

**NON-VOCATIONAL HIGHER SECONDARY**

**MECHANICAL SERVICING &  
AGROMACHINERY**

**TEACHERS' SOURCEBOOK**



**Government of Kerala  
Department of Education**

**2005**

**State Council of Educational Research & Training (SCERT)**  
Vidyabhavan, Poojappura, Thriuvananthapuram-12, Kerala

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**Government of Kerala**

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**2005**

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# **Preface**

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Dear Teachers,

*Significant changes have been introduced in Vocational Higher Secondary Education. The new system gives priority to activity oriented and learner centred education.*

*Mechanical Servicing and Agro Machinery Course throws open vivid employment opportunities. One should be surely proud to be a vocational teacher in MSA to fulfil the social responsibility to mould the future citizens.*

*This source book is prepared with the intention to equip the teacher with the guidelines for planning the class in the new method of interactive learning. Also necessary aids for improving the methods of instruction have been incorporated. Evaluation methods are also included in detail.*

*Earnest effort has been taken in the preparation of this source book. I hope that the teachers will transact the idea in true spirit to mould the future citizen.*

With regards,

**Thiruvananthapuram**  
**25-11-2005**

**Dr E. Valsala Kumar**  
**Director**  
**SCERT, Kerala**

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# GENERAL APPROACH

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The ultimate aim of education is human refinement. Education should enable the learner to formulate a positive outlook towards life and to accept a stand which suits the well being of the society and the individual as well.

The attitude and potential to 'to work' has determined the destiny, progress and cultural development of the human race. As we all are aware, the objective of education to form a society and individuals having a positive work culture. The educational process expected in and outside our formal schools should concentrate upon inculcating concepts, abilities, attitudes and values in tune with these 'work culture.' Hence vocationalised education cannot be isolated from the main stream of education. In another sense, every educational process should be vocationalised. However, due to our inability to utilise the resources wisely, scarcity of job opportunities is a severe issue of the present society. For overcoming this deep crisis, emergent techniques have to be sorted out and appropriate researches have to be seriously carried out. It is in the sense that the content and methodology of vocational Higher Secondary Education have to be approached.

The Vocational Higher Secondary course was envisaged as a part of the National Policy on Education with the noble idea of securing a job along with education. The relevance of Vocational education is very great in this age of unemployment. This education system, which ensures a job along with higher education, stands aloof from other systems of education.

A learning environment which ensures vocational aptitude, vocational training, basic life skills, competencies related to different subjects, appropriate values and attitudes and existential readiness has to be provided here.

The curriculum should be one which recognises the specific personality of the learner and should develop it in a desirable way. It should provide opportunity to imbibe novel ideas to follow a critical approach and for learning through experiences.

The competency to transform one's own resources for the betterment of the society and the individual is to be ensured in each individual. Training in the sense of equality, democratic sense, environmental consciousness and devotion to the constitution is an inseparable factor of the curriculum.

The need of a systematic curriculum is prevailing in vocational subjects. A scientifically structured curriculum incorporating the unique features and peculiarity of Kerala ensuring the possibility of higher education and utilising the national and international possibilities of employment is required.

The new curriculum should be capable of assimilating the life skills, scientific temper, attitude of co-existence, leadership qualities and mental health to face the challenges of life. It should be capable of strengthening the competencies imbibed by the learners up to the tenth class.

A curriculum for selecting vocational areas according to the aptitude of the students, learning it in depth, acquire general awareness in the basic areas and to secure jobs has become the social need of the day. A learner centred, process oriented, need based vocational curriculum is envisaged.

### **What is learning?**

- Learning is construction of knowledge and so it is a live and continuous mental process.
- Learning is a process of advancement through adding and correcting in the light of comparing the new issue with the previously learned concepts.
- Learning takes place as a part of the effort to solve problems.
- Learning takes place by assimilating bits of knowledge into ones own cognitive structure.
- Learning is not a linear process. It is a spiral process growing deeper and wider.
- Learning is an intellectual process rather than the mere memorisation of facts. Learning is a conglomeration of a variety activities like problem analysis, elucidation, critical thinking, rational thinking, finding out co-relations, prediction, arriving at conclusions, applications, grouping for other possibilities and extracting the crux. When opportunities are provided for intellectual processes learning will become effective and intellectual ability will get strengthend.

### **Theoretical foundations of learning**

Education is the best device that can be adopted for creation of a new society. It should be democratic in content and process and should acknowledge the rights of the learner. It should also provide opportunity for better citizenship training. The concept of equality at all areas should get recognition in theory and practice.

There should be consious programme of action to develop nationality, humaness and love and against the enchroachment of the sectarianism of caste and religion.

The learner should be able to take firm steps and deferred against the social crisis like privatisation, liberalisation, globalisation etc and against all kinds of dominations.

They should develop a discrimination to use the acquired learning as a liberative weapon.

They should be able to view education and life with the perspective of social well being.

They should get opportunity to recognise that co-operation is better than competition and that co-operation is the key to social life and culture.

A basic awareness of all the subjects needed for life essential for all students.

The remnants of perspectives formed in us during the colonial period still influence our

educational philosophy. The solution to the present day perplexities of the society which approaches education on the basis of competitions and marketisation is only a comprehensive view of life.

It is high time that education was recognised on the basis of the philosophy of human education. The human approach to education has to reflect in its content, learning process and outlook. The perspective of 'learning to be ' and learning to live together as expressed by the UNESCO and the concepts of existentialist intelligence intrapersonal and interpersonal intelligence.

The basis of new approaches on curriculum, teaching- learning process are derived from the developments place in the east and west of the world.

When we begin to see the learner at the centre of the learning process, the teaching process has to be changed timely. It is the result of the rapid growth and development of Science and Technology and Pedagogy. If we want to undergo the changing process, we have to imbibe the modern hypothesis regarding learner, they have;

- Great curiosity
- Good imagination
- Numerous other qualities and interests
- Independent individuality
- Interest in free thinking and working in a fearless atmosphere.
- Have interest in enquiring and questioning.
- Ability to reach conclusions after logical thinking.
- ability for manifest and establish freely the conclusions arrived at.
- Interest for recognition in the society.
- Determination to face the interference of society and make components which is a part of social life.

When we consider the learning system, the domains to be stressed in education according to the modern development becomes relevant.

The knowledge domain consists of

- Facts
- Ideas
- Laws
- The temporary conclusions and principles used presently by scientists.

The learning is a process. The continuous procedures we undergo to reach a particular goal is process. The skills which are parts of the process to analyse the collected ideas and proofs and come to a conclusion is called process skills. Some important process skills are,

## **The skills;**

- To observe
- To collect data and record
- To classify
- To measure and prepare charts
- To experiment
- To predict
- To recognise and control the variables
- To raise questions
- To generalise
- To form a hypothesis and check.
- To conclude
- To communicate
- To predict and infer
- To use tools.

**Observation** is the process of acquiring knowledge through the senses. It is purely objective oriented. Learning experiences which provide the opportunity to use all the senses may be used.

The process of grouping is known as classifying. Starting from simple groupings of data, it can extend to the level of classification into minute sub-groups.

In addition to this, consider the skills related to creative domain also, they are skills:

- To visualize
- To connect facts and ideas in new ways
- To find out new and uncommon uses of objects
- To fantasize
- To dream
- To develop creative isolated thoughts

**Creativity** is an essential component of process and activities. The element of creativity is involved in finding out problems, formation of hypothesis, finding 'solutions' to problems etc. Through activity oriented learning experiences, opportunities to express creativity can be created.

Again, the following factors consisting in the Attitudinal domain are also important as;

- Self confidence
- Love for scientific knowledge
- Attitude to know and value history

- Respect human emotions
- Decide with reasonable present problems
- Take logical decisions regarding personal values

‘**Hypothesis**’ is a temporary conclusion drawn using insight. Based on knowledge and experiences relating to the problems the causes and solutions can be guessed.

As regards the application domain the important factors are the ability to:

- observe in daily life examples of ideas acquired.
- take the help of scientific process to solve the problems of daily life.
- choose a scientific life style
- connect the ideas acquired with other subjects.
- integrate the subjects with other subjects.

Some basic stands have to be taken on the new scientific knowledge about intelligence learning and teaching. When such basic concepts are accepted changes are required in the following factors.

- The vision, approach, structure and content of the curriculum.
- The vision, approach, structure and content of the textbooks.
- Role of the teacher and the learner.
- Learner atmosphere, learning materials and learning techniques.

Some scientific perspectives accepted by modern world in educational psychology are given below.

### **Constructivism**

This approach puts forward the concept that the learner constructs knowledge. New knowledge is constructed when ideas are examined and practiced in new situations relating them with the previously acquired knowledge and experience. That is assimilated into the cognitive structure of one’s knowledge. This method which gives priority to critical thinking and problem solving provides opportunity for self motivated learning.

### **Social Constructivism**

Social constructivism is a sub section of constructivism. Knowledge is formed, spread and imbibed and it becomes relevant in a social environment. Interactive learning , group learning, co-operative participatory learning, all these are concepts put forward by social constructivism.

The main propounders of constructivism are piaget, vygotsky and Bruner.

Discovery learning and interactive learning have prime importance. Learning takes place as a part of the attempt for problem solving. The activities of a learner who confronts cognitive disequilibrium in a learning situation when he tries to overcome it leads to the renewal of cognitive structure. It is through this process construction of new knowledge and the assimilation

of them that learning take place. Observation and enquiry are unavoidable factors. The learner advances towards new areas of acquisition of knowledge where he tries to compare his new findings with the existing conceptions.

Learning is a live mental process. Rather than the ability for memorisation of facts cognitive process has to be given emphasis. The process of problem analysis, elucidation, critical thinking, rational thinking, finding out co-relation, prediction, hypothesis formation, application, probing for other possibilities, extracting the crux and other processes are of critical importance in learning.

Constructivism gives greater predominance to co-operative learning. Social and cultural factors influence learning. Sharing of knowledge and experience among learners, collective enquiry, assessment and improvement, group activity and collaborative learning, by sharing responsibilities with the objective of public activity, provide opportunity for effective learning.

In learning internal motivation is more important than external motivation. The learner should have interest and initiative in learning. Learning situation should be capable of forming a sense of ownership in of the learner regarding the learning process.

Learning is not a linear process. It progresses in a spiralled way advancing deeper and wider.

### **Learner-his nature and features**

The learners in standard XI has undergone a learner centered and process oriented learning experience up to X standard. He is adequately competent to select vocational subjects according to his aptitude and interest and to acquire higher education and profession as he wishes. The aspirations about future life is framed in this particular age foreseeing national and international job opportunities. Some of the peculiarities of the learner at this stage are:

- Physical, intellectual an emotional planes are intensive changes during this age and their reflections can be observed.
- Ability to enquire, discover and establish cause-effect relationship between phenomena.
- Readiness to undertake challenges.
- Capacity to shoulder leadership roles.
- Attempt to interprest oneself.
- Susceptibility to different presseures.
- Doubts, anxities and eagerness about sex.
- Longing for social recognition.

### **Needs of the learner**

- To make acquaintance with a job through vocational education.
- To acquire more knowledge in the concerned area through higher education.
- To recognise and encourage the peculiar personality of the later adolescent period.
- To enable him to defend against the unfavourable circumstances without any help

## **Role of the Learner**

- Active participant in the learning process.
- Acts as a researcher
- Sharer of information
- Sharer of responsibilities
- Collects information
- Takes leadership
- Involves in group work
- Acts as a co- participant
- Observes his environment
- Experiments and realises
- Makes interpretations and draws inferences.

## **Role of the Teacher**

The teacher should;

- consider the ‘Stress and strain’ of the teenagers
- understand the socio- economic and cultural background of the students.
- promote and motivate the students to construct knowledge.
- arrange proper situations to interact in and outside of the classroom.
- guide the students by explanations, demonstrations etc.
- promote opportunity for co-operative learning and collaborative learning.
- facilitate interpersonal and intra-personal interactions.
- act as a democratic leader.
- act as a problem solver
- effectively guide the students for the selection and conduct of various continuous evaluation elements.
- continuously evaluate the progress of the learners.
- gives scaffolding/support wherever necessary.
- motivate for learning
- promote divergent thinking.
- act as a democratic group leader.
- act as a co-learner
- gives variety of learning experiences.
- be a constant student
- facilitate for reference/data collection

- have a clear understanding about the age, needs, peculiarities, abilities, nature, aptitude etc. of the learner.
- have the ability to motivate the learner in order to acquire and enrich their knowledge.
- be a guide to the learner in developing insights and creating responses on current affairs.
- be capable to lead the learner into a variety of learning methods and process based on curricular objectives.
- be a link between school and community.
- be a good organiser, guide, friend, philosopher and co-learner.
- have an inter disciplinary approach in learning activities.
- be able to guide the learner in his/her career prospects based on his interest aptitude and ability.
- be impartial and democratic.
- provide ample experiences to attain the basic values and objectives of the curriculum.

## **New Concepts of Learning**

### **1. Discovery Learning-**

The teacher has to create a motivating atmosphere for the learner to discover concepts and facts, instead of listening always. Creating occasion to progress towards discovery is preferred. Instead of telling everything before and compelling to initiate the models, situations are to be created to help the children act models as themselves.

### **2. Learning by discussion**

That discussion leads to learning is Burner's theory. Here discussion is not opposing each other. It is a sharing on the plane of ideas. New ideas are arrived at by seeking explanations, by mutual giving and taking of ideas and by problem solving.

### **3. Problem solving and learning**

Only when the learner feels that some thing is a problem to be solved that he takes the responsibility of learning it. It is an inborn tendency to act to solve a problem that causes cognitive disequilibrium in a particular area. It is also needed to have confidence that one is capable of doing it. The problems are to be presented in consideration of the ability and level of attainment of the learner.

### **4. Collaborative learning**

This is the learning in which the responsibilities are distributed among the members of the group keeping common learning objectives. The common responsibility of the group will be successful only if each member discharges his duties. All the members will reach a stage of sharing the result of learning, equally through the activity with mutual understanding. The teachers who arrange collaborative learning will have to make clear the responsibilities to be

discharged. This is possible through the discussion with the learners. Collaborative learning will help to avoid the situations of one person working for the whole group.

### **5. Co-operative learning**

This is the learning in which the learners help one another. Those who have more knowledge, experience and competency, will help others. By this exchange of resources the learners develop a plane of social system in learning also. As there are no high ups and low ones according to status among the learners they can ask the fellow students doubts and for helps without any hesitation or in hesitation Care should be taken not to lead this seeking of help to mechanical copying. It should be on the basis of actual needs. So even while encouraging this exchange of ideas among the members of the group cautions acceptance is to be observed as a convention. There should be an understanding that satisfactory responses should come from each member and that the achievement of the group will be assessed on the basis of the achievement of all the members

### **6 Zone of Proximal Development**

Vygotsky observes that these is a stage of achievement where a learner can reach by himself and another higher zone where he can reach with the help of his teachers and peers and elders. Even though some can fulfil the learning activity by themselves there is the possibility of a higher excellence. If appropriate help is forth covering every learner can better himself.

### **7 Scaffolding**

It is natural that the learner may not be able to complete his work if he does not get support at the proper time. The learner may require the help of the teacher in several learning activities. Here helping means to make the learner complete the activity taking responsibility by himself. The teacher has to keep in mind the objective of enabling the learner to take the responsibility and to make it successful.

### **8 Learning: a live mental process**

Learning is a cognitive process, only a teacher who has an awareness as to what the cognitive process is alone can arrange learning situations to the learner to involve in it. Learning can be made effectively and intellectual sharpness can be improved by giving opportunity for the cognitive processes like reminding, recognising compromising , co- relating, comparing, guessing, summarising and so on. How is cognitive process considered in language learning? Take guessing and prediction for example.

- Guessing the meaning from the context.
- Guessing the content from the heading.
- Predicting the end of the story.
- Guessing the incident, story from the picture.
- Guessing the facts from indications.

- and other such activities can be given the following activities can be given for the cognitive process of summarisation.
- Preparation of blue print.
- Preparation of list.
- Preparation of flow chart.
- Epitomising in one word.
- Giving titles and so on.
- Symbols, performance of characters indications, lines of a poem, tables, pictures, concepts, actions, body language and such things can be given for interpretation. Process based language given for interpretation. Process based language learning has to give prime importance to the cognitive process.

## **9 Internal motivation**

Internal motivation is given more importance than external motivation. The teacher has to arouse the internal motivation of the learner, A person internally motivated like this alone can immerse in learning and own its responsibility. How motivating is each of the activities is to be assessed.

## **10 Multiple intelligence**

The Theory of Multiple Intelligence put forward by Howard Gardener has created a turning point in the field of education. The National curriculum document has recommended that the curriculum is to be designed taking into consideration of this theory.

### **Main factors of the intellect :**

#### **1. Verbal/linguistic Intelligence -**

Ability to read and write, making linguistic creations , ability to lecture competence effective a communication, all these come under this . This can be developed by engaging in language games and by teaching others.

#### **2. Logical /mathematical Intelligence**

Thinking rationally with causes and effect relation and finding out patterns and relations come under this area, finding out relations and explaining things sequential and arithmetical calculations are capable of developing this area of intelligence.

#### **3. Visual /spatial Intelligence**

In those who are able to visualise models and bringing what is in the imagination into visual form and in philosophers, designers and sculptors this area of intelligence is developed. The activities like modelling using clay and pulp, making of art equipments, sculpture, and giving illustrations to stories can help the development of this ability.

#### **4 Bodily Kinaesthetic Intelligence**

The activities using body language come under this. This area of intelligence is more developed in dancers and actors who are able to express ideas through body movements and in experts in sports, gymnastics etc.

#### **5 Musical Intelligence**

This is an area of intelligence which is highly developed in those who are able to recognise the different elements of music in musicians and in those who can hear and enjoy songs. Playing musical instruments, initiating the songs of musicians, listening silently to the rhythms and activities like this are capable of developing this area of intelligence.

#### **6 Interpersonal Intelligence**

Those in whom this area of intelligence is developed show qualities of leadership and behave with others in a noble manner. They are capable of understanding the thought of others and carrying on activities like discussion successfully.

#### **7 Intrapersonal Intelligence**

This is the ability to understand oneself. These people can recognise their own abilities and disabilities. Writing diaries truthfully and in an analysing way and assessing the ideas and activities of others will help developing this areas of intelligence

#### **8 Naturalistic Intelligence**

A great interest in the flora and fauna of the nature, love towards fellow beings interest in spiritual and natural factors will be capable of developing this area.

#### **9. Existential Intelligence**

The ability to see and distinguish our own existence as a part of the universe, ability to distinguish the meaning and meaninglessness of life, the ability to realise the ultimate nature of mental and physical existences, all these are the peculiarities of this faculty of intelligence.

#### **Emotional Intelligence**

The concept of emotional intelligence put forward by Daniel Golman was used in framing the new curriculum. The fact that one's Emotional Quotient (E.Q) is the greatest factor affecting success in life is now widely accepted. The teacher who aims to focus on improving the emotional intelligence of students need to concentrate on the following.

##### **i) Ability to take decisions**

Rather than imposing decision on students while planning and executing activities, the students may be allowed to take part in the decision making process. Taking decisions through open discussion in the class, inviting students suggestions on common problems etc. are habits to be cultivated.

## **ii) Ability to reach consensus**

- When different opinions, ideas and positions arise the students may be given the responsibility to reach a consensus.
- Imagining what would be the course of action in some situations, allowing to intervene in a healthy way in problems between individuals.

## **iii) Problem solving**

- Developing the idea that there is reason and solution to any problem.
- Training in finding reasons for problems.
- Suggesting solutions through individual or group efforts.
- Discussing social problems.
- Analysing the shortcomings in methods to solve problems.

Whether plastic can be banned within school premises can be given as a problem. Group discussion will provide reasons and solutions. Problems which can influence classroom learning and for which the learner can actively contribute solutions need to be posed.

- Self criticism, evaluation
- Ability to face problem-situation in life
- Thinking what one would do if placed in the situation of others, how one would respond to certain experiences of others - All these foster the growth of emotional intelligence.

## **iv) Life skills**

Life skills need to be given a prominent place in education. W.H.O. has listed ten skills required for success in life.

- Self awareness
- Empathy
- Inter personal relations
- Communication
- Critical thinking
- Creative thinking
- Decision making
- Problem solving
- Coping with emotion
- Coping with stress

The new curriculum addresses these areas.

Knowing the characteristics of the learner, role of the teacher and how to use the teachers handbook help the teacher to plan and effectively implement learning activities.

## **Objectives of the Vocational Higher Secondary Curriculum**

- To facilitate higher education while giving opportunity to enter in the field of employment.
- To develop environmental awareness, sense of national integration, tolerance and human values so as to ensure social and cultural improvement.
- To enable the learner to find on his own employment.
- To inculcate mental courage in the learner to face unfavourable situations.
- To make human resource development possible.
- To enable the learner to understand social problems and to react appropriately.
- To develop the learner to identify and develop his own competencies.
- To develop vocational aptitude, work culture and attitude in the learner so as to provide useful products and services to the society.
- To create an awareness about mental and physical health.
- To acquire awareness about different job areas and to provide backgrounds for acquiring higher level training in subjects of interest.
- To develop possibilities of higher education by creating awareness about common entrance examinations.
- To provide situation for the encouragement of creative thinking and organising training programmes in each area, creative abilities and to develop artistic talents.

## **Nature of Approach**

The learning device is to be organised in the selected vocational subjects in such a way that adequate practical experience should be given, making use of the modern technology. The development in each area on the basis of information technology is to be brought to the learner. The work experience in the respective fields(OJT, Field trip, Production/Service ..... training, Survey, Workshop, Exhibition, Youth festival, Physical fitness etc.) are to be adjusted suitable to the learning and evaluation process. The participation and leadership of the students in planning and execution is to be ensured through this kind of activities. Social service is to be made a part of the course.

## **Approach towards Vocational Higher Secondary Education**

The learning methodology has to be organised so as the learning provide adequate practical thinking on the opted vocational subject utilising the new technology. The development of information technology should be made available in each sector. Work experience, OJT, Field trip production, Service cum training centre, Survey, Workshops, Exhibitions, Youth festivals, Physical fitness etc should be systematised well appropriate to learning and evaluation. Learner participation should be ensured in the planning and implementation of these activities. Social service should be a part of the course. If a learner has to change his school, he should be provided an opportunity to continue his studies in the new school. While considering criteria for admission to higher courses, grades of vocational subjects should also be given due weightage.

In tune with the changes in the Vocational Higher Secondary Education changes should be ensured in the field of higher education.

The teachers have to take special care in arranging learning activities for the development of all the faculties of intelligence.

Learning activities and learning atmosphere.

A proper learning atmosphere is essential for the betterment of learning activities.

They are:

- Proper physical environment
- Healthy mental atmosphere
- Suitable social atmosphere
- Active participation of PTA, Local bodies and SRG
- Reference materials and visual media equipments.
- Academic monitoring
- School Resource Group (SRG)

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# APPROACH OF AGRO MACHINERY

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## Introduction

India is a vast country. Its population is increasing at a tremendous rate. It is necessary to provide food to such a large number of people. The green revolution has ensured in new era of partial self sufficiency in food. Now agriculture is considered as an industry and the old methods of agriculture have been abandoned. Technology has contributed in a big way to farm mechanization. Lots of equipment and implements are in extensive use in the agricultural industry. Large scale industries are manufacturing mostly capital intensive equipment like tractors, combine, harvesters, threshers, diesel engines, pumps, power tillers etc. however, the small scale industries are making tools like ploughs, disks, shovels, shears, blades etc. which are used on a large range of implements. Due to limited resources and less technical know- how, the small scale industries, have not been able to do justice with respect to design, performance and manufacturing technology of the agricultural tools. It is felt that advancement in the field of technology be fruitfully utilized for modernization of the agricultural tools, particularly in India.

This condition, the study of agricultural implements is very important. Learning of technology is of prime importance in vocational higher secondary education. The study of agricultural implements, workshop technology, tractor, tillers, diesel engines, petrol engines, irrigation pumps and irrigation methods in the “Mechanical servicing and the agro Machinery” Course throws open vivid employment opportunities. One should be surely proud to be a vocational teacher in MSA to fulfil the social responsibility to mould the future citizens. Agricultural engineering related agro machinery is of much relevance in vocational higher secondary education.

## Objectives

- 1 To prepare the learner for self employment to develop self reliance
- 2 To equip the learner to get wage employment by attaining skill for understanding the repair work
- 3 To meet the need for skilled man power to the society.
- 4 To know agricultural engineering skill at the higher secondary level to give the learner foundation for his future career.

## Learning Approach

The basis of the new curriculum is derived from developments in agricultural machineries, irrigation pumps and oil engines. These developments have helped to make teacher centered learning evolve to student centered learning and to give, currency to the idea that learning take place through social interactions.

The new curriculum gives adequate thrust to the following

- Multiple intelligence
- Constructivism
- Emotional quotient

OJT, field trip, production training, survey, shlipashala, Exhibitions and seminars are conducted. All students are completely participated by extra curricular activities. NSS, research, career guidance, revise the syllabus etc started the school.

### **Learning Aims**

Content - oil engines - classification of oil engines - Difference between petrol engine and diesel engines

Process - Visiting a workshop

Learner should be studied the difference between the engines. Learner able to understanding the parts of engines. Then students are collected different types of vehicles are observed and submit a detail report.

### **Outcome**

Within idea about oil engines

### **Content**

Syllabus

### **Learning Strategies**

- 1 Prepared a project under the different areas of subject  
Eg : Make a model of engine, then learner studies thoroughly by the aims, materials required, conclusion etc.
- 2 Seminar, assignments are prepared take an special areas
- 3 Contact the subject experts and all helps are discussed
- 4 Field visit, OJT programmes are conducted by the subjects.

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# LEARNING STRATEGIES

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The explosion of knowledge has resulted in a new vision of knowledge. Earlier, it was thought that the most effective method was the transmission of knowledge by teacher to the student. However, the modern view is that the student has the responsibility and the right to construct knowledge. The teacher of modern times hence has to use instructional approaches that motivate the student to construct knowledge on his own.

Instructional strategies should be viewed as a social skill which is part of the educational environment and not as a technique to be measured. They are to be considered as important components of teacher student interaction and not as teacher activities alone. While instructional methods are planned the social and psychological aspects of the learner need to be taken into consideration.

Let us examine here some instructional strategies helpful in bringing out the curriculum objectives of Agro Machinery.

## **1. Project**

Project is one of most suitable methods of instruction. It is a method of self instruction using the method of agricultural machineries and useful in the development of a number of process skills and hence it is essential to use projects in education.

Projects help to develop scientific temper, scientific attitude and interest in learning machineries and to ensure active participation of the student in learning activities.

### **Stages of project**

#### **1. *Feeling the problem***

The project topic should not be arbitrarily created. It should reflect a felt problem in the learning situation and which requires a solution to proceed further.

Project topics arise when discussions relating to lessons are held in the class. It is important that the student has an internal urge to find out a solution to the particular problem, when the topic is presented the teacher must ensure this.

#### **2. *Defining the aim***

If the student is to tackle the problem in a way suitable to his/her abilities, thinking skills and available facilities, the aim of the project need to be defined precisely. To state the aims of the project simply and clearly, the student needs the help of the teacher.

### 3. *Planning*

Planning is very important . The nature of the topic, instruments used and the scientific approach followed should be correlated. Some methods and instruments are listed below.

- Survey
- Experimentation
- Tabulation of data
- Analysis
- Conclusion

### 4. *Execution of the project*

### 5. *Project Report*

A model for project report is given below. Report is to be prepared by the students themselves. The structure of the report should be finalised through discussion with the students. It must be ensured that it is not too complex and hinders activities.

The cover page may show title of the project, name of the student/members of the group and school address.

The report may contain

1. Title
2. Introduction
3. Aims
4. Method of study
5. Collected data
6. Analysis and conclusions
7. Suggestions (if any)
8. Reference (if any)
9. Appendix

### 6. *Project Presentation*

The project can be evaluated and the work done may be assessed when the project is presented. Ideas can be communicated and shared with others through presentation of the project.

The project can be presented in

- Class room
- Science Club meeting
- Science fairs
- School annual day Meeting
- PTA meeting ayalkootam
- Other selected forums

## **Seminar**

In seminar, data relating to be specific topic is collected, analysed and presented as paper for the benefit of others. It helps the learner to improve his/her opportunities for collection of secondary data and for drawing conclusions. Topics chosen for seminars may be contemporary and should have social relevance.

### **Organisation of Seminar**

1. Topic presentation
2. Finding out sub topics or different areas
3. Group formation
4. Assigning sub topics to different groups
5. Discuss by each group on the assigned area or sub-topic
6. Organising ideas
7. Paper writing
8. Seeking the opinion of the teacher
9. Presentation
10. Discussion
11. Summarising

### **III Discussion**

Discussion is a natural part of the transaction between teacher and student. Discussions are essential for the student to share new findings, ideas and conclusions at each stage of learning with fellow students and teachers and to assess progress.

Group discussion is an ideal method to inculcate social consciousness, co-operation, democratic attitude, friendliness, open mindedness and compromising attitude which are the ultimate aims of education. It helps the development of communication skill, hypothesis formulation, designing of experiments and analytical skills.

### **IV Debate**

Debate is an important method of learning science, social constructivist theories consider debate as an ideal method of learning.

### **V Experiments**

### **VI Outdoor learning**

1. Field trip
2. Study tour

### **VII. Parallel texts**

### **VIII.Libraries**

## **IX. Multi media Room**

## **X School club**

## **XI Assignments**

Assignments are learning activities helping to achieve the curriculum objectives and also lead the pupil from the present level to a higher level of learning.

Assignments may be of the types -writings, drawings, construction of models etc.

## **XII Problem Solving**

- General steps
- Analysis and data entry

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# PLANNING

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The transaction of geography curriculum in Higher Secondary classes has to be made through different but relevant activities. The teacher should plant those activities which are suitable for the learners to develop the different concepts, skills and elements of multiple intelligences in them. Such activities can be made within or outside the class room. For the effective, timely and systematic transaction of the curriculum the activities has to be planned well in advance. This will help the teacher to guide the learners to prepare for the activities and to evaluate the process at different stages.

It is necessary that the teacher should prepare an annual plan, unit plan and daily plan for the effective transaction of the curriculum.

## **Annual Plan**

An annual plan has to be prepared in order to foresee picture of the whole activities to be conducted in the class in an academic year. The annual plan is to be prepared by the teacher after examining the curriculum objectives, text book, source book and other learning materials. While preparing annual plan the teacher will consider the facilities available in the school, the possibilities of field visits, interviews, seminars, projects, collections, discussions, lab work etc. which form part of the activities of the lessons. Activities are to be arranged by utilising the local resources available. For systematic and effective transaction of the curriculum the annual plan is an important instrument. With the help of annual plan the teacher can transact the curriculum systematically within the stipulated time.

Term	Month	Unit No.	Module No.	Name of Module	Period	Total Period
I	June	Unit 1	Module 1 & 2	Measuring Instruments, Wood working Principle	10	40
	July	Unit 1	Module 3 & 4	Sheet metal work Smithing and Forging	15	
	August	Unit 1	Module 5, 6 & 7	Bench work and Fitting Welding Different Aspects of moulding	15	
II	September	Unit 2	Module 2	Oil Engines	20	
	October	Unit 2	Module 2 & 3	Power Tiller Farm Tractors	20	
	November	Unit 3	Module 1, 2	Seedbed preparation Machinery Plant Equipment	10	
III	December	Unit 3	Module 3	Plant Protection Machinery	10	60
	January	Unit 4	Module 1 & 2	Water resources & their utilisation Measurement, conveyance and control of irrigation Water on farm	15	
	February	Unit 4	Module 3	Water lifts and pumps for irrigation	15	
	March	Unit 4	Module 4	Irrigation methods	10	
<b>Total hours</b>						

## **Unit Plan**

In order to convey the curriculum objectives to the students, the teacher should make adequate and prior preparation in making classroom transaction effective. In the planning process, unit plan occupies an importance place.

In the unit plan the steady growth of the annual plan is reflected. Curriculum objectives, teaching strategies, learning aids, expected outcome, evaluation possibilities etc, are to be decided in advance for unit planning. Each unit plan is attached in concerned units. Teachers can prepare unit plans for every units by utilising this as a base.

## **Daily Plan**

Daily plan is the programme for achieving the curriculum objectives targeted for a day. Teachers have to plan elaborately and systematically before organising a class. The success of a class depends on the daily plan. The following points should be kept in mind while framing the daily plan.

- Learning activities should be formulated in such a way for developing the various skills of the learner.
- It should be in accordance with the availability of time, needs of the learner, learning atmosphere etc. (*if needed the teacher should club one or more periods*)
- Active participation of all the learners should be ensured.
- Learning activities should be challenging, interesting and thought provoking.
- Evaluation part of the daily plan can be completed only after the class.
- Future planning should be based on this feed back.
- The teacher can make use of this part for continuous evaluation.

Daily plan provided here is a sample one. The teacher should prepare daily plans which suits to their classes by considering this sample daily plan as reference.

**Class : Farm Engines**

**Unit : Oil Engine**

**Curriculum Objectives**

To create general idea about Oil Engine and its concepts through discussion, lecture class and present them in the form of report.

<b>Process/ Activities</b>	<b>Evaluation</b>
<p>The teacher introduce the topic by asking few questions like the following to recall the previous knowledge and practical experience of the learners.</p> <ul style="list-style-type: none"><li>• Dismantling and assembling of diesel engine and petrol engine</li><li>• Note the difference between petrol engine and diesel engine make a chart.</li></ul> <p>The students will share their experience in different types of engines.</p>	<p>Majority of the strudents were participated in the discussion by mentioning the diesel engine and petrol engine.</p>

As the curriculum is based on a particular vocation, evaluation becomes an inevitable procedure. Evaluation is done along with learning process throughout the course of study. In order to make an evaluation, the teacher should be able to understand the students, their scholastic and co-scholastic knowledge. Capacity building in the selected vocation is the most important part in vocational education and it should be evaluated accordingly. The technical skills, interest and devotion in the particular field, communication skills, analysis, organising and presentation skills etc. have to be evaluated. The personal and social qualities also have to be evaluated. Thus evaluation is an integral part of learning process which assesses the implementation of the curriculum.

## **Need and importance of Evaluation**

Evaluation is to assess the scientific knowledge of students and to recognise to what extent they have achieved the specified capabilities. A written examination at the end of an year which is purely based on a textbook is not of much use. “Evaluation is a systematic process of collecting, analysing and interpreting evidence of students’ progress and achievement both in cognitive and non-cognitive areas of learning for the purpose of taking a variety of discussions”.

The teacher can properly assess the level of the learner and can identify his/her strength and weakness. This will help each student to evaluate themselves and to improve their level of learning by taking necessary assistance from the teacher (self evaluation) classmates can evaluate themselves through interaction (peer group evaluation) Evaluation even help the teacher to analyse and improve their performance. Evaluation helps to integrate the teacher, learner and even the parents. Thus student who are socially useful and can perform productive work are created. This will improve the quality of our young generation.

## **Features of Evaluation**

- Evaluation should be humane in nature. It must help the students grow as social beings.
- Evaluation should be the responsibility of the teacher who teaches the students and is responsible for developing the requisite healthy attributes in them.
- Evaluation should be consistent with its purpose and must provide a reliable and valid measure of the student’s performance.
- Evaluation should reflect the outcome of each learning intervention and should provide all the students with equal opportunity to display their individual potential.
- Evaluation should take into account both the background and the prior experience of the students.
- Procedures for grading and their reporting should be appropriate and easily understood by one and all.

- Evaluation should restore the faith and trust of the masses by ensuring transparency in the procedure.

Theories of constructivism and multiple intelligence are the basis of modern learning. So evaluation strategies have also to be changed. Evaluation must be;

- Continuous and comprehensive
- Scholastic and co-scholastic
- Depending on grading system.
- Depending on a vocational or trade proficiency.

### **Continuous and Comprehensive Evaluation**

Most of our traditional evaluation methods are related only to the area of scientific knowledge or the memory of students. To eliminate the limitations of this method we are forced to evaluate the multi-dimensional competencies of the learner with respect to the practicability and nature of the subject.

Continuous and Comprehensive Evaluation is an essential ingredient of any learning process. It helps the learner to understand and evaluate his own progress and to develop adequate strategy for further improvement. Continuous Evaluation also helps us to measure the attained goals of formulated curriculum objectives.

### **Merits of Continuous and Comprehensive Evaluation system are:**

1. Making student's learning regular
2. Provides for a variety of activities
3. Effective feedback is possible
4. Assess the allround development of the learner on a continuous basis through a variety of activities.
5. Remedial and diagnostic teaching is possible.
6. The process as well as the product is assessed.

Different tools are used to evaluate the multi dimensional competencies of the learners. The Continuous and Comprehensive Evaluation (CCE) includes not only written test (class tests) but also oral tests, observation, interview, debates, discussions, seminars etc.

The learner proceeds through a variety of learning experiences. Therefore the level of progress should be evaluated in a comprehensive and continuous manner. More over, the learner is to be made aware of the findings and it helps him to measure his progress. Necessary help should be provided to them in time. As such we can generate the environment and opportunity for Continuous Evaluation.

In order to evaluate the multi- dimensional competencies of the learner, different tools and techniques have to be used. The multi- dimensional competencies of the learner include:

- Class -room interaction
- Task orientation

- Creative expression
- Field/institutional interactions
- Knowledge assessment/ expression

### Continuous Evaluation Items

1. Assignment
2. Seminar
3. Class test
4. Project etc.

\* For continuous evaluation class test (CT) is made compulsory taking any two of the above said indicators. CT can be a written test, oral test (viva), Practical test.

CE Item	Evaluation Indicators	Weightage	Score
1. Assignment	1. Awareness of the content	4/3/2/1	20
	2. Comprehensiveness of the content	4/3/2/1	
	3. Systematic and sequential arrangement	4/3/2/1	
	4. Observation/suggestions/Views Judgements/ Evaluation	4/3/2/1	
	5. Timely Submission	4/3/2/1	
2. Seminar	1. Ability to plan and organise	4/3/2/1	20
	2. Skills in the collection of data	4/3/2/1	
	3. Awareness of the content (presentation of the paper, participation in discussion, ability to substantiate the ideas and views)	4/3/2/1	
	4. Ability to prepare the report (sequence in the presentaionof the concepts, authenticity and clarity of ideas/views/concepts	4/3/2/1	
	5. Quality of Seminar Document	4/3/2/1	
3. Project	1. Ability to plan (Selection of the method for solution of the problem, identifying suitable tools, planning the various activities to be carried out in each stage)	4/3/2/1	
	2. Ability to collect data (sufficiency and Relevance of data. Classification and arrangement of data for analysis, reliability and authenticity of the Collected data.)	4/3/2/1	

3. Project	3. Ability to analyse the elements and procedure (Structuring of elements and developing logic. Efficiency in using the package/tool. Recognising design errors and correcting them)	4/3/2/1	20
	4. Ability to prepare the project report  (Reflection of the process skills. Communicability and authenticity of the report in relation with the Project diary)	4/3/2/1	
	5. Viva Voce(Knowledge of the content and Process)	4/3/2/1	

### CE Item calculation

Subject		Item: Assignment					Total Score (20)
Sl. No	Name	Evaluation Indicators					
		I (4)	II (4)	III (4)	IV (4)	V (4)	
1	Anand	2	3	4	4	4	17
2	Shibu	4	3	4	4	4	19

### Total CE calculation

Sl. No	Name	CE Items			Total (60)	Total CE Out of 20
		1 Class Test (20)	2 Assignment (20)	3 Seminar/ Project (20)		
1	Anand	18	17	19	54	18
2	Shibu	20	19	18	57	19

## **Grading for CE**

Each item in CE is evaluated giving its required score and graded as shown. 5 point grading is given

17 → 20 → A grade

13 → 16 → B grade

9 → 12 → C grade

5 → 8 → D grade

Below 4 → E grade

## **Terminal Evaluation (TE)**

Terminal Evaluation is in written form. The test should not be aimed to test the memory alone. The terminal evaluation questions give more emphasis on application level, analysis and synthesis. The questions are framed so that the students are able to apply their different mental process. The maximum score is 80 and the minimum score of TE is 24 (30%).

The terminal evaluation questionnaire should be capable of measuring

- Content validity
- Criterion validity
- Constant validity
- Reliability
- Class test, term evaluation and annual examination should be in tune with the new approach.
- Should not be prepared to test the rote memory.
- Questions asked should provoke the thinking abilities of students.
- Questions to test the competency of application analysis, synthesis and evaluation are to be given. In other words the questions should be framed in such a way that the students are able to apply their various mental processes.
- Questions should be based on the learning process and the new approach to each subject.
- Results should be scientifically analysed.
- Evaluation results should be analysed and follow up may be carried out at relevant levels (remedial measures).
- Eighty percent marks are set apart for the common examination as the part of the Term Evaluation

## **The Question Paper must have**

- Application level questions
- Synthesis level questions
- Comparison of facts

- Challenging questions
- Scope for obtaining innovative ideas
- Giving creative thinking by the students
- Questions based on the objectives of learning activities
- Practical oriented questions
- Environment related questions
- Divergent thinking level questions

### **Role of the Teacher in the Evaluation Process**

- Preparation for the effective execution of evaluation
- Preparation of daily planning notes (teaching manual) and helping learners in their activities.
- While learners are engaged in doing seminars/collections/assignments/ collections, conduct interim evaluation and provide necessary help.
- Consider assignment, seminar, collections etc. as learning activities and approach them as evaluation materials.
- Prepare a format to record continuous evaluation.
- Identify and evaluate the progress at different stage.
- Find out learner's difficulty by conducting feedback.
- Make use of the support mechanism fully, provided by the department of education.
- Make the parents aware of the new approach to curriculum and evaluation system through class P.T.A.
- Make use of the training programme for professional excellence and transparency in work.
- Make use of the Humanities Teachers Council for academic progress.
- Identify and make use of the possibility of action research to resolve classroom learning problems.

### **Grading**

It is not scientific to assess the achievement of a student solely based in the marks in the terminal examinations. Marking system proved unscientific in evaluating the growth and development of students both in cognitive and non-cognitive areas. To overcome this shortcomings, a popular mode of evaluation based on students' performance- grading system- has been evolved. At the Higher Secondary stage, it is desirable to use a point absolute grading to co-ordinate and record the evaluation. After giving the score, they are changed into percentages and appropriate letter grades are awarded corresponding to each percentage. The score percentage and corresponding letter grade in Political Science is given below.

## Subject Consolidation

Sl. No	Name	CE (20)	TE (80)	Total CE+ TE (100)	Grade

The maximum score of CE + TE is 100 and the minimum score is 30 (30%)

### Practical Evaluation (PE)

PE is the important part of vocational practicals. The practical skills must be evaluated after completing all practical experiments in each term and at the end of the academic year. PE must cover all required indicators to evaluate the technical skill and practical knowledge of the different topics covered.

Practical evaluation should be conducted at the end of each year. Evaluation should be done as detailed below.

Sl. No.	Particular	Percentage	Score
1.	Record/observation book	10	15
2.	Tools and materials required	10	15
3.	Procedure with diagram	20	30
4.	Working skill and handling of tools	30	45
5.	Result or output	10	15
6.	Viva and identification of tools	20	30
	Total	100%	150
	Minimum for pass	40%	60

Minimum C grade is required for pass.

Score in percentage	Grade
90 - 100	A+
80 - 89	A
70 - 79	B+
60 - 69	B
50 - 59	C+
40 - 49	C
30 - 39	D+
20 - 29	D
Below 20	E

### Vocational Competency Evaluation

Being a vocational course, a system to judiciously evaluate the required value addition and consequent capacity building in the selected vocational subject is highly essential. As the other evaluation components like CE, PE and TE cannot assess the vocational competencies and professional skills acquired by the students, an internship evaluation (IE) component has been introduced to meet this requirement.

Internship evaluation should be done based on the following components.

#### I. Regularity and punctuality

A regular presence and habit of time bound completion of task is a must for attaining maximum efficiency.

**Regularity and Punctuality can be evaluated by 5 point scale.**

#### Rating scale

		1	2	3	4	5
1	Regularity	Never regular	Often regular	Usually regular	Most of the time regular	Always regular
2	Punctuality	Never Punctual	Often Punctual	Usually Punctual	Most of the time Punctual	Always Punctual

Regularity and punctuality can be assessed by using attendance of the student and time bound completion of tasks.

## II. Value addition

Value addition can be evaluated through conducting field visits/survey. The experiences gained through field visit and survey increases the level of intrinsic motivation and positive attitude towards the vocational field and there by increase his value as a skilled semi- professional.

The aim of value addition is to measure the interest, devotion Group managment, perseverance of the learner in specific areas Value addition can be evaluated from field visit, survey and simulated experiments.

## III. Capacity building

Capacity building can be evaluated through conducting the following activities.

1. OJT/Simulated experiment
2. Performance- Camp/ Exhibition/ Clinic.
3. Performance- Production/Service cum Training centre.

These components helps the students to practice the acquired skills in the real situation and there by increasing self confidence and promoting self reliance.

Capacity building is aimed at measuring the skills of the learner from OJT/ production cum training centre/ research and development/graded area exposure.

IE Item	Evaluation Indicators	Weightage	Score
<b>1. Regularity and Punctuality</b>			10
<b>2. Value addition</b>	<b>Field Visit</b> 1. Attitude and readiness towards the task. 2. Capacity for observation. 3. Data collection. 4. Application of ideas. 5. Documentation/ recording. OR	4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1	20

IE Item	Evaluation Indicators	Weightage	Score
<b>1. Regularity and Punctuality</b>			10
<b>2. Value addition</b>	<b>Survey</b> 1. Planning. 2. Data collection. 3. Consolidation of data and analysis. 4. Drawing inference. 5. Reporting.	4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1	
<b>3. Capacity building</b>	<b>OJT/ Simulated Experiment/ Practical skill</b> 1. Involvement/ Participation. 2. Skills in doing work/ Communication skill. 3. Time bound action. 4. Capacity for observation, analysis and innovation. 5. Documentation, Recording and display. OR <b>Performance in camp/ Exhibition/ clinic</b> 1. Ability for planning and organising. 2. Mastery of subject. 3. Ability for communication.	4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 OR 4/3/2/1 4/3/2/1 4/3/2/1	20

IE Item	Evaluation Indicators	Weightage	Score
	4. Innovation. 5. Involvement/Social commitment. OR <b>Performace in production/ service cum training centre (PSCTC)</b>	4/3/2/1 4/3/2/1	
	1. Mastery of vocational skills. 2. Managerial capacity. 3. Promoting self confidence. 4. Innovative approach. 5. Promoting self - reliance.	4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1 4/3/2/1	

#### Vocational Competency Items for Internship Evaluation

Items	Score
Regularity & Punctuality	10
Field visit/survey(any one)	20
OJT/simulated experiment/ Practical Skill/ Performance- Camp/exhibition/Clinic Performance- PSCTC (any one)	20
<b>Total</b>	<b>50</b>

A minimum of 80% attendance is required for promotion to the second year. Those who have shortage of attendance should repeat first year. Those who have 80% and above attendance but failed to achieve 30% of Internship Evaluation (IE) will be promoted to the second year. He has to improve the component in which he performed poor. He has to attain the minimum by improving the particular component to get eligible for appearing second year public examination.





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# CURRICULUM OBJECTIVES

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## Unit 1 Workshop Technology

- To make students able to identify the different types of measuring instruments through simple discussion and demonstration.
- To create ability to identify different types of classification of principal measuring instruments.
- To help students easy to handle the instruments through experiments, observation, discussion and seminar.
- To help students able to identify the carpentry tools and to make different carpentry joints.
- To make students able to understand the carpentry process through small works in carpentry shop.
- Create ability to identify different types of sheet metal hand tools through discussion and seminar.
- To understand the sheet metal operations through demonstration and make models.
- To understand the sheet metal joints through making joints and models
- To make students able to identify different heat treatment process, various hot working and cold working process used in manufacturing industries.
- To identify the students different types of fitting tools through discussion.
- Create ability to understand the fitting process through discussion and working models.
- To create the students able to understand the different types of welding through practical classes.
- To understand difference between soldering and brazing.
- To help the students able to identify the different types of moulding and costing process.

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## Unit 2 Farm Engines

- To study the principle of operation of IC Engines and its application in farm.
- To study different components in IC Engines.
- To dismantle and assemble and identify troubles.
- To provide students about the knowledge of advanced technologies in this field through various workshop activities.
- To make students able to understand the structure and function of tractors.
- To identify the parts of tractors.

- To make students aware about the necessity of engine lubrication and various system.
  - To make students able to understand the structure and function of tillers.
  - To identify parts of power tillers.
  - To identify various tillage operations.
- 

### **Unit 3 Farm Equipment**

- To make student aware about the operation, repairs and maintenance of farm equipments through discussion, seminar experiment and class demonstration.
  - To create able to understand the working, assembling dismantling and maintenance of form equipments through practical works, observation, charts, project reports.
  - To study the different difference between the primary tillage equipments and secondary tillage equipments through classroom discussion.
  - To understand the plough adjustment through practical experiments and observation.
  - To understand the functions of tillage through classroom discussion and experiments done in the field.
  - To handle the students all equipments care through study of safety precaution rules.
  - To create able to understand the methods of sowing through experiments, discussion and class room demonstration.
  - To make student aware about the operation, repair, maintenance the planting equipment through experiment, seminar and observation.
  - To understand the function of seed drill through discussion.
  - To understand the components of seed drill through show the models, prepare the charts, and class room demonstration.
  - To create the student able to understand the function of sprayer and duster through discussion, seminar and class room demonstration.
  - To understand the different types of sprayers and dusters through discussion and demonstration.
  - To understand the components of sprayers and dusters through practical experiments, preparing charts, seminar and classroom demonstration.
  - To create the students able to understand the advantages and disadvantages of spraying through discussion and observation.
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### **Unit 4 Irrigation Equipments**

- To understand various types of water resources and their utilisation.
- To prepare a water budgets.
- To identify the difference between earth dam and masonry dam.

- Development of irrigation in India.
- To explain the concept of water measuring and measuring devices.
- Basic understanding of various water measuring devices and their usage.
- Concept on conveyance and control of irrigation water.
- To identify the different types of man power and animal powered water lifts.
- To understand the operation and maintenance of different types of pumps used in agricultural farms.
- Selection of pumps.
- Installation of pumps.
- To identify pump troubles and remedies, by means of during practical works, deassembling and assembling mini projects, industrial training etc.
- To understand different types of irrigation method, conventional and modern methods and different components of the system.
- To understand advantages and disadvantages of drip and sprinkler irrigation system.
- Selection and installation of irrigation methods.
- To understand the operation and maintenance of different types of irrigation methods used in agricultural farm.
- The above objective are achieved by means of during practical works, farm visit, mini projects etc.

## Unit 1 Workshop Technology

### Module I Measuring Instruments

Introduction - classification - linear measurement (non-precision) - steel rule - callipers - inside - outside - spring - hermaphrodite - dividers - Telescopic gauge - depth gauge - linear measurement (precision) - micro meter - external - inside - vernier caliper - vernier height gauge - gauges - plug - ring - snap - thread - screw pitch - feeler - plate - wire.

### Module II Wood Working Principles

Introduction to wood - carpentry tools - marking and measuring tools - rules - straight edge - Try square - mitre square - bevel square - marking knife - gauges - marking - mortise and cutting - divider - caliper.

Cutting tools - saws - chisels - gauges - planes. Boring tools - Bradawl and Gimlet - Drill. Striking tools - Hammer - mallet. Holding tools - Bench vice - sash cramp - G-Cramp - Hand screw - Miscellaneous tools - carpentry processes - carpentry joints - halving joints - mortise and tenon joints - Butt joint - corner joint.

### Module III Sheet Metal Work

Introduction - metals used in sheet metal work - Sheet metal hand tools - measuring tools - Sheet metal operations - Sheet metal joints : Hems and seams.

### Module IV Smithing and Forging

Introduction - Hand tools - Hot working - advantages - disadvantages - cold working - types of Hot working process - General forging operations - various heat treatment process - Annealing - Normalizing - Hardening - Tempering - Cyaniding - Nitriding.

### Module V Bench Work and Fitting

Introduction - Vices - Bench vice - leg vice - pipe vice - hand vice - pin vice - Hammers - Ball peen - cross peen - straight peen - soft hammer - chisels - flat - cross cut - Half round - Diamond point - side chisel - files - flat - Hand square - round - triangular - Half round - knife edge - scraper - hack saw - power hack saw - marking tools - surface plate - scribe - punch - try square - drill - flat - twist - straight fluted drill - reamer - tap wrench - die stock - fitting processes.

### Module VI Welding

Introduction - types of welding - welding processes - gas welding - oxy-acetylene - air acetylene - oxy-hydrogen - arc welding - resistance welding - Butt - spot related processes - Brazing - soldering.

## **Module VII Different Aspects of Moulding**

Introduction - types of pattern - pattern material - moulding tools - moulding sands - sand properties - allowances - applications.

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## **Unit 2 Farm Engines**

### **Module I Oil Engines**

Principles of operation of IC engines - Difference between four stroke and two stroke engine - difference between petrol and diesel engine - engine terminology - stroke - bore - compression ratio - displacement volume - BHP - IHP - valve operation - valve timing diagram.

### **Module II Farm Tractors**

Tractors - tractor types and their selection -clutches - single disc type - multiple disc type - tractor transmission - differential - final drive - power take off - tractor pulley - steel wheel and tracks - steering mechanism - hydraulic system - maintenance and repairs of tractors.

### **Module III Power Tiller**

Main parts of power tiller - mechanism of power tiller - functions - starting procedure - field operations - routine maintenance - safety rules - rectify the defects.

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## **Unit 3 Farm Equipment**

### **Module I Seed bed preparation Machinery**

Introduction - tillage - functions of tillage - types of tillage - tillage system - tillage implements - hand operated tools - animal drawn implements - tractors drawn implements - Hand tools - Animal drawn walking type and riding type - tractor drawn - trailed - semi mounted or mounted type - tillage implements - plough - indigenous plough - mould board plough - Disk plough - types - working - dismantling and assembling of various parts - plough adjustment - listers - sub soilers - ridger - sweeps - harrows - types of harrows - puddlers - cultivators - types - bund former.

### **Module II Plant Equipments**

Introduction - planting equipments - seeding - methods of sowing - seed drill - different types of seed drill. Components of seed drill - functions of seed drill - working of seed drill.

### **Module III Plant Protection Machinery**

Introduction - plant protection machinery - sprayer - Different types of sprayers - detail study of bucket type sprayer - knapsack sprayer - rocker sprayer - advantages and disadvantages of spraying - dusters - plunger type - hand duster - rotary type.

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## **Unit 4 Irrigation Equipments**

### **Module I Water Resources and their utilisation**

Introduction - river systems of India - types of wells - farm ponds - dams - difference between earth dam and masonry dam - components of dam - canal system - water budget - need of water budget - development of irrigation in India.

### **Module II Measurement, Conveyance and control of Irrigation water on farm**

Measurement of water - unit and methods of measurement - water meters - orifices - weirs - parshall flumes - Hydraulics of flow - open channel flow - closed channel flow.

### **Module III Water lifts and pumps for Irrigation**

Introduction - water lifts - manually operated devices - swing basket - counter poise lift - Archimedian screw - paddle wheel - Animal powered devices - Rope and Bucket lift - Two bucket lift - persian wheel - chain pump - water wheel - wind powered water lift - wind mill - irrigation pumps - classification of pumps - working of reciprocating pump - centrifugal pump (volute and diffuser type) - Turbine pumps - selection - installation - pump troubles.

### **Module IV Irrigation Methods**

Introduction - different types of conventional irrigation system - modern irrigation system - sprinkler irrigation system - drip irrigation system - components of various irrigation systems - advantages - disadvantages - selection and installation.

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# 1

# WORKSHOP TECHNOLOGY

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## MODULE 1 MEASURING INSTRUMENTS

### Introduction

Measurement has played an important role in man's scientific and technological advancement. Measuring instruments, tools and various gauges are used for measurement and inspection to establish the manufacturing accuracy of parts. This chapter provides for understanding the classification of measuring instruments and identification of the different types of measuring tools.

### Curriculum Objectives

- To enable students to identify the different types of measuring instruments through simple discussion and demonstration.
- To create ability to identify different types of classification of principal measuring instruments.
- To enable the students to easily handle the instruments through experiments, observation, discussions and seminars.

### Syllabus

Introduction to measuring instruments-classification of measuring instruments-linear measurements (nonprecision) -steel rule, calipers-inside, outside, spring, hermaphrodite transfer - dividers - telescopic gauge - depth gauge - linear measurement (precision)-micrometer - external-inside - vernier calipers - vernier height gauge - gauge - plug - ring - snap - thread - screw pitch - feeler - plate - wire.

### Learning activities

#### Activity 1 Study of vernier caliper

1. Study various components of vernier calliper.
2. Least count calculation
3. To finding the diameter of wire of rod with instrument.

#### Activity 2 Study of micrometer

1. Study of the different parts of micrometer.
2. Least count calculation

3. Finding the thickness of a sheet with instrument.

### **Activity 3 Study of Gauges**

1. Study of different types of gauges.
2. Find the gap of spark plug using feeler gauge.
3. Finding the pitch of a thread using screw pitch gauge.

## **MODULE 2 WOOD WORKING PRINCIPLES**

### **Introduction**

Carpentry and joinery are common terms used with any class of work with wood strictly speaking, carpentry deals with all work of a building such as roofs, floors, partitions etc., while joinery deals with the making of doors, windows, cupboards, dressers, stairs and all the interior fittings for a building.

This chapter provides for understanding the classification of measuring instruments and identifying the different types of measuring tools.

### **Curriculum Objectives**

- To help students able to identify the carpentry tools and to make different carpentry joints.
- To make students able to understand the carpentry processes through small tasks in carpentry shop.

### **Syllabus**

Introduction to wood - carpentry tools - marking and measuring tools - rules - straight edge - try square - mitre square - bevel square - marking knife - gauges - marking - mortise and cutting - divider - caliper - cutting tools - saws - chisels - gauges - planes - boring tools - bradawl and gimlet - drill striking tools - hammer - mallet - holding tools - benchvice - sash cramp - G-Cramp- hand screw - Miscellaneous tools - carpentry processes - carpentry joints - halving joints - mortise and tenon joints - butt joint - corner joint.

### **Activity 1**

- Study of cutting and holding tools used in carpentry and their operations.

### **Activity 2**

- Making the Tee joint and cross halving joints, with the help of tools.

### **Activity 3**

- Drawing a chart showing different cutting and holding devices used in carpentry.

### **Activity 4**

- Make a chart showing the drawings of different joints made in carpentry.

## **MODULE 3 SHEET METAL WORK**

### **Introduction**

Sheet metal work is generally regarded as the working on metal from 16 gauge down to 30 gauge, with hand tools and simple machines, into various forms by cutting, forming into shape and joining common examples of sheet metal work are hoppers, canisters, guards, covers, pipes hoods, funnels, bends, boxes etc. In sheet metal work the knowledge of geometry, mensuration and properties of metal is most essential as nearly all patterns come from the development of the surface of a number of geometrical models such as cylinders, prisms, cones and pyramids.

This chapter provides for the chances of understanding the sheet metal hand tools and sheet metal operations.

### **Curriculum Objectives**

- To creative ability to identify different types of sheet metal hand tools through discussions and seminars.
- To understand the sheet metal operations through demonstration making the models and conducting seminar.
- To enable the students to understand the sheet metal joints through making the models and joints.

### **Syllabus**

Introduction - metals used in sheet metal work - sheet metal hand tools - measuring tools - sheet metal operations - sheet metal joints - Hems and seams.

#### **Activity 1**

Study of cutting and holding tools used in sheet metal

#### **Activity 2**

Cutting practices making lap joint and butt joint.

#### **Activity 3**

Make still models Eg: box, tray etc.

#### **Activity 4**

Make drawing of various cutting and holding tools used in sheet metal work.

## **MODULE 4 SMITHING AND FORGING**

### **Introduction**

Smithing is understood as only relatively small jobs such as heating in an open fire or hearth. The shop in which the work is carried out is known as smithy or smith's shop. Forging refers to the production of those parts which must be heated in a closed furnace. Forging processes

are among the most important manufacturing techniques as forged items are used in the small tools railroad equipment, automobiles and tracks as well as in smaller industries.

This chapter provides the chances of understanding various forging and smithy operations and their applications.

### **Curriculum Objectives**

- To make students able to identify different heat treatment processes, various hot working and cold working processes used in manufacturing industries and their applications through observation of hand-on jobs in smithy shop and visiting industrial units to observe foundry-related work.

### **Syllabus**

Introduction - hand tools - hot working -advantages - Disadvantages - cold working - types of hot working process - general forging operations - various heat treatment processes - annealing - normalising - hardening, tempering - cyaniding nitriding.

#### **Activity 1**

Study of different hammers and tools used in smithy.

#### **Activity 2**

Study of the operation of forge.

#### **Activity 3**

Hands on job in heat treatment processes (annealing, hardening etc) and industrial visit to foundry related works.

#### **Activity 4**

Making a chart showing different hammers and tools used in smithy.

## **MODULE 5 BENCH WORK AND FITTING**

### **Introduction**

The term 'Bench work' generally denotes the production of an article by hand working seated on a bench. 'Fitting' is assembling together of parts and removing metals to secure the necessary fit, and any or may not be carried out at the bench.

How ever, all these two types of work require the use of a large number of tools and equipment and involve a number of operations to finish the work to the desired shape and size.

### **Curriculum Objectives**

- To identify the students, different types of fitting tools through discussion.
- To create ability to understand the fitting processes through discussion, make working models for demonstration.
- To handle the tools with ease and care.

## **Syllabus**

Introduction - vices - bench vice - leg vice - pipe vice - hand vice - pin vice - hammers - ball peen - cross peen - straight peen - soft hammer - chisels - flat - cross-cut - half round - diamond-point - side chisel - files - flat round - square-round - triangular - half round - knife edge - scraper - flat - triangular half round - hack saw - power hacksaw - marking tools - surface plate - scribe - punch - try square - drill - flat - twist - straight fluted drill - reamer - tap wrench - die - stock - fitting processes.

### **Activity 1**

Study of various cutting, measuring holding tools used in fitting and their operations.

### **Activity 2**

Study of different types of filing through experiments.

### **Activity 3**

Making joints : (a) Tee joint (b) V-joint.

### **Activity 4**

Making a chart with figures showing different tools used in fitting works.

## **MODULE 6 WELDING**

### **Introduction**

Welding is a process of joining similar metals by application of heat with or without application of pressure and addition of filler material. The result is a continuity of homogenous material of the composition and characteristics of two parts which are being joined together. The applications of welding are so varied and extensive that it would be no exaggeration to say that there is no metal industry and no branch of engineering that does not make use of welding in one form or another.

This chapter provides for the chances of understanding welding, types of welding, welding processes and other related processes like soldering and brazing.

### **Curriculum Objectives**

- To make the students to be able to understand the different types of welding through discussions, seminars and practical classes.
- To make the students understand the difference between soldering and brazing through discussions and experiments and demonstration.
- To observe all the differences and write them one by one.

## **Syllabus**

Introduction - types of welding - welding processes - gas welding - oxy - acetylene air

acetylene - oxy hydrogen - arc welding - resistance welding - butt - spot - related processes - brazing - soldering.

### **Activity 1**

Study of welding instruments and their operations.

### **Activity 2**

Making a butt weld with the help of gas welding.

### **Activity 3**

Making a spot weld with the help of resistance welding.

### **Activity 4**

Study of brazing and soldering instruments and making joints in sheet metal with the help of soldering.

### **Activity 5**

Making a chart with figure showing different tools used in welding.

## **Module 7 Different aspects of moulding**

### **Introduction**

Foundry or moulding engineering is engaged in the process of making castings in moulds prepared by patterns. Pattern is the principal tool during the casting process. It may be defined as a model of anything. It is so constructed that it may be used for forming an impression called mould in damp sand or other suitable materials. When this mould is filled with molten metal and the metal is allowed to solidify. It forms a reproduction of the pattern and is known as casting.

This chapter provides for the changes of understanding various moulding and casting processes and their application in industries.

### **Curriculum Objectives**

- Helping the students to be able to identify the different types of moulding and casting processes.
- Application in daily life through industrial visit and on job trainings.

### **Syllabus**

Introduction - types of patterns - pattern materials - moulding tools - moulding sands - sand properties - allowances - applications.

### **Activity 1**

Study of different moulding tools and their applications.

**Activity 2**

Industrial visit a foundry and observe various activities there and making a report.

**Activity 3**

Classroom demonstration related to moulding and its applications.

**Activity 4**

Preparing a chart showing figures of various moulding tools.

**Unit Analysis - WORKSHOP TECHNOLOGY**

**Unit 1**

<b>Objectives</b>	<b>Facts, ideas, Principles</b>	<b>Process skill</b>	<b>Activities</b>	<b>Materials</b>	<b>Evaluation</b>
<p><b>Module 1</b>  <b>Measuring Instrument</b></p> <ul style="list-style-type: none"> <li>To study different types of measuring instruments so as to help students to handle the instruments easily.</li> </ul>	<p>Study of components                      Working calculations etc.</p>	<p>Handling                      Accuracy                      Observation skill                      Presentation                      identification</p>	<ol style="list-style-type: none"> <li>Least count calculation</li> <li>Parts study</li> <li>Findings diameters and thickness using measuring instrument.</li> <li>Charts</li> </ol>	<ol style="list-style-type: none"> <li>Vernier caliper, Micrometer, gauges.</li> </ol>	<p>Accuracy of work revalued.                      Recalls                      Charts                      Viva</p>
<p><b>Module 2</b>  <b>Wood working principles</b></p> <ul style="list-style-type: none"> <li>To study different carpentry tools and joints.</li> </ul>	<p>Study of tools and their uses, tools handling principles.</p>	<p>Observation skills,                      Handling of tools,                      Finish, accuracy of work, time taken to complete the job.</p>	<ol style="list-style-type: none"> <li>Part identification</li> <li>Making joints</li> <li>Chart</li> <li>Models</li> </ol>	<ol style="list-style-type: none"> <li>Wood</li> <li>Jack plane</li> <li>Chisels, vice etc</li> <li>Saw</li> </ol>	<p>Accuracy                      Method                      Revaluation                      Recalls</p>
<p><b>Module 3</b>  <b>Sheet metal work</b></p> <ul style="list-style-type: none"> <li>To study different sheet metal tools, joints etc.</li> </ul>	<p>Study of tools and their uses, tool handling principles.</p>	<p>Observation skills,                      handling of tools                      finish, accuracy of work.                      Time taken to complete the job.</p>	<ol style="list-style-type: none"> <li>Part identification</li> <li>Making joints</li> <li>Making models</li> <li>Chart</li> </ol>	<ol style="list-style-type: none"> <li>Sheet metal</li> <li>Snips</li> <li>Hacksaw</li> <li>Hammers</li> <li>Punch</li> </ol>	<p>Accuracy                      Method                      Revaluation and recalls.</p>
<p><b>Module 4</b>  <b>Smithy and Froging</b></p> <ul style="list-style-type: none"> <li>To study different heat processes hot working and cold working processes.</li> </ul>	<p>Study of various processes of heat treatment.</p>	<p>Observation                      Handling                      Analysis                      Presentation                      Identification</p>	<p>Industrial visit                      Report preparation                      Hands-on job in heat treatment process                      Data collection</p>	<p>Tongs                      Anvil                      Swage block                      Hammer</p>	<p>Method valuation and recalls.                      Reports                      Charts                      Class tests.</p>

Objectives	Facts, ideas, Principles	Process skill	Activities	Materials	Evaluation
<p><b>Module 5</b> <b>Bench Work and fitting</b></p> <ul style="list-style-type: none"> <li>To study different fitting tools, fitting processes.</li> </ul>	<p>Study of tools and their application. Different types of fittings.</p>	<p>Observation skills Handling of tools Finish, accuracy of work, time taken to complete to the job.</p>	<ol style="list-style-type: none"> <li>1. Tool identification</li> <li>2. Making joints</li> <li>3. Fitting practice</li> <li>4. Charts</li> </ol>	<ol style="list-style-type: none"> <li>1. Files</li> <li>2. Hacksaw</li> <li>3. Steel rule</li> <li>4. Bench vice</li> </ol>	<p>Accuracy Method Reevaluated and recalls Charts Viva Class tests</p>
<p><b>Module 6</b> <b>Welding</b></p> <ul style="list-style-type: none"> <li>To study various welding processes and their applications.</li> </ul>	<p>Principles of gas welding, arc welding, soldering brazing etc.</p>	<p>Concept development Observation Handling of welding equipment Finish of weld.</p>	<ol style="list-style-type: none"> <li>1. Study of welding equipment and operation</li> <li>2. Making weld joints.</li> </ol>	<ol style="list-style-type: none"> <li>1. Welding equipment</li> <li>2. Soldering iron</li> <li>3. Brazing torch</li> <li>4. Chisels</li> </ol>	<p>Accuracy Method Reevaluated and recalls Charts Viva Class tests</p>
<p><b>Module 7</b> <b>Moulding Principles</b></p> <ul style="list-style-type: none"> <li>To study different moulding and casting processes.</li> </ul>	<p>Principles of moulding and casting. Tools used in casting and moulding.</p>	<p>Concept development on moulding and casting. Observation Presentation</p>	<ol style="list-style-type: none"> <li>1. Industrial visit</li> <li>2. Demonstration</li> <li>3. Report preparation</li> <li>4. Chart</li> </ol>	<ol style="list-style-type: none"> <li>1. Chart</li> <li>2. Different moulding tools and sands</li> <li>3. Moulding box</li> </ol>	<p>Recalls Understanding of facts Chart Class test.</p>

# 2 FARM ENGINES

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## MODULE 1 OIL ENGINES

### Introduction

Oil engines are widely used on farms for pumping water, threshing, oil extraction etc. They highly efficient devices for converting fuel into useful work. The efficiency of diesel engines varies between 32 and 38 percent. About 10 lakhs of 5ph oil engines are used in agricultural operations in India. This chapter gives a basic understanding of the working and application of oil engines.

### Curriculum Objectives

- To study the principle of operation of IC engines and its application in farms.
- To study different components of IC Engines.
- To dismantle and assemble and identify various defects and to rectify various them.
- To provide students with the knowledge of advanced technologies in this field through various workshop activities.

### Syllabus

Principles of operation of IC engines - difference between a four stroke and a two stroke engine - difference between petrol and diesel engine - engine terminology - stroke, bore, compression ratio - displacement volume - BHP, IHP - valve operation - valve timing diagram.

### Learning Activities

#### Activity 1

Dismantle a diesel engine and study various parts.

#### Activity 2

Dismantle a petrol engine and study various parts

#### Activity 3

Note the difference between petrol and diesel engine and make a chart.

#### Activity 4

Study the difference between 2 stroke and 4 stroke engine and make a chart.

### **Activity 5**

Collect various data about IC engines used in vehicles and farm machinery and conduct seminar in the classroom.

### **Activity 6**

Make projects related to oil engines used for agricultural purposes.

### **Activity 7**

Identify various defects occurring in oil engines and find remedies.

### **Activity 8**

Make charts of diesel engine and petrol engine show the principle of operation.

### **Activity 9**

Mini project - working models of petrol engine and diesel engine.

## **MODULE 2 FARM TRACTOR**

### **Introduction**

The tractor is a self-propelled machine used either for pulling or pushing loads or for stationary belt work. It gets its driving force in combination with an engine and driving wheels or tracks. Engine power is transmitted to the driving wheels through a series of intermediaries called power trains. These power trains consists of clutch, transmission, differential, final drives and driving axles. Tractor power is used from its power take off shaft, pulley, hydraulic system and drawbar.

This chapter helps the students know and understand the tractor better for a more fruitful relationship. In very simple terms it tells how to operate the machine, maintain it properly and repair it.

### **Curriculum Objectives**

- To make students able to understand the structure and function of tractors through demonstration, discussion and seminar.
- To identify the parts of tractors through charts.
- To make them learn the process of engine starting.
- To make students able to rectify any complaints in the starting system.
- To make students aware of the necessity of engine lubrication and various systems.
- To make them experts in the maintenance of cooling and lubrication system.
- To enable them to understand the assembly of tractor through observation.

## **Syllabus**

Tractors - tractor types and their selection - clutches - single disc type - multiple disc type - tractor transmission - differential - final drive - power take off - tractor pulley - steel wheel and tracks - steering mechanism - hydraulic system - maintenance and repairs of tractors.

### **Learning Activities**

#### **Activity 1**

Studying and identifying various parts and components of tractors and their operation and making a report.

#### **Activity 2**

Driving practice - starting, working of clutch, gearbox, brake etc.

#### **Activity 3**

Making a chart on power transmission system.

#### **Activity 4**

Seminar on various farm tractors used in agricultural field.

#### **Activity 5**

Field visit to agricultural farms to understand in working of tractors.

#### **Activity 6**

Visit to companies manufacturing tractors.

#### **Activity 7**

Fitting of tools used in field operations (Eg: harrow, plough etc.).

#### **Activity 8**

Make a report based on activities 5, 6 and 7.

#### **Activity 9**

Make a chart showing various points noted in the maintenance and servicing of tractors.

## **MODULE 3 POWER TILLER**

### **Introduction**

Tillage is the preparation of the soil for planting and the process of keeping it loose and free from weeds during the growth of crops. The primary objectives and fundamentals purposes of tillage are divided into three phases (1) to prepare a suitable seed bed, (2) to destroy competitive weeds and (3) to improve the physical condition of the soil. In agricultural farm, power tillers are used for tillage operations.

This chapter makes the students know and understand Tiller better for a more fruitful relationship. This help them know how to operate the machine to maintain it properly and to help in repairing and maintaining the tiller.

### **Curriculum Objectives**

- To make the students able to understand the structure and function of tillers.
- To make the students able to identify the parts of power tillers.
- To make the students able to rectify any complaints in the starting system.
- To make them learn the process of engine starting
- To identify the various tillage operations.

### **Syllabus**

Main parts of power tiller - mechanism - functions - starting procedure - field operations - routine maintenance - safety rules - rectifying the defects.

### **Learning Activities**

#### **Activity 1**

Studying and identifying various parts and components of tillers and their operation and make a report.

#### **Activity 2**

Driving practice starting, working of clutch, brake etc.

#### **Activity 3**

Making a chart on power transmission system.

#### **Activity 4**

Field visits to agricultural farm to understand the tilling operations.

#### **Activity 5**

Seminar on various tillers used in the agricultural field.

#### **Activity 6**

Factory visit to companies manufacturing tillers and preparing a report.

#### **Activity 7**

Dismantling and assembling of tillage blades.

<b>Objectives</b>	<b>Facts, ideas, Principles</b>	<b>Process skill</b>	<b>Activities</b>	<b>Materials</b>	<b>Evaluation</b>
<p><b>Module 1 Oil Engine</b></p> <ul style="list-style-type: none"> <li>To study principle of operation of IC engines component study, dismantling, assembling and rectifying defects.</li> </ul>	<p>Principles of operation Trouble shooting Basics etc.</p>	<p>Observation skills Knowledge of parts and its operation. Identifying defects. Trouble shooting.</p>	<p>1. Dismantling and assembling of diesel engine and petrol engine. 2. Projects 3. Charts 4. Assignments</p>	<p>1. Diesel engine 2. Petrol engine 3. Oil 4. Spanner set</p>	<p>Recalls and revaluated understanding of facts. Charts Class test</p>
<p><b>Module 2 Farm Tractors</b></p> <ul style="list-style-type: none"> <li>To make students able to understand the structure and function of various farm tractors.</li> </ul>	<p>Study of different components of tractors and their operation. Types of tractors and their principles.</p>	<p>Observation skills Knowledge of tractors parts and its operation Handling of tools.</p>	<p>1. Study of various parts and components. 2. Charts 3. Seminar on various farm tractors. 4. Field visit 5. Industrial visit.</p>	<p>1. Tractor 2. Spanner 3. Diesel 4. Oil</p>	<p>Understanding of facts Recalls and revaluated Assignment presentation, class test</p>
<p><b>Module 3 Power Tillers</b></p> <ul style="list-style-type: none"> <li>To make students able to understand the structure and function of various power tillers.</li> </ul>	<p>Study of different components of tractors and their operation. Types of Tillers. Principle of operation.</p>	<p>Observation of skills Knowledge of parts Presentation skills Handling of tools.</p>	<p>1. Study of various parts and components. 2. Charts 3. Seminar on various farm tractors. 4. Field visit 5. Industrial visit. 6. Assignment</p>	<p>1. Tiller 2. Spanner set</p>	<p>Understanding of facts Recalls and revaluated Class test.</p>

# 3 FARM EQUIPMENT

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## MODULE 1 SEEDBED PREPARATION MACHINERY

### Introduction

Although a very large area of land is available in the world, all of it is not fit for crop production. In order to bring these areas into an economically fit condition for crop production, a variety of mechanical operations has to be performed. It is interesting to note that the number of mechanical operations performed and crop yield obtained are not related.

Tillage is the preparation of the soil for planting and the process of keeping it loose and free from weeds during the growth of crops. The primary objectives and fundamental purposes of tillage are divided into three phases: (1) to prepare a suitable seedbed, (2) to destroy the competitive weeds, and (3) to improve the physical condition of the soil. The equipment used by the farmer to break and loosen the soil for a depth of 6 to 36 inches (15.2 to 91.4cm) is called primary tillage equipment. It includes the mould board, disk, rotary, chisel and subsoil ploughs.

The term 'secondary tillage' is used to indicate stirring the soil at comparatively shallow depths. There are many types of machines that can be used for secondary tillage. They are the various types of harrows, rollers and pulverizers and tools for mulching and fallowing.

This chapter helps the students to know different types of tillage equipment (mould board, disk, Indigenous ploughs) and secondary tillage equipment (harrows, puddler and cultivators)

### Curriculum Objectives

- To make the students aware of the operation, repairs and maintenance of farm equipment through discussion, seminar, experiments and class demonstration.
- To enable the students to understand the working, assembling, dismantling and maintenance of farm equipment through practical work, observation, preparing charts and making a project reports.
- To study the difference between the primary tillage equipment and secondary tillage equipment through classroom discussion, experiments and observation.
- To understand the plough adjustments through practical experiments and observation.
- To understand the functions of tillage through classroom discussion and experiments done in the field.
- To make the students able to handle all equipment very carefully and to know of safety measures and precaution rules.

## **Syllabus**

Seedbed Preparation Machinery - Tillage- Functions of tillage - Types of Tillage - Tillage system - Tillage Implements - Hand-operated tools - Animal-drawn implements - Tractor drawn implements. Hand tools - Animal-drawn -walking type and riding type- Tractor drawn - trailed, semi-mounted or mounted types - Tillage Implements - Plough - Indigenous plough - Mould board plough - Disk plough - Types- Working - Dismantling and assembling of various parts - plough adjustments - Listers - sub-soiler - ridger- sweeps - Harrows - Types of harrows - Puddlers - working of puddlers - Cultivators - Types - Components Bund formers.

## **Learning Activities**

### **Activity 1**

To make a report of tillage operations and tillage implements used on farms.

### **Activity 2**

Field visit to agricultural farm to understand the different types of tillage operations.

### **Activity 3**

To make a chart showing the drawings of tillage implements,

### **Activity 4**

To make a table showing the different types of ploughs and their properties.

### **Activity 5**

Dismantling and assembling of various parts of Mould board plough.

### **Activity 6**

Dismantling and assembling of various parts of Disk plough.

### **Activity 7**

Dismantling and assembling of various parts of Indigenous plough.

### **Activity 8**

Comparing different ploughs used and finding their advantages and disadvantages.

### **Activity 9**

Studying and making drawings on different types of cultivators used on farms.

### **Activity 10**

Making still models of ploughs, cultivators, harrows.

### **Activity 11**

Field visit to agricultural farms to understand the working of puddlers, bund formers etc.

## **MODULE 2 PLANTING EQUIPMENT**

### **Introduction**

The art of depositing seeds in the soil to obtain good germination and having not to replant is the goal of all who grow crops. There are a number of factors that influence the germination of seeds and the emergence of seedlings.

The amount of seeds to be sown per unit area depends upon the size of the seed, germination percentage, extent of cover at maturity and the expected use of the plant as either fodder or grain. Most of the crops under optimum rainfall conditions are sown on a flat surface. Under too low or too high rainfall conditions, the sowing is done in furrows or on ridges, respectively.

This chapter provides the students with the knowledge of methods of sowing and of the planting equipment, i.e. seed drill.

### **Curriculum objectives**

- To create awareness of the methods of sowing through experiments, discussion and classroom demonstration.
- To make students aware of the operation, repair, maintenance of the planting equipment through experiments seminar and observation.
- To understand the functions of seed drill through discussion.
- To understand the components of seed drill through demonstration of the models, preparation of charts and classroom demonstration.

### **Syllabus**

Planting Equipment - seeding - Methods of sowing - seed drill - Different types of seed drills- Components of seed drill -Functions of seed drill - Working of seed drill.

### **Learning Activities**

#### **Activity 1**

Field visit to agricultural farm to understand the methods of sowing.

#### **Activity 2**

Collecting various data of sowing and submitting a report.

#### **Activity 3**

Making models of seed drill.

#### **Activity 4**

Field visit to study the operations of seed drills.

#### **Activity 5**

Making charts showing the various components of seed drill.

## **MODULE 3 PLANT PROTECTION MACHINERY**

### **Introduction**

The problem of controlling insects, pests and plant diseases makes it necessary for a large percentage of farmers and orchardists to include in their farm equipment machines for applying either dust or liquid insecticides and fungicides.

Many different kinds of spraying and dusting machines are available to meet the requirement of the agriculturists in controlling insects, diseases and weeds. These machines may be classified as: 1. Hand-operated machines. 2. Power-operated machines 3. Air-planes.

This chapter provides for the chances of understanding the different types of Sprayers and Dusters.

### **Curriculum objectives**

- To create awareness of the students of the Function of sprayers and dusters through discussion, seminar and classroom demonstration.
- To understand the different types of sprayers and Dusters through discussion and demonstration.
- To understand the components of sprayers and Dusters through practical experiments, preparation of charts, seminar and classroom demonstration.
- To create students awareness of the advantages and disadvantages of spraying through discussion and observation.

### **Syllabus**

Plant Protection Machinery - Sprayer- Different types of Sprayers - Detailed study of bucket type sprayers - knapsack sprayer - Rocker sprayer - Advantages and disadvantages of spraying - Duster - Plunger Type hand duster - Rotary type.

### **Learning Activities**

#### **Activity 1**

Study and identify various plant protection machinery.

#### **Activity 2**

Studying and identifying various types of sprayers.

#### **Activity 3**

Dismantle and assemble of Rocker sprayer.

#### **Activity 4**

Field visit to understand the operation of sprayers.

**Activity 5**

Collecting various data on plant protection machinery available in the market and making a chart showing all the details.

**Activity 6**

Making discussions related to advantages and disadvantages of spraying.

**Activity 7**

Making a chart showing various components of sprayers, with figures.

Objectives	Facts, ideas, Principles	Process skill	Activities	Materials	Evaluation
<b>Module 1 Seed bed preparation machinery</b> <ul style="list-style-type: none"> <li>To make students aware about various seedbed preparation machinery and their utilisation.</li> </ul>	Working of ploughs Puddles Bund formers	Observation Data collection Identification Presentation Recalls	Reports on field visit Chart Dismantling & assembling Still models.	Indigenous plough Dis plough Mould board plough Bund former Puddlers Charts	Report Assignment Recalls Trouble identification Viva Class test
<b>Module 2 Planting Equipment</b> <ul style="list-style-type: none"> <li>To make students aware of various plant equipment, function of seed drill, sowing etc.</li> </ul>	Basic understanding of sowing operation of seed drill.	Observation identification Data collection and presentation Recalls.	Field visit Data collection Still models Chart Assignment	Reference books Charts Still models.	Charts Assignment Identification Viva Class test
<b>Module 3 Plant Protection machinery</b> <ul style="list-style-type: none"> <li>To make the students able to understand the function of various plant protection machinery like spraying and dusters.</li> </ul>	Principles of operation of sprayers and dusters.	Observation Identification Presentation Inference Recalls	Assignment Dismantling and assembling Field visit Data collection Chart Still models Working models	Reference books Rocker sprayer Duster (Plunger type) Chart Models	Report Assignment Data collection Viva Recalls Class test

# **4** IRRIGATION EQUIPMENT

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## **MODULE 1 WATER RESOURCES AND THEIR UTILIZATION**

### **Introduction**

Irrigation is the application of water to soil to assist in the production of crops. Irrigation water is supplied to supplement the water available from rainfall and ground water. In many areas of the world, the amount and timing of rainfall are not satisfactory to meet the moisture requirements of crops. Water resources play an important role in meeting the requirements. This chapter mainly deals with different types of water resources like canal system and their utilization.

### **Curriculum Objectives**

- To understand various types of water resources and their utilization.
- To prepare a water budget.
- To identify the difference between earth dam and masonry dam.
- To study development of irrigation in India.

### **Syllabus**

Introduction - River systems of India - Types of wells - Farm ponds - Dams - Difference between earth dam and masonry dam - components of dam - Canal system - Water budget- Need of water budget - Development of irrigation in India

### **Learning Activities**

#### **Activity 1**

Study and identify various components and classification of water resources and make a chart.

#### **Activity 2**

Make a field visit to a nearby earth dam and identify various points and submit a report.

#### **Activity 3**

Make a field visit to a nearby masonry dam and identify the various points and submit a report.

#### **Activity 4**

Make a chart showing the difference between earth and masonry dam.

**Activity 5**

Prepare a water budget for your village taking various requirements into consideration.

**Activity 6**

Conduct seminar related to water resources and their effective utilization.

**Activity 7**

Identify various water resources in your village and its utilization and submit a report.

**Activity 8**

Make a still model of dams showing different components related to dam.

## **MODULE 2 MEASUREMENT, CONVEYANCE AND CONTROL OF IRRIGATION WATER ON FARM**

### **Introduction**

An important factor in the efficient working of any irrigation system is the character of the structures used for transporting and distributing water. An additional factor is the measurement of irrigation. Water, which permits more intelligent use of this valuable natural resource. This chapter mainly deals with distribution structure of water measuring of water and measuring devices.

### **Curriculum objectives**

- To explain the concept of water measuring and measuring devices.
- Basic understanding of units and methods of measurement
- Basic understanding of various water measuring devices and their use.
- Concept on conveyance and control of irrigation water.

### **Syllabus**

Measurement of water - units and methods of measurement - water meters -orifices- weirs - parshall flumes- Hydraulics of flow - open channel flow - closed channel flow

### **Learning Activities**

**Activity 1**

Study and understand various types of water measuring methods and devices and submit a report.

**Activity 2**

Field study on different types of measurements if water (conventional visit to irrigation projects)

### **Activity 3**

Make a drawing of Different types of water measuring devices.

### **Activity 4**

Field study on various water controlling and Distribution structures.

### **Activity 5**

Small projects - Making models of simple water measuring devices.

### **Activity 6**

Poster presentation on various measuring devices.

## **MODULE 3 WATER LIFTS AND PUMPS FOR IRRIGATION**

### **Introduction**

Devices used in lifting water for irrigation in India range from crude home-made contrivances to highly efficient factory-made pumps. Water lifting devices may be classified into four groups based on the kind of power used for their operation. Manpower, animal power, wind power and mechanical power. Selection of the suitable device for a given installation should be made taking into consideration the characteristics of the lifting device and also the amount of water to be lifted, the height of water table, power available, cost etc. This chapter deals with different types of water lifts and pumps used on agricultural farms.

### **Curriculum Objectives**

- To identify the different types of man-powered and animal-powered water lifts.
- To understand the operation and maintenance of different types of pumps used in agricultural form.
- Selection of pumps.
- Installation of pumps
- To identify pump troubles and remedies through practical works, dismantling and assembling, mini projects, industrial training etc.

### **Syllabus**

Introduction - water lifts - manually operated devices -swing basket- counter poise lift - Archimedean screw - paddle wheel - Animal-powered Devices - Rope and Bucket lift- Two bucket lift- Persian wheel - chain pump water wheel - wind powered water lift - wind mill - irrigation pumps - classification of pumps - working of reciprocating pumps - centrifugal pump. (volute and Diffuser type) - Turbine pumps - selection installation - pump troubles-

## **Learning Activities**

### **Activity 1**

Study and identify various parts and components of pumps and submit an assignment.

### **Activity 2**

Dismantling and assembling of a Reciprocating pump and identify various troubles that may occur in the pump during operation and installation.

### **Activity 3**

Dismantling and assembling of a centrifugal pump and identify various troubles that may occur in the pump operation and installation.

### **Activity 4**

Based on activities 2 and 3, make a chart showing various pump troubles and remedies.

### **Activity 5**

Collect various data on agricultural pumps available in the market and make a chart showing all the details.

### **Activity 6**

Industrial Training (OJT) in pump manufacturing units to acquire more knowledge and experience.

### **Activity 7**

Make a report showing all the details of agricultural pumps based on the knowledge obtained through OJT.

## **MODULE 4 IRRIGATION METHODS**

### **Introduction**

Irrigation is a means of maintaining a continuous supply of available moisture in the plant root zone. Successful irrigation requires an adequate supply of water of suitable quality application of the right amount of water at right times. Suitable methods for supplying water, and facilities for removing excess water. Good irrigation results in increased yield and conservation of resources with soil productivity maintained and water utilized economically. This chapter deals with different irrigation methods used in agricultural farm,.

### **Curriculum objectives**

- To understand different types of irrigation methods conventional and modern methods and different components of the system.
- To understand advantages and disadvantages of drip and sprinkler irrigation systems.
- Selection and installation of irrigation methods.

- To understand the operation and maintenance of different types of irrigation methods used on agricultural farms.

The above objectives are achieved by doing practical work, farm visit, mini projects etc.

## **Syllabus**

Introduction - Different types of conventional irrigation systems - Modern irrigation system  
- Sprinkler irrigation system - Drip irrigation system- components of various irrigation system  
- Advantages - Disadvantages - Selection and installation.

## **Learning Activities**

### **Activity 1**

Study and identify various parts and components of different types of irrigation methods and submit a report.

### **Activity 2**

Conventional visit to irrigation farm using irrigation methods and identifying advantages and disadvantages of various irrigation methods.

### **Activity 3**

Make a chart showing the components of drip irrigation and sprinkler irrigation

### **Activity 4**

Make small working models of drip irrigation and sprinkler irrigation.

### **Activity 5**

Conduct Seminar among students related to irrigation methods on modern developments.

Objectives	Facts, ideas, Principles	Process skill	Activities	Materials	Evaluation
<p><b>Module 1</b>  <b>Water Resources &amp; their utilisation</b></p> <ul style="list-style-type: none"> <li>Ability to understand different types of water resources and their utilisation.</li> </ul>	<p>Classification of water resources, earth dam, masonry dam.</p>	<p>Observation                      Data collection                      Drawing                      Presentation</p>	<p>Studying different types of water resources.                      Field visit                      Chart analysis                      Preparation of water budget Seminar.</p>	<p>Textbook                      Chart                      Reference books                      Field visit</p>	<p>Report                      Assignment                      Discussion                      Recalls of various data.</p>
<p><b>Module 2</b>  <b>Measurement conveyance &amp; control of Irrigation water on farm</b></p> <ul style="list-style-type: none"> <li>Ability to understand the concept of water measuring and measuring devices.</li> </ul>	<p>Concept of water measuring and use of measuring devices units and methods.</p>	<p>Observation                      Data collection                      Drawing                      Presentation                      Identification</p>	<p>Study on various water measurement systems and devices.                      Field visit                      Chart analysis                      Models.</p>	<p>Reference books                      Models                      Charts</p>	<p>Reports                      Assignment                      Table formation                      Poster presentation</p>
<p><b>Module 3</b>  <b>Water lifts &amp; Pump for Irrigation</b></p> <ul style="list-style-type: none"> <li>To identify different types of water lifting devices operation and maintenance of different types of pumps.</li> </ul>	<p>Classification of pumps and its working principle.</p>	<p>Observation                      Identification of parts                      Differentiation                      Inference                      Presentation</p>	<p>Concept of pumps                      Dismantling and assembling                      Data collection                      Chart preparation                      OJT</p>	<p>Reference books                      Centrifugal pump                      Reciprocating pump                      Turbine pump</p>	<p>Chart                      Assignment                      Reports                      Viva                      Part identification</p>
<p><b>Module 4</b>  <b>Irrigation Methods</b></p> <ul style="list-style-type: none"> <li>To understand different types of irrigation method operation and maintenance of different types of irrigation methods.</li> </ul>	<p>Idea about drip irrigation, Sprinkler irrigation.</p>	<p>Observation                      Differentiation                      Investigation                      Data collection                      presentation.</p>	<p>Study and identification of irrigation methods.                      Data collection                      Field visit                      Chart presentation                      Working models</p>	<p>Reference books                      Charts                      Working models</p>	<p>Table formation                      Chart presentation                      Assignment                      Data collection</p>

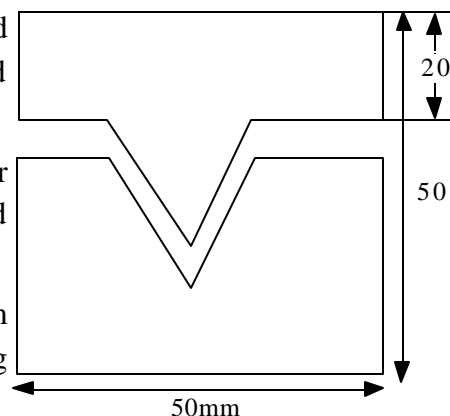
# MODEL QUESTIONS

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## Unit 1 Workshop Technology

- With the help of vernier caliper measure the diameter of a 10mm wire.
  - What are the steps take show least count and calculations.
- Discuss the various standard operations performed for making a V joint and Tools required in Mild Steel plate.
- You are supposed to be appointed a lab instructor in a moulding shop. What are the tools and equipment required for doing the jobs.
- You are assigned to make a square box of 100mm side in sheet metal. Make a standard operating procedure (50p) for the above job.



## Unit 2 Farm Engines

- Identify various types of engines used on Agricultural farm and make a table showing the specifications, application etc.
- Compare two-stroke and four stroke engines with diagrams and tabulate the differences.
- You are asked to select an engine. What are the points to be considered?
- What are the procedures for dismantling and assembling a gearbox.
- Tabulate different types of tractors and their applications.
- Make an industrial report on any OJT programme you have attended related to tractor industries.
- List different Tractor manufactures in India and their tractor models and specifications, if any.

## Unit 3 Farm Equipment

- A farmer is working in a field with puddler what are the other operations to be performed before puddling. What is the need of puddling.
- You are asked to prepare a seed bed for paddy. What are the implements required and what are the operations to be performed?

3. You are asked to make a seed drill for paddy cultivation. Make necessary diagrams for the same
4. Insects are attacking your farm severely. How will you kill the insects? What type of equipment is used for this purpose? Explain its operation.
5. What are the points to be noted while selecting a good sprayer.

#### **Unit 4 Irrigation Equipment**

1. Make a comparative study between centrifugal pump and Reciprocating pump.
2. Identify various types of water resources in your village and make a small project report for the same.
3. Make a field study report on sprinkler irrigation you have visited during your studies.
4. Tabulate Different types of pumps available in the market, their specifications, cost etc.
5. A pump in irrigation field is not working properly. Identify the possible troubles and remedies and tabulate.

### **MULTIPLE CHOICE QUESTIONS**

#### **UNIT 1**

##### **Multiple Choice Questions**

1. The main constituent of moulding sand is .....  
(Silica sand grains, magnesium, phosphorous)
2. Intermediate parts of a box flask is called .....  
(cheek, flask, skirt)
3. .... is the process of removing metal by means of cold chisel.  
(Chipping, Filing, Drilling)
4. A mitre square is used for measuring angles of .....  
(90°, 45°, 180°)
5. .... are used for converting the pencil lines into cut lines.  
(Marking gauge, Marking knife, Punch)

##### **Short Questions**

1. What are the essential properties required for normal moulding sand?
2. Name hand tools used in sheet metal work.
3. What are the different processes of heat treatment of steel?

4. Describe the forging operations.
5. Explain briefly: Brazing.

## UNIT II

### Multiple Choice Questions

1. Diesel engine is a ..... engine  
(compression Ignition, Spark Ignition)
2. In heavy vehicles a device which helps in taking a turn is .....  
(Final drive, differential, P.T.O)
3. .... oil is generally recommended for Tractors.  
(SAE 90, SAE 30, SAE 40)
4. In carburettor type engines, the compression ratio ranges between ..... and .....  
(4.5 & 8:1, 7 & 20:1, 7 & 15:2)
5. Engine power is transmitted to the driving wheels through a service of intermediaries called .....  
(Transmission, power trains, reduction)

### Short questions

1. Write down the difference and similarities between two and four stroke engines?
2. What is meant by master clutch?
3. What are the main parts of an engine?
4. Describe with a sketch the system of transmission of power in modern tractor.
5. What are the functions of power Tiller?

## UNIT III

### Multiple Choice Questions

1. .... is suitable for spraying of tall coconut trees.  
(Rocker sprayer, Knapsack, Bucket type)
2. For general ploughing in dry lands shoes are made of ..... cross section.  
(flat, triangular, square)
3. .... irrigation is commonly seen in Kuttanad.  
(Surface, sub surface, Drip)

4. .... is used for breaking the clods and smoothening the field.  
(Harrows, cultivators, shovels)
5. .... ploughs are favoured in areas where the climate is dry and soil is rough and stony.  
(Disk, mould board, indigenous)

### **Short questions**

1. Different methods of sowing.
2. With neat sketch show different types of cultivating tools used on cultivators.
3. What are the parts of a mould board plough?
4. What are the functions of seed drill?
5. Explain the working of a rockeer sprayer used in agriculture.

## **UNIT IV**

### **Multiple Choice Questions**

1. Water wheel is a ..... head water lifting device.  
(low, medium, high)
2. In a centrifugal pump the rotary element is known as .....  
(rotor, impeller, stator)
3. Animal operated implement, ..... used for lifting water from 7 to 12m height.  
(Persian wheel, rope & bucket lift, swing basket)
4. .... pump develops high head as compared to a centrifugal pump.  
(reciprocating pump, jet, turbine)
5. .... irrigation is commonly seen in Kuttanad.  
(Surface, sub surface, drip)

### **Short Questions**

1. What are the advantages and disadvantages of drip irrigation?
2. What are the important points to be noted in selecting a motor for any particular job?
3. Name different types of irrigation systems?
4. Explain animal powered water lifting devices.
5. With a neat sketch explain the working of a centrifugal pump.

**PRACTICAL ACTIVITIES**  
**MECHANICAL SERVICING (AGRO MACHINERY)**

**Unit 1    Workshop Technology**

**Module 1 Measuring Instrument**

1. Least count calculation of vernies caliper
2. Least count calculation of Micrometer.
3. Finding the gap of spark plug using feeler gauge
4. Study on different types of gauges and then usage.

**Module 2 Wood working principles.**

1. Planning operations in wood
2. Making a Tee Joint
3. Making a cross halve Joint

**Module 3 Sheet metal work**

1. Study of sheet metal Tools and their usage.
2. Cutting practice
3. Filing practice
4. Bending practice
5. Lap and Butt Joint preparation
6. Tray making
7. Box making

**Module 4 Smithing and Forging**

1. Operation of forge
2. Anealing operation in a rod
3. Hardening operation
4. Making a square bar out of a round rod.

**Module 5 Fitting and other allied processes**

1. Different types of filing methods
2. Cutting practice
3. Marking and filing practice
4. V Joint
5. Tea Joint

## **Module 6 Welding**

1. Arc welding operations
2. Gas welding operations
3. Soldering practice
4. Brazing practice

## **Module 7 Different aspects of moulding**

1. Sand preparations
2. Mould making

## **Unit 2 Farm Engines**

### **Module 1 Oil Engines**

1. Dismantling and assembling of diesel engine
2. Dismantling and assembling of a four-stroke petrol engine.
3. Dismantling and assembling of two stroke petrol engine
4. Valve Timing.

### **Module 2 Farm Tractors**

1. Maintenance and service of tractors
2. Dismantling and assembling of clutch.
3. Dismantling and assembling of gearboxes.
4. Dismantling and assembling of differential.
5. Driving practice - Tractors

### **Module 3 Power Tillers**

1. Maintenance and servicing of Power tillers.
2. Servicing of clutch
3. Dismantling and assembling of Mechanical Brake (trailer)
4. Dismantling and assembling of tillage blades.
5. Driving practice.

## **Unit 3 Farm Equipments**

### **Module 1 Seed bed preparation Machinery**

1. Dismantling and assembling of hand tools

2. Working and assembling of indigenous plough
3. Dismantling and assembling of Disc plough
4. Dismantling and assembling of mould board plough.
5. Dismantling assembling of cultivators.

### **Module 2 Planting Equipment**

1. Servicing and maintenance of seed Drill
2. Sawing practice.

### **Module 3 Plant protection Machinery**

1. Maintenance and servicing of sprayers?
2. Maintenance of servicing of Dusters
3. Dismantling and assembling of Rocker sprayers
4. Dismantling and assembling of knapsack sprayer
5. Dismantling and assembling of plunger type duster.

## **Unit 4 Irrigation Equipment**

### **Module 1 Water Resources and their Utilization**

1. Study of various components of earth dam and Masonery dam.

### **Module 2 Measurement Conveyance and control**

1. Measurement of water by orifice meter - close flow
2. Measurement of water - open channel.

### **Module 3 Water Life and Pumps for Irrigation**

1. Maintenance and servicing of Reciprocating pump
2. Dismantling and assembling of Reciprocating pump
3. Maintenance and servicing of centrifugal pump
4. Dismantling and assembling of centrifugal pump
5. Maintenance an servicing of Turbine pump
6. Dismantling and assembling of Turbine pump

### **Module 4 Irrigation Method**

1. Maintenance and servicing of Drip irrigation
2. Maintenance and servicing of sprinkler irrigation