

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

NIL

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	Explain the basics, requirements, construction and working of fuel systems of SI and CI Engines and demonstrate the physical features of components.	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
CO1	H	H		H	H					L	L	
CO2	H	H		H	H					L	L	
CO3	H	H		H	H					L	L	
CO4	H	H		H	H					L	L	
CO5	H	H		H	H					L	L	

H- High; M-Medium; L-Low

7. Course Structure

UNIT I - Construction and Operation**L-9**

Constructional Details of Spark Ignition (SI) and Compression Ignition (CI) Engines. Working Principles. Two Stroke SI and CI Engines – Construction and Working. Comparison of SI and CI Engines, Four Stroke and Two Stroke Engines. Engine Classification, Firing Order.

UNIT II - Fuel Systems**L-9**

Air Fuel Ratio Requirements of SI Engines – Air Fuel Ratio and Emissions – Introduction to Carburetor & Fuel Injection Pump. Fuel System of SI and CI Engines

UNIT III - Combustion and Combustion Chambers**L-9**

Introduction to Combustion in SI and CI Engines and Stages of Combustion– Ignition Systems. Dependence of Ignition Timing on Load and Speed. Knock in SI and CI Engines. Combustion Chambers for SI and CI Engines. Direct and Indirect Injection Combustion Chambers for CI Engines. Importance of Swirl– Squish and Turbulence–Measurements. 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– Water Gate– Variable Geometry– Variable Nozzle Types. Dynamometers Indicated Thermal– Brake Thermal and Volumetric Efficiencies. Measurement of Friction– Cylinder Pressure Measurement. Engine Performance Maps– Thermo Controlled Cooling Fans.

UNIT V - Cooling and Lubrication Systems**L-9**

Need For Cooling– Types of Cooling Systems- Air and Liquid Cooling Systems. Thermo Siphon and Forced Circulation and Pressurized Cooling Systems. Properties of Coolants. Requirements of Lubrication Systems. Types-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 Mc Graw Hill
2. Ramalingam K.K., “Internal Combustion Engines”, Sci-Tech Publications, 2005.

9. References

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.