22FMPE201 TRACTOR AND AUTOMOTIVE ENGINES

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Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Fundamentals and working of IC engine, Mechanism of different components of IC engine, Testing of fuel properties .

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to familiarize the students the working principle and mechanism

of tractor engines, transmission system and fuels, ignition systems etc.

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MODULE-1

UNIT-1 **6L+6T+6P=18 Hours**

STUDY OF SOURCES OF FARM POWER:

Conventional & non-conventional energy sources. Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle. General energy equation and heat balance sheet. Study of mechanical, thermal and volumetric efficiencies. Study of engine components their construction, operating principles and functions. Study of engine strokes and comparison of 2-stroke and 4-stroke engine cycles and CI and SI engines.

Study of Engine: Valve systems, valve mechanism, Valve timing diagram, and valve clearance

adjustment Study of Cam profile, valve lift and valve opening area. Study of importance of air cleaning system. Study of types of air cleaners and performance characteristics of various air cleaners.

UNIT-2 **8L+0T+8P=16 Hours**

STUDY OF FUEL:

Fuel supply system, Study of fuels, properties of fuels, calculation of air-fuel ratio. Study of tests on fuel for SI and CI engines. Study of detonation and knocking in IC engines. Study of carburetion system, carburetors and their main functional components. Study of fuel injection system – Injection pump, their types, working principles. Fuel injector nozzles - their types and working principle. Engine governing - need of governors, governor types and governor characteristics.

PRACTICES:

- Introduction to different systems of CI engines.
- Engine parts and functions, working principles etc.
- Valve system – study, construction and adjustments.
- Oil & Fuel – determination of physical properties.
- Air cleaning system; Fuel supply system of SI engine.
- Diesel injection system & timing.

SKILLS:

- ✓ *Identify 2-stroke and 4-stroke engine.*
- ✓ *Testing of fuel properties.*
- ✓ *Repair and maintenance of cooling system.*

MODULE-2

UNIT-1 **8L+0T+8P=16 Hours**

STUDY OF LUBRICATION SYSTEM:

Need, types, functional components. Study of lubricants – physical properties, additives and their application. Engine cooling system – need, cooling methods and main functional components. Study of need and type of thermostat valves, Additives in the coolant. Study of radiator efficiency.

UNIT-2 **8L+0T+8P=16 Hours**

STUDY OF IGNITION SYSTEM:

Study of electrical system including battery, starting motor, battery charging, cut-out, etc. Comparison of dynamo and alternator. Familiarization with the basics of engine testing.

PRACTICES:

- Cooling system, and fan performance, thermostat and radiator performance evaluation.
- Part load efficiencies & governing.
- Lubricating system & adjustments.
- Starting and electrical system.
- Ignition system; Tractor engine heat balance and engine performance curves.
- Visit to engine manufacturer/ assembler/ spare parts agency.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply their knowledge and identify the working mechanism of different components of IC engine.	Apply	1	1, 2, 3, 9
2	Apply and understand ignition system and problems faced during starting of ignition system.	Apply	2	1, 2, 9, 12
3	Analyze the problems in using right amount of fuel and lubricants for better efficiency and economy.	Analyze	1	1, 2, 9, 12
4	Evaluate and understand the heat engine balance of engine for maintaining at right temperature for different type of work.	Evaluate	2	1, 2, 9, 12

TEXT BOOKS:

1. Liljedahl J B and Others. “Tractors and Their Power units” in 2015.
2. Rodichev V and G Rodicheva. “Tractors and Automobiles” 2nd Edition, 2019.

REFERENCE BOOKS:

1. Mathur ML and RP Sharma. “A course in Internal Combustion Engines IV volume, 2011”.
2. Singh Kirpal. “Automobile Engineering – Vol II” 2008.
3. Heitner Joseph. “Automotive Mechanics: Principles and Practices” 1st Edition, 2013.