

MME313: IC Engines

Programme: B.Tech. (MME)
Course : Core

Year:III
Credits : 3

Semester:VI
Hours : 40

Course Context and Overview (100 words):

The objective of the course is to provide the students with basic knowledge of fundamentals of the internal combustion engines e.g. SI Engines, CI engines etc. This will help the students to develop the skill in understanding the basic principles, mechanisms, design concepts and applications of the internal combustion engines which have become the integral part of the modern life through use of automobile. The further detailed objectives are as following:

1. To understand the basic concepts of thermodynamics and fluid mechanics of Otto and Diesel cycle engines and their modern derivatives.
2. To understand basic engine combustion concepts and how they relate to engine performance and emissions
3. To learn how fueling and ignition requirements of modern engines are met and to understand the working of various sub-systems of the IC engines.
4. To analyze the causes and remedies of pollution created by IC engines.
5. To gain the knowledge of various alternative sources of fuels for IC engines
6. To relate basic engine concepts to hands on IC engine measurements.

Prerequisite Courses: Engineering Thermodynamics

Course Outcomes (COs):

On completion of this course, the students will have the ability to:
CO1 Apply basic thermodynamic conservation laws to non-steady open system of IC Engines
CO2 Understand the combustion requirements of engines and relationships between combustion and energy consumption
CO3 Identify and describe various engine sub-systems e.g. ignition system, cooling system, lubrication system etc.
CO4 Understand the causes of pollution formation from engines and ability to provide the solution to ever increasing problem of air and other pollutions through IC engines
CO5 Identify and apply various alternate fuels for IC engines and ability to suggest suitable type of alternate fuel as per the application to the vehicles
CO6 Understand and perform experimental measurements and relate to basic engine concepts

Course Topics:

Topics	Lecture Hours	
UNIT - I		
1. Topic Introduction to IC Engine:		
1.1 Two and four stroke engines, SI and CI engines	2	4
1.2 Valve timing diagram, Rotary engines, Stratified charge engine	1	
1.3 Scavenging in 2 Stroke engines	1	
UNIT – II		
2. Topic Spark Ignition Engines:		
2.1 Spark ignition engine mixture requirements, Carburetion, Theory of carburetor, SP and MPFI	2	6
2.2 Combustion in SI engine, Flame speed, Ignition delay	2	
2.3 Abnormal combustion and it's control, combustion chamber design for SI engines	2	
UNIT - III		
3. Topic Compression Ignition Engines:		
3.1 Combustion in CI engine, Ignition delay	2	5
3.2 Knock and its control, Combustion chamber design of CI engine	2	
3.3 Turbocharging, Supercharging	1	
UNIT – IV		
4. Topic Engine Systems and Components:		
4.1 Ignition systems- Battery, Magneto and Electronic	2	7
4.2 Lubrication systems, Engine starting system	2	
4.3 Engine cooling system, Intake and exhaust system	2	
4.4 Drive train- Cam shaft and Valves	1	
UNIT-V		
5. Topic Pollutant Formation Control:		
5.1 Pollutant, Sources and types	2	7
5.2 Nox formation, Hydrocarbon emission mechanism, Carbon monoxide formation, Particulate emissions	2	
5.3 Effect of pollutant, Emission standards, Catalytic converters and particulate traps	2	
5.4 Method of measurement	1	
UNIT-VI		
6. Topic Alternate Fuels:		
6.1 Methanol, Ethanol, Hydrogen, Natural gas	2	5
6.2 Biogas, Bio diesel, Liquefied petroleum gas, Properties, suitability	2	
6.3 Engine Modifications, Merits and Demerits	1	
UNIT-VII		
7. Topic Performance Characteristic and Testing of I C Engine:		6

7.1 Standards for testing of I.C. Engine, Mean effective pressure	2	
7.2 indicated power, brake power, friction power, Methods to determine power and efficiencies	2	
7.3 Variables affecting performance of engine, characteristic curves, heat balance sheet, Methods of improving engine performance	2	

Textbook references (IEEE format):**Text Book:**

1. Ganesan V, *Internal combustion Engines*, Tata McGraw Hill Pub. Co. Ltd., 3rd Edition, 2007.
2. Heywood John B, *Internal combustion Engines Fundamentals*, McGraw Hill, Latest Edition.

Reference books:

1. Pulkrabek W. W, *Engineering Fundamentals of the Internal Combustion Engine*, PHI Learning Private Limited, Latest Edition.
2. Mathur M. L and Sharma R. P, *Internal Combustion Engines*, Dhanpat Rai & Sons, Latest Edition

Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.):**Evaluation Methods:**

Item	Weightage (%)
Quiz1: 5	20
Quiz2: 5	
Assignment1: 5	
Assignment2: 5	
Midterm	30
Final Examination	50

Prepared By:**Last Update: _12-10-2015_____**