

**AGRICULTURAL ENGINEERING**

**(Subject Code-94)**

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**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, diesel vs spark ignition engines, two-stroke/ four-stroke engines, various systems of spark and compression ignition engines. Calculation of horse power, speed, firing arrangement, heat load power transmission from piston and fly wheel.

Farm tractors and types, design, mechanical and power steering, tractor chassis mechanics, power filters, hitching systems and hydraulic control, for 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, seeding, land development, sowing, calibration of seed drills, zero ferti-drills, planters – corn planters, potato planters, sugarcane planters, rice transplanters, vegetable transplanters, Plant protection equipment – manual and power operated sprayers and dusters, tractamount 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 and application of solar energy.

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

**Unit 5: Computer Application in Agriculture 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. 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. 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 Loss Soil 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 and its control measures. Estimation of earth work and costing. Water shed 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, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection. Moisture determination, drying and dehydrations methods, cleaning, grading, size reduction, seed treatment, storage, milling machineries of cereals, pulses, oilseeds.

#### **Unit 9: Agriculture structures**

Site selection, design and construction of farm steps – 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. Green house technology: Introduction of green and net house, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air greenhouse heating systems, green house 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.