

1. Preamble

This course make the students to understand the basic Construction, working principles of I.C. Engines, fuel systems, design of combustion chambers, supercharging techniques & cooling system

2. Pre-Requisite

1150ME101	Basic Mechanical Engineering
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3. Links to other courses

- Advanced theory of IC engines
- Fuel conservation & Alternate fuels

4. Course Educational Objective

Students undergoing this course are expected to

- To create the basic knowledge of I.C. Engine working & how combustion takes places.
- Train knowledge about the fuel system used in I.C engine
- To teach the student about supercharging techniques, cooling systems & lubrication systems and its functions.

5. 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	Classify the constructional and working principles of 2 stroke, 4 stroke, SI and CI Engines and demonstrate the physical features of components.	K2
CO2	Demonstrate the basics, requirements, construction and working of fuel systems of SI and CI Engines	K2
CO3	Illustrate the stages of combustion and its influence by different combustion chamber parameters	K3
CO4	Explain the concept, methods and various features related to super charging, turbo charging and engine testing	K2
CO5	Describe the concept, methods and various features related to Cooling and Lubrication Systems	K2

6. 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	H					L	L		M	H
CO2	H	H		H	H					L	L		M	H
CO3	H	H		H	H					L	L		M	H
CO4	H	H		H	H					L	L		M	H

CO5	H	H		H	H					L	L		M	H
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H- High; M-Medium; L-Low

7. Course Structure

UNIT – I: CONSTRUCTION AND OPERATION L-9

Engine Classification, Constructional Details of Spark Ignition (SI) and Compression Ignition (CI) Engines. Air Standard Cycles- Otto, Diesel and Dual. Working Principle of Two Stroke SI and CI Engines – Construction and Working. Comparison of SI and CI Engines, Four Stroke and Two Stroke Engines – Scavenging Process, Scavenging Pump, Firing Order.

UNIT – II: FUEL SYSTEMS L-9

Air Fuel Ratio Requirements of SI Engines, Air Fuel Ratio and Emissions, Introduction to Carburetor, MPFI, GDI, Fuel Injection Pumps and CRDI.

UNIT – III: COMBUSTION AND COMBUSTION CHAMBERS L-9

Introduction to Combustion in SI and CI Engines, Stages of Combustion, Ignition Systems. Dependence of Ignition Timing on Load and Speed, Knock in SI and CI Engines. Combustion Chamber for SI and CI Engines. Direct and Indirect Injection Combustion Chambers for CI Engines. Importance of Swirl, Squish and Turbulence. Factors Controlling Combustion Chamber Design, Introduction to Heat Release Measurements.

UNIT – IV: INTAKE, EXHAUST & TURBO CHARGING SYSTEMS L-9

Intake System, Exhaust Systems, Supercharging and Turbo Charging, Different Methods of Turbo Charging, Inter Cooling, Turbocharger Controls Including, Waste Gate, Variable Geometry. Dynamometers Indicated Thermal, Brake Thermal And Volumetric Efficiencies. Measurement of Friction Power, Cylinder Pressure Measurement, Engine Performance Maps.

UNIT – V: COOLING AND LUBRICATION SYSTEMS L-9

Need for Cooling, Types of Cooling Systems- Air and Liquid Cooling Systems. Thermo-Syphon And Forced Circulation and Pressurized Cooling Systems -- Thermo Controlled Cooling Fans - Properties of Coolants, Hydrodynamic Lubrication - Requirements of Lubrication Systems - Types of Lubrication - Mist, Pressure Feed, Dry and Wet Sump Systems. Properties of Lubricants.

Total: 45 Periods

8. Text Books

1. Internal Combustion Engines by V. Ganesan, 2007, Tata McGraw Hill
2. Ramalingam K.K., “Internal Combustion Engines”, Sci-Tech Publications, 2005.

9. Reference Books

1. Advanced Engine Technology by Heisler, SAE Publication.
2. Edward F. Obert Internal Combustion Engines.
3. H.N. Gupta, Fundamentals of Internal Combustion Engines by, PHI.
4. Mathur and Sharma, Internal Combustion Engines, Dhanpat Rai and Sons, 2002.
5. John B. Heywood, “Fundamentals of Internal Combustion Engines.