FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Engineering

Semester I

Course Code: 102440108

Course Title: Fuels,Combustion & Environment

Type of Course: Program Elective II

Course Objectives: This subject is designed to provide knowledge of combustion phenomenon and different types of fuels.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	40 /16	20 /08	60 /24	30 /12	150 /60

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	FUELS Detailed classification – Conventional and Unconventional Solid, Liquid, gaseous fuels and nuclear fuels – Origin of Coal – Analysis of coal. Coal – Carburization, Gasification and liquification – Lignite: petroleum based fuels – problems associated with very low calorific value gases: Coal Gas – Blast Furnace Gas Alcohols and Biogas.	6
2	PRINCIPLES OF COMBUSTION Chemical composition – Flue gas analysis – dew point of products – Combustion stoichiometry. Chemical kinetics – Rate of reaction – Reaction order – Molecularity – Zeroth, first, second and third order reactions - complex reactions – chain reactions. Theories of reaction Kinetics – General oxidation behavior of HC's	7
3	IMPORTANT CHEMICAL MECHANISMS The H2-O2 system, Carbon monoxide Oxidation, Oxidation of Higher Paraffin, Methane Combustion, Oxides of Nitrogen Formation.	6
4	LAMINAR AND TURBULENT FLAMES PROPAGATION AND STRUCTURE Physical Description, Simplified analysis –Flame stability – Burning velocity of fuels – Measurement of burning velocity – factors affecting the burning velocity. Combustion of fuel, droplets and sprays – Definition of Turbulent Flame Speed – Structure of Turbulent Premixed Flames – Turbulent Nonpremixed Flames– Combustion systems – Pulverized fuel furnaces – fixed, Entrained and Fluidized Bed Systems.	12
5	ENVIRONMENTAL CONSIDERATIONS Air pollution – Effects on Environment, Human Health etc. Principal pollutants – Legislative Measures – Methods of Emission control	8

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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
10%	30%	25%	20%	10%	05%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1	Combustion Fundamentals, Roger A Strehlow, McGraw-Hill
2	Fuels and Combustion, Sharma and Chander Mohan, Tata McGraw-Hill
3	Combustion Engineering and Fuel Technology, Shaha A.K., Oxford and IBH
4	Principles of Combustion, Kenneth Kuan-yun Kuo,Wiley
5	Fuel and Combustion, Samir Sarkar, Universities Press
6	An Introduction to Combustion: Concepts and Applications, Stephen R. Turns, McGraw Hill Education
7	Combustion Engineering, Gary L. Berman & Kenneth W. Ragland, McGraw-Hill
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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understanding of thermodynamics and kinetics of combustion	**20**
CO-2	Students able to apply the principles of combustion	**25**
CO-3	Understanding of the laminar and turbulent flames propagation and structure	**35**
CO-4	Effect of the fuel combustion on the environmental emissions	**20**
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List of Practicals / Tutorials:

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1	To study various types of fuels
2	Study of Carburisation coal
3	Study of Gasification of coal
4	Study of liquification of coal
5	Study of combustion stoichiometry
6	Study of rate of reaction and reaction order
7	To study enthalpy formation
8	Study of burning velocity of fuel
9	To study different combustion systems
10	Study of environmental consideration
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Supplementary learning Material:	
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Curriculum Revision:	
Version:	**1**
Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22

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