

Subject Code: 01ME0605

Subject Name: Internal Combustion Engines & Automobiles

B. Tech. Year - III (Semester - 6)

Type of course : Programme elective

Prerequisite : Thermodynamics, Heat Transfer

Rationale : The course is designed to introduce students to working of SI and CI engines, to enhance their understanding in engine emissions and control, to teach students about usage of alternative fuels for IC engines and to introduce students to the recent trends in IC engines.

Course Outcome :

After completion of this course, student will be able to

1. Understand construction and working of engine.
2. Understand fuel supply systems used in SI and CI engines.
3. Gain knowledge on combustion in SI and CI engines.
4. Understand the various engine subsystems.
5. Gain knowledge about the instrumentation used to measure engine performance and testing standards.
6. Identify and critically evaluate different types of alternate fuels for automobiles.
7. Understand recent developments in the area of engines.

Teaching and Examination Scheme :

Teaching Scheme			Credits	Examination Marks					Total Marks
Theory	Tutorial	Practical		Theory Marks			Practical Marks		
			ESE(E)	IA	CSE	Viva (V)	Term Work (TW)		
3	0	2	4	50	30	20	25	25	150

Content :

Sr. No.	Content	Total Hrs.
1	Construction and Working Review of Otto, Diesel and Dual cycles, Construction and working: spark ignition (SI) and compression ignition (CI) engines - Two stroke SI and CI engines. Comparison of SI and CI engines and four stroke and two stroke engines. Engine classification, firing order	03
2	Fuel Supply System for SI and CI Engines Air-fuel ratio requirements of SI engines, Air-fuel ratio, working of a simple fixedventuri carburetor, properties of fuel, injection systems, monopoint and multipoint injection, gasoline direct injection	08

	Requirement of fuel injection system in CI engines, properties of fuel, fuel pump, fuel injector, types of nozzles and fuel spray pattern	
3	Ignition and Combustion in IC Engines Function of Ignition system, Battery and Magneto Ignition system, Electronic Ignition system, Spark plug and its types, Firing order, Governing System Stages of combustion in SI and CI engines, factors affecting ignition lag and flame propagation in SI engines, knock and methods of control in SI and CI engines, theory of detonation, engine variables affecting detonation, control of detonation, types of combustion chambers in SI and CI engines	08
4	Engine Subsystems Need for cooling, types of cooling systems and its working, properties of coolants, requirements of lubrication systems, types of lubricating systems and its working, properties of lubricants, supercharging and turbocharging – types - working – control	05
5	Engine Testing and Performance Measurement Dynamometers, indicated thermal, brake thermal and volumetric efficiencies, measurement of friction power, indicated power and brake power, heat balance, Engine performance maps, Engine testing standards	04
6	Engine Emission and Control Pollutant – sources and types – effect on environment and human health – formation of NO _x – hydrocarbon emission mechanism – carbon monoxide formation – particulate emissions Methods of controlling Emissions – catalytic converters and particulate traps – Selective Catalytic Reduction (SCR) – Diesel Oxidation Catalyst (DOC), emission norms and driving cycles – Indian and Euro norms	05
7	Alternative Fuels Alcohol - Hydrogen - Natural Gas and Liquefied Petroleum Gas – Biodiesel- Biogas- Properties - Suitability - Engine Modifications - Merits and Demerits as fuels.	04
8	Recent Trends in IC Engines LHR engines – lean burn engines – stratified charge spark ignition engine – homogeneous charge compression ignition – reactivity-controlled compression ignition – rotary engine – six stroke engine concept	05

Distribution of Theory Marks

R Level	U Level	A Level	N Level	E Level	C Level
10	20	25	25	10	10

Legends: R: Remember; **U:** Understand; **A:** Apply; **N:** Analyze; **E:** Evaluate; **C:** Create

List of Experiments :

1. To demonstrate various engines and their components.
2. Performance test of 4 stroke Petrol engine.
3. Plot a Heat balance Sheet for 4 stroke petrol engine.
4. Determination of friction power of multi cylinder petrol engine using Morse Test Method.

5. To perform Exhaust Gas analysis test on Petrol engine.
6. Performance test of 4 stroke Diesel engine.
7. Determination of friction power of single/multi cylinder diesel engine using Willan's Line Method.
8. To perform Exhaust Gas analysis test on Diesel engine.
9. Demonstration of Vehicle layout.
10. Demonstration of different types of gear boxes.
11. Demonstration of different types of automobile brakes.
12. Demonstration of steering systems.

Reference books :

1. Internal Combustion Engines by V. M. Domkundwar, Dhanpat Rai Publications (P) Ltd.
2. Internal Combustion Engine Fundamentals by John B. Heywood, McGraw Hill Education Pvt Ltd.
3. Internal Combustion Engine by V Ganeshan, McGraw Hill Education Pvt. Ltd.
4. Internal Combustion Engine by M.L.Mathur and R.P.Sharma, Dhanpat Rai Publications (P) Ltd.
5. Fundamentals of Internal Combustion engine by H.N.Gupta, PHI Learning.
6. Internal Combustion Engines by K. K. Ramalingam, Scitech Publications Pvt. Ltd.

List of Open Base Software / learning website:

1. <http://nptel.ac.in/>
2. <http://ocw.mit.edu/>