19AE213 FUNDAMENTALS OF IC ENGINES

Source :
http sthu mbs.dreamstime.comzmain-components-parts-display-internal-combustion-engine.jpg

Hours Per Week :

L	T	P	C
3	0	2	4

Total Hours :

L	T	P
45	-	30

CS	WA/RA	SSH	SA	S	BS
5	5	30	20	5	5

COURSE DESCRIPTION AND OBJECTIVES:

The course offers fundamental knowledge of IC engines, working and combustion processes in SI and CI engines. It also provides knowledge on various fuel systems used in different engines. The objective of this course is to provide fundamental aspects of engines, thermodynamic cycles, fuels, charging techniques, cooling systems and lubrication systems and their functions. It also provides knowledge on recent technological developments in fuel systems of S.I and C.I engines.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to achive the follwoing outcomes :

COs	Course Outcomes	POs
1	Understand the constructional and working principles of SI and CI engines and to learn the concept of combustion of SI and CI engines in microscopic level.	9,10
2	Apply the knowledge to familiarize with modern technology in S.I and C.I engines.	1,9
3	Analyze the methods of turbo and super charging of the engines.	2,10
4	Evaluate the features of the parameters involved in the basic design of combustion chambers.	4,9

SKILLS:

- ✓ *Identify the influence of fuel on engine performance*
- ✓ *Select suitable engine for different applications*
- ✓ *Identify different engine constructions*
- ✓ *Analyze and design a fuel supply system*
- ✓ *Differentiate different engine constructions*

UNIT – I **L-9**

ENGINE CYCLES: Introduction to engines and its classifications. Classification with respect to cycle of operation, Cycles like Otto, Diesel and Dual air standard cycles, Comparison, Fuel-air cycle, Deviation of actual cycle from air standard cycle. Basic engine components and nomenclature, Cooling methods, Valve timing diagram, Port timing diagram.

UNIT – II **L-9**

ENGINE COMPONENTS: Cylinder head, Valves, Valve seat inserts, Valve actuating mechanisms, Piston types, Piston rings, Connecting rods, Crank shafts, Cylinder block, Cylinder liners, Crank case, Sump, Cooling passages.

UNIT – III **L-9**

FUELS: Properties of fuels and Availability, LCV, HCV, Octane number, Cetane number. Biofuels: Various vegetable oils for engines, Esterification, Performance of engines, Heat Balance sheet, Performance and emission characteristics, Bio diesel and its characteristics. (Conventional fuels, properties etc.)

UNIT – IV **L-9**

FUEL SUPPLY SYSTEM: Carburetion, Factors affecting carburetion, Mixture requirements, Principle of carburetion, Simple carburetor, Calculation of air fuel ratio, Limitations of carburetor, Altitude compensation, Gasoline injection- Direct, Port, Manifold injection, Electronic fuel injection system.

Air induction system, Supercharging and Turbocharging, Fuel Supply System in CI Engine. Types of injection systems, fuel injection pumps, Injectors, governor – mechanical, Pneumatic, Common rail fuel injection, Electronic injection system.

UNIT – V **L-9**

COOLING AND LUBRICATION SYSTEM:

Cooling System: Requirements of cooling system, Types, Air cooling, Liquid cooling, and Comparison. Mechanical friction, Factors affecting friction, Pumping losses, Blow bylosses, Lubrication of engine components, lubricating systems. Temperature distribution of engine components.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS:30**

1. Dismantling and assembling of an SI engine
2. Dismantling and assembling of an CI engine
3. Valve and port timing Diagram.
4. Ignition systems demonstration and study.
5. Fuel feed pumps demonstration
6. Performance tests on four stroke diesel engine
7. Engine friction measurement using Morse test
8. Heat balance test on a multi cylinder engine
9 .Air fuel ratio and volumetric efficiency measurement
10 .Performance tests on variable compression ratio engines

TEXT BOOKS:

1. V. Ganesan,"Fundamentals of Internal Combustion Engines", 3rdedition, Tata McGraw Hill, 2012
2. Heywood J.B, "Internal Combustion Engine Fundamentals", 2nd edition, McGraw Hill, 2002

REFERENCE BOOKS :

1. "Automobiles and Pollution" SAE Transactions, 1995.
2. Gill P. W., Smith J. H. and Zurich E. J., "Fundamentals of I. C. Engine", 3rd edition, Oxford and IBH Pub. Co.,1999.Mathur & Sharma, "I. C. Engine", Dhanpat Rai & Sons, 2000.
3. H. N. Gupta, "Fundamentals of Internal Combustion Engines", PHI Learning,2012.