Lok Jagruti Kendra University
University with a Difference

Diploma in Mechanical Engineering

LJ Polytechnic

Course Code: 025060504

Internal Combustion Engine

Programme / Branch Name	Diploma in Mechanical Engineering					
Course Name	Internal Combustion Engine				**Course Code**	025060504
Course Type	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 Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**TOTAL**
3	0	2	4	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ Engineering Physics
- ✓ Thermodynamics
- ✓ Thermal Engineering
- ✓ Fluid mechanics and Machines

3. Rationale

The course aims at providing fundamental knowledge of internal combustion engines. To Impart the knowledge on basic concepts and fundamental principles of Petrol and Diesel Engines and its various sub components along with its function and to acquire knowledge about the different systems of an I.C. Engine.

4. Objectives

- ✓ To give an overview of Internal Combustion Engines, their classification, applications, operation and processes.
- ✓ To address the underlying concepts, methods and application of Internal Combustion Engine.
- ✓ To give complete knowledge of type of fuels used in IC engines and the fuel supply systems.
- ✓ To describe combustion phenomena in IC engines.
- ✓ To explain the different performance analysis of IC engines.
- ✓ To explain the effects of exhaust emission on human health and various pollution norms.

5. Contents

Unit No.	Topics	Sub-Topics	Learning Outcome	% Weightage	Hours
1.	**Engine Principles and fundamentals**	1.1. Introduction-Engines, History of development of I.C. Engines,Internal & External combustion engine and their comparision,Classification of an I.C. Engine, Basic Engine Nomenclatures 1.2. Working Principle of an I.C Engine, Concepts of 2-Stroke and 4-Stroke S.I. and C.I. Engines,Comparisons. 1.3. Ideal and Actual PV diagrams 1.4. Air Standard Cycles.	• To learn about Understand various types of I.C. Engines • To understand about basic principle of 2-stroke and 4-stroke engine. • To learn about different cycles of operation.	20	8
2.	**Constructional features, function and working of I.C. Engine Components**	2.1. Cylinder Block,Cylinder Liners,types of liners,function,cylinder head, Cranckcase & Material 2.2. Piston, Piston material, Piston rings types,function & Materials 2.3. Connecting Rod,Crank Shaft, Cam Shaft, Materials, types, Timing gears,Applications. 2.4. Valve,Side Valve,Overheaded valve(Single and Double),Valve Operating Mechanism 2.5. Valve timing and Port timing diagram. 2.6. Manifolds(Inlet and Exhaust),function,Silencers,types, Flywheels,Working Principle.	• To understand various components used in I.C engine and their types. • To learn about the different properties of material used in components of an I.C. Engine. • To understand the concept of Valva and valve mechanism and timing diagram.	15	6
3.	**I.C.Engine Systems**	3.1. Fuel supply systems in S. I. engines, Carburation and carburettor, fuel injection in S. I. engine. 3.2. Fuel supply systems in C. I. engines. Fuel injection systems. 3.3. Cooling, Lubrication and Ignition system 3.4. Governing of I.C.Engine	• To understand the working of different systems used in I.C. Engines and their different types.	30	14

		3.5. Supercharging and Turbocharging			
4.	**Alternative Fuels for IC Engine**	4.1. Alternative fuel-types, properties, Compostions. 4.2. Methanol, Ethanol, Vegetables oils, Bio gas,bio-fuels. 4.3. LPG, CNG 4.4. Comparison of their properties with Diesel and petrol. 4.5. National and International emission norms.	• Understand the conventional and non-conventional fuels. • To aware about the alternative fuels and their properties	10	4
5.	**Testing and Performance, Emission and Pollution**	5.1. Engine Performance parameters- Engine torque, Brake power Indicated power, Frictional power, Mean effective pressure [on IP& BP], Fuel Consumption, Specific fuel consumption. 5.2. Engine efficiency – indicated thermal efficiency, Brake thermal efficiency, Mechanical Efficiency, Efficiency ratio, Air standard efficiency, Volumetric Efficiency [on mass & volume], Air-Fuel ratio, relative A/F ratio 5.3. Measurement of Indicated power with the help of Engine Indicator.Measurement of frictional power- of single cylinder or multi cylinder engines with the help of Morse test and Motoring test. 5.4. Measurement of brake power- Dynamometer 5.5. Emission and Pollution: S. I. Engine and C. I. Engine emissions and its control and comparison. Effect of pollution on Human health and biosphere.	• Evaluate performance analysis and evaluation of internal combustion engine. • To understand the effects of emission formation of IC engines, its effects and the legislation standards.	25	10
				Total Hours	**42**

6. List of Practicals / Exercises

The practicals/exercises have been properly designed and implemented in an attempt to develop different types of skills, so that students can acquire the competencies/programme outcomes. Following is the list of practicals/exercises.

Sr. No.	Practical / Exercises	Key Competency	Hours
1.	To Identification of components of 4-stroke and 2 stroke cycle engines.	To understand the various components of 2-stroke and 4-stroke engine cycle.	2
2.	To demonstrate about internal combustion engines fuels.	To learn and identify the different engine fules.	2
3.	To Demonstration of valve and valve timing diagram.	To understand the working of valve timig diagram and its calculation.	2
4.	To demonstrate about ignition system of S.I. Engines.	To learn the ignition system used in Spark Ignition engine.	2
5.	To demonstrate about the fuel injection system for C.I. Engine.	To learn the fuel injection system used in Compression Ignition engine .	2
6.	To demonstrate about carburetor and its types.	To understand about the working of Carburator and their types.	2
7.	To demonstrate the single/Multi cylinder two stroke petrol engine and its characteristics.	To understand the working and construction of Petrol engine.	4
8.	Performance test on four stroke Petrol/Diesel engine.	Testing and performance-Indicated power,Brake Power and engine efficiecny.	4
10.	Various Performance tests: Morse Test and William Line Plot	To Measurement of friction power (Willian‟s line method, Morse test)	4
11.	Seminar presentation	Prepare the seminar and make presentation on power point.	4
		Total Hours	**28**

7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	Ap %	C %	E %	An %
1.	Engine Principles and fundamentals	25	35	20	-	10	10
2.	Constructional features, function, and working of I.C.Engine Components	40	25	15	-	5	15
3.	I.C.Engine Systems	30	25	30	-	5	10
4.	Alternative Fuels for IC Engine	35	25	20	-	20	-
5.	Testing and Performance, Emission and Pollution	15	20	25	10	20	10

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

8. Textbooks

1) A Course in Internal Combustion Engines – M. L. Mathur & R.P. Sharma – Dhanpat Rai & Sons.
2) Internal Combustion Engine – V. Ganeshan – Tata-McGraw Hill Publishing Co.

9. Reference Books

1) A Course in Internal Combustion Engine – V. M. Domkundwar – Dhanpat Rai & Sons.
2) Internal Combustion Engine – R. Yadav – Central Publishing House, Allahabad.
3) Fundamental of Internal Combustion Engine – Paul W. Gill, James H. Smith, Eugene J. Ziurys Oxford and IBH Publishing Company
4) Internal Combustion Engines – R. K. Rajput – Laxmi Publication.
5) A text Book of Thermal Engineering – R.S.Khurmi & J.K.Gupta-S.Chand Publications- Revised Edition

10. Open Sources (Website, Video, Movie)

1) https://www.youtube.com/playlist?list=PLwdnzlV3ogoXHbVNKWL1BYOo_8PpyNtnC
2) https://www.youtube.com/watch?v=rvpMbBB6RrU&list=PL6kB4KeyhXc6GN3Gcvhl9YQEcMGD9M_Ym
3) https://www.youtube.com/watch?v=hs7bABMtOMI&list=PLyqSpQzTE6M9G2SNxKfsVEjcM9MlJau4F&index=1
4) https://www.youtube.com/watch?v=fTAUq6G9apg&list=PLy4d0AptRUmLjsfuuM-cvdwjdSH0qy5jg
5) https://www.youtube.com/watch?v=xTQJxpLE6bw