

MLPE3007 FUEL REFRACTORIES AND FURNACES (3-0-0)

Course Objective:

To develop understanding of fuels, coal properties, carbonization, furnace design, and refractory materials, enabling students to select, utilize, and optimize industrial fuel and heating systems efficiently and sustainably.
Syllabus Contact Hour

Module – I: (06 Hours)

Definition of Fuel; Types of Fuel; Conventional and Non-conventional Fuel; Types of Energy Resources; Potential of Energy Resources and their exploitation

Module – II: (06 Hours)

Types of solid fuels. Origin and formation of coal. Classification of Coal. plastic/coking properties of coal, thermal decomposition of coal, selection, testing utilization of coking and non-coking coal.6 hrs

Module – III: (06 Hours)

Coal carbonization: Fundamentals of coal carbonization, types of carbonization process, byproduct recovery and coke properties; non-recovery coke ovens.

Module – IV: (06 Hours)

Types of furnaces and classification, Industrial application of furnaces, design and construction aspects of furnaces. Chimney design, process efficiency.

Module – V: (06 Hours)

Refractories: refractory material and characterization, types of Refractories and their application in boilers and furnace construction. Properties and testing methods of Refractories. Manufacture of fire basic bricks, acidic and neutral Refractories, refractory mortars, cements and monoliths, special refractory and ceramics. Role of refractories in energy conservation in furnaces.

Course Outcome:

CO1:To understand various fuels, their classifications, and potential of conventional and non-conventional energy resources

CO2:To learn coal origin, classification, properties, and its suitability for industrial applications

CO3:To gain knowledge of coal carbonization processes, coke properties, and by-product recovery systems

CO4:To understand types of furnaces, design principles and industrial applications

CO5:To acquire knowledge of refractory materials, their properties, manufacturing methods, and their role in metallurgical operation

Text Books:

1. Gupta, O.P., Elements of Fuels, Furnaces and Refractories, Khanna Publishers
2. Gupta, R.C., Fuels, Furnaces and Refractories, PHI Learning

Reference Books:

1. Mazumder B., Coal Science and Engineering, Woodhead Publishing Ltd
2. Havard F.T., Refractories and Furnaces: Properties, Preparation, and Application of Materials Used in the Construction and Operation of Furnaces, Legare Street Press