FUELS AND COMBUSTION
(Professional Elective III)

II Semester

Course Code: 19ME2256

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3	0	3

Prerequisites: Thermodynamics

Course Outcomes: At the end of the course the student shall be able to

CO1: Compare various fuels.
CO2: Explain different steps in refinery process of petroleum.
CO3: Analyze exhaust and flue gases.
CO4: Design burners.
CO5: Explain methods for emission control in combustion.

UNIT-I: **(10-Lectures)**

Classification of coal, analysis and properties of coal, oxidation of coal, hydrogenation of coal, agro fuels, solid fuel handling.

Learning outcomes: At the end of this unit, the student will be able to

1. Define various coals. (L1)
2. Explain the concepts of coal formation. (L2)
3. Analyse the coal based on the various compositions. (L4)

UNIT-II: **(10-Lectures)**

Classification of petroleum products, Handling and storage of petroleum products, Refining and other conversion processes, property and testing of petroleum products, other liquid fuels. Types of gaseous fuels, natural gas, methane from coal mines, manufactured gases, producer gas, water gas, blast furnace gas, refinery gas, LPG, cleaning and purification of gaseous fuels.

Learning outcomes: At the end of this unit, the student will be able to

1. Explain various petroleum products, their handling and storage (L2)
2. Summarize various gaseous fuels. (L2)
3. Explain various refining, conversion, cleaning and purification of fuels. (L2)

UNIT-III **(10-Lectures)**

Stoichiometry relations, theoretical and minimum air required for complete combustion, calculation of dry flue gases, exhaust gas analysis, flue gas analysis. Principles of combustion, rapid methods of combustion, flame propagation, various methods of flame stabilization.

Learning outcomes: At the end of this unit, the student will be able to

1. Summarize stoichiometry relations for combustion.(L2)
2. Calculate flue gas analysis using various methods. (L4)
3. Explain the principles of rapid combustion and flame propagation. (L2)

UNIT-IV: (10-Lectures)

Basic features of burner, types of solid, liquid and gaseous fuel burners, design consideration of different types of burners, recuperative and regenerative burners, Pulverised fuel furnaces–fixed, entrained, and fluidized bed systems.

Learning outcomes: At the end of this unit, the student will be able to

1. Interpret different types of burners.(L2)
2. Generate different design considerations of burners. (L6)
3. Summarize and explain various coal burners.(L2)

UNIT-V: (10-Lectures)

Emissions, Emission index, corrected concentrations, control of emissions for premixed and non-premixed combustion.

Learning outcomes: At the end of this unit, the student will be able to

1. Summarize different emission indexes.(L2)
2. Explain the methods to control emissions. (L2)
3. Summarize and discuss the emissions from non-premixed combustion. (L2)

TEXT BOOKS:

1. S. Sarkar, *Fuels and combustion*, 3rd Edition, Universities Press, 2009.
2. S.P. Sharma and C. Mohan, *Fuels and combustion*, Tata McGrawHill, 1987.

REFERENCE BOOKS:

1. H. Joshua Phillips, *Fuels, solid, liquid and gaseous: Their analysis and valuation*, General Books, 2010.
2. S.R. Turns, *An introduction to combustion: Concepts and applications*, Tata McGraw- Hill, 2000.
3. K. Kanneth, *Principles of combustion*, Wiley and Sons, 2005.