MM 448 Fuels Combustion and Combustion Systems	DEPARTMENT of MECHANICAL ENGINEERING

Semester	Methods of Education							Credits	
	Lecture	Recit.	Lab.	Project/Field Study	Homework	Other	Total	Credit	ECTS Credit
8	42	0	-	23	10	-	75	3	3.0

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	None
Course Contents	Fossil fuels, their formations and properties. Fuel analyses and heating values. Fundamental requirements of the combustion process. Combustion with continuous- and intermittent-ignition Conversion mechanisms of fuel into gaseous form, fuel/air mixing, ignition and formation of sustainable flame. Combustion reactions, chemical equilibrium, reaction rates. Combustion stoichiometry and combustion calculations. Combustion air requirements, combustion products and emissions calculations. Fuel preparation systems and their functions. Combustion systems and their classification, combustion systems with grate, circulating bed and burners. Thermal performances and emission behaviours of different combustion systems. Design fundamentals of combustion systems and combustion chambers.
Course Objectives	To teach the fundamental properties, importance and application of fuels, combustion and combustion systems in engineering. To give the ability to apply basic methods for analysis, design and optimization of the related systems.
Learning Outcomes and Competences	Understanding of technical, economical, and environmental properties of combustion systems, their design and applications in economical sectors. Learing the applications of related analyses, design and optimization methods for research, system development, design, operation and optimization.
Textbook and /or Reference	P.BASU, C.KEFA, L.JESTİN, Boilers and Burnes, Springer-Verlag, 2000.3. J.B.HEYWOOD, Internal Combustion Engine Fundamentals, McGraw-Hill Book Company,1988. J.B.HEYWOOD, Internal Combustion Engine Fundamentals, McGraw-Hill Book Company,1988. Hüseyin TOPAL, Lecture Notes

Assessment Criteria		If any, mark as (x)	Percentage (%)
	Midterm Exams	2	40
	Quizzes	5	10
	Homeworks	1	10
	Projects		
	Term Paper		
	Laboratory Work		
	Other		
	Final Exam	1	40

Instructors	Assist.Prof. Huseyin TOPAL
Week	**Subject**
1	Introduction: Importance of fuels, combustion and combustion systems in engineering. Types of combustion systems, their applications in economical sectors, their effects on operational, energy and environmental economy.
2	Fossil fuels: Formation of coal, oil and natural gas, their production and processing.Classification of fuels, their properties and sectorial preferences.
3	Fuel technologies: Production of technical fuels from rough solid, liquid and gaseous fuels. Fuel analyses, their interpretations in respect to system design, operation and environmental effects. Conversion calculations of fuel analyses.
4	Combustion: Definition and types of combustion, fundamental requirements of sustainable combustion. Fundamental combustion formation mechanisms.
5	Conversion mechanisms of fuel into gaseous form, fuel-air mixing, ignition and sustainable flame formation. Related design and operational measures.
6	Chemical thermodynamics, combustion reactions, chemical equilibrium and calculation of equilibrium constants, interpretations of equilibrium constants in combustion applications. Combustion rate and combustion time.
7	Combustion calculations for solid, liquid and gaseous fuels.
8	Midterm Exam I, Solution of application oriented sample problems.
9-10	Thermodynamic properties of combustion gases. Calculation of flame emissivities and the condensation temperature of chimney gas. Thermal losses of combustion processes.
11	Midterm II. Solutions of design related sample problems
12	Experimental determination of combustion thermal performance and emission properties. Emission parameters and emission calculations.
13	Calculations of combustion efficiency, fuel consumption, flow rate of required combustion air and combustion products. Adiabatic flame temperature. Combustion chamber design
14	Preparation systems for coal, fuel-oil and natural gas combustion. Classification of combustion systems, their combustion and emission properties, application areas.