

FMPE 505 : Design of Farm Machinery–I 2+1**Objectives:**

To understand the interaction of tillage tools with soil and design the components of the tillage tools based on their requirement and also to learn how the systems of planting machinery are designed.

Unit-I

Farm machinery design: Modern trends, tasks and requirements, economic considerations of durability, reliability and rigidity. Physico-mechanical properties of soils. Technological process of ploughing. Wedge. Working process of mould board plough, determination of basic parameters. Design of coulter, shares, mould boards.

Unit-II

Constructing of mould board working surface. Design of landside, frog, jointer. Forces acting on plough bottom and their effect on plough balance: Trailed, semi mounted and mounted plough. Draft on ploughs, resistance during ploughing. Design disk ploughs: Concave disk working tools, forces acting.

Unit-III

Machines and implements for surface and inter row tillage: Peg toothed harrow, disk harrows, rotary hoes, graders, rollers, cultivators. Design of V shaped sweeps. Rigidity of working tools. Rotary machines: Trajectory of motion of rotary tiller tynes, forces acting, power requirement. Machines with working tools executing an oscillatory motion.

Unit-IV

Methods of sowing and planting: Machines, agronomic specifications. Sowing inter-tilled crop. Grain hoppers: Seed metering mechanism, furrow openers and seed tubes. Machines for fertilizer application: Discs type broadcasters. Organic fertilizer application: Properties of organic manure, spreading machines. Liquid fertilizer distributors. Planting and transplanting: Paddy transplanters, potato planters.

Practical:

Design of mould board working surface: Coulter, frog, share, jointer, mould board plough. Trailed, semi mounted and mounted ploughs. Design of disc plough, disc harrow, peg tooth harrow, cultivators, sweeps. Design of rotary tiller. Design of traction and transport devices. Design of seed drills: Metering mechanism, hopper, furrow opener. Fertilizer spreader, liquid fertilizer applicators and design of its sub systems. Design of paddy transplanters and potato planters.

Course Outcome:

The student will be able to appreciate the principles behind the design of tillage tools and planting machinery. He will be able to arrive at design configurations for such machines.

Teaching Schedule

S.No.	Topic	No of Lectures
1.	Farm machinery design: Modern trends, tasks and requirements, economic considerations of durability, reliability and rigidity.	3
2.	Farm machinery design: economic considerations of durability, reliability and rigidity.	2
3.	Physio-mechanical properties of soils.	1

4.	Technological process of ploughing. Wedge. Working process of mould board plough, determination of basic parameters.	2
5.	Design of coulters, shares, mould boards.	2
6.	Constructing of mould board working surface.	1
7.	Design of landside, frog, jointer.	1
8.	Forces acting on plough bottom and their effect on plough balance: Trailed, semi mounted and mounted plough. Draft on ploughs, resistance during ploughing.	2
9.	Design disk ploughs: Concave disk working tools, forces acting.	2
10.	Machines and implements for surface and inter row tillage: Peg toothed harrow, disk harrows, rotary hoes, graders, rollers, cultivators.	2
11.	Design of V shaped sweeps. Rigidity of working tools.	1
12.	Rotary machines: Trajectory of motion of rotary tiller tynes, forces acting, power requirement.	2
13.	Machines with working tools executing an oscillatory motion.	2
14.	Methods of sowing and planting: Machines' agronomic specifications. Sowing inter-tilled crop, Grain hoppers Seed metering mechanism, Furrow openers and seed tubes.	2
15.	Machines for fertilizer application: Discs type broadcasters.	1
16.	Organic fertilizer application: Properties of organic manure spreading machines. Liquid fertilizer distributors.	2
17.	Planting and transplanting: Paddy transplanters, potato planters.	2
18.	Case studies	2
	Total	32

List of Practicals

S.No.	Topic	No of practicals
1.	Design of mould board: Coulter, frog, share	1
2.	Design of mould board: mould board plough working surface, jointer.	1

3.	Trailed, semi mounted and mounted ploughs.	1
4.	Design of disc plough	2
5.	Design of disc harrow	1
6.	Design of peg tooth harrow	1
7.	Design of cultivators and sweep.	1
8.	Design of rotary tiller.	1
9.	Design of traction and transport devices.	1
10.	Design of seed drills: Metering mechanisms	1
11.	Design of seed drills: hopper and furrow opener.	1
12.	Design of Fertilizer application equipment: fertilizer spreaders	1
13.	Design of Fertilizer application equipment: Liquid fertilizer applicators and design of its sub systems	1
14.	Design of paddy transplanters	1
15.	Design of potato planters.	1
	Total	16

Suggested Reading :

1. Bosoi, E S, Verniaev O V, Smirnov II and Sultan-Shakh E G 1990. *Theory, Construction and Calculations of Agricultural Machinery* - Vol. I. Oxonian Press Pvt. Ltd. No.56, Connaught Circle, New Delhi.
2. Gill R and Vanden Berg G E 2013. *Soil Dynamics in Tillage and Traction*. Scientific Publishers(India) ISBN-10: 8172338031
3. Bernacki C, Haman J. and Kanafajski Cz.1972. *Agricultural Machines Theory and Construction. Vol.I*. U.S. Dept. of Commerce, National Technical Information Service, Springfield, Virginia 22151.
4. Yatsuk E P 198.1 *Rotary Soil Working Machines Construction, Calculation and Design*. American Publishing Co. Pvt. Ltd, New Delhi.