

Course code	Course Name	L-T-P-Credits	Year of Introduction
AO361	FUELS AND COMBUSTION	3-0-0-3	2016
<b>Prerequisite : Nil</b>			
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>• To give an account of fuels and their properties</li> <li>• To introduce the concepts in combustion science</li> </ul>			
<b>Syllabus</b>			
Fuels - Types and Characteristics of Fuels - Determination of Properties of fuels - Solid Fuels Liquid Fuels-combustion fundamentals – flame propagation – premixed flames – diffusion flames – emission.			
<b>Expected Outcome</b>			
The students will			
<ol style="list-style-type: none"> <li>i. Become aware of the various types of fuels</li> <li>ii. Understand the basics of combustion</li> </ol>			
<b>Text Books:</b>			
<ol style="list-style-type: none"> <li>1. Samir Sarkar, Fuels &amp; Combustion, 2nd Edition, Orient Longman, 1990</li> <li>2. Bhatt, Vora Stoichiometry, 2nd Edition, Tata Mcgraw Hill, 1984</li> <li>3. BlokhAG, Heat Transfer in Steam Boiler Furnace, Hemisphere Publishing Corpn, 1988.</li> </ol>			
<b>References:</b>			
<ol style="list-style-type: none"> <li>1. Civil Davies, Calculations in Furnace Technology, Pergamon Press, Oxford, 1966</li> <li>2. Sharma S P, Mohan Chander, Fuels &amp; Combustion, Tata McGraw Hill, 1984</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	End Sem. Exam Marks
<b>I</b>	Fuels - Types and Characteristics of Fuels - Determination of Properties of Fuels -	1	15%
	Fuels Analysis - Proximate and Ultimate Analysis - Moisture Determination - Calorific Value - Gross & Net Calorific Values	1	
	Flue gas Analysis - Orsat Apparatus	2	
	Fuel & Ash Storage & Handling - Spontaneous Ignition Temperatures.	2	
<b>II</b>	<b>Liquid Fuels</b> Types - Sources - Petroleum Fractions	3	15%
	Classification - Refining	3	
	Properties of Liquid Fuels -Calorific Value, Specific Gravity, Flash & Fire Point, Octane Number, Cetane Number etc,	4	
<b>FIRST INTERNAL EXAM</b>			

<b>III</b>	<b>Gaseous Fuels:</b> Classification - Composition & Properties	2	15%
	Estimation of Calorific Value - Gas Calorimeter - Rich & Lean Gas - Wobbe Index	2	
	Natural Gas - Dry & Wet Natural Gas - Stripped NG - Foul & Sweet NG - LPG - LNG – CNG, Methane - Producer Gas	3	
<b>IV</b>	Stoichiometry - Mass Basis & Volume Basis - Excess Air Calculation	1	15%
	Fuel & Flue Gas Compositions - Calculations - Rapid Methods	2	
	Combustion Processes - Mechanism of Combustion - Ignition & Ignition Energy - Spontaneous Combustion	2	
	Flame Propagation - Liquid & Gaseous Fuels Combustion - Flame Temperature - Theoretical, Adiabatic & Actual - Ignition Limits - Limits of Inflammability	2	
<b>SECOND INTERNAL EXAM</b>			
<b>V</b>	Premixed flames: Physical description Detailed analysis, Factors Influencing flame velocity and thickness,	2	20%
	Quenching, Flammability and Ignition Flame stabilization.	2	
	Diffusion flames: jet flame physical descriptions, flame lengths for circular port and slot burners	2	
	Soot formation and destruction	1	
<b>VI</b>	Emissions: Effects of pollutants, Quantification of emissions,	2	20%
	Emission from premixed combustion, Emissions from non premixed combustion.	3	
<b>END SEMESTER EXAM</b>			

**Question Paper Pattern**

Maximum marks: 100

Exam duration: 3 hours

The question paper shall consist of three parts

**Part A**

4 questions uniformly covering modules I and II. Each question carries 10 marks  
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part B**

4 questions uniformly covering modules III and IV. Each question carries 10 marks  
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part C**

6 questions uniformly covering modules V and VI. Each question carries 10 marks  
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

**Note:** In all parts, each question can have a maximum of four sub questions