

DEPARTMENT OF AGRICULTURAL ENGINEERING

AENG 152

Credits 2(1 + 1)

FARM EQUIPMENT MACHINERY AND FARM MECHANIZATION

Theory

Importance of farm mechanization - Sources of Farm power, I.C. engines - working principles, four stroke and two stroke engines, terminology and problems connected with engine power, different systems of I.C. engines. Tractors - Types, selection of tractors and power tillers. Tillage implements - Primary and secondary tillage implements, M.B. plough, disc plough, harrows, cultivators. Puddlers and rotavators. Implements for intercultural operations. Seed drills - calibration and related problems, paddy transplanter. Plant protection equipment. Cost of operation of tractors, power requirements for operating various tractor drawn implements. Equipment for land development and soil conservation. Harvesting equipment - Sickles. Mowers power tiller / tractor operated and combines.

Practicals

1. Study of different components of I.C. engine
2. Study the principle and working of 4 stroke petrol engine
3. Study the principle and working of 2 stroke petrol engine
4. Study the principle and working of 4 stroke diesel engine
5. Study of indigenous plough, M.B. plough - measurements of plough
6. Study of disc plough
7. Study of seed drills and sowing equipment
8. Study and maintenance of tractors
- 9 & 10. Tractor driving
11. Study and operation of power tillers
12. Study of intercultivation equipment
13. Operation and maintenance of sprayer
14. Operation and maintenance of dusters
15. Study of paddy transplanting equipment
16. Study and operation of mowers

References

1. Farm machinery and equipment Nakra C P 1970. Dhanpat Rai and Sons, New Delhi

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|----|---|--|
| 2. | Elements of Agricultural Engineering | Jagadishwar Sahay 1992. Agro Book Agency, Patna |
| 3. | Principles of Agricultural Engineering, Vol.I | Michal A M and Ojha T P 1998. Jain Brothers, New Delhi |
| 4. | Basic farm machinery | Shippen J M and Turner J C Robert 1976. Maxwell M C Pergamon Press, Oxford. New York, Sydney. Paris, Toronto |

AENG 252

Credits 2(1 + 1)

IRRIGATION ENGINEERING

Theory

Surveying - definition, objectives, equipment used in chain survey, calculation of area. Leveling - leveling equipment, terminology, calculation of reduced levels, types of leveling. Irrigation - definition, advantages and disadvantages, sources of irrigation water, classification. Irrigation projects, flow irrigation and lift irrigation.

Water lifting devices - pumps (shallow well and deep well), their Characteristics, installation constructional features. Selection of pumps, calculation of capacity, horse power and trouble shooting in pumps.

Irrigation water measurement - by direct and indirect methods, instruments and devices used for measurement of irrigation water.

Water conveyance systems - open channel and underground pipelines. Calculation of carrying capacity of open channels and underground water pipelines.

Irrigation methods - drip and sprinkler systems, components, their layout, installation and - Calculation of water requirements.

Use of plastics in water management.

Practicals

1. Acquaintance with chain survey equipment
2. Chain triangulation
3. Cross staff survey
4. Plotting of chain triangulation
5. Plotting of cross staff survey
6. Calculation of area of regular and irregular fields

7. Leveling equipment
8. Differential leveling
9. Profile leveling
10. Calculation of reduced levels
11. Plotting of Profile leveling Study of centrifugal pumps
12. Study of centrifugal pumps
13. Measurement of irrigation water by Weirs, Orifices and Flumes
14. Study of different components of sprinkler irrigation systems
15. Study of different components of drip irrigation systems
16. Uniformity of water application in drip and sprinkler systems

References

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|---|---|---|
| 1 | Surveying and Leveling Vol. 1 | Kanetkar T P and Kulkarni S V 1981. Vidyarthi Griha Prakasan, Pune |
| 2 | Land and Water Management Engineering | Murthy V V N 1982. Kalyani Publishers, New Delhi |
| 3 | Irrigation Theory and Practice | Michael A M 1989. Vikas Publishing House Private Limited, New Delhi |
| 4 | Principles of Agricultural Engineering -Vol II. | Michael A M and Ojha T P 1998. Jain Brothers, New Delhi |

AENG 253

Credits 2(1+ 1)

PROCESSING EQUIPMENT OF AGRICULTURAL PRODUCE

Theory

Threshing - threshers for paddy crop, components, terminology, care and maintenance. Threshing of red gram, green gram and black gram. Threshing of maize, jowar, pearl millet, oats - traditional methods - mechanical threshers - components - materials, working efficiencies precautions and care. Winnowing - manual and power operated winnowers, cleaning and grading. Groundnut decorticators, hand operated and power operated. Castor, sunflower and mustard shellers - manual and power operated. Extraction of oil - care and maintenance.

Ginning of cotton - types - working principles. Processing of jute - balling machines for berseem, sunhemp, styles, napier etc, sugarcane crushers - jaggery making.

Milling of cereals and pulses - paddy, jowar, bajra, redgram, greengram, blackgram, sovabean. bengalgram etc..

Practicals

1. Study of paddy threshers
2. Study of Millet threshers, multi crop thresher
3. Study of pulses threshers
4. Study of winnowing machines
5. Study of groundnut decorticator
6. Study of castor shellers
7. Study of sugarcane crushers
- 8 &9. Study of ginning machines and balers
- 10&11. Study of paddy milling machines
- 12&13. Study of pulses milling machines
14. Study of chaff cutter and fodder cutting machines
15. Visit to local processing units

References

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|---|--|---|
| 1 | Post Harvest. Technology of cereals and pulses | Chakraborty A and De D S 1981 .
Oxford & IBH Publishing Company, New Delhi |
| 2 | Elements of Agricultural Engineering | Jagadishwar Sahay 1992. Agro Book Agency, Patna |
| 3 | Agricultural Process Engineering | Henderson S M and Peray 1993. |
| 4 | Rice Post Harvest Technology | Arande E V Pepadua P B and Goswamy 1985. |

AENG 352

Credits 2(1 + 1)

PROCESSING EQUIPMENT FOR HORTICULTURAL PRODUCE

Theory

Cleaning and grading of fruits and vegetables - methods of cleaning in soaking and rinsing. Cleaning and washing, wet and dry brushing. chemical washing. Sorting and grading of fruits and vegetables - grading standards. principles of sorting and grading, grading equipment and their working. Size reduction of fruits and vegetables - methods, pitting, coring, peeling, trimming, slicing and dicing,

shredding. Drying of fruits and vegetables - hot air drylig, fluidised bed dryer, pneumatic dryer, spray dryer and solar dryer. Evappration of juices of fruits & vegetables. Applications, types of evaporation equipment. Canning and packing - types of containers, fabrication of sanitary cans. preparatory treatment for canning. Cold storage of fruits and vegetables. Material handling and transportation equipment - types of conveyors belt conveyor, pneumatic conveyor, bucket elevator, screw conveyor. Agricultural waste and byproduct utilization - utilization of paddy husk, paddy straw, coconut shells, cotton stalks, groundnut shells. Processing of medicinal and aromatic plants. Processing of spices and condiments.

Practicals

- 1 & 2. Study of cleaning and grading equipment
3. Study of drying equipment
4. Study of belt conveyors
- 5 & 6. Study of pulp and juice extraction machinery
7. Study of size reduction equipment for fruits and vegetables
8. Study of evaporators
- 9 & 10. Visit to fruit and vegetable processing plants
11. Study of canning and packing machinery
- 12 & 13. Study of distillation units, medicinal and aromatic plant
14. Study of processing of spices and condiments
15. Study and visit to cold storage
16. Practical Examination

References

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|---|---|--|
| 1 | Agricultural Process Engineering | Henderson S M and Peray 1993. |
| 2 | Unit Operations of Agricultural Processing | Sahay K M and Singh K K 1998. |
| 3 | Food Engineering Operations | Brennian J G Betters J R 1965. Couwell N D and Lilly A E V |
| 4 | Agricultuml Waste and Bi-product utilisation in India Maheswari | Maheswari RC & Ojha TP 1993. Jain brothers, New Delhi |

GREENHOUSE TECHNOLOGY

Engineering

Theory

Greenhouse effect and factors effecting the plant growths and development such as temperature, light, moisture, CO₂ and RH in response to green house environment. Solar energy in greenhouse - importance, effect of greenhouse environment on plant parameters, Design criteria of greenhouse for cooling and heating purposes. Study of greenhouse equipments, misting, fogging, air circulation and fertigation systems. Materials of construction for traditional, high cost (high-tech) and low cost greenhouses, their cost estimation and economic analysis. Low tunnels, Poly tunnels and shade nets and their' application. Hydroponics - their arrangement. Different systems of irrigation followed in greenhouse. Light and CO₂ management inside the greenhouse. Harvesting and post-harvesting handling equipment and cold chain.

Horticulture

Theory

Introduction to greenhouses (protected agriculture), definition, history of greenhouses, uses of greenhouses, export and import of greenhouse horticultural products. Area covered under greenhouses, its status and development, constraints, research needs and future of protected culture of horticultural crops in India and A.P.

Points to be considered while selecting the site for greenhouse. Classification and characteristics of different growing media and their pasteurization. Suitability of water for growing greenhouse crops.

Commercial production of rose, carnation, chrysanthemum, gerbera, anthurium, tomato, cucumber, lettuce and capsicum in greenhouses. Harvesting and post harvest handling of greenhouse flower and vegetable crops.

Protection of nursery plants through seedlings and other methods. Maintenance of stock plants for nursery production in greenhouses. International standards for different horticultural commodities. Export and import codes and procedures for license in India.

Practicals

1& 2. Equipments used for measurement of light intensity, temperature, Relative

- humidity and CO₂ inside and outside the greenhouse at different ventilation positions and their maintenance
3. Measurement of wind velocity and Relative humidity of the outgoing air through exhaust fan in pad and fan cooling system
 4. Study of different types of greenhouse construction materials and study of different shapes and designs of greenhouses
 5. Study of heating and cooling equipment and estimation of cooling efficiency of greenhouse
- 6& 7. Visit to greenhouses
8. Fabrication of a greenhouse structure
 9. Preparation of growing media and sterilization for some important greenhouse crops
 10. Scheduling of fertigation (calculation of nutrient concentration treatments) to flower crops
 11. Management of pH and EC at desired levels in soil and fertigation water
 12. Practicing training and pruning in rise and deshooting and dosbudding in chrysanthemum and carnation
 13. Practicing, training and pruning in tomato, chilli and cucumber
 14. Harvesting and postharvest handling of greenhouse crops
- 15& 16. Visit to commercial greenhouses

References

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|---|---|---|
| 1 | The Complete Book of Greenhouse Gardening | Cavendish M 1974. Marshal Cavendish Books, London |
| 2 | Greenhouse management for flowers and Plant Production. | Kennard S Nelson B A 1977. International Printers and Publishers Incorporated, Illinois |
| 3 | Solar Energy and its Utilisation | Rai G D 1995. Khanna Publishers, New Delhi |

Horticulture

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|---|---------------------------|---|
| 4 | Progressive Floriculture | Yadav I S and Choudhary M L 1997. The House of Sarpan (Media) Incorporated. |
| 5 | Commercial flower forcing | Alex Laurie B Kiplinger D C and Nelson K S |

		1979. McGraw Hill Company, New York
6	Greenhouse Operation and Management	Nelson PV 1991. Ball Publishing, USA
	Introduction of Floriculture	Larson RA Academic Press, New York

** Jointly offered by Agricultural Engineering and Horticulture Department.*