

## ABOUT THE COURSE

A vocational course in Agro Machinery and Power Engineering envisages producing a pool of talented and skilled mechanics in Agricultural sector. This skilled workforce can surpass the crisis of shortage of labourers and contribute to increase in food production, through the use of modern techniques.

The course is so designed as to impart technical skills to teenagers and inculcate an urge in them to be friendly with farming and nature.

Agriculture, especially mechanized agriculture has prime importance in the development policies of both central and state governments and various schemes are being implemented in the country under plan fund. Students of higher secondary level and high school level need to be trained in the use of farm machineries, their repair and maintenance so that their tremendous strength can be utilized in food production.

In the coming decade agricultural scenario is likely to undergo drastic changes. Maximum production from diminishing agricultural lands will be the main concern.. Modern Agriculture will transform to Agri-Business and investors will be focusing on maximum profit with minimum input .Employment opportunities like drivers, operators of modern machineries, mechanics, Irrigation system designers entrepreneurs in utilizing renewable energy like solar energy and biomass ,technicians in post harvest operations and seed processing, will arise in plenty

Engineering graphics and Mechanical Auto cad are also included in the syllabus which will help the students to enter into higher skill level courses in future.

Students accustomed with these engineering practices will definitely be the forerunners of a generation thinking seriously of preserving fresh air, pure water, and greenery of our earth for the future .Hence the vocational course in Agro Machinery and Power Engineering is highly relevant.

**FOR JOB ROLES**

<b>GOVT/ SEMI GOVT SECTOR</b>	<b>PRIVATE SECTOR</b>	<b>SELF EMPLOYMENT</b>
<ul style="list-style-type: none"> <li>• Tractor Mechanic</li> <li>• Tractor Driver, cleaner,</li> <li>• Operator of Combine Harvester</li> <li>• Transplanter operator</li> <li>• Pump operator</li> <li>• Machine operators</li> <li>• Power tiller mechanic,</li> <li>• operator of modern implements</li> <li>• Workshop assistants</li> <li>• Mechanics</li> <li>• Skilled assistants in Hi-Tech farming</li> <li>• Opportunities are existing in 14 District Agrl. Engg. Work shops of Agrl. Department,</li> <li>• Research testing and training center, Vellayani ,</li> <li>• State seed farms,</li> <li>• Kerala Agricultural university.</li> <li>• KAMCO---Tiller production unit and tractor unit</li> <li>• Kerala Agro Industries corporation</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering Assistants in Private Tractor and Tiller manufacturing companies</li> <li>• Sales executives of dealers o f Agrl. Machineries</li> <li>• Servicing agents in workshops of Pump set dealers</li> <li>• Supervisors in Irrigation companies {Drip &amp; sprinkler}</li> <li>• Skilled assistants in Hi tech farming(Green Housing)</li> </ul>	<ul style="list-style-type: none"> <li>• Farm Mechanics in Self help groups of Grama Panchayaths</li> <li>• Entrepreneurs in Mechanized farming( start project and purchase machineries for own use, hiring, service providers)</li> <li>• Agents for Hi tech farming</li> <li>• Irrigation system designers for Large Agrl. Farms and mini units in local areas.</li> </ul>

**SUBJECT APPROACH**

The ultimate goal of vocational education is to generate skill through continuous practice along with investigation and invention. Continuous practice transforms the unskilled to be skilled.

Increased cost of production ,rapid climate changes, physical strain faced by labourers, low yield, diminishing price lack of technical knowledge are the factors that detain the youngsters from agriculture.

Hi-Tech farming is the only remedy for this. What we need is a pool of skilled technicians and a hub of modern implements and machineries that can alleviate the physical strain. Post harvest engineering process and food processing machineries will be helpful to change the harvested crops to value added products.

Power Tillers, Garden tractors, Trans planter, drum seeders, Combine Harvesters and straw bailers are common in our paddy fields as bicycles. Implements for seedbed preparation are quite popular in rural areas too. Food and feed processing areas are also thoroughly changed with modern technology. Rain water harvesting, soil conservation and land reclamation measures, retaining paddy fields as rainwater reservoirs are the other areas to be concentrated.

### Objectives

- To promote sustainable agriculture for conserving nature and eradicating poverty.
- To create environmental awareness
- To develop entrepreneurial competencies for starting employment generating projects
- To set up a pool of skilled workforce
- To expose areas of higher education for achieving higher levels of skills
- To promote innovation and exploration.
- To provide overall healthy atmosphere for physical, mental and social growth of the learner
- To acquire awareness about different job areas
- To provide back ground for acquiring higher level skills in concerned subject
- To explore future opportunities through career guidance
- To develop entrepreneurial competencies and skills of learner

There should be a learner friendly classroom inspiring democratic thinking and nourishing life skills. ICT facilities and updated library enabling reference and deeper analysis is inevitable

The principle of vocational education is learning by doing and hence fully equipped workshops and labs are the centers of all activities. It is in the labs where the unskilled is being trained to be skilled technician.

A work shop where the student can practice carpentry jobs, fitting work welding jobs sheet metal work and repair and maintenance of machineries is the main focus of attraction of this course. In the initial

stage students are exposed to tools and machineries in the school lab. In the secondary stage during field visit and OJT, the students learn more through actual work.

In every district Agricultural Engineering work shops are functioning well under the guidance of Asst. Executive Engineer of Agricultural department of Kerala. Large number of modern machineries and implements are available there. The students can utilize these facilities and can be thoroughly aware of service and maintenances of implements in the field and in work shop.

State seed farms in Agricultural department, Krishi Vigyan Kendras, Agricultural resurch stations, Kerala Agro Industries Corporation, RAIDCO, KAMCO etc., are centers in government sector which act as supporting and learning centers. The students can ensure quality based field training and practical guidance.

Hence the venture is the need of the hour for encouraging the teenagers to produce their own food and protect the nature rather than being electronic slaves purchasing poisoned food from other states.

## SYLLABUS

### **Basic Engineering and Workshop Technology (340 periods)**

#### **Unit 1 - Measuring Instruments (30 Periods)**

- 1.1.1 Introduction to measuring Instruments
- 1.1.2 Classification -Precision and non precision.
- 1.1.3 Precision-instruments-Micrometer, Vernier caliper, Gauges,
- 1.1.4 Non Precision-instruments-Steel rule, dividers, depth gauges, Calipers Inside, out side

#### **Unit 2 - Workshop Technology (140periods)**

- 1.2.1 Introduction, Safety precautions, Classification of Different Processes.
- 1.2.2 Carpentry -Identification and use of different tools, Handling, Practicing, cutting, Plaining, boring etc., Learning to make different carpentry joints-Halving, butt, corner, mortise and Tenon joints.
- 1.2.3 Bench Work and fitting -Introduction, study of tools handling, Practicing, Fitting works.
- 1.2.4 Sheet metal - Introduction, study of tools handling, making joints, Making useful articles using sheets like boxes, small bins etc.
- 1.2.5 Metal joining process - Welding, brazing, soldering  
Welding - Introduction, Tools - identification, handling. Types

of welding, practicing welding to make joints. Making small articles like garden fork, supporting Stands, frames etc.

Brazing - Introduction, Tools handling

Soldering -Introduction, Tools, practice soldering using Soldering iron.

- 1.2.6 Mechanical properties of metals and alloys - Study of different mechanical properties of metals and alloys like tensile strength malleability etc ...Heat treatment processes - Nitriding , annealing, normalizing, tempering hardening

### **Unit 3 - Electrical Engineering (80 periods)**

- 1.3.1 Electricity, Basic Concepts of electricity,  
 1.3.2 Faraday's laws of electro Magnetic Induction,  
 1.3.3 Ohm's law, Voltage, Current, AC and DC, Resistance  
 1.3.4 Flemings Rule  
 1.3.5 Electric Circuits, Different Types of circuits- Parallel and Series  
 1.3.6 Use of ammeter, Voltmeter Measurement of Resistances.  
 1.3.7 Simple wiring practice, gauges of electrical cables .  
 1.3.8 Generators, Concepts, Different types, working, Field visit.  
 1.3.9 Transformer - Basic concept, different types, working.

### **Unit 4 - Renewable Energy resources (60 periods)**

- 1.4.1 Work, power and Energy Introduction to Newton's laws of motion, Concepts - force, work, power and energy, Calculation of energy.  
 1.4.2 Energy Resources - Introduction, Classification, Renewable and Non Renewable- Solar, wind and Bio Energy and other Resources.  
 1.4.3 Solar energy, Solar Voltaic, Solar Thermal Devices like Dryers and Solar cooker.  
 1.4.4 Biogas plants--Study of different types, production of energy from bio waste.-fabrication of models

### **Unit.5 - Engineering Graphics (30 periods)**

- 1.5.1 Drawing instruments and uses  
 1.5.2 Lines - Different types and its applications  
 1.5.3 Lettering and numbering  
 1.5.4 Dimensioning  
 1.5.5 Construction of basic shapes- polygon, conic section, spiral curve  
 1.5.6 Introduction of projection of points, lines, planes

- 1.5.7 Quadrants and objects in different quadrants
- 1.5.8 Basic section views
- 1.5.9 Auxiliary views
- 1.5.10 Isometric views
- 1.5.11 Introduction to machine drawing

## Module 2

### **Heat Engines And Farm Power (340 Periods)**

#### **Unit 1 - Heat Engine (50 periods)**

- 2.1.1 Thermodynamic System process and cycles.
- 2.1.2 Engine cycles- Otto and diesel cycles
- 2.1.3 Introduction to Heat Engines and Classification -IC, EC, SI, CI
- 2.1.4 Engine parts, functions and materials of construction
- 2.1.5 Principle and working of SI and CI engines
- 2.1.6 Performance characteristics of an engine- BHP, IHP, IMEP and efficiencies
- 2.1.7 Rating of fuels, lubrication system, fuel injection, spark plug
- 2.1.8 Cooling system Air and water
- 2.1.9 Modern Engines and parts

#### **Unit 2 - Farm Motors (60 periods)**

- 2.2.1 Introduction, working, principle
- 2.2.2 D.C motor- Introduction, parts, working
- 2.2.3 A.C motor- Introduction, parts, working
- 2.2.4 Single phase motor-Introduction, parts, working
- 2.2.5 2 phase motor-Introduction, parts, working
- 2.2.6 3 phase motor-Introduction, parts, working
- 2.2.7 Selection of motors-Domestic and industrial purpose
- 2.2.8 Installation, maintenance, and servicing of D.C motor
- 2.2.9 Installation, maintenance, and servicing of A.C motor
- 2.2.10 Identify the complaints and repairing motors

#### **Unit 3 - Power Tiller (70 periods)**

- 2.3.1 Concept-Types of tillers-time, power and money saver  
Different models, engine specifications, use of power tiller for different works
- 2.3.2 Parts of a power tiller-Functions, material of construction
- 2.3.3 Starting procedure-operating the tiller on road with and without trailer.

- 2.3.4 Clutch and gear system, Side clutches and break system
- 2.3.5 Power tiller attachments Rotovator, hitching practicing, tilling in field for seed bed preparation.
- 2.3.6 Other uses of P/T-Utilizing engine power of power tiller to operate irrigation pumps, winnowers, thresher, milling M/C etc.
- 2.3.7 Garden tiller

**Unit 4 - Tractor (70 periods)**

- 2.4.1 Tractor-Introduction, different types, models, Classification
- 2.4.2 Transmission system
- 2.4.3 Differential
- 2.4.4 Cooling system
- 2.4.5 Lubrication
- 2.4.6 Steering mechanism
- 2.4.7 Break system
- 2.4.8 Self starter, battery, ignition
- 2.4.9 Tyres and PTO shaft
- 2.4.10 Hitching-Different methods, practicing
- 2.4.11 Cage wheel fitting
- 2.4.12 Driving practice
- 2.4.13 Operation in field using cultivator, rotovator and cage wheel.

**Unit 5 - On the job training (two weeks 90 periods)**

**LEARNING OUTCOMES**

**MODULE 1. BASIC ENGINEERING AND WORKSHOP TECHNOLOGY**

Learners will be able to

**1.1. Measuring Instruments**

- 1.1.1 recognize the measuring tool
- 1.1.2 identify the tools as precision and non precision and classify them
- 1.1.3 measure dimensions like length breadth diameter etc.,
- 1.1.4 estimate or calculate volume, area etc., from measured dimensions

**1.2. Workshop Technology**

- 1.2.1 recognize importance of safety precautions in the work place

- 1.2.2 select right tool for specific carpentry work and perform the works
- 1.2.3 Identify different fitting tools, do fitting work
- 1.2.4 select sheet metal tools and make useful articles
- 1.2.5 select particular type of welding and make welded joints
- 1.2.6 explain mechanical properties of metals and alloys

### **1.3 Electrical Engineering**

- 1.3.1 understands how electricity is produced
- 1.3.2 explain electromagnetic induction
- 1.3.3 Explain resistance in a circuit
- 1.3.4 analyze direction of flow of current
- 1.3.5 identify series and parallel circuit
- 1.3.6 use ammeter and volt meter
- 1.3.7 make simple electric wiring
- 1.3.8 operate electric generators
- 1.3.9 repair transformers

### **1.4 Renewable Energy Resources**

- 1.4.1 explain the concept of energy
- 1.4.2 distinguish various energy resource
- 1.4.3 tap solar energy for domestic purpose
- 1.4.4 fabricate bio gas plant

### **1.5 Engineering Graphics**

- 1.5.1 identify drawing instruments for specific purpose
- 1.5.2 do lettering and numbering
- 1.5.3 Mark dimensions
- 1.5.4 draw different types of lines
- 1.5.5 construct different types of geometric shapes
- 1.5.6 project points and lines
- 1.5.7 Distinguish different quadrants
- 1.5.8 identify basic sectional views
- 1.5.9 draw auxiliary views objects
- 1.5.10 draw isometric views of objects
- 1.5.11 draw engineering components perfectly

## **MODULE 2. HEAT ENGINES AND FARM POWER**

### **2.1. Heat Engines**

- 2.1.1 explain thermo dynamic process, Otto cycle, diesel cycle



- 2.1.2 identify different engines
- 2.1.3 classify the engine
- 2.1.4 list the engine parts and their function
- 2.1.5 assemble the parts of an engine
- 2.1.6 calculate HP, efficiency
- 2.1.7 Assemble parts of fuel pump and spark plug
- 2.1.8 identify different cooling systems
- 2.1.9 identify the parts of modern engines

## **2.2. Farm Motors**

- 2.2.1 explain the working of a motor
- 2.2.2 list the part of a DC motor
- 2.2.3 install and do servicing of a motor
- 2.2.4 identify the parts of AC motor
- 2.2.5 install and do servicing of the AC motor
- 2.2.6 assemble the part of single face motor
- 2.2.7 assemble the parts of two phase motor
- 2.2.8 repair a three phase motor
- 2.2.9 select motor for specific purpose
- 2.2.10 identify the defects of the damaged motor and rectify

## **2.3. Power Tillers**

- 2.3.1 explain the working of the power tiller
- 2.3.2 identify the parts and their function
- 2.3.3 operate a power tiller
- 2.3.4 perform different tilling practices
- 2.3.5 use power tiller for other purposes like irrigation winnowing milling etc.,
- 2.3.6 operate a garden tiller

## **2.4. Tractors**

- 2.4.1 identify different types of tractors
- 2.4.2 operate the transmission system of a tractor
- 2.4.3 assemble the parts of a differential
- 2.4.4 explain working of cooling system
- 2.4.5 do servicing of lubricating system
- 2.4.6 operate the steering mechanism
- 2.4.7 assemble the parts of break system

- 2.4.8 assemble the parts of ignition system, battery , self starter
- 2.4.9 fit tyres and check tyre pressure
- 2.4.10 practice different types of hitching
- 2.4.11 fit and remove rubber tyres and cage wheel
- 2.4.12 operate a tractor
- 2.4.13 operate tractor drawn implements

**SCHEME OF WORK**

Month	Module	Units	Period	Total period
June	1	1	30	30
July	1	2	80	80
August	1	2 3	60 20	80
September	1	3 4	60 20	80
October	1	3 5	40 30	70
November	2	1	50	50
December	2	2	60	60
January	2	3	70	70
February	2	4	70	70
March	2	5	90(OJT)	90

**COURSE STRUCTURE**

**AGRO MACHINERY AND POWER ENGINEERING**

This course Consists of Four Module

- Module I Basic Engineering And Workshop Technology
- Module II Heat Engines And Farm Power
- Module III Farm Mechanisation And Postharvest Engineering.
- Module IV Hi-tech Farming And Computer Aided Designing

Certificates will be issued to the students after the completion of each module respectively as :

1. Work shop technician
2. Farm Mechanic

3. Machine operator (farms)
4. Technician Hi-tech farming.

### Agro Machinery And Power Engineering

#### Module: 01 Basic Engineering And Workshope Technology

Unit No	Name of unit	Total Periods
01	Measuring Instruments	30
02	Workshop Technology	140
03	Electrical Engineering	80
04	Renewable Energy Resources	60
05	Engineering Graphics	30
	<b>TOTAL</b>	<b>340</b>

#### Module: 02 Heat Engines And Farm Poewr

Unit No	Name of unit	Total Periods
01	Heat Engines	50
02	Farm Motors	60
03	Power Tillers	70
04	Tractors	70
05	OJT (15 Days)	90
	<b>TOTAL</b>	<b>340</b>

#### ON THE JOB TRAINING

Linkage with industry is the important factor to achieve the goals in vocational education. This can be achieved only through O J T, provided if conducted in strict accordance to the rules and regulations

The students will be exposed to the organizational culture and industrial atmosphere of OJT centers. OJT period will help them to develop social skills and motivate team work. OJT helps to improve leader ship quality punctuality and responsibility. The technical expertise gained during OJT will nourish creative and innovative skills

OJT may be conducted in two spells of 15 days each at the end of Module II and Module IV.

#### OVERVIEW OF MODULE - 1

As the name indicates this module transacts the basic engineering concepts to the learner. He / she develops the capacity to select and use different tools and perform carpentry work, fitting jobs, welding joints and make articles from sheet metals. He will be able to fabricate models

of bio gas plants, solar dryers and cookers thus nourishing creative and innovative skills. He / she can do simple electric wiring. The basic course in engineering graphics provides drawing skill to sketch machine parts precisely.

#### MODULE 1

#### BASIC ENGINEERING AND WORKSHOP TECHNOLOGY

Periods: 340

<b>Unit No.</b>	<b>Name of units</b>	<b>Periods</b>
1.1	Measuring Instruments	30
1.2	Workshop Technology	140
1.3	Electrical Engineering	80
1.4	Renewable Energy Resources	60
1.5	Engineering Graphics	30
	<b>TOTAL PERIODS</b>	<b>340</b>

Module 1 : BASIC ENGINEERING AND WORKSHOP TECHNOLOGY		Unit : MEASURING INSTRUMENTS (30 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Introduction to measuring Instruments Skill</li> <li>Observation &amp; Distinguish Classification, Precision and non precision Skill</li> <li>Observing Classification</li> <li>Identifying Precision, Micrometer, Vernier caliper, Gauges, Skill</li> <li>Observing Classification</li> <li>Identifying Non Precision, Steel rule, dividers, depth gauges, Calipers, inside/outside Skill</li> <li>Observing Classification</li> </ul>	<ul style="list-style-type: none"> <li>recognize the measuring tool</li> <li>To identify the tools as precision and non precision and classify them</li> <li>To measure dimensions like length breadth diameter etc.,</li> <li>To estimate or calculate volume, area etc., from measured dimensions</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration, Practical work</li> <li>Display Components Classification Photographs Group Discussion</li> <li>Practical work Chart Preparation Demo, Photograph.</li> <li>Practical work Demonstration, Recording observation,</li> </ul>	<ul style="list-style-type: none"> <li>Activity log Practical records Viva</li> <li>Chart Practical Record Questionnaire</li> <li>Practical record Solving problems Unit test</li> <li>Measuring accuracy of work</li> </ul>
Module 1 : BASIC ENGINEERING AND WORKSHOP TECHNOLOGY		Unit : Workshop Technology (140periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Introduction, Safety precautions, Classification of different process. Skill</li> <li>Precaution Observing identifying</li> </ul>	<ul style="list-style-type: none"> <li>To recognize importance of safety precautions in the work place</li> </ul>	<ul style="list-style-type: none"> <li>Animation Video Group discussion</li> </ul>	<ul style="list-style-type: none"> <li>Note Presentation Activity log Record collection Practical test, Viva</li> </ul>

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>• Carpentry, Identification and use of different tools, Handling, Practicing, cutting, planing, boring etc. Skill Handling Observing Working</li> </ul>	<ul style="list-style-type: none"> <li>• To select right tool for specific carpentry work and perform the works</li> </ul>	<ul style="list-style-type: none"> <li>• Practical work Measurement Still model Presentation Field visit,</li> </ul>	<ul style="list-style-type: none"> <li>• Record collection Practical test, Viva</li> </ul>
<ul style="list-style-type: none"> <li>• Bench Work and fitting, Introduction, study of tools handling, practicing, Fitting works. Skill Handling Observing Working</li> </ul>	<ul style="list-style-type: none"> <li>• Identify different fitting tools, do fitting work</li> </ul>	<ul style="list-style-type: none"> <li>• Practical work Measurement Still model Presentation Field visit,</li> </ul>	<ul style="list-style-type: none"> <li>• Record collection Practical test, Viva</li> </ul>
<ul style="list-style-type: none"> <li>• Sheet metal, Introduction, study of tools handling, making joints, Making tiny useful articles Skill Handling Observing Working</li> </ul>	<ul style="list-style-type: none"> <li>• To select sheet metal tools and make useful articles</li> </ul>	<ul style="list-style-type: none"> <li>• Practical, Measurement Field visit, Seminar Demonstration,</li> </ul>	<ul style="list-style-type: none"> <li>• Record, Practical Viva</li> </ul>
<ul style="list-style-type: none"> <li>• Metal joining process, Welding , brazing, soldering, Introduction, Tools - identification, handling. Types of welding. Practicing welding to make joints Soldering, Brazing Introduction, Tools handling Skill Handling Observing Working</li> </ul>	<ul style="list-style-type: none"> <li>• To select particular type of welding and make welded joints</li> </ul>	<ul style="list-style-type: none"> <li>• Practical, Measurement Field visit, Seminar Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Record, Practical Viva</li> </ul>
<ul style="list-style-type: none"> <li>• Mechanical properties Of metals and alloys, Study of different mechanical properties of metals, Different Heat Treatment Processes Skill Observing Classification Identifying</li> </ul>	<ul style="list-style-type: none"> <li>• To explain mechanical properties of metals and alloys</li> </ul>	<ul style="list-style-type: none"> <li>• Power point presentation E learning Seminar</li> </ul>	<ul style="list-style-type: none"> <li>• Chart Unit test Quiz</li> </ul>

Module 1 : BASIC ENGINEERING AND WORKSHOP TECHNOLOGY		Unit : Electrical Engineering (80 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Electricity, Basic Concept, Skill Observing Listening</li> </ul>	<ul style="list-style-type: none"> <li>To understands how electricity is produced</li> </ul>	<ul style="list-style-type: none"> <li>Power point presentation Seminar</li> </ul>	<ul style="list-style-type: none"> <li>Practical, Reports, Practical test.</li> </ul>
<ul style="list-style-type: none"> <li>Faraday's laws of electro Magnetic Induction Skill Observing Classification Listening</li> </ul>	<ul style="list-style-type: none"> <li>To explain electromagnetic induction</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration using coil and battery Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical test Viva</li> </ul>
<ul style="list-style-type: none"> <li>Ohm's law, Voltage, Current, AC and DC, Resistance Skill Observing Identifying Listening</li> </ul>	<ul style="list-style-type: none"> <li>To Explain resistance in a circuit</li> </ul>	<ul style="list-style-type: none"> <li>Chart/ album Power point presentation Seminar</li> </ul>	<ul style="list-style-type: none"> <li>Practical test Quiz Viva</li> </ul>
<ul style="list-style-type: none"> <li>Flemings Rule, Skill Observing Listening</li> </ul>	<ul style="list-style-type: none"> <li>To analyze direction of flow current</li> </ul>	<ul style="list-style-type: none"> <li>Power point presentation Seminar</li> </ul>	<ul style="list-style-type: none"> <li>Practical, Reports, Practical test.</li> </ul>
<ul style="list-style-type: none"> <li>Electric Circuits Different Types of circuits Parallel and Series Skill Observing Classification Listening</li> </ul>	<ul style="list-style-type: none"> <li>To identify series and parallel circuit</li> </ul>	<ul style="list-style-type: none"> <li>Chart/ album Seminar</li> </ul>	<ul style="list-style-type: none"> <li>Practical Test Quiz Viva</li> </ul>
<ul style="list-style-type: none"> <li>Use of ammeter, Voltmeter Measurement of Resistances Skill Observing Identifying Listening</li> </ul>	<ul style="list-style-type: none"> <li>To use ammeter and volt meter</li> </ul>	<ul style="list-style-type: none"> <li>Chart/ album Seminar</li> </ul>	<ul style="list-style-type: none"> <li>Practical test Quiz Viva</li> </ul>

Module 1 : BASIC ENGINEERING AND WORKSHOP TECHNOLOGY		Unit : Electrical Engineering (80 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>• Simple wiring practice. Skill Observing Listening</li> <li>• Generators, Different types, working, Skill Repairing Observing Listening Handling Working</li> <li>• Transformers, Basic concept, different types, working Skill Repairing Observing Listening Handling</li> </ul>	<ul style="list-style-type: none"> <li>• To make simple electric wiring</li> <li>• To operate electric generators</li> <li>• To repair transformers</li> </ul>	<ul style="list-style-type: none"> <li>• Power point presentation Seminar</li> <li>• Power point presentation Demonstration Models Field visit</li> <li>• Power point presentation Demonstration Models Field visit Interaction with experts E learning</li> </ul>	<ul style="list-style-type: none"> <li>• Practical, Reports, Practical test.</li> <li>• Practical Reports, Practical test. viva</li> <li>• Practical Reports, Practical test. viva</li> </ul>



Module 1 : BASIC ENGINEERING AND WORKSHOP TECHNOLOGY		Unit : Renewable Energy Resources (60 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>• Work, power and Energy, Concept of force, Newton's laws. Skill</li> <li>• Observing Classification Listening</li> </ul>	<ul style="list-style-type: none"> <li>• To explain to the concept of energy</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive lecturing E learning</li> </ul>	<ul style="list-style-type: none"> <li>• Unit test viva</li> </ul>
<ul style="list-style-type: none"> <li>• Energy Resources. Introduction, Classification, Renewable and non Renewable Skill</li> <li>• Observing Classification Listening</li> </ul>	<ul style="list-style-type: none"> <li>• To distinguish various energy resource</li> </ul>	<ul style="list-style-type: none"> <li>• Chart/ album Power point presentation E learning Seminar</li> </ul>	<ul style="list-style-type: none"> <li>• Class Test Quiz Viva</li> </ul>
<ul style="list-style-type: none"> <li>• Solar energy ,Solar Energy, Solar panels, Solar dryers Skill</li> <li>• Observing Identifying Listening</li> </ul>	<ul style="list-style-type: none"> <li>• To tap solar energy for domestic purpose</li> </ul>	<ul style="list-style-type: none"> <li>• Chart/ album Power point presentation Seminar E learning Debate</li> </ul>	<ul style="list-style-type: none"> <li>• Class Test Quiz Viva</li> </ul>
<ul style="list-style-type: none"> <li>• Biogas plants Study of different types, production of energy from bio waste. Skill</li> <li>• Observing Identifying Listening</li> </ul>	<ul style="list-style-type: none"> <li>• To fabricate bio gas plant</li> </ul>	<ul style="list-style-type: none"> <li>• Field visit Seminar E learning</li> </ul>	<ul style="list-style-type: none"> <li>• Class test viva</li> </ul>

Module 1 : BASIC ENGINEERING AND WORKSHOP TECHNOLOGY		Unit : Engineering Graphics (30 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Drawing instruments and uses</li> <li>Skill</li> <li>Observing</li> <li>Listening</li> <li>Drawing</li> </ul>	<ul style="list-style-type: none"> <li>To identify drawing instruments for specific purpose</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration</li> <li>Interactive lecturing</li> </ul>	<ul style="list-style-type: none"> <li>Drawing</li> <li>Viva</li> </ul>
<ul style="list-style-type: none"> <li>Lettering and numbering</li> <li>Skill</li> <li>Observing</li> <li>Listening</li> <li>Writing</li> <li>Drawing</li> </ul>	<ul style="list-style-type: none"> <li>To do lettering and numbering</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration</li> <li>Interactive lecturing</li> </ul>	<ul style="list-style-type: none"> <li>Drawing</li> <li>Viva</li> </ul>
<ul style="list-style-type: none"> <li>Dimensioning</li> <li>Skill</li> <li>Observing</li> <li>Listening</li> <li>Perfection</li> <li>Drawing</li> </ul>	<ul style="list-style-type: none"> <li>To Mark dimensions</li> </ul>	<ul style="list-style-type: none"> <li>Drawing Class</li> <li>Demonstration</li> <li>Interactive lecturing</li> </ul>	<ul style="list-style-type: none"> <li>Drawing</li> <li>Viva</li> </ul>
<ul style="list-style-type: none"> <li>Lines, Different types and its applications</li> <li>Skill</li> <li>Observing</li> <li>Listening</li> <li>Perfection</li> <li>Drawing</li> </ul>	<ul style="list-style-type: none"> <li>To draw different types of lines</li> </ul>	<ul style="list-style-type: none"> <li>Drawing Class</li> <li>Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>Drawing</li> <li>Viva</li> </ul>
<ul style="list-style-type: none"> <li>Construction of basic shapes conic section, spiral curve</li> <li>Skill</li> <li>Observing</li> <li>Perfection</li> <li>Drawing</li> <li>Constructive</li> </ul>	<ul style="list-style-type: none"> <li>To construct different types of geometric shapes</li> </ul>	<ul style="list-style-type: none"> <li>Drawing Class</li> <li>Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>Drawing</li> <li>Viva</li> <li>Perfection</li> </ul>

Module 1 : BASIC ENGINEERING AND WORKSHOP TECHNOLOGY		Unit : Engineering Graphics (30 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>• Introduction of projection of points, lines, planes Skill Observing Perfection Drawing</li> </ul>	<ul style="list-style-type: none"> <li>• To project points and lines</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing Class Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing Viva</li> </ul>
<ul style="list-style-type: none"> <li>• Quadrants and objects in different quadrants Skill Observing Perfection Drawing</li> </ul>	<ul style="list-style-type: none"> <li>• Distinguish different quadrants</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing Class Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing Viva</li> </ul>
<ul style="list-style-type: none"> <li>• Basic section views Skill Observing Perfection Drawing</li> </ul>	<ul style="list-style-type: none"> <li>• To identify basic sectional views</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing Class Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing Viva Perfection</li> </ul>
<ul style="list-style-type: none"> <li>• Auxiliary views Skill Observing Perfection Drawing</li> </ul>	<ul style="list-style-type: none"> <li>• To draw auxiliary use objects</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration Drawing classes</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing Viva Perfection</li> </ul>
<ul style="list-style-type: none"> <li>• Isometric views Skill Observing Perfection Drawing</li> </ul>	<ul style="list-style-type: none"> <li>• To draw isometric views of objects</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration Drawing classes</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing Viva Perfection</li> </ul>
<ul style="list-style-type: none"> <li>• Introduction to machine drawing Skill Observing Perfection Drawing Imaging</li> </ul>	<ul style="list-style-type: none"> <li>• To draw engineering components perfectly</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration Drawing classes Practical class</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing Viva Perfection</li> </ul>

## PRACTICAL ACTIVITIES OF MODULE - 1

### Unit I- Measuring Instruments

- 1 Identification of non precision measuring tools and observe their use. Take down sketches steel rule, caliper, divider, depth gauge
- 2 Identification of precision measuring tools and observing their use.
- 3 Determine L.C of a vernier caliper
- 4 Calculating volume of sphere, cuboid etc. by measurement of L, B, H Radius etc.
- 5 Determine L.C and pitch of a screw gauge and look for zero correction.
- 6 Calculating volume, measuring thickness, diameter etc. of spheres, wires, pipes, etc.

### Unit II - Work Shop Technology

- 1 Visit to carpentry section and identifies tools , learns their use and holding devices
- 2 Cutting practice using saws
- 3 Planing practice using planes
- 4 Making grooves using chisels
- 5 Learns to make different types of joints using above pieces-but joint, corner, halving joint, mortise gauge
- 6 Visit fitting section and identifies the tools and their uses.
- 7 Cutting practice on M.S flat using hacksaw.
- 8 Filing practice
- 9 Fitting practice by making L cut and V cut
- 10 Study of tools in sheet metal working
- 11 Cutting work pieces from sheets of desired dimension
- 12 Making different types of joints
- 13 Making boxes, waste tray, tool holders etc. from sheets.
- 14 Study of welding tools and accessories for safety
- 15 Welding practice
- 16 Welding practice to make different joints (4 types)
- 17 Making garden fork using M.S rod and hollow pipe.
- 18 Soldering practice

**Unit III - Electrical Engineering**

- 1 Ohm's Law verification
- 2 Simple wiring practice
- 3 Automobile wiring for tractor
- 4 Estimating resistance in parallel circuit connection
- 5 Estimating resistance in series circuit connection
- 6 Identifying parts of generator
- 7 Assembling transformer

**Unit IV- Renewable Energy Resources**

- 1 Visit to hydro electric power station and understand generators, turbines, transformers, etc. learn production and transmission of electric energy.
- 2 Study of solar panels
- 3 Field visit to ANERT for knowing about solar energy tapping
- 4 Field visit to Biogas plant in the local premises
- 5 Making tiny models of Biogas plants
- 4 Measuring voltage in simple solar circuit
- 5 Making models of solar water heaters
- 8 Making solar cookers
- 9 making solar driers
- 10 Study of solar water heater

**Unit V- Engineering Graphics**

- 1 Use of drawing instruments
- 2 Different lines, lettering, numbering, and dimensioning
- 3 Basic shapes –construction
- 4 Projection of points, lines, planes
- 5 Sectional view, auxiliary view, isometric view
- 6 Introduction to M/C drawing

## OVERVIEW OF MODULE - 2

This module transacts the working principles of different types of engines. The learner identifies the parts by disassembling and assembling of both CI and SI engines.

He/she will be able to detect the defective parts and replace them. Farm Motors Power tiller and Tractor are the sources of power in the fields and learner will be able to choose the specific energy resource for a particular purpose.

Selection of motors, care, repair and maintenance of motor, tractor and power tiller are the areas where the learner gets thorough practical expertise.

### MODULE 2

#### HEAT ENGINES AND FARM POWER

Periods: 340

Unit No.	Name of units	Periods
2.1	Heat Engines	50
2.2	Farm Motors	60
2.3	Power Tillers	70
2.4	Tractors	70
2.5	OJT (15 Days)	90
	<b>TOTAL PERIODS</b>	<b>340</b>

Module 2 : HEAT ENGINES AND FARM POWER		Unit : Heat Engines (50 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Introduction to Thermo dynamic System, process and different types of cycles</li> <li>Skills</li> <li>Observing</li> <li>Listening</li> <li>Classification</li> <li>Identifying</li> </ul>	<ul style="list-style-type: none"> <li>To explain thermo dynamic process, otto cycle, diesel cycle</li> </ul>	<ul style="list-style-type: none"> <li>Power point Presentation</li> <li>Practical work,</li> </ul>	<ul style="list-style-type: none"> <li>Activity log</li> <li>Practical records</li> <li>Viva</li> </ul>
<ul style="list-style-type: none"> <li>Introduction to Heat Engines Engine cycles, Otto and Diesel Cycle.</li> <li>Skill</li> <li>Observing</li> <li>Classification</li> <li>Identifying</li> </ul>	<ul style="list-style-type: none"> <li>To identify different engines</li> </ul>	<ul style="list-style-type: none"> <li>Photographs</li> <li>Group Discussion</li> </ul>	<ul style="list-style-type: none"> <li>Chart</li> <li>Practical Record</li> <li>Questionnaire</li> </ul>
<ul style="list-style-type: none"> <li>Classification of engines IC, EC, SI, CI, Skill</li> <li>Observing</li> <li>Classification</li> <li>Identifying</li> </ul>	<ul style="list-style-type: none"> <li>To classify the engine</li> </ul>	<ul style="list-style-type: none"> <li>Practical work</li> <li>Chart Preparation</li> <li>Demo, Photograph, , ,</li> </ul>	<ul style="list-style-type: none"> <li>Practical record</li> <li>Solving problems</li> <li>Unit test</li> </ul>
<ul style="list-style-type: none"> <li>Engine parts, functions and materials of construction</li> <li>Skill</li> <li>Observing</li> <li>Identifying</li> <li>Classification</li> </ul>	<ul style="list-style-type: none"> <li>To list the engine parts and their function</li> </ul>	<ul style="list-style-type: none"> <li>Practical work</li> <li>Demonstration ,</li> <li>Recording and observation,</li> </ul>	<ul style="list-style-type: none"> <li>Chart</li> <li>Practical record</li> </ul>
<ul style="list-style-type: none"> <li>Principle and working of SI and CI engines</li> <li>Skills</li> <li>Observing</li> <li>Listening</li> <li>Classification</li> <li>Identifying</li> </ul>	<ul style="list-style-type: none"> <li>To assemble the parts of an engine</li> </ul>	<ul style="list-style-type: none"> <li>Power point Presentation</li> <li>Practical work,</li> </ul>	<ul style="list-style-type: none"> <li>Activity log</li> <li>Practical records</li> <li>Viva</li> </ul>

Module 2 : HEAT ENGINES AND FARM POWER			
Unit : Heat Engines (50 periods)			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Performance characteristics of an engine- BHP, IHP, IMEP and efficiencies</li> <li>Skill Observing Classification Identifying</li> </ul>	<ul style="list-style-type: none"> <li>To calculate HP, efficiency</li> </ul>	<ul style="list-style-type: none"> <li>Practical work Chart Preparation</li> </ul>	<ul style="list-style-type: none"> <li>Chart Practical Record Questionnaire</li> </ul>
<ul style="list-style-type: none"> <li>Rating of fuels, duplication system, fuel injection, spark plug</li> <li>Skill Observing Classification Identifying</li> </ul>	<ul style="list-style-type: none"> <li>To Assemble parts of fuel pump and spark plug</li> </ul>	<ul style="list-style-type: none"> <li>Practical work Chart Preparation Demo, Photograph</li> </ul>	<ul style="list-style-type: none"> <li>Practical record Solving problems Unit test</li> </ul>
<ul style="list-style-type: none"> <li>Cooling system Air and water</li> <li>Skill Observing Classification Identifying</li> </ul>	<ul style="list-style-type: none"> <li>To identify different cooling systems</li> </ul>	<ul style="list-style-type: none"> <li>Practical work Demonstration, observation,</li> </ul>	<ul style="list-style-type: none"> <li>Practical record</li> </ul>
<ul style="list-style-type: none"> <li>Modern Engines and parts</li> <li>Skill Observing Listening Classification Identifying</li> </ul>	<ul style="list-style-type: none"> <li>To identify the parts of modern engines</li> </ul>	<ul style="list-style-type: none"> <li>Power point Presentation Practical work</li> </ul>	<ul style="list-style-type: none"> <li>Activity log Practical records Viva</li> </ul>



Module 2 : HEAT ENGINES AND FARM POWER		Unit : Farm Motors (60 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Introduction, working, principle Skills</li> <li>Observing</li> <li>Listening</li> <li>Classification</li> <li>Identifying</li> </ul>	<ul style="list-style-type: none"> <li>To explain the working of a motor</li> </ul>	<ul style="list-style-type: none"> <li>Power point Presentation</li> <li>Practical work,</li> </ul>	<ul style="list-style-type: none"> <li>Activity log</li> <li>Practical records</li> <li>Viva</li> </ul>
<ul style="list-style-type: none"> <li>D.C motor</li> <li>Introduction, parts, working</li> <li>Skill</li> <li>Observing</li> <li>Classification</li> <li>Identifying</li> </ul>	<ul style="list-style-type: none"> <li>To list the part of a DC motor</li> </ul>	<ul style="list-style-type: none"> <li>Practical work</li> <li>Chart Preparation</li> </ul>	<ul style="list-style-type: none"> <li>Chart</li> <li>Practical Record</li> <li>Questionnaire</li> </ul>
<ul style="list-style-type: none"> <li>Installation, maintenance, and servicing of D.C motor</li> <li>Skill</li> <li>Repairing</li> <li>Observing</li> <li>Listening</li> <li>Assembling</li> <li>Handling</li> </ul>	<ul style="list-style-type: none"> <li>To install and do servicing of a motor</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Group activity</li> <li>Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical,</li> <li>Record,</li> <li>viva</li> </ul>
<ul style="list-style-type: none"> <li>A.C motor,</li> <li>Introduction, parts, working</li> <li>Skill</li> <li>Repairing</li> <li>Observing</li> <li>Listening</li> <li>Assembling</li> <li>Tools Handling</li> </ul>	<ul style="list-style-type: none"> <li>To identify the parts of AC motor</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Group discussion</li> <li>Power point presentation</li> <li>E learning</li> </ul>	<ul style="list-style-type: none"> <li>Practical,</li> <li>Record,</li> <li>viva</li> </ul>
<ul style="list-style-type: none"> <li>Installation, maintenance, and servicing of A.C motor</li> <li>Skill</li> <li>Repairing</li> <li>Observing</li> <li>Listening</li> <li>Assembling</li> <li>Tools Handling</li> </ul>	<ul style="list-style-type: none"> <li>To install and do servicing of the AC motor</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Group activity</li> <li>Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical,</li> <li>Record,</li> <li>viva</li> </ul>

Module 2 : HEAT ENGINES AND FARM POWER		Unit : Farm Motors (60 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Single phase motor, Introduction, parts, working Skill</li> <li>Observing</li> <li>Listening</li> <li>Handling</li> </ul>	<ul style="list-style-type: none"> <li>To assemble the part of single phase motor</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Group activity</li> <li>Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical, Record, Viva</li> </ul>
<ul style="list-style-type: none"> <li>2 phase motor Introduction, parts, working Skill</li> <li>Observing</li> <li>Listening</li> <li>Handling</li> </ul>	<ul style="list-style-type: none"> <li>To assemble the parts of two phase motor</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Group activity</li> <li>Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical, Record, Viva</li> </ul>
<ul style="list-style-type: none"> <li>3 phase motor Introduction, parts, working Skill</li> <li>Observing</li> <li>Listening</li> <li>Handling</li> </ul>	<ul style="list-style-type: none"> <li>To repair a three phase motor</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Group activity</li> <li>Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical, Record, Viva</li> </ul>
<ul style="list-style-type: none"> <li>Selection of motors, Domestic and industrial purpose Skill</li> <li>Observing</li> <li>Listening</li> </ul>	<ul style="list-style-type: none"> <li>To select motor for specific purpose</li> </ul>	<ul style="list-style-type: none"> <li>Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Record, Viva</li> </ul>
<ul style="list-style-type: none"> <li>Troubles, and remedies of motors Skill</li> <li>Problem detecting skill</li> <li>Observing</li> </ul>	<ul style="list-style-type: none"> <li>To identify the defects of the damaged motor and rectify</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Power point presentation</li> <li>lecturing</li> </ul>	<ul style="list-style-type: none"> <li>Practical Record Viva</li> </ul>

Module 2 : HEAT ENGINES AND FARM POWER		Unit : Power Tiller (70 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Introduction Types of tillers Time, power and money saver. Different models, engine specifications, use of power tiller for different works Skill</li> <li>Repairing Observing Listening Assembling Tools Handling</li> <li>Parts of a power tiller, Clutch gear and break system Functions, material of Construction Skill</li> <li>Repairing Observing Assembling Tools Handling</li> <li>Starting procedure, operating the tiller on road with or without Trailer Skill</li> <li>Observing Listening Handling</li> <li>Power tiller attachments Rotavator, hitching practicing, tilling in field for seed bed preparation. Skill</li> <li>Observing Listening Handling</li> </ul>	<ul style="list-style-type: none"> <li>To explain the working of the power tiller</li> <li>To identify the parts and their function</li> <li>To operate a power tiller</li> <li>To perform different tilling practices</li> </ul>	<ul style="list-style-type: none"> <li>Power point presentation Group activity</li> <li>Practical Group activity Power point presentation</li> <li>Practical Group activity Power point presentation</li> <li>Practical Group activity Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Chart, Questionnaire viva</li> <li>Practical, Record, viva</li> <li>Practical, Record, Viva</li> <li>Practical, Record, viva</li> </ul>

Module 2 : HEAT ENGINES AND FARM POWER			
Unit : Power Tiller (70 periods)			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Other uses of Power Tiller</li> <li>Utilizing engine power of power tiller to operate irrigation pumps, winnowers, threshers milling machines etc.</li> <li>Skill Observing Listening Handling</li> <li>Garden tiller Skill Observing Listening Handling</li> </ul>	<ul style="list-style-type: none"> <li>To use power tiller for other purposes like irrigation winnowing milling etc.,</li> <li>To operate a garden tiller</li> </ul>	<ul style="list-style-type: none"> <li>Practical Group activity Power point presentation</li> <li>Practical Group activity Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical, Record, viva</li> <li>Practical, Record, viva</li> </ul>
Module 2 : HEAT ENGINES AND FARM POWER			
Unit : Tractor (70 periods)			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Tractor - Introduction, different types, models, Classification Skill Repairing Observing Listening Assembling Tools Handling</li> <li>Transmission system Skill Repairing Observing Assembling Tools Handling</li> </ul>	<ul style="list-style-type: none"> <li>To identify different types of tractors</li> <li>To operate the transmission system of a tractor</li> </ul>	<ul style="list-style-type: none"> <li>Power point presentation Group activity</li> <li>Practical Group activity Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Chart, Questionnaire viva</li> <li>Practical, Record, viva</li> </ul>

Module 2 : HEAT ENGINES AND FARM POWER		Unit : Tractor (70 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Differential Skill</li> <li>Observing</li> <li>Listening</li> <li>Handling</li> </ul>	<ul style="list-style-type: none"> <li>To assemble the parts of a differential</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Group activity</li> <li>Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical, Record, viva</li> </ul>
<ul style="list-style-type: none"> <li>Cooling system</li> <li>Skill</li> <li>Repairing</li> <li>Observing</li> <li>Listening</li> <li>Assembling</li> <li>Tools Handling</li> </ul>	<ul style="list-style-type: none"> <li>To explain working of cooling system</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Power point presentation</li> <li>Group activity</li> </ul>	<ul style="list-style-type: none"> <li>Chart, Questionnaire</li> <li>viva</li> </ul>
<ul style="list-style-type: none"> <li>Lubrication</li> <li>Skill</li> <li>Repairing</li> <li>Observing</li> <li>Assembling</li> <li>Tools Handling</li> </ul>	<ul style="list-style-type: none"> <li>To do servicing of lubricating system</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Group activity</li> <li>Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical, Record, viva</li> </ul>
<ul style="list-style-type: none"> <li>Steering mechanism</li> <li>Skill</li> <li>Observing</li> <li>Listening</li> <li>Handling</li> </ul>	<ul style="list-style-type: none"> <li>To operate the steering mechanism</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Group activity</li> <li>Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical, Record, viva</li> </ul>
<ul style="list-style-type: none"> <li>Break system</li> <li>Skill</li> <li>Repairing</li> <li>Observing</li> <li>Listening</li> <li>Assembling</li> <li>Tools Handling</li> </ul>	<ul style="list-style-type: none"> <li>To assemble the parts of break system</li> </ul>	<ul style="list-style-type: none"> <li>Power point presentation</li> <li>Group activity</li> </ul>	<ul style="list-style-type: none"> <li>Chart, Questionnaire</li> <li>viva</li> </ul>
<ul style="list-style-type: none"> <li>Ignition System- Self starter, battery, Skill</li> <li>Repairing</li> <li>Observing</li> <li>Assembling</li> <li>Tools Handling</li> </ul>	<ul style="list-style-type: none"> <li>To assemble the parts of ignition system, self starter and battery</li> </ul>	<ul style="list-style-type: none"> <li>Practical</li> <li>Group activity</li> <li>Power point presentation</li> </ul>	<ul style="list-style-type: none"> <li>Practical, Record, Viva</li> </ul>

Module 2 : HEAT ENGINES AND FARM POWER		Unit : Tractor (70 periods)	
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>• Tyres and PTO shaft Skill</li> <li>• Observing Listening Handling</li> <li>• Hitching, Different methods, practicing Skill</li> <li>• Repairing Observing Listening Assembling Tools Handling</li> <li>• Cage wheel fitting Skill</li> <li>• Repairing Observing Assembling Tools Handling</li> <li>• Driving practice Skill</li> <li>• Observing Listening Handling</li> <li>• Field operation with cultivator, rotovator and cage wheel Skill</li> <li>• Repairing Observing Listening Assembling Tools Handling</li> </ul>	<ul style="list-style-type: none"> <li>• To fit tyres and check tyre pressure</li> <li>• To practice different types hitching</li> <li>• To remove rubber tyres and fit cage wheel</li> <li>• To operate a tractor</li> <li>• To operate the various tractor drawn implements</li> </ul>	<ul style="list-style-type: none"> <li>• Practical Group activity Power point presentation</li> <li>• Power point presentation Group activity</li> <li>• Practical Group activity Power point presentation</li> <li>• Practical Group activity Power point presentation</li> <li>• Practical; Power point presentation Group activity</li> </ul>	<ul style="list-style-type: none"> <li>• Practical, Record, viva</li> <li>• Chart, Questionnaire viva</li> <li>• Practical, Record, viva</li> <li>• Practical, Record, Viva</li> <li>• Questionnaire P E, viva</li> </ul>

## **PRACTICAL ACTIVITIES OF MODULE - 2**

### **Unit I Heat Engine**

- 1 Study of engine models in lab
- 2 Dismantling petrol engine and assembling
- 3 Dismantling diesel engine and assembling
- 4 Engine parts identification replace defolt items
- 5 Determine swept volume and compression ration
- 6 Field visit to local work shop
- 7 Repairing spark plug
- 8 Servicing fuel pump and injector

### **Unit II - Farm Motors**

- 1 Study of D C motors, parts, uses, working
- 2 Study of A C motors, parts, uses, working
- 3 Installation, connection, and wiring of motors, and motor winding practice in local repairing shop.
- 4 Practicing care and maintenance of motors
- 5 Repairing damaged motors (3 nos)

### **Unit III - Power Tiller 56 Hours**

- 1 Identifying parts of a power tiller
- 2 Observing specification of engine, learning types of lubricant and fuels
- 3 Functions of parts from catalogue
- 4 Gear system
- 5 Operation tiller on road
- 6 Operating tiller in field
- 7 Fitting tilling blades
- 8 Fitting cage wheel
- 9 Driving practice
- 10 Clutch system
- 11 Tiller for other purpose (pump, milling, threshing.....
- 12 Preparing seed bed for vegetables
- 13 Servicing and repairing

### **Unit IV - Tractor 56 Hours**

- 1 Tractor transmission system - studying
- 2 Differential
- 3 Cooling system

- 4 Lubrication system
- 5 Steering mechanism
- 6 Break system
- 7 Study of self starter, battery, ignition, switch
- 8 Operation of PTO shaft
- 9 Practicing hitching implements
- 10 Fitting cage wheel
- 11 Field visit
- 12 Driving practice

**Unit V - OJT Two weeks**



## DETAILED UNIT ANALYSIS

### Module I Basic Engineering and Work shop Technology

#### Unit 1.1 Measuring Instruments

Accurate measurement is of great importance in the engineering field. For the perfection of the product and prompt working of each tiny engineering components of a machinery accurate and precise measurement is essential. A beginner in the Basic Engg. Field should have a thorough knowledge of different types of measuring instruments. He or she must have a continuous and repeated exposure to different types of measuring tools and learn to use the specific tool for a specific purpose

#### Unit Detailing

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Introduction to measure Instruments</li> <li>Skill Observation &amp; Distinguish</li> </ul>	<ul style="list-style-type: none"> <li>recognize the measuring tool</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration, Practical work, Brain storming</li> </ul>	<ul style="list-style-type: none"> <li>Activity log</li> <li>Practical records</li> <li>Viva</li> </ul>

#### Through the chapter

##### 1. Introduction to measuring instruments and its classification

This topic aims to introduce different types of measuring instruments. The learner understands the significance of accurate and precise measurement in engineering field. The classification of tools into precision and non precision category helps him to use the specific tool for specific purpose

#### Suggested strategy : Demonstration

Demonstration of measuring tools may be conducted either in the class room or in the lab by the teacher with the help of the instructor

#### Different stages

1. Planning
  - a. A brief introduction by teacher about the significance of accurate and precise measurement.
  - b. Selection of different tools for demonstration
2. Introducing different tools stating their names and use.
3. Learning by touching and inspecting. The learners are allowed to take the tool in hand and inspect different parts
4. Grouping the tools into precision and non precision

- The students are asked to make a list of the tools exhibited and group them in two.

### Evaluation stage

The teacher picks up one tool and invites any one of the students to mention its name and use.

### Expected outcome

Students submit records or chart with sketches of different tools specifying their names and use

### Repository of CE possibilities

Process	Portfolio	Unit Based Evaluation
Demonstration	Charts	Practical test
Practical activity	Activity log	Record
Data entry	Record book	Viva
Brain storming		Unit test

### Sample question

- Pick out the tools used for measuring the diameter of a sphere (Steel rule, Micro meter, height gauge)
- You are given ten measuring tools identify them based on their use and classify them into two groups.
- Arjun is asked to find the volume of a piece of MS Flat, suggest the right tool to use and help him to estimate the volume accurately

### LIST OF TOOLS AND EQUIPMENTS

Sl. No.	Name of items	Specification	Quantity
1	Bench vice	6"	5 nos.
2	Machine vice		1 nos.
3	Hacksaw (adjustable)	30 cm x 10 cm	10 nos.
4	Carpentry vice	250 mm	5 nos.
5	Flat file	12 " rough	5 nos.
6	Flat file	12 " smooth	5 nos.
7	Scriber		4 nos.
8	Metal jack plane	300 mm	5 nos.
9	Firmer chisel	2 "	5 nos.
10	Firmer chisel	1.25 "	5 nos.

11	Firmer chisel	1 “	5 nos.
12	Mortise chisel	½ “	5 nos.
13	Mortise chisel	1 “	5 nos.
14	Mortise gauge		5 nos.
15	Mallet		3 nos.
16	Hand saw	450 mm	5 nos.
17	Tenon saw	300 mm	5 nos.
18	Face shield		2 nos.
19	Gloes		2 nos.
20	Welding apron		2 nos.
21	Chipper hammer	Standard size	2 nos.
22	Flat tonges		2 nos.
23	Welding table		1 nos.
24	chisel	fold	2 nos.
25	Wire brush		2 nos.
26	Soldering iron	35 W	5 nos.
27	Single phase motor	1.5 H P	1 nos.
28	Screw driver	6 “	4 nos.
29	Star screwdriver	6 “	2 nos.
30	Ball pen hammer	½ Kg	2 nos.
31	Ball pen hammer	1 kg	2 nos.
32	Vernior caliper	0 to 15 mm	2 nos.
33	Out side caliper		2 nos.
34	Jenny caliper		2 nos.
35	Piston ring compressor		1 nos.
36	Piston ring expander		1 nos.
37	Hacksaw frame	12 “	5 nos.
38	Welding transformer	250 AMP 3 phase	1 set
39	Micro meter	0 to 100 mm	2 nos.
40	Snipes	12 “	5 nos.
41	Flat file	6" smooth	5nos.
42	Shearing machine		1 nos.

43	Spanner set	standard	2 set
44	Screw jack		1 nos.
45	Hydraulic Jack		1 nos.
46	Screw driver	9 “	5 nos.
47	Screw driver	10 “	5 nos.
48	Screw driver	15 ‘	5 nos.
49	Sledge hammer	2.5 kg	1 set
50	Socket spanner		1 set
51	Torque wrench	0 to 15 kg	1 nos.
52	Plug spanner with lever		1 nos.
53	Iron pan		4 nos.
54	Microw meter		
55	Steel rule	0 to 30 cm	4 nos.
56	Feeler gauge		1 nos.
57	Valve spring compressor		1 nos.
58	SOLAR CELL accessories		As required
59	Bio gas accessories		“
60	Cage wheel - Tiller		2 nos.
61	Cage wheel - Tractor		2nos.
62	Power tiller with trailer (Old/auctioned)	7 – 12 HP	1 nos.
63	Tiller blade	‘	2 set
64	Tractor with cultivator	40 HP	1 nos.
65	Single cylinder diesel engine with pump	5 HP	1 NOS.
66	Petrol kerosene engine with pump	1.5 HP	1 nos.
67	Multi cylinder petrol engine	10 HP	1 nos.
68	Power sprayer		1 nos.
69	Rocker sprayer		1 nos.
70	Three phase motor		1
71	Star delta starter		1
72	Thresher		1
73	Power weeder		1

74	Garden tractor “		1
75	Transplanter “		1
76	Brush cutter “		1
77	Generator (Old)		1
78	Transformer (Old)		1
79	Refrigerator (Old)		1
80	Tacho meter		1
81	Ammeter moving coin		1
82	Volt meter		5
83	Multi meter digital		5
84	Winding machine		1
85	Wire cutter		1
86	Connection screw driver		5
87	Line tester		5
88	Drilling machine		2

### CONSUMABLES

1	PVC insulated cable 1/18		4 coils
2	CTS cable 1/18		4 coils
3	PVC conduit	½”	25 meter
4	Junction box	3 way	25 nos.
5	Junction box	4 way	25 nos.
6	PVC elbow		25 nos.
7	PVC tee	½”	25 nos.
8	Lamb holder	PVC	25 nos.
9	Round block	PVC	50 nos.
10	Switch 2 way	5 A 250 V	50 nos.
11	Switch single way	5 A 250 V	50 nos.
12	Switch box	PVC	50 nos.
13	Plug 2 pin	5A 250 V	10 nos.
14	Plug 3 pin	5 A 250 V	10 nos.
15	Work board teak wood	30" x 30"	10 nos.

16	Main switch ICDP	250V 15 H	10 nos.
17	Electric blub LED	15 W	20 nos.
18	Fluorescent tube set	250 v	5 set
19	Ms FLAT	50 x 6 mm	10 kg
20	MS rode		5 kg
21	GI sheet		1
22	Hacksaw blade		50 nos.
23	Wooden reaper	2 " x 1.5 "	25 M
24	Nails		1 KG
25	Welding electrode		2 pkt.
26	Soldering led		½ kg
27	Diesel,		25 ltr
28	petrol,		5 ltr
29	Cotton waste		10 kg
30	Washing soap		5 bar
31	Grease		3 kg
32	Insulation tape		5 role
33	kerosene		10 ltr
34	lubricating oil,	SAE 40	10 ltr
35	lubricating oil,	SAE 60	10 ltr
36	lubricating oil,	SAE 90	10 ltr
37	screws		100 nos
38	rivets		2 kg

#### REFERENCES BOOKS

- |                                  |   |
|----------------------------------|---|
| 1. Choudhary Hajra               | Workshop technology                           |
| 2. Vanshi Raghu                  | Workshop technology                           |
| 3. Michael A M , Ojha T P (1987) | Principals of agricultural engineering Vol _1 |
| 4. Michael A M , Ojha T P (1987) | Principals of agricultural engineering Vol _2 |
| 1. Sahay , Jayadishwar           | Elements of agricultural engineering          |
| 5. Michael A M                   | Irrigation theory and practice                |
| 6. Theraja B L                   | Electrical technology                         |