



**Lok Jagruti Kendra University**  
University with a Difference

# **Diploma in Automobile Engineering**



**Course Code: 025010302**

**Internal Combustion Engine**

<b>Programme / Branch Name</b>				Diploma in Automobile Engineering		
<b>Course Name</b>	Internal Combustion Engine				<b>Course Code</b>	025010302
<b>Course Type</b>	HSSC	BSC	ESC	PCC	OEC	PEC

**Legends:** HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses  
 ESC: Engineering Science Courses PCC: Program Core Courses  
 OEC: Open Elective Courses PEC: Program Elective Courses

## 1. Teaching and Evaluation Scheme

Teaching Hours / Week					Evaluation Scheme				
L	T	P	Total Teaching Hours	Total Credit	CA	CCE	SEE (TH)	SEE (PR)	Total
3	0	2	5	4	10	40	50	50	150

**Legends:**

L: Lectures T: Tutorial P: Practical  
 CA: Continuous Assessment (Attendance + Activity)  
 CCE: Continuous & Comprehensive Evaluation  
 SEE (Th): Semester End Evaluation (Theory)  
 SEE (Pr): Semester End Evaluation (Practical)

## 2. Prerequisite

- ✓ Physics
- ✓ Thermal Engineering

## 3. Rationale

The course aims to impart basic skills for understanding of construction of automobile engines, working principle and latest technologies.

## 4. Objectives

- ✓ Penetrate deep into engine classification, construction and operation of IC engines with latest technologies
- ✓ Grasp the importance SI and CI engine application in automobiles
- ✓ Understand the performance parameters and testing methodologies.
- ✓ Understand the necessity of Ignition system SI engines
- ✓ Understand the combustion process for both SI and CI engines, the concepts of Governors, Fuel pump, Fuel Injectors.

## 5. Contents

Unit No.	Unit Name	Topics	Learning Outcome	% Weightage	Hours
1.	<b>General Concepts of IC Engine</b>	1.1 Introduction, History of development of engines, Classification of engines 1.2 Fundamentals of IC Engine, Basic engine nomenclature, Working of Four Stroke Petrol Engine, Working of Four Stroke Diesel Engine, Working of Two Stroke Petrol Engine, Theoretical and Actual P-V Diagram for 4-stroke Petrol Engine, Theoretical and Actual P-V Diagram for 4-stroke Diesel Engine, Theoretical and Actual Valve Timing Diagram for SI and CI, Firing Order	<ul style="list-style-type: none"> <li>Grasp the basic engine terminologies.</li> </ul>	15	5
2.	<b>Constructional Details and Engine Operation</b>	2.1 Construction of I.C Engine components, Major and Minor Components of I.C Engine 2.2 Functions of different I.C. engine components with its assemblies and sub-assemblies 2.3 Different types of Combustion chamber in S.I engine, Different types of Combustion chamber in C.I engine, Factors affecting design of combustion chamber	<ul style="list-style-type: none"> <li>Describe SI and CI engine system application in automobiles.</li> </ul>	25	10
3.	<b>Fuel Feed System</b>	3.1 Properties of Conventional Fuel Gasoline and Diesel 3.2 Types of Fuel Supply System, Gravity feed fuel supply system, Pressure feed fuel supply system 3.3 Fundamentals of Carburetion, Construction and Working of Simple	<ul style="list-style-type: none"> <li>Differentiate the fuel dynamics for SI and CI engines and define the key terms such as carburetion, stoichiometric ratio, etc.</li> </ul>	15	15

		<p>Carburetor, Air filters and Fuel Filters, Types of Fuel Pumps, Construction and Working of Electronic Fuel Injector, Electronic Petrol Injection System, Port Fuel Injection, Direct Injection</p> <p>3.4 Requirement of Injection System in Diesel Engine, Types of Fuel filters in Diesel Engine, Types of Air filters in Diesel Engine, Types of Injection System in Diesel Engine, Common Rail Direct Injection System, Individual Pump fuel Injection System, Types of Nozzles in Diesel Engine, Types of High-Pressure Fuel Injection Pumps, Types of Governors</p> <p>3.5 Combustion Process in SI &amp; CI Engine</p>			
4.	<b>Cooling and Lubrication System of I.C Engine</b>	<p>4.1 Purpose of Cooling System, Necessity and basic requirement of cooling system in I.C. Engine</p> <p>4.2 Types of Cooling System, Air- and Water-Cooling system</p> <p>4.3 Components of Cooling System, Construction and Working of components cooling system, Requirements of Coolant and its additives</p> <p>4.4 Purpose of Lubrication System, Primary and Secondary objectives of Lubrication system in I.C. Engine</p> <p>4.5 Lubricants and Oil Additives, Physical and Chemical Properties of Lubricants</p> <p>4.6 Systems of Engine Lubrication, Types of</p>	<ul style="list-style-type: none"> <li>Describe Cooling and lubrication system of engine.</li> </ul>	25	8

		Engine Lubrication system 4.7 Components of Lubrication System, Types of Oil filter, Types of Oil Pumps, Oil cooler, Oil pressure gauge			
5.	Advanced Engine Technologies	5.1 Purpose of Forced Induction 5.2 Turbocharger: Construction and Working of Turbocharger, Working of Intercooler, Types of Turbochargers, V.G.T., Twin Turbo, Bi Turbo 5.3 Supercharger: Construction and Working of Supercharger, Types of Superchargers 5.4 Working of HCCI and TSI Engine	<ul style="list-style-type: none"> <li>Understanding forced induction system and advance technologies used in modern IC engines.</li> </ul>	20	4

**Total Hours**      **42**

## 6. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	App %	C %	E %	An %
1.	General Concepts of IC Engine	40	40	10	0	10	0
2.	Constructional Details and Engine Operation	25	50	0	0	0	25
3.	Fuel Feed System	30	70	0	0	0	0
4.	Cooling and Lubrication System of I.C Engine	20	50	10	0	20	0
5.	Advanced Engine Technologies	20	20	40	0	10	10

**Legends:**      R: Remembering      U: Understanding  
                     App: Applying      C: Creating  
                     E: Evaluating      An: Analyzing

**7. List of Practicals / Exercises**

<b>Sr. No</b>	<b>Practical / Exercises</b>	<b>Key Competency</b>	<b>Hours</b>
1	Dismantling study and assembling of 4-cylinder SI engine.	Measure the bore stroke, cubic capacity and compression ratio of a given 4-cylinder petrol engine. Compare the significance of cubic capacity with power. Identify the name, function and material of the components.	2
2	Dismantling study and assembling of 4-cylinder CI engine.	To calculate the clearance volume and compression ratio of a 4-cylinder diesel engine. Measure the pressure in the cylinder at the end of compression stroke. Draw the motoring curve. Identify the name, function and material of the components.	2
3	Dismantling study and assembling of 2 stroke SI engine.	Measurement of 2 stroke SI engine specifications Identification of Name function and material of the components. Understanding of the following scavenging and short-circuiting process, air cooling system	2
4	Study of intake systems Carburetor, TBI, MPFI and GDI for SI engine and DI, IDI and CRDI systems for CI engine.	Identify the Name of components function material etc. Measurement of injector performance, Measurement of runner length of manifold and its significance.	2
5	Study of cooling systems.	Identification of name, function and material of the components. Measurement of discharge of water pump at various speed.	2
6	Study of lubrication systems.	Identification of Name, function and material of the components. Measurement of discharge of oil pump at such pressure for difference speeds.	2
7	Measurement of dimensional variation of cylinder block and gudgeon pin.	Measurement on cylinder block – cylinder bore, crankshaft bore and camshaft bore for taper and ovality. Measurement of gudgeon pin, diameter and taper Analysis of the impact of dimensional variation on engine performance.	2
8	Measurement of dimensional variation of Crankshaft, camshaft, connecting rod.	Measurement of crankshaft journal and pin for taper and ovality Measurement of camshaft journal taper and ovality and cam lift. Measurement of connecting rod big end and small end bores for taper and ovality.	2
9	Measurement of valve and port timing of Engines.	Analysis of the impact of dimensional variation on engine performance.	2
10	Study of Super charger and Turbo charger.	Identification of name, function and material of the components. Measurement of discharge of impellor at various speed.	2

Total Hours **20**

## 8. Reference Books

- 1) Automobile Engineering Vol. 2 by Dr. Kirpal Singh, Standard Publishers (Text Book)
- 2) A Course in Internal Combustion Engine by V.M. Domkundwar, Dhanpat Rai and Sons
- 3) Automotive Engines Theory and Servicing by James Halderman, Pearson
- 4) Auto Engines by R.B. Gupta, Satya Prakashan
- 5) Automotive Mechanics by William Crouse, McGraw Hill
- 6) Advanced Engine Technology by Heisler, SAE
- 7) Internal Combustion Engines by Edward F. Obert, Harper and Row
- 8) Fundamentals of Internal Combustion Engines by H.N. Gupta, PHI
- 9) Internal Combustion Engines by Mathur and Sharma, Dhanpat Rai and Sons
- 10) Fundamentals of Internal Combustion Engines by John B. Heywood, McGraw Hill

## 9. Open Sources (Website, Video, Movie)

- 1) <https://www.youtube.com/c/TheAutomotives>
- 2) <https://www.youtube.com/channel/UC4la8Cf7-DxaxsfMhaWpHiQ>
- 3) <https://theautomobileengineers.blogspot.com/>
- 4) <http://nptel.ac.in/>
- 5) <https://www.youtube.com/c/LearnEngineering>
- 6) <http://www.learnerstv.com/>
- 7) <http://auto.howstuffworks.com/>