GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Diploma in Agricultural Engineering		
Semester	II	Version	1.0.0.0
Effective from Academic Year	2025-26	Effective for the batch Admitted in	JULY 2025
Course code	1AE2102	Course Name	Farm Machinery and Power

I.TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme											
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical				Based on SL		Total Marks
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	
DSC	Farm Machinery and Power	2	0	2	2	6	3	40	60	100	40	30	20	50	20	20	8	170

Abbreviation:	**CL-** Classroom Learning	**TL -** Tutorial Learning	**LL -** Laboratory Learning
	SLH - Self Learning Hours	**NLH -** Notional Learning Hours	**SLA -** Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		**SA -** Summative Assessment

II. PRE-REQUISITES

Basic knowledge of farm machinery role in agriculture.

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES

Ability to assess soil formation, classification, and physical properties for appropriate land use and crop planning. Proficiency in evaluating soil organic matter and managing soil reactions (acidic, saline, sodic) to enhance productivity.

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

CO1. To understand engine principles, classification, terms, and efficiencies.
CO2. To explore components like pre-air cleaners, inlet manifold, and air cleaner types.
CO3. To grasp fuel system components, including pumps, injectors, and micro fuel systems.
CO4. To comprehend cooling system importance, defects, and lubrication system functions.
CO5. To study power, efficiency, tests, and pollution control in IC engines.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's) & CO's	Marks	Hours
Unit–1: Introduction to IC Engines	**TLO 1.1**: Explain the classification and working principles of IC engines (two-stroke and four-stroke). **TLO 1.2:** Differentiate between petrol and diesel engines. **TLO 1.3:** Identify various engine parts and their functions. **TLO 1.4:** Define and calculate engine parameters (bore, stroke, dead centers, compression ratio, volumes, piston speed, etc.). **TLO 1.5:** Calculate IHP, BHP,	1.1 Introduction and classification of IC engines 1.2 Working principle of four-stroke and two-stroke cycles 1.3 Comparison of petrol and diesel engines 1.4 Location and function of various engine parts 1.5 IC engine terms: bore, stroke, dead center, compression ratio, clearance volume, swept volume, piston displacement, total volume, engine displacement, piston speed 1.6 Calculation of IHP, BHP, FHP, and engine efficiencies	**12**	**6**

	FHP, and efficiencies.			
Unit–2: Air Intake System	**TLO 2.1:** Describe the components of the air intake system. **TLO 2.2:** Differentiate between types of air cleaners.	2.1 Components of air intake system: pre-air cleaner, inlet manifold, exhaust manifold 2.2 Types of air cleaners: wet and dry	**12**	**6**
Unit–3: Fuel System	**TLO 3.1:** Explain components of the fuel system. **TLO 3.2:** Describe and compare types of fuel feed and injection pumps. **TLO 3.3:** Illustrate the working of fuel injectors and micro fuel injection system.	3.1 Components of fuel system 3.2 Fuel feed pump: description and working 3.3 Types and working of fuel injection pump and injector 3.4 Working of micro fuel injection system for multi-cylinder engine	**12**	**6**
Unit–4: Cooling and Lubrication Systems	**TLO 4.1:** Explain the necessity and components of cooling systems. **TLO 4.2:** Diagnose and rectify cooling system defects. **TLO 4.3:** Identify functions, types, and properties of lubricants. **TLO 4.4:** Explain lubrication systems and their components.	4.1 Necessity of engine cooling 4.2 Cooling system features, thermostat 4.3 Defects in cooling system and rectification 4.4 Functions, types, and properties of lubricants 4.5 Additives for improving lubricant properties 4.6 Lubrication system of IC engine: oil pumps, oil filters, relief valves	**12**	**6**
Unit–5: Engine Performance and Efficiencies	**TLO 5.1:** Define and calculate engine power (indicated and brake). **TLO 5.2:** Explain efficiency measures. **TLO 5.3:** Demonstrate methods of finding horsepower.	5.1 Engine power: indicated power, brake power 5.2 Efficiency measures: mechanical, thermal, relative, volumetric efficiencies 5.3 Methods of finding indicated and brake horsepower	**12**	**6**

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL			
Sr. No.	**Practical/Laboratory Learning Outcome (LLO)**	**Practical Titles**	**Relevant Cos**
1	**LLO 1.1:** Identify various types of diesel engines and their classification.	Identification of various types of diesel engines.	**CO1**
2	**LLO 2.1:** Recognize tools used for dismantling and assembling IC engines.	Identification of various tools used for dismantling and assembling IC engines.	**CO1**
3	**LLO 3.1:** Demonstrate dismantling of IC engine, inspection of parts, and clearance measurement.	Engine dismantling and inspection of various parts, measurements of clearances.	**CO3**
4	**LLO 4.1:** Reassemble IC engine and diagnose troubleshooting issues.	Engine assembly and troubleshooting.	**CO3**
5	**LLO 5.1:** Explain the working of governing system in IC engines.	Study of engine governing system.	**CO5**
6	**LLO 6.1:** Examine construction and working of valve systems.	Study of valve system.	**CO1, CO5**
7	**LLO 7.1:** Dismantle, study, and reassemble fuel injection equipment of multi-cylinder engine.	Study of fuel injection equipment of multi-cylinder engine, dismantling and reassembling.	**CO3**
8	**LLO 8.1:** Examine cooling system components and thermostat valve operation.	Study of cooling system, water pump, thermostat valve.	**CO4**
9	**LLO 9.1:** Examine lubrication system components, oil pump, and oil filter.	Study of lubrication system, oil pump, oil filter.	**CO4**
10	**LLO 10.1:** Calculate indicated power,	Determination of indicated power/brake	**CO5**

	brake power, and specific fuel consumption.	power and specific fuel consumption.	

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Prepare a diagram showing 4-stroke and 2-stroke engine cycles.
- Compare petrol and diesel engines with labeled parts.
- Calculate IHP, BHP, and engine efficiencies for a small engine.
- Identify components of air intake and types of air cleaners in vehicles.
- Make a small model to show airflow through filters.
- Study fuel injection system and injectors.
- Measure fuel consumption of a small engine under different loads.
- Observe cooling system parts and troubleshoot simple defects.
- Identify engine lubricants and their applications.
- Determine brake power and efficiency of a small engine.
- Prepare a report on ways to improve engine efficiency and reduce pollution.

Mini projects

- Prepare a chart comparing petrol and diesel engines with parts and working cycles.
- Build a simple 4-stroke or 2-stroke engine model to demonstrate the cycle.
- Measure fuel consumption of a small engine under different loads and calculate efficiency.
- Observe and analyze engine cooling and lubrication systems; suggest improvements.
- Conduct experiments to find brake power, indicated power, and overall efficiency of a small engine.
- Study and demonstrate spray patterns of fuel injectors in a multi-cylinder engine.
- Identify common faults in a small engine, dismantle, troubleshoot, and reassemble it.

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD

1	Diesel Engine Trainer Board – Single-cylinder or multi-cylinder, for studying engine operations.Petrol Engine Trainer Board – 4-stroke engine trainer for demonstration.
2	Air Intake System Components – Pre-air cleaner, inlet manifold, exhaust manifold.
3	Fuel System Components – Fuel feed pump, fuel injection pump, injectors, micro fuel injection system.
4	Cooling System Components – Radiator, water pump, thermostat, coolant circulation setup.
5	Lubrication System Components – Oil pump, oil filter, oil pan, relief valves.
6	Dismantling and Assembly Tools – Wrenches, screwdrivers, pullers, torque wrenches, feeler gauges.
7	Measuring Instruments – Vernier caliper, micrometer, dial gauge, manometer, pressure gauge.
8	Dynamometer / Brake Test Rig – For measuring engine power (BHP/IHP).
9	Exhaust Gas Analyzer – To study emission and pollution parameters.
10	Indicator Diagram Apparatus – For drawing P–V diagrams and calculating indicated power.
11	Stopwatch / Tachometer – For measuring engine speed and time-based experiments
12	Diesel Engine Trainer Board – Single-cylinder or multi-cylinder, for studying engine operations.Petrol Engine Trainer Board – 4-stroke engine trainer for demonstration.

IX. LIST OF REFERENCE BOOKS			
Sr.No.	**Title**	**Author**	**Publication**
1	Elements of Agricultural Engineering.	Sahay, Jagdishwar	Standard Publishers Distributors, Nai Sarak,Delhi
2	Principles of Agricultural Engineering (Vol.-1) 14th Edition	Michael, A.M., & Ojha, T.P. (2021)	JainBrothers.

X.LINK OF LEARNING WEB RESOURCE

1	https://nptel.ac.in/courses/126105011
2	https://onlinecourses.nptel.ac.in/noc24_me41/preview
3	https://www.fao.org/3/w1238e/w1238e.pdf
4	https://ecoursesonline.iasri.res.in/mod/page/view.php?id=125658
5	https://ecourses.icar.gov.in/https://ecourses.icar.gov.in/
6	https://agrimoon.com/wp-content/uploads/Elements-of-Agricultural-Engineering.pdf
7	https://www.agrimoon.com/wp-content/uploads/Principles-of-Agricultural-Engineering-Volume-I.pdf
8	https://www.slideshare.net/ErAmitKumar7/farm-machinery-and-power
9	https://extension.okstate.edu/fact-sheets/farm-power-and-machinery-management.html
10	https://open.umn.edu/opentextbooks/textbooks/introduction-to-mechanical-engineering-design-and-manufacturing

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE							
Unit	**Unit Title**	**Aligned COs**	**Learning Hours**	**R-Level**	**U-Level**	**A-Level**	**Total Marks**
1	Introduction to IC Engines	CO1	6	5	3	4	12
2	Air Intake System	CO2	**6**	5	4	3	12
3	Fuel System	CO3	**6**	5	2	5	12
4	Cooling and Lubrication Systems	CO4	**6**	4	5	3	12
5	Engine Performance and Efficiencies	CO5	**6**	4	4	4	12
		Grand Total	30	23	18	19	60

XII. COs AND POs AND PSOs MAPPING										
Course outcome (Cos)	**Programme Outcomes (POs)**							**Programme Specific Outcomes (PSOs)**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	1	3	1	1	2	2	1	1
CO2	1	1	1	3	1	1	2	1	2	1
CO3	1	2	2	3	1	1	2	1	3	1
CO4	1	2	2	3	2	1	2	1	3	1
CO5	2	3	2	4	2	2	2	2	3	1
Legends: - *3- High* *2-Moderate/Medium* *1-Slight/Low* *0-None*										