

INSTITUTE	FACULTY OF TECHNOLOGY
PROGRAM	BACHELOR OF TECHNOLOGY (MECHANICAL ENGINEERING)
SEMESTER	6
COURSE TITLE	IC ENGINES & AUTOMOBILES
COURSE CODE	01ME0605
COURSE CREDITS	4

Objective:

- 1 This course is designed to provide the detailed understanding of internal combustion engine mainly based on its working and performance parameters.
- 2 The course is designed to provide the detailed understanding of Internal Combustion Engine mainly based on its performance and emission parameters.
- 3 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 Outcomes: After completion of this course, student will be able to:

- 1 Students will be able to understand different types of internal combustion engines, its components and their applications.
- 2 Students will be able to understand the performance parameters of the engine and its signification with the economical and environmental issues.
- 3 Students will be able to apply principles of thermodynamics, fluid mechanics, and heat transfer to the design and analysis of engines and engine components.
- 4 Students will be able to analyze the various methods of power enhancement such as supercharger and turbocharger
- 5 Students will be able to analyze fuel supply systems, ignition and governing systems of IC engines.
- 6 Students will be able to evaluate the performance of I.C. engines based on the different test on SI and CI engines

Pre-requisite of course: Thermodynamics, Heat Transfer

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Introduction Components of I. C. Engines and its material, Classification of I. C. Engines, Two stroke/Four stroke - Petrol/Diesel engine and its comparison, Valve timing diagram, Scavenging and its types, Application of I. C. Engines	
2	Fuel Air Cycles and Actual Cycles Assumptions for fuel-air cycles, Reasons for variation of Specific heat of gases, Change of Internal energy and Enthalpy during a process with variable Specific heats, Isentropic expansion with variable Specific heat, Effect of variable Specific heat on Otto, Diesel and Dual cycle, Dissociation, Comparison of Air standard and Fuel air cycles, Effect of operating variables, Comparison of Air standard and Actual cycles, Effect of Time loss, Heat loss and Exhaust loss in Petrol and Diesel engines, Valve and Port timing diagrams	
3	Combustion Combustion equation, Minimum air requirement for complete combustion, Stoichiometric Air fuel ratio, Enthalpy of formation, Adiabatic Flame Temperature, Calculate Calorific values of fuels, Bomb and Junkers Gas Calorimeter	
4	Spark Ignition Engines Fuel Supply System: Air - Fuel mixture requirements, Fuel-Air ratio, Working of Simple Carburettor, Types of carburettor, Ignition System: Function of Ignition system, Battery and Magneto Ignition system, Electronic Ignition system, Spark plug and its types, Firing order, Governing System, Combustion: Stages of Combustion in Spark Ignition engine, Factors affecting Ignition lag and Flame propagation, factors affecting Knocking, Effect and Control of Knocking, Types of Combustion Chamber used in SI Engines	
5	Compression Ignition Engines Fuel Injection System: Requirement of Fuel Injection system, Fuel pump, Fuel injector, Types of Nozzles and Fuel Spray Pattern, Combustion: Stages of Combustion in Compression Ignition engine, Detonation, factors affecting Detonation, Controlling Detonation, Types of Combustion Chamber used in CI Engines	
6	Supercharging Purpose and objectives of Supercharging, Thermodynamic cycles of Supercharged engine, Types of Supercharger, different arrangement of Supercharger, Limitations of supercharging, Turbocharger and its types	
7	Performance Measurement of Internal Combustion Engine Methods of measuring Indicated Power, Brake power and Friction power, Air and Fuel consumption, Indicated and Brake Thermal efficiency, Indicated and Brake specific fuel consumption, Mechanical efficiency, Volumetric efficiency, Heat balance sheet of I.C.Engines	

Contents : Unit	Topics	Contact Hours
8	Lubrication and Cooling of Internal Combustion Engine Types of Lubricants, properties of Lubricant, SAE ratings, Wet and Dry sump lubricating system, Requirement of Engine cooling, Types of cooling system, comparison of cooling system	
9	Emissions from Internal Combustion Engine and its Control Spark Ignition and Compression Ignition Engine Emissions, Effect of emissions on Human Health and Environment, Control of engine emissions - Catalytic Converter, EURO and BHARAT norms	
10	Non Conventional Internal Combustion Engines Stratified Charged Engine, Wankel Engine, Free Piston Engine, Stirling Engine, Variable Compression Ratio Engine, Dual Fuel Engines, Multi Fuel Engines	
Total Hours		

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Study about ignition and governing system of I C engines. Study about ignition and governing system of I C engines	
2	Study about supercharging and turbo charging of I C engines. Study about supercharging and turbo charging of I C engines.	
3	Study about various methods for measurements and testing of I C engines. Study about various methods for measurements and testing of I C engines.	
4	Performance test on 4 Stroke Petrol Engine Performance test on 4 Stroke Petrol Engine	
5	Performance test on 4 Stroke Diesel Engine Performance test on 4 Stroke Diesel Engine	
6	Performance test of 2 stroke Petrol Engine. Performance test of 2 stroke Petrol Engine.	
7	Determination of Indicated Power of Multi Cylinder Petrol Engine using Morse Test. Determination of Indicated Power of Multi Cylinder Petrol Engine using Morse Test.	
8	Measurement of calorific value for solid/liquid/gaseous fuel. Measurement of calorific value for solid/liquid/gaseous fuel.	
9	Determination of friction power of single/multi cylinder diesel engine using Willan's Line Method. Determination of friction power of single/multi cylinder diesel engine using Willan's Line Method.	
10	Determination of valve timings for four stroke Petrol/Diesel Engine. Determination of valve timings for four stroke Petrol/Diesel Engine.	

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
11	Study about engine emissions and their control Study about engine emissions and their control	
12	Demonstration and study of commercial exhaust gas analyzers. Demonstration and study of commercial exhaust gas analyzers.	
Total Hours		

Textbook :

- 1 Internal Combustion Engine, V Ganeshan, McGraw Hill Education Pvt. Ltd. , 1997

References:

- 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 M.L.Mathur and R.P.Sharma, Dhanpat Rai Publications (P) Ltd.
- 4 Fundamentals of Internal Combustion engine by H.N.Gupta, PHI Learning.
- 5 Internal Combustion Engines by K. K. Ramalingam, Scitech Publications Pvt. Ltd.

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
15.00	20.00	25.00	25.00	15.00	0.00

Instructional Method:

- 1 Lecture
- 2 demonstration
- 3 presentation

Supplementary Resources:

- 1 <http://nptel.ac.in/courses/112104033/>
- 2 <https://www.intechopen.com/books/internal-combustion-engines>
- 3 <https://ocw.mit.edu/courses/mechanical-engineering/2-61-internal-combustion-engines-spring-2008/>
- 4 <https://www.eng.famu.fsu.edu/>
- 5 <http://www.marinediesels.info/>