

B.TECH. (AGRICULTURAL ENGINEERING): V SEMESTER SYLLABUS

5 AG 1 : FARM MACHINERY AND EQUIPMENT – II

Cr. Hrs. 3 (3 + 0)
L T
Credit 3 0
Hours 3 0

Unit-I

Principles and types of cutting mechanisms. Harvesting equipment, Mowers – types of mowers (reciprocating and rotary); cutter bar, mowers parts, construction operation and adjustments. Accelerating forces on reciprocating parts and numerical problems. Attachments to the cutter bar, trouble shooting, cutting pattern of reciprocating knife. Simple numerical problems on mowers.

Unit-II

Forage Chopping and Handling: Types of field forage harvesters and choppers, part and construction, details of forage choppers, Attachments, maintenance, trouble shooting. Numerical problems on forage choppers

Unit-III

Introduction of Grain harvesting. Types and different functional units of combine. Operation, adjustment and different losses. Numerical problems on losses. Introduction to straw combine. VCR :Parts and working.

Unit-IV

Principles of threshing and various types of threshers. Maize harvesting and shelling equipment, Introduction to plot combines and plot threshers.

Unit-V

Root crop harvesting equipment – potato. Horticultural tools: hand tools and posthole digger. Testing procedure for thresher and combine by using BIS Test codes. Introduction to Laser land leveller.

Text Books\References

1. Bainer, R. Barger, E.L. and R.A. Kepner. (1997). Principle of Farm Machinery. John Wiley & Sons, inc, New York.
2. A.C. Shrivastava. et al. Principle of Farm Machinery, ASAE publications.
3. H.P. Smith. (1977). Farm Power and Equipment, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi
4. FAO, Bulletin. (1977). Elements of Agricultural Machinery, volume II.
5. O.P. Singhal. Elements of Agricultural Engineering, Part I and II. Saroj Prakashan, Allahbad.
6. Singh, S. Principles of Farm Machinery. DIPA, ICAR, KAB -I, New Delhi.
7. Singh, S. and Verma, S.R. Farm Machinery Maintenance and Management. DIPA, ICAR, KAB -I, New Delhi.

5 AG2 : CONSTRUCTION TECHNOLOGY

Cr. Hrs. 3 (3 + 0)

	L	T
Credit	3	0
Hours	3	0

(A) CONSTRUCTION TECHNOLOGY

Unit-I

Components of a building and their function.

Foundation: Function, shallow and pile foundation. Causes of failure and remedial measures.

Masonry Construction: English bond and Flemish bond for one bricks thick wall.

Stone Masonry: Types of stone masonry, Essentials of good stone masonry.

Unit-II

Concept in Concrete Technology and test on concrete.

Load Carrying Floors: Types, stone patti, timber and R.C.C. floors.

Floor Finishing: Lime, Cement concrete, terrazzo, marble and P.V.C. tiles, details of construction.

Unit-III

Roofs: Simple roof trusses, king post roof truss, queen post roof truss.

Earthquake Disaster Management: Introduction, causes of earthquake, their intensities, its effect, safety measures and precautions to face earthquake problem.

(B) ESTIMATING COSTING

Unit-IV

Object, Main item of works, the unit of measurement for various item of works & materials.

Various methods of building estimate i.e. long wall-short wall methods & centre line method for one & two room building.

Unit-V

Organization of Engineering Department: General discussion of P.W.D. accounting & procedure of works classification of work. Contract & contact document. Tender Notice- how to invite tender notice. Opening of tender & various conditions to accept it. Running & Final bill, Earnest money, Security money & measurement book.

Valuation: Purpose of valuation, Outgoings, Scrap value, Salvage value, Market value, Book value, annuity capitalized value, Methods of calculating depreciation, Sinking fund depreciation, Valuation of building.

Text Books/References

1. S.P. Arora and Bindra. Building Construction. Dhanpat Rai & Sons, New Delhi
2. S.N. Awaasthy. Building Construction, Publishing House, Bhopal.
3. B.N. Datta. (1994). Estimating & Costing in Civil Engineering, Theory & Practice, Publishing Distributors Ltd., New Dehli.

5 AG 3 : REFRIGERATION AND AIR CONDITIONING

Cr. Hrs. 3(3 + 0)
L T
Credit 3 0
Hours 3 0

Unit-I

Introduction: Second law of thermodynamics applied to refrigeration. Reversed Carnot cycle, coefficient of performance. Unit of refrigeration.

Vapour Compression System: Theoretical vapour compression cycle. Deviation of actual cycle from ideal cycle, undercooling, dry and wet compression. Compressors, expansion valves, evaporators and condensers.

Unit-II

Vapour Absorption System: Vapour absorption refrigeration system and components.

Refrigerants: Desirable properties of ideal refrigerant. Classification of refrigerants. Important refrigerants like ammonia, Freons. Secondary refrigerants like water and brine.

Unit-III

Psychrometry: Thermodynamic properties of moist air, perfect gas relationship for approximate calculation. Adiabatic saturation process. Wet bulb temperature and its measurement. Psychrometric chart and its use. Elementary psychrometric processes

Unit-IV

Air Conditioning: Types of air conditioning systems, concept of thermal comfort. Basics of air-conditioning load estimation and space air distribution.

Unit-V

Cooling and Dehumidification: Chilled water spray, surface cooling and dehumidification, sensible cooling with dry coils, direct expansion wet coils. Evaporative cooling. Design of cold storage for perishable products using sensible and latent cooling loads, electrical appliances load, respiration load.

Text Books/References

1. S. Domkundwar and S.C. Arora. Refrigeration and Air Conditioning, Dhapat Rai & Sons, Delhi.
2. J.L. Threlkeld. Thermal Environmental Engineering, Prentice Hall.

5 AG 4 : WELLS AND PUMPS

Cr. Hrs. 3(3 + 0)
L T
Credit 3 0
Hours 3 0

Unit-I

Occurrence and movement of ground water, aquifer and its types, classification of wells, steady and transient flow into partially, fully and non-penetrating and open wells, familiarization of various types of bore wells common in the state.

Unit-II

Design of open well, groundwater exploration techniques, methods of drilling of wells, percussion, rotary, reverse rotary, design of assembly and gravel pack, installation of well screen, completion and development of well.

Unit-III

Groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow's etc. Theis recovery method, well interference, multiple well systems, surface and subsurface exploitation and estimation of ground water potential, quality of ground water, artificial groundwater recharge planning, modelling, ground water project formulation.

Unit-IV

Pumping Systems: Water lifting devices; different types of pumping machinery, classification of pumps, component parts of centrifugal pumps; pump selection, installation and trouble shooting. Design of centrifugal pumps, performance curves, effect of speed on head capacity, power capacity and efficiency curves, effect of change of impeller dimensions on performance characteristics.

Unit-V

Hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; priming, self priming devices, rotodynamic pumps for special purposes such as deep well turbine pump and submersible pump.

Text Books/References

1. A.M. Michael. Irrigation Theory and Practices.
2. Michael and Thaper. Wells and Pumps.
3. Todd. Ground Water Hydrology.

5 AG 5 : DESIGN OF STRUCTURES

Cr. Hrs. 3 (3 + 0)
L T
Credit 3 0
Hours 3 0

(A) REINFORCED CEMENT CONCRETE STRUCTURES

Unit-I

Introduction – Grade of Concrete and Characteristics strength, permissible stress in concrete and steel reinforcement. Modular ratio.

Singly Reinforced Beams: Fundamental assumptions, Equivalent area of sections, Neutral axis and Moment of resistance. Balanced, Under-reinforced, Over-reinforced sections.

Types of problems in singly reinforced beams.

Shear stress in R. C. beams, Effect of shear, Reinforcement for shear. I.S. recommendations.

Bond, anchorage, development length.

Unit-II

Doubly Reinforced Beam: Neutral axis, Moment of resistance. Type of problems.

T-Beams: Dimensions, Neutral axis. Lever arm, Moment of resistance with or without web compression. Type of problems in T-Beams.

Cantilever: Design of simple cantilever.

Unit-III

Slabs spanning in one direction.

Two way slabs: Supported on four edges with corners not held down and carrying U.D.L.

Axially loaded columns: Long and short columns. Types of columns.

Load carrying capacity, I. S. recommendations, Design of columns with lateral and spiral reinforcement.

(B) STEEL STRUCTURES

Unit-IV

Introduction: Common steel sections, Selection criterion for beams and columns.

Design of Beams: Assumptions in the theory of bending, Design of laterally restrained beams, with checks for shear, deflection; Web buckling and crippling, Design steps, Problems.

Unit-V

Columns: Classification of columns, Types of sections, Strength of column, Design of axially loaded columns. Compound columns. Design of compound column.

Lacing and Battening: Design of lacing, Design of battening, Column bases, Slab bases. Design of slab with concrete block, Problems.

Text Books/References

1. B.C. Punmia. (1992). Reinforced Concrete Structure, Vol. I, Standard Publishers & Distributors, Delhi.
2. Jain and Jaikrishna. (1992). Plane and Reinforced Cement Concrete, Nemi Chand Bros., Roorkee.
3. M.M. Malhotra. (1992). Design of Steel Structure, Jain Brothers, New Delhi.
4. Ram Chandra. (1992). Design of Steel Structures, standard Publishers & Distributors, New Delhi.

5AG6.1: RENEWABLE ENERGY SOURCES

Cr. Hrs. 3(3 + 0)

L T

Credit 3 0

Hours 3 0

Unit-I

Classification of energy sources; Introduction to renewable energy sources; role of energy in economic development; energy consumption patterns.

Biomass: Introduction to biomass as source of energy and its advantages, Biomass Classification. Characterization of biomass (proximate analysis and ultimate analysis), Biomass combustion.

Unit-II

Biomass conversion technologies (thermo-chemical, biochemical and agrochemical) technology, Biomass gasification technology.

Types, construction, working principle, design & operational parameters of different biomass based renewable energy devices like gasifiers, biogas plants, etc.

Unit-III

Selection of size, site and beneficiaries, uses and safety/environmental aspects of different biomass based renewable energy devices like gasifiers, biogas plants, etc.

Unit-IV

Solar passive heating devices, photovoltaic cells and arrays; Brief introduction to wind energy, hydroelectric energy and ocean energy.

Unit-V

Densification of biomass, briquetting and baling of biomass, bio-diesel preparation and energy conservation in agriculture.

Text Books/References

1. G.D. Rai. Non-Conventional Energy Sources, Kh Publishers, New Delhi.
2. N.S. Rathore. A.K. Kurchania, N.L. Panwar. (2007). Non Conventional Energy Sources, Himanshu Publications.
3. K.C. Khandelwal. & S.S. Mandi. (1990). Biogas Technology.
4. N.S. Rathore. A.K. Kurchania, N.L. Panwar. (2007). Renewable Energy, Theory and Practice, Himanshu Publications.
5. N.S. Rathore. A.K. Kurchania. (2006). Biomethanation Technology, Apex Publications, Udaipur.

5AG6.2: PESTICIDES APPLICATION AND EQUIPMENT

Cr. Hrs. 3 (3 + 0)

	L	T
Credit	3	0
Hours	3	0

Unit-I

Fundamentals of Pesticide application, Sprayers- manually and power operated – types-construction operations, calibration

Unit-II

Introduction to electrostatic and ULV sprayers. Air assisted sprayers, High clearing sprayers.

Unit-III

Atomizing devices, nozzles, types, flow rates, spray angles, droplet size, agitations of spray material, Measurement of efficiency of pesticide application- collection and measurement of droplets- determination of vmd.

Unit-IV

Dusters: manually and power operated – types- construction, operation, calibration. Aerial spray application- Limitation and advances, air crafts spraying and dusting equipment.

Unit-V

Factors for selection of sprayer/duster and planning pesticide application. Safety in pesticide application- selection of pesticide – storage and handling of protective devices.

Text Books/References

1. R. Bainer, E.L. Barger and R.A. Kepner. (1979). Principles of Farm Machinery. John Wiley & Sons, Inc, New York.
2. H. Singh and O.S. Bindra. (1980). Pesticides and Application Equipment, Oxford & IBM Publication Co.
3. P.R. Mathew. Pesticides Application and Equipment.

5AG6.3: GULLEY AND RAVINE CONTROL STRUCTURES

Cr. Hrs. 3 (3 + 0)
L T
Credit 3 0
Hours 3 0

Unit-I

Introduction; floods - causes of occurrence, flood classification - probable maximum flood, standard project flood, design flood.

Unit-II

Flood estimation - methods of estimation; estimation of flood peak - Rational method, empirical methods, Unit hydrograph method.

Unit-III

Statistics in hydrology, flood frequency methods - Log normal, Gumbel's extreme value, Log-Pearson type-III distribution; depth-area-duration analysis; flood forecasting, flood routing - channel routing, Muskingum method, reservoir routing, modified Pul's method.

Unit-IV

Flood control - history of flood control, structural and non-structural methods of flood control measures, storage and detention reservoirs, levees, channel improvement.

Unit-V

Gulley erosion and its control; soil erosion and sediment control measures; river training works, planning of flood control projects and their economics.

Text Books/References

1. R.V. Singh. (2003). Watershed Planning and Management, Second Edition Yash Publishing House, Bikaner. P. 624.
2. P.K. Singh. (2000). Watershed Management (Design and Practices), e-media Publication, Udaipur. P. 174.
3. V.V.N. Murty. (1985). Land and Water Management Engineering, Second Edition Kalyani Publisher, Ludhiana. P.586.
4. R. Suresh. (2002). Soil and Water Conservation Engineering, Fourth Edition Standard Publishers and Distributors, Delhi.
5. Ullah, Wasi, S.K. Gupta and S.S. Dalal. (1972). Hydrological Measurements for Watershed Research, Jugal Kishore and Co., Dehradun.

Practicals

5AG7: FARM MACHINERY AND EQUIPMENT – II LAB

1. Familiarization with various farm machines related to harvesting, threshing and combine.
2. Study of cutterbar: constructional details, adjustments and working.
3. Study of vertical conveyor reaper: constructional details, adjustments and working.
4. Study of potato harvester: constructional details, adjustments and working.
5. Study of forage harvester: constructional details, adjustments and working.
6. Study of maize sheller: constructional details, materials and working.
7. Study of various types of threshers: constructional details, adjustments and working.
8. Study of combine harvester: constructional details, working and trouble shooting.
9. Study of straw combine.
10. Study of laser land leveller.
11. Study of post hole digger.

5AG8: CONSTRUCTION TECHNOLOGY LAB

Practicals

1. To find aggregate crushing value.
2. To perform slump test using slump test apparatus.
3. To perform compacting factor test.
4. To find compressive strength of concrete.
5. Blue print reading & finding dimension for quality calculations.
6. Long-wall & Short wall methods of estimation for one room.
7. Long-wall & Short wall methods of estimation for two room.
8. Centre line method of estimation for one room.
9. Centre line method of estimation for two room.
10. Visiting various sites.
11. Visiting various sites.

5AG9: REFRIGERATION AND AIR CONDITIONING LAB

Practicals

1. Study of vapour compression and vapour absorption systems.
2. Study of Electrolux refrigerator.
3. Study and determining COP of ice plant.
4. Study and determining of COP of water cooler.
5. To determine COP of vapour compression refrigeration rig.
6. Study of charging of vapour compression refrigeration system.
7. Study of leak detection devices.

8. Study of evaporative cooling system.

5AG10: WELLS AND PUMPS LAB

Practicals

1. Verification of Darcy's Law.
2. Study of different drilling equipments.
3. Sieve analysis for gravel and well screens design.
4. Estimation of specific yield and specific retention.
5. Testing of well screen.
6. Drilling of a tubewell.
7. Measurement of water level and drawdown in pumped wells.
8. Estimation of aquifer parameters by Thies method, Coopers-Jacob method, Chow method, Thies Recovery method.
9. Well design under confined and unconfined conditions, well losses and well efficiency.
10. Estimating ground water balance.
11. Study of artificial ground water recharge structures.
12. Study of radial flow and mixed flow centrifugal pumps, multistage centrifugal pumps, turbine, propeller and other pumps; Installation of centrifugal pump.
13. Testing of centrifugal pump and study of cavitations.
14. Study of performance characteristics of hydraulic ram.
15. Study and testing of submersible pump.

5AG11: DESIGN OF STRUCTURES LAB

Practicals

R.C.C.:

1. Design of Singly R.C.C. Beams.
2. Design of Doubly R.C.C. Beams.
3. Design of T-Beam.
4. Design of One-way R.C.C. Slab.
5. Design of Axially Loaded R.C.C. Column.

Steel:

6. Design of Laterally Restrained R.S. Beam.
7. Design of Axially Loaded R.S. Beam.
8. Design of R.S. Compound Column.
9. Design of Lacing & Battening.
10. Design of Base Slab and Concrete Block.

B.TECH. (AGRICULTURAL ENGINEERING): VI SEMESTER SYLLABUS

6AG1: DRYING AND STORAGE ENGINEERING

Cr. Hrs. 3 (3 + 0)

L T

Credit 3 0

Hours 3 0

Unit-I

Moisture and its removal, utilities of drying, moisture content representation, various methods for moisture content measurement, EMC, importance of EMC and methods of its determination, EMC curve and EMC model.

Unit-II

Principle of drying, theory of diffusion, various drying rate periods - falling rate and constant rate period of drying, critical moisture content, heat transfer in grain drying.

Unit-III

Dryer performance, drying methods, classification of dryers and operation. Importance of storage, Fundamental requirements of storage, types and causes of spoilage in storage.

Unit-IV

Insect/pest of stored grains, changes occurring in food grains during storage, traditional storage structures such as Morai, Bukhari, Kothar, mud Kothi *etc.*, bag storage, Improved storage structures such as Pusa bin and CAP.

Unit-V

Temperature and moisture change in storage structures, Deep and Shallow bin, Introduction to grain storage design theories such as Jansen and Rankine, fumigations, controlled and modified atmosphere storage.

Text Books/References

1. K K Singh and K.M. Sahay. (1996). Unit Operations in Agricultural Processing. Vikas Publishing House, New Delhi.
2. A.M. Michael and T.P. Ojha. Principles of Agriculture Engineering, Jain Brothers, Jodhpur
3. B.K. Bala. (2001). Drying and Storage of Cereal Grains. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi

6AG2: DAIRY AND FOOD ENGINEERING

Cr. Hrs. 3 (3 + 0)

L T

Credit 3 0

Hours 3 0

Unit-I

Composition and properties: Dairy development in India, composition, thermal and chemical properties of milk and milk products.

Cream Separation and Homogenization: centrifugal cream separator, Effect of homogenization of milk, homogenization valve and pump, theory of homogenization, energy requirements, efficiency of homogenization.

Unit-II

Pasteurization: Definition of pasteurization, vat pasteurization; agitation and control in vat pasteurizers, advantages and disadvantages, Plate Heat Exchanger, HTST pasteurization and controls, UHT processing and sterilization.

Butter Handling Equipment: Principle of churning, Churn construction; types of churn.

Unit-III

Thermal processing of foods: Decimal reduction time, thermal death time, spoilage probability.

Evaporation: Atmospheric concentrators, vacuum pan, condenser, single and multiple effect evaporators, properties of liquid foods in evaporation, calculation of energy consumption in evaporators, performance evaluation of evaporators, vapour recompression systems.

Unit-IV

Drying: Milk dryer, drum or roller dryer, spray dryer, atomization system, cyclone separator, bag filters, heat balance of drying equipment, equipments for instantizing milk powder.

Freezing of foods: Freezing of foods, freezing point depression, calculation of freezing rate using plank's equation, freezing equipments viz. air blast freezer, plate freezer, immersion freezer.

Unit-V

Freeze drying: Freeze drying of foods, freeze dryer, calculation of freezing time.

Water activity: Role of water and water activity of foods, methods of determination of water activity, control of water activity by addition of solutes and dehydration.

Text Books/References

1. Tufail Ahmed. (1997) Dairy Plant Engineering and Management. Kitab Mahal, New Delhi.
2. A.W. Farrall. Engineering for Dairy and Food Products; Robery, E. Krieger Publishers Company, New York.
3. R.T. Toledo. (1997). Fundamentals of Food Process Engineering. 2nd ed. CBS Publishers, New Delhi

6AG3: COMPUTER AIDED DESIGN AND MANUFACTURING

Cr. Hrs. 3 (3 + 1)
L T
Credit 3 0
Hours 3 1

Unit-I

Design process, application of computers for design, definition of CAD, benefits of CAD. CAD system components. Computer hardware for CAD. Display, input and output devices.

Introduction to optimisation methods in design. Classical optimization techniques, maxima-minima etc. Optimal design of elements and systems.

Unit-II

Role of optimisation techniques and finite element method in CAD. (Introductory treatment only). Computer Graphics: Graphics primitives, display file, frame buffer, display control, display processors. Line generation, graphics software. Points and lines, DDA and Bresenham's line algorithms, antialiasing lines.

Unit-III

Polygons, filling of polygons. Bresenham's algorithm for drawing circle and ellipse. Text primitive. Other primitives. Windowing and clipping, viewport. Homogeneous coordinates. Transformations.

Unit-IV

Introduction to numerical control, basic components of NC system, NC coordinates and motion control systems. Computer numerical control, direct numerical control, combined CNC/DNC.

Unit-V

NC machine tools and control units. Tooling for NC machines, Part programming, punched tape, tape coding and format, manual and computer assisted part programming.

Texts/References

1. Steven Harrington: Computer Graphics- A Programming Approach, McGraw Hill.
2. M. P. Groover and E.W. Zimmers: CAD/CAM- Computer Aided Design and Manufacturing, Prentice-Hall of India, New Delhi.
3. Surendra Kumar and A.K. Jha: Technology of Computer Aided Design and Manufacturing CAD/CAM, Dhanpat Rai & Sons, Delhi.

6AG4: TRACTOR SYSTEMS AND CONTROLS

Cr. Hrs. 3 (3 + 0)

	L	T
Credit	3	0
Hours	3	0

Unit-I

Study of transmission system: Clutch:single and multiple clutches and their functions, gear box: sliding and constant mesh, differential and final drive mechanism. Simple numerical problems on clutch and gear speed ratios.

Unit-II

Familiarization of brake mechanism: Mechanical and hydraulic. Steering: Ackerman and hydraulic. Hydraulic system of tractor: Automatic position and draft control.

Unit-III

Tractor power outlets: P.T.O., belt pulley, drawbar. Introduction to traction mechanics.

Unit-IV

Tractor chassis mechanics: C.G. determination and weight transfer. Simple numerical problems on tractor chassis mechanics.

Tractor stability: Grade and non-parallel pull, turning at high speed. Simple numerical problems on tractor stability

Unit-V

Introduction to ergonomic considerations: Anthropometry and physiological cost measurements and tractor safety. Introduction to advances in tractor systems and controls.

Text Books/References

1. B.J. Liljedahl, P.K. Turnquist, W.D. Smith and Hoki Vaketo. (1989). Tractor and their Power units. Jhon Wiley & Sons., New York.
2. F.R. Jones. Farm Gas Engines & Tractors – Mc. Grow Hill Book Company, New York.
3. Mosses & Frost. Farm Power, John Wiley & Sons, New York.
4. Rai & Jain. Farm Tractor Maintenance and repair, Tata McGraw Hill Publishing Co.Ltd., New-Delhi.

6AG5: IRRIGATION ENGINEERING

Cr. Hrs. 3 (3 + 0)

L T

Credit 3 0

Hours 3 0

Unit-I

Water resources development and utilization, Terminology and basic concepts in water resources, Physical properties of soil, Infiltration, Soil water potential. Soil moisture constants and characteristics curves, Measurement of soil moisture.

Unit-II

Rooting characteristics and moisture use of crops. Consumptive use- terminology and determination by direct method, Determination of consumptive use by climatological methods, Determination of reference crop Evapo transpiration by climatological methods,

Unit-III

Selection of crop coefficients and irrigation requirements, Irrigation efficiencies, Effective rainfall, Irrigation scheduling and water management procedures for principal crops ,Measurement of irrigation water by volumetric, velocity area and tracer methods, Measurement of irrigation water by weir, orifices, flumes.

Unit-IV

Open channels – designs, Lining materials, precast concrete channels, water control and diversion structures, Border method-Adaptability, limitations, Design and Evaluation, Furrow method-Adaptability, limitations, Design and Evaluation.

Unit-V

Basin method-Adaptability, limitations. Design and Evaluation, Sprinkler method-Adaptability, limitations, Design and Evaluation, Drip method-Adaptability, limitations, Design and Evaluation

Text Books/References

1. A.M. Micheal, 1991, Irrigation Theory and Practices, Vikas Publishing House Pvt. Ltd., New Delhi

2. Lal R. and A.C. Datta 1971 Agricultural Engineering through Worked Examples, Saroj Publications, Allahabad
3. V.V.N. Murthy, 1985 Land and Water Management Engineering, Kalyani Publisher, New Delhi.

6AG6.1: MICROPROCESSOR AND LOGIC CIRCUITS

Cr. Hrs.	3 (3 + 0)
	L T
Credit	3 0
Hours	3 0

Unit-I

Computer Number Systems and Codes: Number System and their conversion, Negative Numbers representation, Binary Coded Decimal number, Excess-3 BCD Code, Gray Codes representation.

Logical Operation, Logic Gates and Boolean Algebra: Truth Table, Logical Operation and logic gates, Logic Circuit, Realizing Circuits From Boolean Expressions, Derived Logical Functions and Gates: The NAND Gate, The NOR Gate, The Exclusive - OR or XOR Gate, The Exclusive-NOR, or XNOR Gate, Boolean Algebra, Boolean Algebra Theorems, De Morgan's Theorems, Duality Theorem, Universal Gates.

Unit-II

Principles of Combinational Logic Circuits: Minterm and Maxterm designations, Canonical Forms, Karnaugh Map: Karnaugh Map upto 4 variables, Simplification of Boolean expressions using K-map in POS and SOP form, Incompletely Specified Functions (Don't Care Terms). *Arithmetic Circuit:* Adders, Subtractor, Digital comparator, Decoders, Encoders, Multiplexers.

Unit-III

Sequential Logic Circuits: Latches, Flip-flops: SR(Set-Reset) Flip-Flop, Edge-Detector Circuits, Master-Slave S-R Flip-Flop, J-K flip-flop, Master-Slave J=K Flip-flop, D Flip-Flop, T Flip-flop. Introduction to Register.

Unit-IV

Microprocessor: Introduction to Microprocessor, Basic Concepts of 4-8-16-32-64 bit μ p's. Evolution of Microprocessors. Internal architecture and pin configuration of 8085A, Interrupt system of 8085A, Instruction Set of the 8085, Addressing modes of 8085A. Simple Assembly language programming of 8085A.

Unit-V

Interfacing Memory and I/O Devices: Address space partitioning; Address map; Address decoding, Memory mapped I/O scheme, I/O mapped I/O scheme. Memory interfacing, Data transfer schemes, Interrupts of 8085, Multiple Interrupts; Direct Memory Access. Application of microprocessors in Agriculture Engineering.

Text Books/References

1. R.S. Gaonkar. (1995). Microprocessor Architecture, Programming and applications with the 8085/8080A, Wiley Eastern Ltd., 2nd ed, Up date.
2. Aditya P. Mathur. (1999). Introduction to Microprocessor, 3rd ed., Tata McGraw, Hill Publishing Company Limited, New Delhi.
3. Dharm Singh. (2004). Introduction to Digital Logic Design, Yash Publishing House, Bikaner.

6AG6.2: FOOD PACKAGING TECHNOLOGY

Cr. Hrs. 3 (3 + 0)

L T

Credit 3 0

Hours 3 0

Unit-I

Significance of packaging, Spoilage mechanism during storage: environmental conditions favoring microbial growth, moisture sorption isotherm and water activity of foods;

Unit-II

Food Packaging: definition, functions, importance and scope of packaging of foods, types and classification of packaging. Packaging forms; Packaging materials: Plastic films, paper and papers boards, types and characteristics of papers.

Unit-III

Packaging materials: metal containers, feature of metal containers, three piece can, soldered side can, welded side can, two piece can, aluminum, advantages and disadvantages of aluminum.

Unit-IV

Glass containers, properties of glass, types of glasses and glass containers, properties of glass containers; Printing processes: Letter press, offset, litho and gravure printing, Disposal methods of waste packaging materials;

Unit-V

Vacuum and gas packaging-process and machines, packaging materials, gas barriers property, water vapor barrier property, applications in some foods; Active packaging, Estimation of shelf life of packaged foods.

Text Books/References

1. Takashi Kodoya. Food Packaging Academic Press, Inc.
2. R. C. Griffin, and S. Sacharow. Principles of Package Development. The AVI Publishing Company, Westport, Connecticut.

6AG6.3: GROUND WATER RECHARGE TECHNOLOGY

Cr. Hrs. 3 (3 + 0)

L T

Credit 3 0

Hours 3 0

Unit-I

Concept of artificial recharging. Basic Phenomena of ground water recharge, selection of site and identification of recharge structures, Natural recharging. Analysis of rainfall for estimation of probability of occurrence of rainfall.

Unit-II

Artificial recharge structures, Direct surface technique– Flooding, Basin or Stream augmentation, Ditch & furrow method, Over irrigation. Estimation of surface runoff from various surfaces e.g. RCC flooring, barren land Katchha roof, cultivated land etc. (Soil cover complex method).

Unit-III

Direct sub surface technique – Injection well, Recharge pit and shaft, Dug well recharge, Sub surface dykes.

Unit-IV

Roof top rain water harvesting – Design of filter and estimation of size of pipe, runoff potential and size of tank.

Unit-V

Design criteria of recharge structures, Design and cost estimation of recharge structures, use of RS & GIS for identification of potential artificial recharge Zones.

Suggested readings

1. Todd D.K. (2004), Ground water hydrology, second edition. John Wiley & sons New York.
2. Jat M.L. and S.R. Bhakar (2009), Ground water hydrology, Agrotech publishing academy Udaipur.

6AG7: DRYING AND STORAGE ENGINEERING LAB

Practicals

1. Measurement of moisture content
2. Determination of EMC
3. Determination of ERH
4. Study the effect of temperature on stored grains
5. Study of solar dryer
6. Study of tray dryer
7. Study of fluid bed dryer
8. Measurement of relative humidity during drying
9. Study of drying rate period
10. Design and layout of commercial bag storage facilities
11. Design and layout of commercial bulk storage facilities
12. Study of different traditional storage structures
13. Study of different improved storage structures
14. Visits to commercial handling and storage facilities for grains.

6AG8: DAIRY AND FOOD ENGINEERING LAB

Practicals

1. Study of a milk processing plant & equipments;
2. Study of pasteurizers;
3. Study of homogenizers;
4. Study of separators and butter churns;
5. Study of evaporators;
6. Study of milk dryers;
7. Study of freezers;
8. Determination of D and z value.
9. Determination of fat in milk.
10. Calculation of freezing time.

11. Determination of physical properties of food products;
12. Estimation of steam requirements;
13. Estimation of refrigeration requirements in dairy & food plant;
14. Visit to Food industry.

6AG9: TRACTOR SYSTEMS AND CONTROLS LAB

Practicals

1. Introduction to transmission systems and components.
2. Study of clutch system.
3. Study of different types of gear box and calculation of speed ratios.
4. Study on differential and final drive of a tractor.
5. Study of brake system of a tractor.
6. Study of hydraulic system in a tractor.
7. Study of traction performance of a tractor wheel.
8. Anthropometric measurements of a farm worker.
9. Measurement of physiological cost of tractor operator during farm operation.
10. Study of advances in tractor systems and controls.

6AG10: FIELD OPERATIONS AND MAINTENANCE OF FARM MACHINERY LAB

Practical

1. Study and practising the hitching and dehitching of implements.
2. Field operation and field adjustments of m.b. plough and disk plough.
3. Field operation of disk harrow.
4. Field operation and adjustments of weeding equipment (Wheel hoe/power weeder).
5. Adjustment and maintenance of seeding and planting machines.
6. Field operation of seed drill/planter.
7. Adjustment and maintenance of a foot sprayer/knapsack sprayer.
8. Field operation, adjustment and maintenance of a vertical conveyor reaper.
9. Field operation, adjustments and maintenance of power thresher.
10. Adjustment and maintenance of a combine harvester.
11. Visit to small scale farm machinery manufacturing unit.

6AG11: IRRIGATION ENGINEERING LAB

Practicals

1. Determination of Soil Moisture by Different Methods,
2. Determination of physical properties of soil related to irrigation,
3. Study of infiltration characteristics of soils,

4. Estimation of evapotranspiration by empirical methods,
5. Study of various farm irrigation structures,
6. Measurement of discharge through weirs, orifices and flumes,
7. Fabrication of precast concrete channels,
8. Determination of water conveyer efficiency in case of an unlined channel,
9. Design and evaluation of border irrigation,
10. Design and evaluation of furrow irrigation,
11. Design and evaluation of sprinkler irrigation
12. Design and evaluation of drip irrigation method.

B.TECH. (AGRICULTURAL ENGINEERING): VII SEMESTER SYLLABUS

7AG1: POST HARVEST ENGINEERING

Cr. Hrs. 3 (3 + 0)
L T
Credit 3 0
Hours 3 0

Unit-I

Importance of engineering of properties of biological materials, study of different physical and thermal characteristics of important biological living materials like shape, size volume density, roundness, sphericity, angle of repose, surface area, sp. Heat, thermal conductivity, color, thermal velocity, chemical composition of grain.

Unit-II

Cleaning and separation, effectiveness of separation, husking of grain, factors affecting and effectiveness of husking, traditional rice milling machine, modern rice milling machinery,

Unit-III

General principles of cleaning, double sieve cleaner and single scraper, drum cleaner, paddy cleaner with destoner, rubber roll husker (Japan type), whitening of grain.

Unit-IV

Post harvest engineering of cereals and millets, milling of corn, introduction corn dry milling, tempering, degerming method, corn wet milling method, wheat milling, modern flour milling.

Unit-V

Milling of pulses and oil seeds, introduction to pulse milling, traditional pulse milling, commercial pulse milling processes, introduction to oil milling, traditional methods for oil milling such as village Ghanis, mechanical oil expeller, pre-treatments for oil milling.

Text Books/References

1. A. Chakravorty & D.E. De. (1998). Post Harvest Technology of Cereal and Pulses. Oxford & ISH Publishing Co. Pvt. Ltd., New Delhi.

7AG2: DRAINAGE ENGINEERING

Cr. Hrs. 3 (3 +1)
L T
Credit 3 0
Hours 3 1

Unit-I

Drainage, objectives of drainage, familiarization with the drainage problems of the state, benefits of drainage Surface drainage, drainage coefficient, types of surface drainage.

Unit-II

Sub-surface drainage purpose and benefits, types and use of subsurface drainage system, Design of sub-surface drainage system.

Unit-III

Interceptor and relief drains. Derivation of ellipse (Hooghoudt's) and Ernst's drain spacing equations, Drainage materials, drainage pipes, drain envelope.

Unit-IV

Design of open channel, investigations of design parameters, hydraulic conductivity, drainable porosity, water table etc, Layout, construction and installation of drains. Drainage structures, Vertical drainage.

Unit-V

Bio-drainage. Tile Drains. Drainage of irrigated and humid areas. Salt balance, reclamation of saline and alkaline soils. Leaching requirements, conjunctive use of fresh and saline waters. Economic aspects of drainage.

Text Books/References

1. H.M. Ritzema, (Editor in Chief). (1994). Drainage Principles and Applications (2nd edition), International Institute of Land Reclamation and Improvement, Post Box-45, Wageningen. The Netherlands.
2. Luthin, James N. (Editor) (1957). Drainage of Agricultural Lands, Agronomy Monograph No. 17, American Society of Agronomy, USA.
3. A.M. Michael and T.P. Ojha. Principles of Agricultural Engineering, Vol. II, Jain Publication, New Delhi.

7AG3: LAND DEVELOPMENT AND GRADING

Cr. Hrs. 3 (3 + 0)

	L	T
Credit	3	0
Hours	3	0

Unit-I

Land leveling-Criteria for land leveling, plane profile, plane inspection and contour adjustment methods, land leveling design problems related to land leveling design and earth work calculation.

Unit-II

Engineering fundamentals related to earth-moving machinery. Earth moving and excavation machines: classification and application of bulldozers, advantage and disadvantage, straight and angle bulldozers, moving earth with bulldozers and estimation of output of a bulldozer numerical problems.

Unit-III

Land clearing equipments, Power shovel: Construction and operation of power shovel size selection of power shovel factors affecting the output of a power shovel. *Scraper:* Types, construction and operation of scrapers, size of the scraper, cycle time production rates of scrapers, numerical problems, load-growth curve and estimation of output of a scraper.

Unit-IV

Dragline: Types of dragline, size basic parts and operation of a dragline, output of a dragline, estimation of output, effect of different factors on output, numerical problems.

Clam shell: Basic parts and operation of a clam shell, application, size and output of a clam shell.

Motor grader: Construction and operation of motor grader, application, basic adjustment parameters of major grader, output of motor grader,

Unit-V

Trenching machines: types, construction and operation of wheel and ladder type trenching machines, selection of suitable equipment for excavating trenches and production rates of trenching machines.

Compactors: Properties-swell and shrinkage type of compacting equipment and construction details.

Job planning and management: Project network analysis, definitions of terms used in critical path method (CPM), critical path scheduling, AOA diagram, computerized scheduling.

Text Books/References

1. R.L. Peurifoy. Construction, Planning, Equipment and Methods.
2. Mahesh Verma. Construction equipment and its planning and application.
3. Jagman Singh. Heavy construction, planning, equipment and methods.
4. A.M. Michael. Irrigation theory and practices.

7AG4: FOOD PROCESSING PLANT DESIGN & LAYOUT

Cr. Hrs. 3(3 + 0)

	L	T
Credit	3	0
Hours	3	0

Unit-I

Introduction to plant design: Types of manufacturing processes, phases of plant design.

Plant location: levels of location problems, influence of location, location factors, plant site selection.

Unit-II

Industrial Buildings and grounds: Industrial buildings, building design and construction viz. floors, walls and windows, roof and ceilings; grounds and exterior facilities viz. Access highways and parking, rail access, access by water, landscaping, security, disaster protection.

Unit-III

Preparation of plant layout: layout problems, classes of layout problems, objectives, types of layout, optimization for plant layout, trends in plant layout, space requirement.

Unit-IV

Development of the layout: Developing the plot plan, constructing the detailed layout, layout installation. Selection of processes, plant capacity, project design, flow diagrams, selection of equipments, process and controls

Unit-V

Material Handling: Importance, Kinds of conveyor systems, Plant layout for material handling, efficient use of material handling equipment, maintenance. Sanitary features of food processing plant.

Text Books/References

1. Chander, Lalat. (2004). Textbook of Dairy Plant Layout and Design. ICAR, New Delhi - 110012
2. A.W. Farallel. Food Engineering Systems. Vol 2-Utilities. AVI Publications.
3. J.M. Moore. Layout and Design. Macmillon Publishing Co., INC. New York.

7AG5: GREENHOUSE TECHNOLOGY

Cr. Hrs. 3 (3 + 0)

	L	T
Credit	3	0
Hours	3	0

Unit-I

Controlled Environment agriculture: An introduction, Importance of protected cultivation, Conventional versus protected cultivation, scope of greenhouse technology. Greenhouse: concept and applications.

Unit-II

Constituents of Greenhouse environment: greenhouse environment, light, air composition: carbon dioxide, temperature, humidity, root media. Classification of greenhouses on the basis of working principles, shape, cost of construction, cover material, utility and season.

Unit III

Greenhouse construction: climatic conditions, problems and requirements of greenhouse, factors to be considered for constructing a greenhouse, standards of construction, different load factors for greenhouse construction, materials and methods of construction, properties of greenhouse coverings and structural components of greenhouse.

Unit IV

Heating and cooling of greenhouses: Units of heat, modes of heat loss, heating arrangements, heat load calculations, greenhouse cooling, natural and forced ventilation, ventilation efficiency ratio, greenhouse summer and winter cooling systems, combination of cooling and heating systems.

Unit V

Instrumentation and automation for greenhouse: instrumentation for greenhouse, measurement of various parameters in greenhouse, automation and control system in greenhouse, power management, some applications of automation of greenhouse.

Text Books/Reference

1. Salokhe V.M. and Ajay K. Sharma (2006). Greenhouse: Technology and Applications. Agrotech Publishing Academy, Udaipur, Rajasthan.
2. N.S. Rathore, A.K. Kurchania, N.L. Panwar. (2007). Non Conventional Energy Sources, Himanshu Publications.

6AG6.1: HYDRAULIC DRIVES AND CONTROLS

Cr. Hrs. 3 (3 + 1)
L T
Credit 3 0
Hours 3 1

Unit I

Principles of Hydraulics: Hydraulic Basics: Pascal's Law, Flow, Energy, Work, and Power. Working of Hydraulic Systems, Open centre and close centre hydraulic systems,

Unit II

Reservoirs, Strainers and Filters, Filtering Material. Types of hydraulic Fluid and their properties. Pumps: Pump Classifications, selection, Performance, Displacement

Unit III

Gear Pumps, Vane Pumps, Piston Pumps, Pump Operation. Hydraulic Actuators: Cylinders-displacement, Construction and Applications, Semi rotary actuators. Simple numerical problems on pumps.

Unit IV

Hydraulic Motors. Accumulators: Types and working. Fittings and Connectors. Hydraulic valves: Pressure-Control Valves, Directional-Control Valves, Flow-Control Valves, Valve Failures and Remedies, Valve Assembly.

Unit V

Hydraulic Troubleshooting. Tractor hydraulics, nudging system, ADDC. Use of Hydraulics and Pneumatics drives in agricultural systems. Maintenance of hydraulic system.

Text Books/References

1. Liljedahl, B.J., Turanquist, P.K. Smith W.D. and Hok: Makoto, 1989. Tractors and their power unity. AG publication, fourth edition, New York.
2. Michael, J.P. and John., G.A. 1989. Power Hydraulics, Prentice Hall, New York.
3. Fundamentals of service 'FOS', Hydraulics, John deere and company, Moline.
4. Singh Kirpal, Automobile Engineering Part I, Standard Publishing Distributors, Delhi.

7AG6.2: WATERSHED PLANNING AND MANAGEMENT

Cr. Hrs. 3(3 + 1)

	L	T
Credit	3	0
Hours	3	1

Unit-I

Watershed management - problems and prospects; watershed based land use planning, watershed characteristics—physical and geomorphologic, factors affecting watershed management,

Unit-II

Hydrologic data for watershed planning, Watershed delineation, delineation of priority watershed. Water yield assessment and measurement from a watershed

Unit-III

Hydrologic and hydraulic design of earthen embankments and diversion structures; sediment yield estimation and measurement from a watershed and sediment yield models. *Rainwater conservation technologies* - in-situ and storage

Unit-IV

Design of water harvesting tanks and ponds; water budgeting in a watershed; effect of cropping system, land management and cultural practices on watershed hydrology.

Unit-V

Evaluation and monitoring of watershed programmes; people's participation in watershed management programmes; planning and formulation of project proposal; cost benefits analysis of watershed programmes; optimal land use models; case studies.

Text Books/References

1. Ghanshyam Das. (2000). Hydrology and Soil Conservation Engineering. Prentice Hall of India, New Delhi.
2. K. Subramanya. (1993). Engineering Hydrology, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. R.K. Linsley, M.A. Kohler and J.L.H. Paulhus. (1983). Hydrology for Engineers, McGraw Hill International Book Company, London.
4. H.M. Raghunath. (1988). Hydrology, Wiley Eastern Ltd., New Delhi.
5. Ullah, Wasi, S.K. Gupta and S.S. Dalal. (1972). Hydrological Measurements for Watershed Research, Jugal Kishore and Co., Dehradun.
6. P.K. Singh. (2000). Watershed Management (Design and Practice), e-media publications, Udaipur.
7. R. Suresh. (2002). Soil and Water Conservation Engineering, Fourth Edition Standard Publishers and Distributors, Delhi.
8. Raj Vir Singh. (2003). Watershed Planning and Management, Second Edition, Yash Publishing, Bikaner.

7AG6.3: TRACTOR DESIGN AND TESTING

Cr. Hrs. 3 (3 + 1)
L T
Credit 3 0
Hours 3 1

Unit-I

Introduction to development of agricultural tractor. Study of parameters for balanced design of tractor for stability, weight distribution and hitch system.

Unit II

Design of various engine components: piston, cylinder and cylinder liner, connecting rod, crankshaft and valve.

Unit-III

Design of mechanical power transmission in agricultural tractors. Design of Ackerman Steering.

Unit-IV

Introduction of computer application to design of engine components, differential, final drive and axle power takeoff shaft.

Unit-V

Design of seat and controls of an agricultural tractor. Tractor Testing as per BIS codes.

Text Books/References

1. A. Kolchin and V. Dominov. (1984). Design of Automotive Engines. Mir Publications, Moscow.
2. B.J. Liljedahl, P.K. Turnquist, W.D. Singh and Hoki, Makato. (1989). Tractor and there Power Units, Fourth Edition, Avi Publication, New York.
3. C.V. Litchy. (1951). Internal Combustion Engines, McGraw Hill Pub., New York.
4. V.L. Maleev. (1951). Internal Combustion Engines, McGraw Hill Pub., New York.

7AG7: POST HARVEST ENGINEERING LAB

Practicals

2. To find the shape and size of cereals, pulses and oil seeds grains
3. To determine the bulk density of grains
4. To determine porosity of grain
5. Study of cleaner cum grader
6. Study of mechanical oil expeller
7. Study of maize dehusker sheller
8. Study of whole flour mill
9. Study of CFRTI Dal mill
10. Study of CIAE Dal mill
11. Study of modern rice mill
12. Visit to modern flour mill
13. Visit to solvent extraction plant
14. Determination of hardness of grain

7AG8: DRAINAGE ENGINEERING LAB

Practicals

1. In-situ measurement of hydraulic conductivity.
2. Determination of drainage coefficients.
3. Installation of piezometer and observation well.
4. Preparation of iso-bath and iso-bar maps.
5. Measurement of hydraulic conductivity and drainable porosity.
6. Design of surface drainage systems.
7. Design of subsurface drainage systems.
8. Determination of chemical properties of soil and water.
9. Fabrication of drainage tiles.
10. Testing of drainage tiles.
11. Determination of gypsum requirement for land reclamation.
12. Installation of sub-surface drainage system.
13. Cost analysis of surface and sub-surface drainage system.

7AG9: LAND DEVELOPMENT AND GRADING LAB

Practicals

1. Determination of earthwork and cut fill ratio by plane method for land leveling.
2. Determination of earthwork and cut fill ratio by profile method for land leveling.
3. Planning and proposing structures for land leveling.
4. Study and working of various components of bulldozer.
5. Study and working of various components power shovel.
6. Study and working of various components dragline.
7. Study and working of various components of clamshell.
8. Construction and operation and maintenance of Jack Hammer.
9. Practice of drilling hole with pneumatic drill.

7AG10: FOOD PROCESSING PLANT DESIGN & LAYOUT LAB

Practicals

1. Planning, visit and layout of flour milling plant;
2. Planning, visit and layout of rice milling plant;
3. Planning, visit and layout of milk plant;
4. Planning, visit and layout of bakery plant;
5. Planning, visit and layout of fruits and vegetable dehydration plant;
6. Planning, visit and layout of beverages industry;
7. Planning, visit and layout of edible oil extraction plant;
8. Planning, visit and layout of ice-cream plant;
9. Planning, visit and layout of sugar mill plant;
10. Planning, visit and layout of honey/turmeric/chillies processing plant.

B.TECH. (AGRICULTURAL ENGINEERING): VIII SEMESTER SYLLABUS

8AG1: PRINCIPLES OF FOOD PRESERVATION

Cr. Hrs. 3 (3 + 0)

	L	T
Credit	3	0
Hours	3	0

Unit-I

Sources of foods, scope and benefits of industrial food preservation, perishable and non-perishable foods, causes of food spoilage

Food preservation methods- salt and sugar, principle and method, preservation by chemicals, antioxidants, mold inhibitors, acidulants; Fermentation preservation-definitions, advantages and disadvantages, types of fermentations, equipments.

Unit-II

Thermal processing method – canning process for foods, D Value and Z value for microorganisms and nutrients, TDT curve, evaluation of process effectiveness by graphical method; Blanching-theory, equipments, effect on food quality such as nutrients, colour, flavour and texture; Pasteurization – theory, equipments, effect on foods quality;

Unit-III

Sterilization- in container sterilization, theory, retorting, UHT process, aseptic process, effect of food quality; Evaporation of foods- theory and principles, boiling point elevation, equipments, effect on foods.

Low temperature preservation: chilling of foods- theory, equipments, chill storage; Freezing-ice crystal formation, solute concentration, freezing time, equipments, effect on food quality

Unit-IV

Freeze concentration- principles and process, problems due to precipitation of solids, food applications, equipments; membrane concentration-techniques, equipments used, effect on foods, hurdle technology,

Drying of foods- mechanism of drying, process, types of dryers, physical and chemical effect on foods;.

Unit-V

Irradiation of foods- theory, measurement of doses, dose distribution, effect on microorganisms, effect on foods, applications physical, chemical and biological methods of detections of irradiated foods.; introduction to pulsed electrical field processing, dielectric and ohmic-heating of foods, high process processing.

Text Books/References

1. P. Fellows. Food Processing Technology, Woodhead Publishing Limited, England.

8AG2: REMOTE SENSING AND GIS APPLICATION

Cr. Hrs. 3 (3 + 0)
L T
Credit 3 0
Hours 3 0

Unit-I

Aerial photography- aerial photograph, their classification, map v/s aerial photograph, photogrammetry and its application, aerial photography mission, planning and design, stereoscopic vision. Elements of aerial photo interpretation,

Unit-II

Aerial photo interpretation for water resources development and soil conservation survey. Remote sensing- definition, electromagnetic radiations, Interactions with the Atmosphere. Passive v/s Active Sensing, Characteristics of Images,

Unit-III

Satellite and Sensors-Satellite Characteristics, Resolution, Multi-spectral Scanning.

Thermal Imaging, Satellite missions, microwave sensing, Image Analysis- Visual interpretation, Digital image processing, image, Enhancement and Classification.

Unit-IV

GIS- definition, basic components, data types- spatial, non-spatial, GIS data modeling, vector and raster representation, GIS data base management, GIS data file management.

Unit-V

GIS data input and editing- data input methods, scanning, digitization, GPS data, data editing, errors and data reduction, Data analysis- format conversion, spatial measurement, overlay analysis and data output.

Text books/references

1. K.K. Rampal. (1999) Hand Book of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi
2. M.A. Reddy (2002) Remote Sensing and Geographical Information Systems, B.S. Publications, Hyderabad
3. Lillisand and Kiefer (1987) Remote sensing and Image Interpretation, John Weiley and sons.

8AG3: FARM POWER AND MACHINERY MANAGEMENT

Cr. Hrs. 3(3 + 0)
L T
Credit 3 0
Hours 3 0

Unit-I

Farm Mechanization: Objectives, reasons, myths and future trends, Different stages of farm mechanization, The role of mechanization and its relationship to productivity, employment, social and technological change.

Unit-II

Agricultural Machines Capacities: Rates of work, Field efficiency and factors affecting it, Calculations of machine capacities and field efficiency for different field conditions and machines.

Unit-III

Selection of machinery from a capacity standpoint, Selection of optimum width of machinery, timeliness of operation.

Unit-IV

Selecting tractors and implements from power requirement standpoint; Estimating power and fuel requirements for different farm operations.

Unit-V

Cost analysis of machinery: fixed cost and variable costs; Replacement of farm machine; mechanization planning; case studies of agricultural mechanization in India.

Text Books/References

1. Hunt, D, Farm Power and Machinery Management, Lows State University Press, USA, 1979
2. Culpin, C, Profitable farm Mechanization, Lock Wood & Sons, London, 1996
3. Bainer, R. Barger, E.L. and R.A. Kepner 1997. Principles of Farm Machinery. John Wiley & Sons, Inc, New York,
4. Shrivastava A.C. et al. Principle of Farm Machinery ASAE publications.

8AG4.1: AGRIBUSINESS MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

Cr. Hrs. 3 (3 + 0)

L T

Credit 3 0

Hours 3 0

Unit-I

Agribusiness: Management: - Concept, process, functions and FOYAL principles of management, Introduction to management by objectives, Concept, of Agribusiness and application of management principles to agribusiness.

Unit -II

Agriculture products: production, consumption and marketing, Meaning and theories of International trade, WTO provisions for trade in agriculture and food commodities, India's contribution to International trade in food and agri-commodities.

Unit -III

Entrepreneurship Development: concept, characteristics, functions & types of entrepreneurs, factors responsible for entrepreneurship .Motivation and leadership in entrepreneurship development, managing a small scale enterprise, constraints perceived in rural entrepreneurship.

Unit -IV

SWOT analysis Govt. schemes and incentives for promotion of entrepreneurship. Govt. policies on small & medium enterprise. Project preparation for small scale agri enterprises and appraisal.

Unit -V

Globalization and international emerging business environment, Development of service sector in agribusiness. Contract farming and custom hiring- Its advantages and specific areas. Public- private partnership & its necessity. Fundamentals of Participatory rural appraisal (PRA), Rapid rural appraisal (RRA) techniques and SHG.

Text Books/References

1. Francis Cherunilam. International Trade and Export Management. Himalaya Publication House, New Delhi.
2. Raja Gopal. Marketing Management. Vikas Publication, New Delhi.
3. B.P. Singh and T.N. Chhabra. An Introduction to organization and Management. Kitab Mahal, New Delhi.
4. Akhouri, M.M. P., Mishra, S.P. and Sen Gupta, R. 1989. Trainers Manual on Developing Entrepreneurial Motivation, UIESBUD, New Delhi.
5. Bidgoli, H.2989. Decision Support Systems: Principles and Practices, St.Paul, West Publishing Co.,USA.
6. Goyal D.P. 1994. Management Information System: Concept and Application, Deep & Deep Publisher, New Delhi.
7. Mancuso, J.1974. The Entrepreneurs Handbook (Vol.1920, Artech House, Inc.,USA.
8. Patel, V.G. 1987. Entrepreneurship Development Programme in India and Its Relevance to Developing Countries Entrepreneurship Development Institute of India, Ahmedabad.
9. Rao, T.V. 1974. Development of an Entrepreneur, Indian Institute of Management, Ahmedabad.
10. De, Dipak and Jirli, Basavaprabhu (2010) A Handbook of Extension Education, AGROBIOS (INDIA).

8AG4.2: MINOR IRRIGATION AND COMMAND AREA DEVELOPMENT

Cr. Hrs. 3 (3 + 0)
L T
Credit 3 0
Hours 3 0

Unit-I

Major, medium and minor irrigation projects – their comparative performance; development and utilization of water resources through different minor irrigation schemes.

Unit-II

Basic concepts of command area – definition, need, scope, and development approaches: historical perspective, command area development authorities.

Unit-III

Interaction/collaboration of irrigation water use efficiency and agricultural production. Planning and execution of on farm development activities within the scope of command area development.

Unit-IV

Planning and layout of water conveyance system. Conjunctive water use planning, Technical Feasibility and economic viability of a command area project Preparation of command area development layout plan.

Unit-V

Use of remote sensing techniques for command area development; case studies of some selected commands; Farmers participation in command area development.

Text Books/References

1. A.M. Michael. (1978). Irrigation Theory and Practice, Vikas Publishing House Pvt. Ltd., New Delhi.
2. R. Lal and A.C. Datta. (1971). Agricultural Engineering through worked examples, Saroj Prakashan, Allahabad
3. V.V.N. Murty. (1985). Land and Water Management Engineering, Kalyani Publishers, New Delhi.
4. R.K. Sharma. (1984). Text book of Irrigation Engineering and Hydraulic Structures, oxford & IBH Publishing CO. New Delhi.
5. S.R. Sahasrabudha. (1978). Irrigation Engineering and Hydraulic Structures, Katson Publishing House, Ludhiana.
6. B.C. Punmia and B.L. Pande. (1983). Irrigation and Water Power Engineering, Standard Publishers Distributors, Delhi.

8AG4.3: HORTICULTURAL CROP PROCESSING

Cr. Hrs. 3 (3 + 0)

	L	T
Credit	3	0
Hours	3	0

Unit-I

Production and processing scenario of fruits and vegetable: India; Scope of Fruit and Vegetable Preservation Industry in India. Present status, constraints and prospectus. Overview of principles and preservation methods of fruits and Vegetables. Processing of Canned fruits and vegetables.

Unit-II

Preparation of Jam, Jelly and Marmalade of various fruits such as Guava, Grape, Aonla, Carrot and Citrus fruits. Preservation by heat treatment, addition of sugar, acids and flavour, boiling under vacuum, end point and storage.

Unit-III

Preparation Extraction and Preservation of fruit juice and squash of the following fruits: Guava, Grape Aonla, Wood apple, Citrus fruits. Candy of different types of fruits such as Citrus fruits, Aonla, Ginger.

Unit-IV

Papaya and Carrot. Processing technology for powder making of various fruits such as Aonla, Mango, Banana. Processing technology of vegetables for various products viz. Tomato: Ketchup, sauce, puree.

Unit-V

Dried Leafy Vegetables viz. Spinach, Fenugreek, Coriander leaves, etc

Quality control: Food Laws and regulation in India, PFA Act, FPO Act, AGMARK, HACCP, ISO-2000, CAC (Codex Alimentarius, commission), BIS.

Text Books/References

1. Girdhari Lal, G.S. Siddappaand, G.L. Tandon. Preservation of fruits and vegetables. Publication ICAR, New Delhi - 110012.
2. W.V. Cruess. Commercial Fruit and Vegetable Products, Agrobios (India).

8AG5: PRINCIPLES OF FOOD PRESERVATION LAB

Practicals

1. Demonstration of various machineries used in processing.
2. Demonstration of blanching of foods.
3. Preservation of food by high concentration of sugar i.e. preparation of jam.
4. Preservation of food by using salt- Pickle.
5. Preservation of food by using acidulants i.e. pickling by acid, vinegar or acetic acid.
6. Preservation of Bread, Cake using mold inhibitors.
7. Preservation of coconut shreds using humectants.
8. Drying of pineapple slices, apple slices in cabinet drier.
9. Demonstration on drying of green leafy vegetables.
10. Drying of Mango/other pulp by foam mat drying.
11. Demonstration of spray drying of a liquid food.
12. Drying of foods using freeze-drying process.
13. Demonstration of preserving foods by freezing process.

8AG6: REMOTE SENSING AND GIS APPLICATION LAB

Practicals

1. Study of aerial photographs under mirror stereoscope
2. Preparation of stereo model of aerial photograph,
3. Land use/cover studies through aerial photograph,

4. Use of optical scanners and digitizers,
5. Use of GPS in mapping and GIS data input,
6. Satellite data product
7. Familiarization with image processing and GIS software's and their applications.

8AG7: FARM POWER AND MACHINERY MANAGEMENT LAB

Practicals

1. Solving problems related to various capacities, pattern efficiency, system limitation, power requirement and other operational parameters.
2. Solving of problems related to cost analysis.
3. Solving problems related to selection of equipment and replacement.
4. Presentation of seminar on topic assigned related to farm machinery management.
5. Design of farm mechanization plan for different farm size and cropping pattern.

8AG8: WATERSHED PLANNING AND MANAGEMENT LAB

Practicals

1. Study of watershed characteristic.
2. Analysis of hydrologic data for watershed management.
3. Delineation of watershed and measurement of area under different vegetative and topographic conditions.
4. Measurement of water and sediment yield from watershed.
5. Study of different watershed management structures.
6. Study of various water budget parameters.
7. Study of watershed management technologies.
8. Preparation of a techno-economically effective project proposal.