Course Number: ME 636 **Approval: 10th senate meeting**
Course Name: Combustion Technology
Credits: 3-0-0-3
Prerequisites: Instructor's consent
Intended for: M. Tech. /UG/MS/PhD
Distribution: Specialized stream elective course for M.Tech. in Mechanical Engineering with specialization in Energy Systems, and elective course for other students

Semester: Odd/Even

Preamble: This course will contribute to a comprehensive understanding of combustion process involved in energy conversion techniques.

Course Outline: The objective of the course is to introduce the students to the science and technology of combustion in the context of specific applications including those related to various energy systems.

Course Modules:

Module - 1:
Introduction to combustion processes; combustion thermodynamics, reaction kinetics and combustion transport. Chain reactions, ignition, quenching and flammability limits, detonations, deflagrations and flame stability; Introduction to turbulent premixed combustion; Applications in

IC engines, furnaces, gas turbines, and rocket engines. (4 **L**)

Module - 2:
Fuels - Characteristics and Properties; Combustion Thermodynamics and Thermo-chemistry, Heat of Reaction, Calorific Value, Adiabatic Flame Temperature etc

Combustion Kinetics – Reaction Mechanism / Pathways, Rate Constants, Activation Energy; Flame –Diffusion Flame, Mixed Flame, Flame Velocity; Formation of Pollutants – CO, Soot, NOX and SOX; Combustion Modeling – Solid Combustion, Gas Combustion and Liquid (12 **L**)

Module - 3:

Combustion - Combustion Equipment: Combustion in Boilers (including Fluidized Bed

Combustion), Liquid Combustion – Atomizer, Spray Combustion etc.; Gas Combustion – Gas Burners

Interchangeability of Fuels, Special Equipment; Engines, Combustion Phenomenon in Engines, Performance of Engine and Emissions; Stoves; Catalysis – Catalytic Combustion and Control of

Emissions (14 **L**)

Module - 4:
Advanced treatment of fundamental combustion processes; Conservation equations for reacting gas mixtures; The structure of one-dimensional diffusion and premixed flames; introduction to

activation energy asymptotics. Two-dimensional Burke-Schumann flames and boundary layer combustion; Flame instabilities and flame stretch; turbulent combustion (12 **L**)

Text Books:

1. Stephen Turns. An Introduction to Combustion: Concepts and Applications. McGraw Hill Education India Private Limited; 3rd edition (June 2012).
2. Mishra D P. Fundamentals of Combustion. PHI Learning Private Limited-New Delhi (2010).