U. P. Education Service Selection Commission, Prayagraj

Syllabus.

AGRICULTURAL ENGINEERING
(Subject Code-94)

Unit 1: Farm Power

Status of farm mechanization in India. Power availability on farm. Selection of machine elements-gears, pulleys, chains, sprockets, belts, bearing, coupling, springs. Engine components, their details and functions, Compression vs spark ignition engines, two-stroke/four-stroke engines, various systems of spark and compression ignition engines. Calculation of horse power, speed, firing arrangement, power transmission from piston to fly wheel.

Farm tractors and their types, design, mechanical and power steering, tractor chassis, power filters, hitching systems and hydraulic control in tractors, automatic position control, draft control system used in tractors, types of dynamometers, tractor testing.

Unit 2: Farm Machinery

Animal and power operated equipment - (design, construction, operation, maintenance and field evaluation) of tillage, land development, seed drill, zero till ferti drills, calibration of seed drills: Planters corn planters, potato planters, sugarcane planters, rice transplanters, vegetable transplanters: Plant protection equipment- manual and power operated sprayers and dusters, tractor mounted sprayers, calibration of sprayers, microbial spraying for stubble decomposition, harvesting equipment- mower, reaper, combine harvester, forage Harvester, thresher- different types, installation, operation and safety considerations and threshing losses for wheat and rice, potato harvester, calculation of field capacity, field efficiency and cost analysis.

Unit 3: Dairy Engineering

Dairy development in India, Engineering, thermal and chemical properties of milk and milk products, Process flow charts for product manufacture, Unit operation of various dairy and food processing systems. Cleaning of dairy utensils, Principles and equipment related to receiving of milk, pasteurization, sterilization, homogenization, centrifugation and cream separation. Preparation methods and equipment for manufacture of cheese, paneer, shrikhand, butter and ice cream, Filling and packaging of milk and milk products; Spray and roller drying; Dairy plant design and layout, Plant utilities.

Unit 4: Renewable Energy

Classification of energy sources, contribution of these sources in agricultural sector, Bioconversion of biomass, types of biogas plants- design, construction, operation and maintenance; gasifiers, biogas, bio alcohol, biodiesel and bio oil production and their utilization, densification of biomass.

Introduction of solar energy, collection and their application, solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar

distillation, solar photovoltaic system and their application. solar radiations and its measurement, heat and mass transfer in solar energy and solar systems materials, collection methods and solar energy storage.

Introduction of wind energy and their application. Generation and application of wind energy, wind velocity measurement, wind power production, wind current, wind power equipment, wind power measurement and recording, wind velocity equipment, types of wind mills. Construction and working of wind mills, application of wind energy in irrigation.

Unit 5: Computer Application in Agricultural Engineering

Computer introduction, input/output devices, central processing unit, memory devices, operating systems, processors, keyboards and printers, algorithms, flow chart specifications, program translations and problem analysis in agricultural engineering. Measurement system for level flow, strain force, torque, power, pressure, vacuum, and temperature. Application of microprocessors in data acquisition and control of agricultural engineering processes. Use of ICT in agricultural engineering, Drone operated aerial spray.

Unit 6: Soil and Water Conservation Engineering

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by Universal Soil Loss Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control. Estimation of earth work and costing. Watershed management. Use of remote sensing and GIS in planning and development. Plastic film lining in canal, pond and reservoir

Unit 7: Irrigation and Drainage Engineering

Sources of irrigation water, methods of irrigation, and micro systems of irrigation devices, irrigation schedules, moisture regime, physiological stages of crops and metrological parameters, water use efficiency, weather forecasting equipment, evapo-transportation and consumptive use, measurement of irrigation water, drainage system and methods of drainage, irrigation pumps classification, design and control systems. Selection and installation. On-farm irrigation structure.

Unit 8: Post-harvest Technology

Important Engineering properties such as physical, thermal, rheological and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory (Thin layer and deep bed drying). various drying methods, commercial grain dryers (flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryers). Material handling equipment; conveyers and elevators, their principles, working and

selection. Moisture determination, drying and dehydration method, cleaning, grading, size reduction, seed treatment, storage, milling machineries of cereals, pulses, oilseeds.

Unit 9: Agriculture structures

Site selection, design and construction of farm stead- farm house, cattle shed, dairy barn, poultry house, goat housing, machinery and implement sheds, storage structure for food grains, feed and forage, construction of silos. Greenhouse technology: Introduction of greenhouse and net house, Types of Greenhouses; Plant response to Greenhouse environment, Planning and design of greenhouses, Design criteria of greenhouse for cooling and heating purposes. Greenhouse equipment, materials of construction for traditional and low cost greenhouses. Irrigation systems used in greenhouses, typical applications, passive solar greenhouse, hot air greenhouse heating systems, greenhouse drying. Cost estimation and economic analysis.

Unit 10: Surveying & Levelling

Linear measurements, Chain surveying, Cross staff survey, Compass survey. Planimeter, Errors in measurements, their elimination and correction. Plane table surveying. Levelling, levelling difficulties and error in leveling, Contouring, Computation of area and volume. Theodolite traversing. Introduction to setting of curves. Total station, Electronic Theodolite. Introduction to GPS survey.

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