Semester	**:**	**IV**		
Course No.	**:**	**FMPE-244**	**Credit Hrs.** **:**	**3(2+1)**
Course Title	**:**	**Farm Machinery and Equipment-II**		

SYLLABUS

Objectives : To make the students acquainted with the basic construction and operational features and economics of operation of different farm machineries used in operations such as weeding, harvesting, etc., including operations done by combines etc.

THEORY

Plant protection equipment: Different types of sprayers and dusters; Classification of sprayers and sprays; Types of nozzles; Calculations for calibration of sprayers and chemical application rates;

Introduction to intercultural equipment; Weeders- different types of manual and powered weeders; Functional requirements of weeders and main components; Different types of fertilizer application methods and equipment.

Harvesting of crops: Harvesting methods, harvesting terminology; Mowers- types, constructional details, working and adjustments; Shear type harvesting devices- cutter bar, inertia forces, counter balancing, terminology, cutting pattern; Reapers, binders and windrowers- principle of operation and constructional details; Hay conditioning, importance, methods of hay conditioning, and calculation of moisture content of hay.

Threshing: manual and mechanical systems; Types of threshing drums and their applications; Types of threshers- tangential and axial, constructional details and cleaning systems; Factors affecting thresher performance; Grain combines- combine terminology and features, classification of grain combines, study of material flow in combines; Computation of combine losses; Combine troubles and troubleshooting; Chaff cutters- working principle, constructional features and capacity calculations; Straw combines- working principle and constructional details.

Root crop diggers: Principles of operation, functional components, blade adjustment and approach angle, calculation of material handled; Potato and groundnut diggers; Cotton harvesting: cotton harvesting mechanisms, cotton pickers and strippers; Maize harvesting combines; Vegetables and fruit harvesting equipment and tools.

Testing and Evaluation of intercultural, plant protection and harvesting machinery and their test codes.

PRACTICAL

Familiarization with plant protection and interculture equipment; Study of sprayers types, functional components, calibration; Study of dusters- types and functional components; Calculations for chemical application rates; Study of nozzle types and spread pattern using patternator; Familiarization with manual and powered weeding equipment and identification of functional components; Study of fertilizer application equipment including manure spreaders and fertilizer broadcasters; Study of various types of mowers, reaper, reaper binder; Study of functional components of mowers and reapers; Study of threshing systems, cleaning systems in threshers, calculations of losses in threshers; Study of functional units of grain combines and their types, calculations for grain losses in a combine; Study of root crop diggers and familiarization with the functional units and attachments; Study of the working of cotton and maize harvesters; Study of different vegetable and fruit harvesters; Testing and evaluation of intercultural, plant protection and harvesting machinery; Visit to field showing operations various machines; Visit to implement manufacturing unit.

TEACHING SCHEDULE

THEORY [FMPE-244]

Lecture No.	Topic	Subtopics/ Key Points	Weightage (%)
1 - 5	**Plant Protection Equipment**	Different types of sprayers and dusters; Classification of sprayers and sprays; Types of nozzles; Calculations for calibration of sprayers and chemical application rates.	15
6 - 9	**Inter-culture Equipment**	Weeders- Different types of manual and powered weeders; Functional requirements of weeders and main components; Different types of fertilizer application methods and equipment	15
10 - 13	**Harvesting Equipment**	Harvesting methods, Harvesting Terminology; Mowers - Types, Constructional details, Working and Adjustments; Shear type harvesting devices- Cutter bar, Inertia forces, Counter balancing, Terminology, Cutting pattern; Reapers, Binders and Windrowers- Principle of operation and Constructional details.	15
14	**Hay Preparation**	Hay conditioning, Importance, Methods of hay conditioning, and Calculation of moisture content of hay.	3
15 - 20	**Threshing Equipment**	Threshing: Manual and Mechanical systems; Types of threshing drums and their applications; Types of threshers- Tangential and Axial, Constructional details and Cleaning systems; Factors affecting thresher performance.	18
21 - 23	**Grain Combines**	Combine Terminology and Features, Classification of grain combines, Study of material flow in combines; Computation of combine losses; Combine troubles and troubleshooting; Straw Combines - Working principle and Constructional details.	10
24	**Chaff Cutters**	Chaff Cutters- Working principle, Constructional features and Capacity calculations;	3
25 - 26	**Root Crop Diggers**	Principles of operation, Functional components, Blade adjustment and approach angle, Calculation of material handled, Potato and Groundnut diggers	5
27 - 28	**Other Harvesting Equipment/Tools**	Cotton Harvesting: Cotton harvesting mechanisms, Cotton pickers and strippers; Maize harvesting combines; Vegetables and fruit harvesting equipment and tools.	6
29 - 32	**Equipment Testing and Evaluation**	Testing and Evaluation of intercultural, plant protection and harvesting machinery and their test codes.	10
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [FMPE-244]

Exercise No.	Exercise Title
1	Familiarization with plant protection equipment, Study of different types of sprayers. functional components, calculations for chemical application rates and calibration.
2	Study of various types of dusters and functional components.
3	Study of manual and powered weeding equipment and functional components.
4	Study of fertilizer application equipment.
5	Study of various types of mowers and reapers and reaper binder, functional components of mowers and reapers.
6-7	Study of different types of threshers, cleaning systems in threshers, calculations of losses in threshers.
8-9	Study of functional units of grain combines and their types, calculations for grain losses in a combine.
10	Study of root crop diggers and familiarization with the functional units and attachments.
11	Study of the working of cotton and maize harvesters.
12	Study of different vegetable and fruit harvesters.
13	Testing and evaluation of intercultural and harvesting machinery.
14	Testing and evaluation of plant protection equipment, study of nozzle types and spread pattern using patternator.
15	Visit to field showing operations various machines.
16	Visit to implement manufacturing unit.

Suggested Readings [FMPE-244]:

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.