process
7	To be able to gain high level ability to define the required information and data
8	To be able to work in multi-disciplinary teams and to take responsibility to define approaches for complex situations
9	To be able to transfer of the process and results of studies at national and international environments systematic and clear verbal or written
10	To be able to become aware of social, scientific and ethical values guarding adequacy at all professional activities and at the stage of data collection, interpretation, and announcement
11	To be able to become aware of new and developing application of profession and ability to analyze and study on those applications
12	To be able to gain ability to interpret engineering application’s social and environmental dimensions and it’s compliance with the social environment

Contribution of Learning Outcomes to Programme Outcomes *1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High*

	L1	L2	L3	L4	L5
P1	5	4	5	4	4
P2	4	5	4	5	5
P3	5	3	4	4	4
P4	3	4	3	3	3
P5	4	5	5	5	4
P6	5	3	3	3	3
P7	3	5	4	4	5
P8	4	4	3	3	4
P9	5	5	5	5	3
P10	5	3	3	3	5
P11	5	5	3	4	3
P12	4	4	3	5	4