

MM 494 Gas Turbines				DEPARTMENT of MECHANICAL ENGINEERING					
Semester	Methods of Education							Credits	
	Lecture	Recit.	Lab.	Project /Field Study	Homework	Other	Total	Credit	ECTS Credit
8	42	0	-	25	8	-	75	3	3.0
Language	Turkish								
Compulsory / Elective	Elective								
Prerequisites	MM 416 Energy Engineering								
Course Contents	Fundamental concepts. Ideal-cycle analysis, gas dynamics, one dimensional steady and unsteady flows, actual performances of gas turbine cycles, radial and axial compressors. Combustion systems. Axial flow turbines, performance analysis of gas turbines.								
Course Objectives	To teach principles and analysis of gas turbine cycles used for aircrafts and different areas. To give students detailed knowledge about main components of gas turbines. To present advantages and disadvantages of gas turbines compared to other energy producing machines.								
Learning Outcomes and Competences	After completion of this course, students will gain basic knowledge about characteristics, advantages and disadvantages of gas turbines and methods used for thermodynamic analysis and design of gas turbines. Also students will be able to apply these methods to practical problems.								
Textbook and /or Reference	Gas Turbine Theory, H. Saravanamutto, G.F.C. Rogers and H. Cohen, Prentice Hall, Fifth Edition. Elements of Gas Turbine Propulsion, J. D. Mattingly, McGraw-Hill, Inc., International Editions, 1996.								
Assessment Criteria						If any, mark as (x)		Percentage (%)	
	Midterm Exams					X		60	
	Quizzes								
	Homeworks								
	Projects								
	Term Paper								
	Laboratory Work								
	Other								
Final Exam					X		40		
Instructors	Prof. Nuri YUCEL								
Week	Subject								
1	FUNDEMENTAL CONCEPTS: Introduction. Review of thermodynamics.								
2	ANALYSIS OF IDEAL CYCLES: Analysis of simple gas turbine cycle (Brayton cycle). Analysis of gas turbine cycles with heat-exchange and with reheat.								
3	ANALYSIS OF IDEAL CYCLES: Analysis of gas turbine cycles with heat-exchange, reheat and intercooled compression.								
4	COMPONENT LOSSES IN GAS TURBINES: Differences between real and ideal cycles. Stagnation properties. Compressor and turbine efficiencies, polytropic efficiency.								
5	COMPONENT LOSSES IN GAS TURBINES: Pressure losses. Heat-exchanger effectiveness. Mechanical losses. Variation of specific heat. Combustion efficiency.								
6	COMPARATIVE PERFORMANCE OF REAL CYCLES: Comparative performance analysis of simple, heat-exchange and heat exchange with reheat or intercooling cycles.								
7	GAS TURBINE CYCLES FOR AIRCRAFT PROPULSION: Introduction, critteria of performance. Definition of efficiencies: propulsion efficiency, efficiency of energy conversion, overall efficiency, and efficiencies of intake and nozzle								
8	MIDTERM EXAM I and demonstration of gas turbines in the lab.								
9	GAS TURBINE CYCLES FOR AIRCRAFT PROPULSION: Thermodynamic analysis of simple turbojet cycle. Optimization of turbojet cycle.								
10	GAS TURBINE CYCLES FOR AIRCRAFT PROPULSION: Thermodynamic analysis of turbofan cycle. Optimization of turbofan cycle. Thermodynamic analysis of turboprop cycle.Thrust augmentation.								
11	MAIN COMPONENTS OF GAS TURBINES: Centrifugal and axial flow compressors: their characteristics, their comparisions and velocity triangles.								
12	MAIN COMPONENTS OF GAS TURBINES: Types and characteristics of combustion systems. Radial and axial flow turbines: their characteristics, their comparisions and velocity triangles. Cooling methods of turbine blades.								
13	MIDTERM EXAM II and solution of exam problems.								
14	PERFORMANCE ANALYSIS OF GAS TURBINES: Component characteristics. Variation of power output and specific fuel consumption with output speed , elevation and turbine speed.								