

DEGREE STANDARD

SOIL AND WATER CONSERVATION AND AGRICULTURAL STRUCTURES

UNIT I

SURVEYING

Surveying -uses -Instruments and necessaries - methods of surveying - computation of area - triangulation, intersection, traversing, cross staff survey - plane table survey -earth work computation - simpson's rule - reduction of levelling data by rise and fall method and height of collimation method-contouring -profile surveying -cross section survey.

UNIT II

HYDROLOGY

Hydrology - measurement of rainfall, evaporation, infiltration - instruments used for measurement - estimation of runoff - factors affecting runoff - computation of volume of runoff and peak flow -unit hydrograph.

UNIT III

SOIL CONSERVATION

Soil erosion - types - factors affecting erosion by water and wind - stages of water erosion - types of wind erosion - biological control measures - contour farming, strip cropping, mixed cropping, inter cropping, mulching -mechanical control measures-their suitability for different conditions -design of contour bunds, graded bunds, terraces, contour stone wall-gully control structures- check dams-wind erosion control -universal soil loss equation.

UNIT IV

FLUID MECHANICS AND IRRIGATION

Hydraulics of flow - open channel flows, steady and non steady, uniform and non-uniform, laminar and turbulent, rotational and irrotational flow - Reynold's Number, Froude Number - Velocity distribution - critical depth -hydraulic jump-Orifice-mouthpiece-weirs and flumes -co-efficient of discharge-Chezy's and Manning's formula -most efficient cross section for maximum flow - Irrigation -need-measurement of irrigation water - units and inter relationship surface and subsurface conveyance of irrigation water-merits- duty, delta-base period relationship -irrigation methods gravity and pressure irrigation system and their adoptability -water requirement of crops-on farm water management.

UNIT V

WELLS AND PUMPS

Ground water occurrence-aquifers-types,wells-types and methods of construction -well development - screens-gravel packing radius of influence -transmissibility -artificial recharge - pumps-types and suitability -selection of pumps based on energy requirement and water requirement.

UNIT VI

SOIL WATER - PLANT RELATIONSHIP:

Soil water - types -field capacity, wilting point, permanent and ultimate wilting point -available soil moisture-scheduling of irrigation-irrigation efficiencies-conveyance, application,storage and distribution efficiencies-crop and field water use efficiencies project efficiency - consumptive use.

UNIT VII

DRAINAGE:

Drainage - water logging -benefits of proper drainage-surface and subsurface methods- drainage coefficient-bio-drainage-well drainage-mole drainage -salt affected soil, reclamation-leaching requirement.

UNIT VIII

WATERSHED DEVELOPMENT:

Watershed - Concept land capability classification, gully and ravine reclamation - water harvesting, micro catchments - farm pond percolation pond - selection of suitable soil and water conservation practice - planning.

UNIT IX

FARM IRRIGATION STRUCTURES:

Surface conveyance structures - earthen channels - lined channels - advantages of lining - materials of lining - design of channel cross section - crossing control structures - drop spillway, chute spillway, pipe inlet spill way - crossing structures - culvert, inverted siphon aqueduct - their uses. Under ground pipe line system - component structures and their functions - types of points used in under ground pipe lines.

UNIT X

FARM STRUCTURES:

Materials of construction - quality - bearing capacity of the soil - factor of safety - types of masonry - foundation, basement and superstructure - types of roofs - building plan and estimation. requirements of farm house, threshing floor, drying floor, poultry house, dairy farm, rat proof godown, construction procedure - estimating storage requirements of farm products - silos - farm roads - types stability test for retaining structures - earthen dams - flownet - gravity dams - design features.

PAPER -II

FARM POWER & MACHINERY AND POST HARVEST TECHNOLOGY

UNIT I

Thermodynamics and heat engines - Laws of Thermodynamics - cycles - gas laws - air standard cycles - Otto cycle - Diesel cycle and dual combustion cycle - Thermal efficiency. I.C. engines - classification - construction - S.I, C.I engines - two stroke, four stroke engines - working principles - valve timing diagrams - Air-fuel ratio - Carburation - combustion - Governor - cooling - lubrication - performance - Characteristics - heat balance - thermal efficiency.

UNIT II

Tractors, power tillers and earth moving machinery. Tractors - types - fuel system - lubrication and cooling system. Transmission system - clutch - gear box - speed reduction - differential - final drive wheels - tyres - size - inflation - ballast. Hydraulic system - working principle. Steering - alignment. PTO - best pulley Draw bar - three point linkage - draft control. Brake. Tractor testing. Power tiller - types - transmission system - controls - balancing - Care and maintenance of tractors and power tillers. Bulldozer - transmission system - shovel and its actuation tracks and suspension - steering. Well drilling machines - rig - jack hammers - rotary drilling - compressors.

UNIT III

Theory of machines and design of Agricultural machinery:-

Kinematics links - pairs - chain - four bar linkage - velocity and acceleration - velocity polygon. Friction - pivot - collar - bearing. Transmission - belt - chain and gear. Gear trains Cam profile - simple harmonic and cycloidal motion - uniform angular velocity. Balancing of masses - Vibration - free and forced. Gyroscopic theory. Stress - stress concentration - bending - torsion and factor of safety. Design of shafts - key - couplings - beams - belt. Bearing - selection and installation. Fits and tolerance - force fit - shrink fit.

UNIT IV

Farm implements and equipments:-

Tillage - Primary and secondary tillage implements - mould board plough - disc plough - cultivator - harrows - disc harrow - sub soiler - ridger - bund former. Hitching - adjustments - force measurement - draft - weight transfer. Puddler, green manure trampler, cage wheels and levels or seed drills and planters - seed cum fertilizer drills - adjustments and operation. Low land seeders - transplanters. Weeding tools - intercultural implements. Operation of tillage, sowing, planting and weeding

implements - field efficiency. Plant protection equipments - sprayers and dusters - types - operation, care and maintenance. Harvesting machinery - classification and types. Selection of farm implements and machinery for different size holdings and cropping pattern - cost economics.

UNIT V

Unit operations in Agricultural processing:-

Unit operations - classifications. Evaporators - types. Mechanical separations - filtration - sedimentation - settling - centrifugal separation - size reduction and its equipments - mixing - blending - emulsification - mixing index. Contact equilibrium separation processes - gas absorption. Extraction - crystallization - distillation. Equipments used for the above process.

UNIT VI

Process engineering of Agricultural and Horticultural Crops:-

Engineering properties of food materials - moisture content - psychometry. Threshing. Drying - thin layer drying - deep bed drying - types of heat sources. Cleaning and grading - principles - separators - efficiency - Performance index. Shelling and decortication - seed processing and layout of seed processing units. Rice processing - parboiling. Dehusking of paddy - machines used. Milling of wheat, corn and pulses. Material handling conveyors - elevators. Storage - conditions for safe storage - bag and bulk storage - modified atmosphere storage - storage structures. Equipments used for processing of horticultural crops - Vegetable seeds - preservation of fresh fruits and vegetables - drying and dehydration - Processing of coffee - tea - rubber - cashew nut - coconut - oil palm - tobacco - aromatic plants - flowers - spices.

UNIT VII

Heat transfer and refrigeration:-

Heat transfer laws - conduction - convection - types - heat exchangers. Radiation concept of black body and gray body. Refrigeration principles - Carnot, Bell Coleman cycles - Entropy - enthalpy concepts - Wet and dry compression. Under cooling - super heating. Refrigerants. Application of refrigeration in food industries - cold storage of fruits and vegetables and other perishables - cooling load calculations. Types and functioning of air conditioning - humidification and dehumidification - room dehumidifiers - storage environmental control.

UNIT VIII

Food and Dairy Engineering:-

Constituents of food - pigments and colours - nutritive aspects - Washers - manufacture of fruit juices - pasteurization - sterilization - canning. Reaction kinetics - decimal reduction time - thermal death time. Concentration of foods. Dehydration of food - drying and types - preservation of food by irradiation. Microwave and dielectric heating of foods. Fats and oil processing - extraction methods and equipments. Food processing plants. Food packaging, milk - processing and its by products manufacturing. Packaging of milk and milk products. Steam and refrigeration requirement.

UNIT IX

Solar, wind and biogas energy technologies:-

Electrochemical cells. Decomposition potential - photoelectric cells - fuel cells - Electromotive force and its measurement - corrosion - electrochemical coating - galvanizing - paints - proximate and ultimate analysis of material constituents - Natural gas - Energy plantations and producer gas production - Biogas plants - domestic and community biogas plants - Dual fuel engines - Solar energy application in domestic and agricultural application - Water heaters, cookers - pumps - dryers - Photovoltaic cells.

UNIT X

Agricultural Wastes and byproduct utilisation:-

Crop residues and farm wastes for energy production - Silica from rice husk - Production of wastes for paper making - coconut husk, shell utilisation - utilisation of wastes from fruits - weeds.