INTRODUCTION TO FUEL TECHNOLOGY

Course Type	Course Code	Name of Course	L	T	P	Credits
DC	FME222	Introduction to Fuel Technology	3	0	0	9

Course Objective

The main aim of the course is to give an introduction to the different types of fossil fuels. The emphasis of the course will be on the characterizations and utilizations of solid fuels, basics of liquid and gaseous fuels.

Learning Outcomes

At the end of this course students would have the knowledge of

- coal characterisation and its utilisation in different thermochemical conversion processes
- design of coal utilisation equipment
- biomass characterisation and utilisation.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction to energy resources, Indian perspective, Origin and formation of coal: Different theories on coal formation, Rank of coal, classification of coal.	4	Students will get overview of energy resources, including coal
2	Coal Properties: Chemical, Physical and Plastic properties: Proximate analysis, Ultimate analysis, coal petrography, Gross calorific value, Net calorific value, Free Swelling Index, Caking Index, Roga Index, LTGK, plastometer, dilatometer, Estimation of total moisture. Hardness, determination of HGI. Porosity, density, specific heat, thermal conductivity, Selection of coal for various processes.	10	Students will learn various characterization techniques for coal
3	Behaviour of coal at elevated temperature**.** Fundamental and mechanism of coal carbonization, Types of carbonization and processes, Coke properties, Formed coke, bi-products of coal carbonization.	7	Knowledge on fundamentals of coal carbonization.
4	Fundamentals of coal combustion, mechanism of combustion, different coal firing systems, stoichiometric calculations.Clean coal technology for power, cement and steel industries.	6	Knowledge on coal combustion.
5	Design of coke ovens, coal combustion and gasification systems. Classification and selection of refractories. Fuel and heat losses in combustion and carbonization units.	7	Knowledge on design of coal utilization equipment, selection of refractories
6	Biomass and its utilization: types of biomass, biomass utilisation process, Production of biochar, bio oils/fuel for various industrial applications. Utilization of various waste materials as fuel. Introduction to Fuel cell.	4	Knowledge on biomass, waste materials as fuel. Fuel cell.
7	Classification of crude petroleum, characteristics of petroleum and their products. Classification of gaseous fuels, production of gaseous fuel from coal. Liquefaction of coal, other utilization potential of coal. CBM/CMM, Gas hydrates, shale gas	4	Introductory knowledge on liquid and gaseous fuel
	Total	42	

Text Books:

1. Fuels and Combustion: Samir Sarkar, University Press (India) Pvt Limited, India.

Reference Books:

1. Elements of Fuels, Furnaces and Refractories: O P Gupta, Khanna Publishers, India
2. Fuels, Furnaces and Refractories: R C Gupta, PHI Learning Private Limited, India
3. An Introduction to Chemistry and Technology of coal utilization: James P Speight