EXTENDED LECTURE OUTLINE

FMP6 **Tractor and Automotive Engines** **(2+1)**

S.No	Lec No	Lectures
1	1-3	Sources of farm power- Human power – Works performed by human, Merits and demerits Animal power – power developed by a pair of bullock. Merits and demerits Mechanical power – tractor, power tiller, oil engines and self-propelled combines Conventional & Non- conventional energy sources – Definitions Farm Mechanization – concept, scope, benefits and limiting factors.
2	4-6	Classification of IC engines, Compression Ignition and Spark Ignition, Thermodynamic principle of IC engines (CI & SI), P-V diagram of otto cycle and diesel cycle. General energy equation – Heat balance sheet
3	7-9	Classification of tractor - based on structural design and purpose Based on structural design – wheel tractor, crawler tractor and walking tractor Based on purpose – general purpose, row crop and special purpose Factors affecting selection of tractor.
4	10-11	Engine components & their construction, Material made of engine components and operating principles Functions of engine components -Piston, piston rings (compression rings & oil rings), connecting rod, crankshaft, flywheel
	12 - 14	Study of engine strokes – 2 stroke and 4 stroke engines Comparison between 2 stroke and 4 stroke engine cycles. Comparison between CI and SI engines.
5	15-18	Valve system and valve mechanism Valve arrangements – L- head and overhead type. Valve timing diagram and firing order and firing interval.
	19-21	Study of types of air cleaners – dry type and oil bath type Performance characteristics of various air cleaners
6	22-26	Fuel properties, calorific value, ignition quality (Octane & Cetane number) Fuel tests for SI and CI engines – Gravity test, Distillation test, Vapour pressure test, sulphur test, carbon residue, colour test, gum test and flash test Fuel supply system - SI engines - carburetor- working principle, functions. Fuel supply system –CI engines - fuel injection pump and injector nozzles and working principle, Detonation and knocking in IC engines - Definition
7	27-28	Governing system – Definition, purpose, requirements of good governor, Types of governing systems.
		Lubricating system – purpose, Functional components Lubrication theory, types-splash , force feed system and combination system Lubricating oils – properties, lubricating oil tests.
8	29-31	Cooling system – purpose, Functional components Types – air cooling & water cooling- Open jacket, Thermo siphon &Forced circulation method and components.

		Thermostat valves – purpose and types Properties of coolants, anti-freezers and anti- corrosion materials
9	32-33	Ignition system, Spark ignition – battery and magneto ignition. Compression ignition, other Methods of ignition
10	34-35	Electrical system – Battery – Components – plates, separators, electrolyte, container, terminal wires Dynamo, self starter, wiring and electrical circuits.
11	36-38	Familiarization with the basics of engine testing – types of testing, importance of testing

Reference:

1. Elements of agricultural engineering- Jagdishwar Sahay.
2. Tractor Mechanics - C.P.Nakra
3. A text book of tractor at a glance- Sanjay Kumar.
4. Principles of farm machinery- Kepner, Bainer & Barger.