Semester	**:**	**III**		
Course No.	**:**	**FMPE-233**	**Credit Hrs.** **:**	**3(2+1)**
Course Title	**:**	**Farm Machinery and Equipment-I**		

SYLLABUS

Objectives : To make the students acquainted with the basic construction and operational features of different farm machineries used in operations such as seed-bed preparation, sowing, planting and transplanting, etc. and their economics of operation.

THEORY

Introduction to Farm Mechanization; Classification of farm machines; Unit operations in crop production; Identification and selection of machines for various operations on the farm.

Materials used in construction of farm machines; Heat treatment processes and their use in farm machines; Properties of materials used for critical and functional components of agricultural machines; Different types of steels and alloys for agricultural applications; Identification of heat treatment processes specially for the agricultural machinery components.

Seed-bed preparation and its classification; Land reclamation and earth moving equipment; Machines used for primary tillage, secondary tillage, rotary tillage, deep tillage and minimum tillage, viz., mould-board plough, disc plough, chisel plough, sub-soiler, harrows, puddler, cultivators, identification of their major functional components; Attachments with tillage machinery; Hitching systems and controls.

Calculation of field capacities and field efficiency; Draft of tillage tools and calculations for power requirement for the tillage machines; Calculation for economics of machinery usage; Comparison of ownership with hiring of machines.

Sowing, planting and transplanting equipment, viz. seed drills, no-till drills, strip-till drills, different types of planters, bed-planters; Planting equipment for crops like sugarcane, potato; Furrow openers and metering systems in drills and planters; Calibration of seed-drills/ planters; Adjustments during operation. Testing and Evaluation of tillage and sowing equipment and their test codes.

PRACTICAL

Familiarization with different farm implements and tools; Study of hitching systems; Study on draft measurement; Study of different problems on machinery management.; Study of primary tillage machinery- types, construction, operation, adjustments and calculations of power and draft requirements; Study of secondary tillage machinery- types, construction, operation, adjustments and calculations of power and draft requirements; Study of different types of puddlers and determination of puddling index in the field; Study of sowing and planting equipment- construction, types, calculation for calibration and adjustments; Study of seed drill and its calibration; Study of different types of metering mechanisms used in seed drills and planters; Study of paddy transplanters; Study of various pre-germinated paddy seeder; Study of vegetable transplanters; Identification of materials of construction in agricultural machinery and study of material properties; Testing and Evaluation of tillage and sowing equipment; Visit to a site to observe field operations of paddy transplanters; Visit to an implement manufacturing unit.

TEACHING SCHEDULE

THEORY [FMPE-233]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1 - 3	Farm Mechanization and Selection of Farm Machinery	Introduction to Farm Mechanization; Classification of farm machines; Unit operations in crop production; Identification and selection of machines for various operations on the farm.	10
4 - 7	Construction of Farm Machinery	Materials used in construction of farm machines; Heat treatment processes and their use in farm machines; Properties of materials used for critical and functional components of agricultural machines; Different types of steels and alloys for agricultural applications; Identification of heat treatment processes specially for the agricultural machinery components.	10
8 - 9	Seed-bed Preparation	Seed-bed preparation and its Classification; Land reclamation and earth moving equipment;	10
10 - 14	Tillage Equipment	Machines used for primary tillage, secondary tillage, rotary tillage, deep tillage and minimum tillage viz., mould-board plough, disc plough, chisel plough, sub-soiler, harrows, puddler, cultivators, Identification of their major functional components.	15
15 - 16	Hitching System	Attachments with Tillage machinery; Hitching systems and controls.	5
17 - 20	Performance Parameters and Cost Economics	Calculation of field capacities and field efficiency; Draft of tillage tools and calculations for power requirement for the tillage machines; Calculation for economics of machinery usage; Comparison of ownership with hiring of machines.	10
21 - 25	Sowing and Planting Equipment	Sowing and Planting Equipments viz., Seed drills, no-till drills, strip-till drills, different types of planters, bed-planters; Planting equipment for crops like sugarcane, potato; Furrow openers and metering systems in drills and planters.	20

Continued…

26	Calibration of Seed-drills	Calibration of seed-drills/ planters; Adjustments during operation.	5
27 - 28	Transplanting Equipment	Paddy, vegetables and other transplanters.	5
29 - 32	Testing and Evaluation of Agricultural Equipment	Testing and Evaluation of tillage and sowing equipment and their test codes.	10
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [FMPE-233]

Exercise No.	Exercise Title
1	Study of hitching systems
2	Study of draft measurement of agricultural machinery
3	Study of different problems on machinery management
4 - 5	Study of primary tillage machinery- Types, construction, operation, adjustments and calculations of power and draft requirements
6 - 7	Study of secondary tillage machinery- Types, construction, operation, adjustments and calculations of power and draft requirements
8	Study of different types of puddlers and determination of puddling index in the field.
9	Study of Sowing and planting equipments: Construction, metering mechanism and adjustments
10	Study of calibration of seed drills and planters
11	Study of paddy transplanters and various pre-germinated paddy seeder
12	Study of vegetable transplanters
13	Identification of materials of construction in agricultural machinery and study of material properties
14	Testing and Evaluation of tillage and sowing equipment
15	Visit to a site to observe field operations of transplanters
16	Visit to an Implement Manufacturing Unit

Suggested Readings [FMPE-233]:

1. Jain, S.C. and Phillips, G. 2003. Farm Machinery - An Approach. Standard Publishers and Distributors.
2. Kepner, R. A., Bainer, R. and Barger, E. L. 2005. Principles of Farm Machinery. CBS Publishers and Distributors.
3. Lal Radhey and Datta, A.C. 1978. Agricultural Engineering through Worked Out Examples. Saroj Prakashan, Allahabad.
4. Nakra, C.P. 2003. Farm Machines and Equipment. Dhanpat Rai and Publishing Co.
5. Smith, H.P. and Wilkes, L.H. 2011. Farm Machinery and Equipment. McGraw Hill Publication, New York.
6. Srivastav, A.K., Goering, C.E. and Rohrbach, R.P. 2005. Engineering Principles of Agricultural Machines. ASAE. St. Joseph, Mich.
7. Srivastava, A.C. 1991. Elements of Farm Machinery. Oxford and IBH Publication.
8. Srivastava, T.K. 2007. A Work Book on Practical Farm Machinery. Vol. I and II. Saroj Prakashan, Allahabad
9. Suresh, R. and Kumar, S. 2018. Farm Power and Machinery Engineering. Standard Publishers.