

GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology			Branch/Spec.	Automobile Engineering				
Semester	VIII			Version	1.0.0.0				
Effective from Academic Year		2020-21		Effective for the batch Admitted in			July 2017		
Subject code	2AE804PE1		Subject Name	Advance I C Engines					
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE	SEE	Total	
	L	TU	P	TW					
Credit	3	0	0	0	3	Theory	40	60	100
Hours	3	0	0	0	3	Practical	0	0	0

Pre-requisites:

Fundamentals of Automobile Engines

Objectives of the Course:

After completion of this course, student will be able to

1. Understand the operating characteristics of IC engines.
2. Perform a thermodynamic analysis of IC engine cycles.
3. Perform a combustion analysis of IC engines.
4. Understand the generation of undesirable exhaust emissions and ways to reduce them
5. Understand the various heat transfer mechanisms in the engine.

Theory syllabus

Unit	Content	Hrs.
1	Engine Design and Operating Parameters: Engine operating cycles, spark ignition engine operation, compression ignition engine operation, geometrical properties of reciprocating engine, brake torque and power, mechanical efficiency, mean effective pressure, specific fuel consumption, air/fuel and fuel/air ratio, specific emission and emission index, engine design and performance data	9
2	Ideal Models of Engine Cycles: Ideal models of engine processes, thermodynamic relations for engine processes, constant volume cycle, constant pressure cycle, basics of simulation in SI and CI Engine cycles, real engine cycles	6
3	Gas Exchange Processes: Flow through valves, phase of the flow, scavenging in two stroke cycle engines, turbulence, swirl, squish, flow in intake manifolds, analysis of suction and exhaust processes, fuel injection systems, supercharging, turbocharging	6
4	Combustion: Combustion in SI engine with homogeneous air –fuel mixture, ignition and flame development, flame propagation and termination in SI engines, octane number, MPFI, combustion in CI engines, ignition delay, cetane number, cold weather problems, fuel spray structure, spray penetration and evaporation.	6
5	Emission from IC Engines and its Control: Formation of nitrogen oxides, carbon monoxide, hydrocarbon emission in petrol and diesel engines, SI and CI engine particulates, soot formation and control, exhaust gas temperature, catalytic convertor, Indian emission standards for SI and CI engines.	6
6	Measurements and Testing of IC Engines: Measurement of friction power, indicated power, brake power, fuel consumption, air consumption, emission, noise, endurance test of IC engines as per Indian standards	6
7	Recent Developments in IC Engines: PIV in turbulence measurement, optical methods for flame velocity measurement, new materials for engine components, improved two stroke engines, hybrid engines and vehicles, lean burn engines, stratified charge engines, HCCI engines, Partially Pre-mixed Charge Compression Ignition (PPCCI) Engines, Modulated Kinetics (MK) Combustion Engines	6

Practical content	
None	
Open Ended Problem:	
<ol style="list-style-type: none"> 1. To prepare velocity contour plot on a cut through the intake valve within the intake stroke. 2. Stress Analysis and Optimization of Crankshafts 3. To study about improvement in efficiency of internal combustion engine. 	
Text Books	
1	Internal Combustion Engine by M L Mathur and R P Sharma, Dhanpat Rai Publications (P) Ltd.
2	Internal Combustion Engine by V Ganeshan, McGraw Hill Education Pvt Ltd.
Reference Books	
1	Internal Combustion Engine Fundamentals by John B. Heywood, McGraw Hill Education Pvt Ltd.
2	Fundamentals of Internal Combustion Engines by H N Gupta, PHI Learning
ICT/ MOOCs references	
1.	NIL
Course Outcomes:	
<ol style="list-style-type: none"> 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. 	