

**M.E Semester: 1 Mechanical Engineering (Thermal Engineering)**  
**Subject Name: Advanced Internal Combustion Engine**

**A. Course Objective**

- To present a problem oriented in depth knowledge of Advanced Internal Combustion Engine
- To address the underlying concepts and methods behind Advanced Internal Combustion Engine

**B. Teaching / Examination Scheme**

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
CODE	NAME	L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
		Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
METH107-A	Advanced Internal Combustion Engine	4	0	2	6	5	3	70	30	20	30	150

**C. Detailed Syllabus**

1. Review of thermodynamic cycles: ideal, fuel – air and real cycles. I.C engine Processes: Suction, compression, Combustion, Expansion, Fuel injection and carburetion, Exhaust, Supercharged & turbocharged engine, cycle simulation.
2. Gas exchange processes: Flow through valves, phase of the flow, turbulence, analysis of suction and exhaust processes, manifold tuning.
3. Alternate fuels for IC engines: Fuels & their properties, future fuels like Hydrogen, Bio gas, Alcohols, producer gas, LPG, CNG- fuels rating Coal- gasification & liquefaction, Non edible vegetable oils, non edible wild oil, NH<sub>3</sub> as substitute fuel for SI and CI engine, fuel additives. Pros and cons of alternate fuel.
4. Combustion in SI and CI engine: Combustion of SI and CI engine, Normal and abnormal combustion parameters effecting various phases of combustion, Combustion chambers, construction and design, Battery, magneto electronic- ignition system in SI engine, Volumetric efficiency.
5. Recent development in IC engine: MPFI, their advantages & limitations, circuit discussion PIV in turbulence measurement, optical methods for flame velocity measurement, new materials for engine components, alternative power plants, improved two stroke engine, hybrid, propulsion system, Fuel efficient IC engines, emission control technology emission, economics and performance for alternative fuels for IC engines.
6. Air–pollution from I.C. Engines: S.I. & C.I. Engine Emission effects of pollutants on Human health & Biological sphere. Measurement techniques used to measure pollutants. Control of emission from S.I. & C.I. engines, Noise pollution & its control. Catalytic converters, Pollution law.

**D. Lesson Planning**

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

**E. 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 weightage 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.
8. Suggested List of Experiments
  1. To determine optimum injection pressure in single cylinder diesel engine by varing the injection pressur
  2. Performance test of single cylinder I.C. engines as per I.S.10001
  3. To Determine indicated hourse power of multi cylinder petrol engineand find out mechanical efficiency of an engine
  4. Optimization of fuel injection advances in single cylinder diesel engines
  5. To check operation and performance of multi cylinder fuel pump for diesel engine with the help of fuel pump test bench
  6. Assignment on various cycle analysis and turbochargers

**F. Students Learning Outcomes**

- The student can identify different areas of Advanced Internal Combustion Engine.
- Can find the applications of all the areas in day to day life.

**G. Recommended Study Materials**

• **Text & Reference Books:**

1. Maleev, "I. C. Engines: Theory and Practice", McGraw -Hill-2000.
2. Heywood, J. B., "Internal Combustion Engine Fundament als", McGraw Hill International Edition, 2002.
3. Richard, Stone, "Introduction to Internal Combustion Engines", 2 ndEdn. McMillan Press, 2003.
4. Taylor, C. F., "Internal Combustion Engine in Theory and Practice", Vol. 1 & 2, M. I. T. Press, Cambridge, USA, 2003.
5. Juvinall, R. C., and Marshek, K. M., "Fundamental of Machine Component Design", John Wiley & Sons, N.Y., 2001.