

## Internal Combustion Engine

3 1 - 4 to 4

**Objectives:**

*This course studies the fundamentals of how the design and operation of internal combustion engines affect their performance, operation, fuel requirements, and environmental impact.*

## UNIT I

Introduction Engine classification, Engine Design and Operating Parameters Engine geometry Brake Performance, Indicated Performance, Friction Relationships among performance parameters

## UNIT II

Ideal Properties Models of Engine Processes and Cycles Constant volume (Otto) Constant pressure (Diesel) Limited pressure (Dual) Comparisons of ideal cycle results Ideal intake/exhaust processes Open Cycle calculation with residual. Combustion Thermodynamics Air and Fuels Combustion Stoichiometry First law analysis of open reacting systems Combustion efficiency

## UNIT III

Thermodynamic Properties of Engine Working Fluids Working fluids for engine processes Ideal gas mixtures Tables for species properties Curve fits for species properties Computer routines for properties and composition, Fuel/Air Cycle Analysis Fuel/air cycle computer simulation Fuel/air cycle results: efficiency and performance Comparison with actual cycles Deviation from Ideal Cycle Behavior

## UNIT IV

Spark-Ignition Engine Combustion Features of process Flame structure and propagation Factors affecting burning rate Abnormal combustion and knock Combustion chamber design 8. Diesel Engine Combustion Features of diesel combustion process Ignition delay Knock in diesel engines, SI and Diesel Engine Emissions

## UNIT V

IC Engines: The Future Engine development prospects Stratified charge, direct injection systems Homogeneous charge, compression ignition Low temperature diesel combustion Advanced electronic-controlled engines Hybrids and fuel cells

**Suggested reading**

1. V Ganesan. Internal Combustion Engines.
2. Maleev VL. 1945. *Internal Combustion Engines*. McGraw Hill.
3. Mathur ML & Sharma RP. 1988. *A Course in Internal Combustion Engines*. Dhanpat Rai & Sons.
4. John B Heywood, Internal Combustion Engine Fundamentals
5. Charles Fayette Taylor. The Internal Combustion Engine in Theory and Practice: Vol. 1 & 2
6. Willard W. Pulkrabek. Engineering Fundamentals of the Internal Combustion Engine
7. Gill P W., J H. Smith, E J. Ziury. Fundamentals of Internal Combustion Engines