

Renewable and Bio Energy Engineering

Solar Energy: sun and its characteristics, flat plate and concentrating collectors, different solar thermal devices, natural and forced convection solar drying system and green house. Solar photovoltaic

Wind Energy: availability, lift and drag, coefficient of performance (COP), conversion, effect of density, frequency variances, angle of attack, wind speed and types of wind mill rotors.

Bio-energy: characteristics of biomass, pyrolysis of biomass to produce solid, liquid and gaseous fuels, biomass gasification and types of gasifiers, biomass cookstoves and briquetting/pelletization. Bio-fuel and biodiesel production and their applications.

Biogas: biogas generation, biogas plants, uses of biogas, purification and bottling, power generation from biogas and handling of bio-digested slurry.

Energy audit: energy accounting, energy analysis, energy balance, energy management in agriculture and agro-processing.

Processing & Food Engineering

Steady state heat transfer in conduction, convection and radiation; heat exchangers; mass transfer;

Material and energy balances in food processing systems; water activity, sorption and desorption isotherms; centrifugal separation of solids, liquids and gases;

Pasteurization and sterilization; preservation by cooling and freezing; refrigeration and cold storage;

Psychrometry – properties of air-vapour mixture; concentration and drying of liquid foods – evaporators, tray, drum and spray dryers.

Mechanics and energy requirement in size reduction of granular solids; particle size analysis for comminuted solids; size separation by screening; fluidization of granular solids-pneumatic, bucket, screw and belt conveying; cleaning and grading; Effectiveness of grain cleaners.

Hydrothermal treatment, drying and milling of cereals, pulses and oilseeds; Processing of seeds, spices, fruits and vegetables; By-product utilization from processing industries.

Controlled and modified atmosphere storage; Perishable food storage, godowns, bins and grain silos.

Farm Machinery & Power Engineering

Sources of power, machine elements, measurement of force, torque, speed, displacement, acceleration

Soil tillage; forces acting on a tillage tool; hitch systems; traction;

Equipment for primary and secondary tillage, sowing, planting, fertilizer application, inter-cultivation, plant protection, mowing, harvesting, threshing and transport;

Machine performance parameters- field capacity, efficiency, application rate and losses; cost analysis

Principles of I.C. engines; engine components; engine systems – fuel, cooling, lubrication, ignition, electrical, intake and exhaust; selection, operation, maintenance and repair of I.C. engines; power efficiencies and measurement; calculation of power, torque, fuel consumption

Tractors and power tillers – type, selection, maintenance and repair; tractor clutches and brakes; power transmission systems, differential, final drives and power take-off; mechanical steering and hydraulic control systems used in tractors;

Human engineering and safety in agricultural machine design; tests and performance.

Soil & Water Engineering

Hydrological cycle; analysis of precipitation data; runoff; hydrograph analysis, stream flow measurement; flood routing; Mechanics of soil erosion, soil erosion types; wind and water erosion; factors affecting erosion; soil loss estimation; erosion control measures ; terraces and bunds; vegetative waterways; gully control structures, drop, drop inlet and chute spillways; earthen dams; water harvesting structures, farm ponds, watershed management.

Soil-water-plant relationship, water requirement of crops; irrigation scheduling; irrigation efficiencies; design of irrigation channels; measurement of soil moisture, irrigation water and infiltration; surface, sprinkler and drip methods of irrigation.

Drainage coefficient; surface and sub-surface drainage systems; leaching requirement and salinity control; irrigation and drainage water quality.

Confined and unconfined aquifers, well hydraulics; groundwater recharge, pumps and electric motors

Properties of fluids; hydrostatic pressure; continuity equation; laminar and turbulent flow in pipes

Measurement of distance and area; chain surveying, plane table surveying; levelling; contouring