B.E Semester: VI
Automobile Engineering
Subject Name: C.I engine (AE604)

Course Objective:

- To present a problem oriented in depth knowledge of C.I engine.
- To address the underlying concepts and methods behind C.I engine.

Teaching / Examination Scheme:

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
AE604	C.I ENGINE	3	0	2	5	4	3	70	30	20	30	150

Detailed Syllabus:

Topic no	Details
1	**Engine construction**: Construction of 2- stroke diesel engine construction of 4 - stroke diesel engine, valve timing diagram of four stroke diesel engine, valve timing diagram of two stroke diesel engine and rotary engine.
2	**Working principle**: Theoretical and actual PV diagram of four stroke diesel engine, Theoretical and actual PV diagram of two stroke diesel engine, ideal, fuel air and actual Diesel cycle, effect of variable specific heat on diesel cycle, dual fuel cycle, comparison Otto, Diesel and Dual fuel cycles.
3	**Diesel fuel**: Ignition quality. Cetane number, Stoichometric, equation of combustion of diesel fuel.
4	**Diesel Engine Combustion Concepts**: Combustion stages in diesel engine , heat release and ignition delay correlations. Abnormal combustion, factors affecting abnormal combustion. Knock in CI engines- comparison of knock in CI & SI engines
5	**Fuel air mixing**: Importance of air motion-swirl, squish and turbulence-swirl ratio. Delay period, factors affecting delay period.
6	**Combustion Chambers**- Combustion chamber design objectives. Different types of combustion chamber. Direct and indirect injection chambers.
7	**Fuel Injection System**: Fuel Injection System: Requirements, Air and solid injection, function of components, Jerk and distributor type Pumps. Pressure waves, Injection lag, Unit injector, Mechanical and Pneumatic governors. Fuel injector-types of injection nozzle, Spray characteristics, injection timing, pump calibration, and multi point fuel injection system.

8	**Supercharging and Turbo Charging**: objects of supercharging, supercharging of CI engine, effect of supercharging on engine performance supercharging limits of CI engines, methods of supercharging, superchargers, turbo charging, Relative merits.
9	**Testing and performance:** Automotive and stationary diesel engine testing and related standards. Engine power and efficiencies. Performance characteristics. Variables affecting engine performance. Methods to improve engine performance. Heat balance. Performance maps.

Lesson Planning:

Sr.No.	Date/Week	Unit No.	% Weightage	Topic No:
1	1^{st} ,2^{ed} ,3^{ed}	Unit 1	20 % .	1,2
2	4^{th} ,5^{th} ,6^{th}	Unit 2	20 %	3,5
3	7^{th} ,8^{th} ,9^{th}	Unit 3	20 %	4,6
4	10^{th} ,11^{th} ,12^{th}	Unit 4	20 %	7,8
5	13^{th} ,14^{th} ,15^{th}	Unit 5	20 %	9

Instructional Method & Pedagogy:

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- 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.
- 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.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.
    - Constructional details of four and two stroke diesel engine.
    - Valve and port timing diagram of diesel engine.
    - Experiment based on combustion of diesel engine.
    - Demonstration and study of fuel injection system in diesel engine.
    - Performance test on two stroke diesel engines.
    - Performance test on four stroke diesel engines.

- Heat balance sheet for diesel engine.
- Experiment based on supercharging and turbo charging.
- Tutorials based on cycles and fuel injection.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Students Learning Outcomes

- The student can identify different areas of automotive diesel engine.
- Can find the applications of all the areas in day to day life.

Recommended Study Materials

- **Text & Reference Books:**

1. Ganesan. V. “Internal Combustion Engineering”, Tata McGraw-Hill Publishing Co., New Delhi, 2003.
2. Obert. E.F. “Internal Combustion Engineering and Air Pollution”, International book Co., 1988.
3. Mathur D.S., Sharma. R.P. “A course in internal combustion engines”, Dhanpatrai publication, 2003.
4. Brame. J.S.S. and King. J.G – Fuels – Solids, Liquids, Gaseous.
5. R.K.Rajput “Internal combustion engines”, Laxmi publications(p) ltd New dehli.
6. Domkundwar “Internal combustion engines”,.