

**1. Preamble**

This course imparts knowledge in the advanced developments in automobiles, engines and various emission controlling technologies.

**2. Prerequisite**

1151AU107 IC Engines

**3. Course Educational Objectives**

Students undergoing this course are expected to:

- Gain knowledge about the advanced theory and working of I.C engines.
- Express the phenomena of combustion and modeling.

**4. Course Outcomes**

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Explain the various working cycles of engine.	K2
CO2	Describe the various types of combustion in IC engines.	K2
CO3	Illustrate the engine combustion parameters.	K3
CO4	Describe the different types of modern engines.	K2
CO5	Explain the modern electronic engine management system (EMS) of IC engines.	K2

(K2 – Understand; K3 – Apply)

**5. Correlation of COs with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	H	H	M	M	M	L	L	M	L	L	L	M	H
CO2	H	H	H	M	M	M	L		M	L	L	L	M	H
CO3	H	H	H	M	M	M	H		M	L	L	L	M	H
CO4	H	H	H	M	M	M	H		M	L	L	L	M	H
CO5	H	H	H	M	M	M	H		M	L	L	L	M	H

H- High; M-Medium; L-Low

**6. Course Content****UNIT I COMBUSTION OF FUELS**

L-9

Chemical Composition and Molecular Structure of Hydrocarbon Fuels. Combustion Stoichiometry of Hydrocarbon Fuels – Chemical Energy and Heat of Reaction Calculations – Chemical Equilibrium and Adiabatic Flame Temperature Calculation. Theory of SI and CI Engine Combustion – Flame Velocity and Area of Flame Front. Fuel Spray Characteristics – Droplet Size, Depth of Penetration and Atomization.

**UNIT II ENGINE CYCLE ANALYSIS**

L-9

Ideal Air, Fuel Air Cycle and Actual Cycle Analysis. Progressive Combustion Analysis in SI Engines. Parametric Studies on Work Output, Efficiency and Other Engine Performance.

**UNIT III COMBUSTION MODELING** **L-9**

Basic Concepts of Engine Simulation – Governing Equations, Classification of Engine Models-Thermodynamic Models for Intake and Exhaust Flow Process – Quasi Steady Flow - Filling and Emptying - Gas Dynamic Models. Thermodynamic Based in Cylinder Models for SI Engine and CI Engines.

**UNIT IV – NONCONVENTIONAL IC ENGINES** **L-9**

LHR Engines, Surface Ignition Concept and Multi Fuel Engines, Stratified Charge and Lean Burn Engines, Performance and Emission Characteristics, Merits and Demerits of HCCI, GDI, RCCI, GDCI, CRDI, Lean Burn Engines

**UNIT V-ELECTRONIC ENGINE MANAGEMENT** **L-9**

Computer Control of SI & CI Engines for Better Performance and Low Emissions. Closed Loop Control of Engine Parameters of Fuel Injection And Ignition.

**Total: 45 Periods**

**7. Text Books:**

1. Ganesan .V - “IC Engines” - Tata McGraw-Hill, 2012.
2. John B. Heywood, “Internal Combustion Engine Fundamentals”, McGraw-Hill Automotive Technology Series ISBN 0-07-1000499-8, 1988.
3. B.P.Pundir, “IC Engines-Combustion and Emissions”, 1st ed., Narosa Publishing House, New Delhi

**8. References:**

1. Richard Stone – “Introduction to IC Engines” – 2<sup>nd</sup> edition – Macmillan – 1992.
2. BOSCH hand book, edition: 2012