

PCH226 FUEL COMBUSTION SYSTEMS

L	T	P	Cr
3	1	0	3.5

Course Objective:

To learn about types of fuels and their characteristics, and combustion systems with emphasis on engineering applications.

Introduction: Perspective of fuels and combustion technology, Types and general characteristics of fuels, Proximate and ultimate analysis of fuels, Moisture and heating value determination, Gross and net heating values, Calorimetry, DuLong's formula, Flue gas analysis, Orsat apparatus.

Thermodynamics and Kinetics of Combustion: Properties of mixture, Combustion stoichiometry, Chemical energy, Chemical equilibrium and criteria, Properties of combustion products, First law combustion calculations, Adiabatic flame temperature (analytical and graphical methods), Simple second law analysis, Elementary reactions, Chain reactions, Pre-ignition kinetics, Global reactions, Reactions at solid surface.

Combustion of Solid Fuels: Drying, Devolatilization, Char combustion, Fixed bed combustion, Suspension burning, Fluidized bed combustion.

Combustion of Liquid and Gaseous Fuels: Spray formation and droplet behaviour, Oil fired furnace combustion, Gas turbine spray combustion, Direct and indirect injection combustion in IC engines, Energy balance and furnace efficiency, Gas burner types, Pulse combustion furnace, Premixed charge engine combustion, Detonation of gaseous mixtures.

Course learning outcomes (CLOs):

The students will be able to

1. characterize the various types of fuels
2. apply thermodynamics and kinetics of combustion
3. analyze the combustion mechanisms of various fuels

Recommended Books:

1. Kuo, K.K., *Principles of Combustion*, John Wiley and Sons, Inc.(2005).
2. Sarkar, S., *Fuels and Combustion*, Orient Longman, (1990).
3. Sharma, S.P., and Chander, M., *Fuels and Combustion*, Tata Mcgraw Hill (1984).
4. Borman, G.L., and Ragland, K.W., *Combustion Engineering*, McGraw Hill (1998).
5. Bhatt, B.I., and Vora, S.M., *Stoichiometry*, Tata Mcgraw Hill (1996).
6. Bureau of Energy Efficiency, Government of India (www.beeindia.in)

Evaluation Scheme:

S.No.	Evaluation Elements	Weightage (%)
1.	MST	30
2.	EST	45
3.	Sessional (may include Assignments/Projects/Tutorials/Quizes/Lab Evaluations)	25