

B.E Semester: 6 Mechanical Engineering

Subject Name: Internal Combustion Engine (ME605-N-C) [Dept. Elect.-2]

A. Course Objective:

- To present a problem oriented in depth knowledge of Internal Combustion Engine.
- To address the underlying concepts, methods and application of Internal Combustion Engine

B. Teaching / Examination Scheme:

Teaching Scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
3	0	2	5	4	3	70	30	20	30	150

C. Detailed Syllabus:

Unit No.	Details
1	Introduction: Basic components and terminology of IC engines, working of four stroke/two stroke - petrol/diesel engine, classification and application of IC engines, engine performance and emission parameters
2	Fuels and its supply system for SI and CI engine: Important qualities of IC engine fuels, rating of fuels, Carburation, mixture requirement for different loads and speeds, simple carburetor and its working, types of carburetors, MPFI, types of injection systems in CI engine, fuel pumps and injectors, types of nozzles, spray formation
3	Ignition and Governing System: Battery and magneto ignition system, spark plug, firing order, quality, quantity & hit and miss governing
4	Supercharging: Need for supercharging, Effect of supercharging, types of supercharger, methods of supercharging, thermodynamic analysis of supercharged engine cycle, limitations of supercharging, turbocharging
5	Combustion in SI and CI Engines: Stages of combustion in SI engines, abnormal combustion and knocking in SI engines, factors affecting knocking, effects of knocking, control of knocking, combustion chambers for SI engines, Stages of combustion in CI engines, detonation in C.I. engines, factors affecting detonation, controlling detonation, combustion chamber for SI and CI engine
6	Engine Lubrication and Cooling: Lubrication of engine components, Lubrication system – wet sump and dry sump, crankcase ventilation, Types of cooling systems – liquid and air cooled, comparison of liquid and air cooled systems
7	Measurement and Testing of IC engines: Measurement of indicated power, brake power, fuel consumption and emission, Measurement of friction power by Willan's Line Method and Morse Test, calculation of brake thermal efficiency, brake power and brake specific fuel consumption of IC Engines, variable compression ratio engines, heat balance sheet of IC Engines
8	Engine Emission and their control: Emission of pollutants from SI and CI engine, control of emissions from SI and CI engines, measurement of pollutants in exhaust gases, effect of different pollutants on human and plant life, emission norms-Euro norms and Bharat Norms

9	Internal combustion fuels: Desirable properties of IC engine fuels, required quality of fuel, rating of SI and CI engine fuels, dopes and additives of SI and CI engine fuels. Alternative Fuels for IC engine: Liquefied Natural Gas, Compressed Natural Gas, Liquefied Petroleum Gas, Methanol, Ethanol, hydrogen, vegetable oils, bio gas, bio-fuels, comparison of their properties with Diesel and petrol, method of manufacturing.
10	Unconventional Engines: Working principle of stratified charge engines sterling engine, Wankel engine.

Total hours (Theory):48
Total hours (Practical):32
Total hours:80

D. Lesson Planning:

Sr. No.	Date/Week	Unit	Weight age	Topic No
1	1 ST , 2 ND , 3 RD	1,2	20	1,2
2	4 TH , 5 TH , 6 TH	3,4	20	3,4
3	7 TH , 8 TH , 9 TH	5,6	20	5,6
4	10 TH , 11 TH , 12 TH	7,8	20	7,8
5	13 TH , 14 TH , 15 TH	9,10	20	9,10

E. Instructional Method & Pedagogy

1	At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2	Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal Weight age should be given to all topics while teaching and conduction of all examinations.
3	Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4	One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5	Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6	Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7	The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures. Suggested list of experiment is given below

F. List of Practical:

1	To demonstrate various engines and their components.
2	Comparison of Otto, Diesel and Dual combustion cycles.
3	Demonstration of valve timing diagram
4	To study about internal combustion engines fuels.

5	To demonstrate about ignition system of S.I. Engines.
6	To demonstrate about the fuel injection system for C.I. Engine
7	To demonstrate and study about carburetor and its types.
8	To performance the single cylinder two stroke petrol engine and its characteristics.
9	To performance the multi cylinder four stroke petrol engine and its characteristics.
10	Performance test on four stroke Diesel engine.
11	Various Performance tests: Morse Test and William Line Plot
12	Emission characteristics of single cylinder engine

G. Students Learning Outcomes:

1	Do in-depth cycle analysis for different types of engines.
2	Analyze fuel supply systems, ignition and governing systems of IC Engines.
3	Understand combustion process of SI and CI Engines.
4	Measure operating characteristics of IC Engines.
5	Compare the experimental results with theoretical trends.

H. Text Books & Reference Books:

1	Internal Combustion Engine Fundamentals by John B. Heywood, McGraw Hill Education Pvt. Ltd.
2	Internal Combustion Engine by V.Ganeshan, McGraw Hill Education Pvt Ltd.
3	Internal Combustion Engine by M.L.Mathur and R.P.Sharma, Dhanpat Rai Publications.
4	Fundamentals of Internal Combustion engine by H.N.Gupta, PHI Learning
5	Internal Combustion Engines 2 nd Edition by Colin Ferguson and Allan Kirkpatrick, Wiley India Pvt. Ltd.
6	Internal Combustion Engine by Er. R.K.Rajput,Laxmi Publication (P) Ltd.
7	Internal Combustion Engine by V.M.Domkundwar,Dhanpat Rai & Co.