GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

FARM POWER ENGINEERING
(Code: 3336307**)**

Diploma Programme in which this course is offered	Semester in which offered
Agricultural Engineering	3rd

1. RATIONALE.

All farm vehicles are powered by automobile engines. Hence the fundamental knowledge of automobile engine is most essential to an agriculture technician. This course will help the students in understanding the classification of I.C. engines, thermodynamic cycles, construction, operation, servicing and maintenance of various types of engines, different associative systems like lubricating system, cooling system, air intake system etc. Knowledge of this course will be helpful in diagnosis and testing of engine and other associative systems and also performing well as a professional.

2. COMPETENCY.

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency.

a. Apply knowledge for construction and operation of different components of engines during assembly, disassembly, manufacturing servicing and maintenance.

3. TEACHING AND EXAMINATION SCHEME.

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
2	0	2	4	70	30	20	30	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** – Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment

4. COURSE DETAILS.

Unit	Outcomes (in cognitive domain)	Major Learning Topics and Sub-topics
Unit – I Principles of l. C. Engines	1a. Explain types of Engines 1b. Explain types of cycles 1c. I C Engine Terminology	1.1Introduction and classification of IC engines. 1.2Working principle of four stroke and two stroke cycle. Petrol and Diesel engines, 1.3Their comparison location and function of various parts of IC engines and material used for them. 1.4 Concept of IC engine terms bore, stroke, dead centre, crank throw, compression ratio, clearance volume, piston displacement and piston speed . 1.5 Working principle of rotary (wankle) engine
Unit– II Thermodynamics Cycles	2a. Concept of reversibility cycle 2b. Various efficiency of cycle and implementation 2c. Computation of various efficiency	2.1Concepts of reversibility cycle, perpetual motion machine, 2.2thermal efficiency and air standard efficiency, 2.3carnot cycle efficiency and its implications, Otto, Diesel and dual combustion cycles 2.4Simple problems of their cycles and laws of thermodynamics.
Unit–III Air Intake System	3a.Explain construction and working of Air intake system and its components	3.1Components of air intake system viz. pre-air cleaner, inlet manifold, exhaust manifold 3.2 Types of air cleaners: wet, dry
Unit–IV Fuel System in Diesel Engine	4a.Explain construction and working of conventional and modern diesel fuel system	4.1Components of fuel system, description and working of fuel feed pump 4.2Types working of fuel injection pump, 4.3 injector, fuel filters, complete detail and working of micro fuel injection system for a multi cylinder engine
Unit–V Cooling and Lubrication	5a.Explain need of Cooling system. 5b.Explain construction and working of various components of cooling Systems 5c.Troubles and rectification of cooling system 5d.Explain construction and working of various components of lubrication Systems	5.1Necessity of engine cooling, cooling system, their main features, 5.2Thermostat, defects in cooling system and their rectification, 5.3Functions of lubrication, types and properties of engine lubricants, additives for improving the properties 5.4Lubrication system of IC engine, oil pumps, oil filters, pressure relief valve, positive crank case ventilation
Unit–VI IC Engine Testing	6a. Explain various testing equipment. 6b. Compute performance of engine using measured parameters. 6c. Prepare and interpret Graphical representation to get relationship of different parameters pertaining to IC	6.1Engine power, indicated and brake power, 6.2Efficiency - mechanical, thermal, relative and volumetric efficiencies, 6.3Methods of finding indicated and brake horse power, 6.4Morse test and heat balance sheet performance and endurance tests of IC engine specification (according To ISI) 6.5Exhaust smoke analysis and pollution control.

Unit	Outcomes (in cognitive domain)	Major Learning Topics and Sub-topics
	engine.	
Unit–VII Maintenance, repair and overhaul of engines	7a.Identification of Tools 7b.Various Troubles and its Rectification	7.1Basic Hand and Power tools 7.2Engine Troubleshooting 7.3Engine Tune-up 7.4 Engine Overall hauling

5. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Principles of l C Engines	10	08	06	00	14
2	Thermodynamics Cycles	06	04	03	00	07
3	Air Intake System	04	04	03	00	07
4	Fuel System in Diesel Engine	06	07	03	00	10
5	Cooling and Lubrication	08	04	03	03	10
6	IC Engine Testing	08	06	03	03	12
7	Maintenance, repair and overhaul of engines	06	00	06	04	10
	Total	**48**	**33**	**27**	**10**	**70**

Legends: R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy).

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

General Notes:

1. If mid sem test is part of continuous evaluation, unit numbers I and II are to be considered.
2. Ask the questions from each topic as per marks weightage. Numerical questions are to be asked only if it is specified. Optional questions must be asked from the same topic.
3. In examination, example of same chapter is to be asked in place of example.

6. SUGGESTED LIST OF EXERCISES/PRACTICALS.

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

Sr. No.	Unit No.	Practical Exercise (Any Seven)	Teaching Hours
1	1	Identification of various types of diesel engines	04
2	4	Study of fuel injection equipments of multi cylinder engine, dismantling and reassembling	04
3	5	Study of cooling system, water pump, thermostat	04
4	5	Study of lubrication system, oil pump, oil filter	04
5	6	Determination of indicated power/brake power and specific fuel consumption	04
6	7	Identification of various tools used for dismantling and assembling IC engines	04
7	7	Performing pre-starting checks on engine	04
8	7	Engine dismantling and inspection of various parts, measurements of clearances	04
9	7	Engine assembly and trouble shooting	04
		Total	**36**

7. LIST OF STUDENT ACTIVITIES:

Following is the list of proposed student activities like:

a. Seminar by Students on construction & operation of various components of engine, associate systems like cooling system, lubricating system etc.

b. Prepare Display Board such as fuel injection system etc.., & Chart like 2 & 4 Stroke engine, various cycles.

c. Study Cut section model of S.I & C.I engine.

d. Assembly and disassembly of Engine components, cooling and lubricating system etc.

e. Teacher guided self learning activities to prepare report as an assignment from industrial survey/internet/library/or group discussion on any of the automobile transmission mechanisms.

8 SUGGESTED LEARNING RESOURCES

A. List of Books

S.r. No.	Title Of Book	Author	Publication
1	Mathur M.L. Sharma R.P.	Course in Internal Combustion Engines	Dhanpat Rai & Co. (P) Ltd
2	Elements of Agricultural Engineering	Dr. Jagdishwar Sahay	Standard Publisher Distributors, Nai Sarak
3	Farm Tractors	S.C. Jain and Rai	Tata Oxford Company
4	Automotive Mechanics	W.H.Crouse & D.L. Anglin	Tata Mc-Graw Hill Publishing Co. Ltd.

B. List of Major Equipment/ Instrument

a. Charts for Otto & Diesel Cycles, Components of I.C Engines, Fuel Systems (Circuits) of Petrol/ Diesel powered Engines, Lubricating System and Cooling Systems.

b. Models of various components of I.C. Engine.

Cut Section model showing Two Stroke Petrol/ Diesel Engine.

Cut Section model showing Four Stroke Petrol/ Diesel Engine.

Cut Section model showing Fuel Systems (Circuits) for various fuels.

Cut Section model showing Lubricating System.
Cut Section model showing cooling System.

C. List of Software/Learning Websites

1. **http://auto.indiamart.com/auto-technology/auto-tech-engine.html**
2. **http://inventors.about.com/library/weekly/aacarsgasa.htm**
3. **http://www.nextgreencar.com/lpg-cng.php**
4. **http://www.air-quality.org.uk/26.php**
5. **http://www.engineering.com/Videos/VideoPlayer/tabid/4627/VideoId/573/Internal-Combustion-Engine.aspx**
6. **http://www.youtube.com/watch?v=uB2cmkWbCMI**
7. **http://www.animatedengines.com**
8. **http://en.wikipedia.org/wiki/Internal_combustion_engine**