

Semester- IV

1. Farm Machinery & Equipment-II (FPM 106)

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| | L | P |
| Credits | 2 | 1 |
| Contact Hours | 2 | 2 |

Theory: Principles & types of cutting mechanisms. Construction & adjustments of shear & impact-type cutting mechanisms. Crop harvesting machinery : mowers, windrowers, reapers, reaper binders and forage harvesters. Forage chopping & handling equipment. Threshing mechanics & various types of threshers. Threshers, straw combines & grain combines, maize harvesting & shelling equipment, Root crop harvesting equipment - potato, groundnut etc., Cotton picking & Sugarcane harvesting equipment. Principles of fruit harvesting tools and machines. Horticultural tools and gadgets. Testing of farm machine. Test codes & procedure. Interpretation of test results. Selection and management of farm machines for optimum performance.

Practical: Familiarization with various Farm machines related to harvesting, threshing, root harvesting, combine etc; Study of various types of mowers, constructional details, materials and working; Study of various types of reaper, constructional details, materials and working & performance; Study of various types of reaper binder, constructional details, materials and working; Study of various types of potato harvesters, constructional details, materials and working; Study of various types of groundnut harvesters, constructional details, materials and working & performance; Study of various types of forage harvester, constructional details, materials and working; Study of various types of sugarcane harvester, constructional details, materials and working; Study of various types of maize sheller, constructional details, materials and working & performance; Study of various types of threshers, constructional details, materials and working & performance; Study of various types of cotton pickers and strippers, constructional details, materials and working; Study of various types of harvester tools, constructional details, materials and working; Study of various types of combine harvester, constructional details, materials and working; Study of various types of straw combines, constructional details, materials and working; Study of various types of fruit harvester equipment, constructional details, materials and working.

2. Renewable Energy Sources (FPM 107)

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| | L | P |
| Credits | 2 | 1 |
| Contact Hours | 2 | 2 |

Theory: Classification of energy sources; Introduction to renewable energy sources; characterization of biomass; types, construction, working principle, uses and safety/environmental aspects of different renewable energy devices like gasifiers, biogas plants, solar passive heating devices, photovoltaic cells and arrays; Brief introduction to wind energy, hydroelectric energy, ocean energy, briquetting and baling of biomass, biomass combustion, biodiesel preparation and energy conservation in agriculture.

Practical: Preparation of biomass sample; Determination of calorific value; Estimation of ash content of biomass; Estimation of moisture content of biomass; Estimation of fixed carbon and volatile matter of biomass; Demonstration of down draft throatless rice husk gasifier; Demonstration of down draft gasifier with throat; Demonstration of rice husk gasifier for thermal use; Demonstration of working of a fixed dome type biogas plants; Demonstration of working of a floating drum type biogas plants; Demonstration of biodiesel preparation; Measurement of basic solar parameters; Demonstration of solar water heater; Demonstration of PVC; Demonstration of solar cooker; Determination of fuel properties.

3. Irrigation Engineering (SWE 107)

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| | L | P |
| Credits | 2 | 1 |
| Contact Hours | 2 | 2 |

Theory: Irrigation Engineering: Irrigation, impact of irrigation on Human Environment, some major and medium irrigation schemes of India, purpose of irrigation, sources of irrigation water, present status of development and utilization of different water resources of the country; Measurement of irrigation water, weir, notches, flumes and orifices and other methods; water conveyance, design of irrigation field channels, underground pipe conveyance system, irrigation structures, channel lining; land grading, different design methods and estimation of earth work and cost; soil water plant relationship, soil water movement, infiltration, evapotranspiration, soil moisture constants, depth of irrigation, frequency of irrigation, irrigation efficiencies; surface irrigation methods of water application, border, check basin, furrow and contour irrigation; sprinkler and drip irrigation method, merits, demerits, selection and design; Participatory irrigation management. Economics of water resources utilization.

Practical: Measurement of soil moisture by different soil moisture measuring instruments; measurement of irrigation water; measurement of infiltration rate; computation of evaporation and transpiration; land grading exercises; design of under ground pipe line system; infiltration-advance in border irrigation; measurement of advance and recession in border irrigation and estimation of irrigation efficiency; measurement of advance and recession in furrow irrigation and estimation of irrigation efficiency; measurement of uniformity coefficient of sprinkler irrigation method; measurement of uniformity coefficient of drip irrigation method; field problems and remedial measures for sprinkler and drip irrigation method.

4. Crop Process Engineering (PFE 105)

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| | L | P |
| Credits | 2 | 1 |
| Contact Hours | 2 | 2 |

Theory: Scope and importance of food processing, principles and methods of food processing. Processing of farm crops; cereals, pulses, oil seeds, fruits and vegetables and their products for food and feed. Processing of animal products, Principal of size reduction, grain shape, size reduction machines; crushers, grinders, cutting machines etc. - operation, efficiency and power requirement – Rittinger's, Kick's and Bond's equation, fineness modulus. Theory of mixing, types of mixtures for dry and paste. materials, rate of mixing and power requirement, mixing index. Theory of separation, size and un sized separation, types of separators, size of screens, sieve analysis, capacity and effectiveness of screens, pneumatic separation. Theory of filtration, study of different types of filters, rate of filtration, pressure drop during filtration. Scope & importance of material handling devices, study of different types of material handling systems; belt, chain and screw conveyor, bucket elevator, pneumatic conveying, gravity conveyor- design consideration, capacity and power requirement.

Practical: Preparation of flow and layout charts of a food processing plant; Determination of fineness modulus and uniformity index; Performance evaluation of hammer mill; Performance evaluation of attrition mill; Study of cleaning equipment; Separation behaviour in pneumatic separation; Study of grading equipment; Evaluation of performance of indented cylinder and screen pre-cleaner; Mixing index and study of mixers; Study of conveying equipments; Performance evaluation of bucket elevator.

5. Watershed Hydrology (SWE 108)

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| | L | P |
| Credits | 2 | 1 |
| Contact Hours | 2 | 2 |

Theory: Introduction; hydrologic cycle; precipitation - forms, rainfall measurement, mass curve, hydrograph, mean rainfall depth, frequency analysis of point rainfall, plotting position, estimation of missing data, test for consistency of rainfall records; interception; infiltration; evaporation; evapo-transpiration - estimation and measurement; geomorphology of watersheds - stream number, stream length, stream area, stream slope and Horton's laws; runoff - factors affecting, measurement; stage and velocity, rating curve, extension of rating curve; estimation of peak runoff rate and volume; rational method, Cook's method, SCS method, Curve number method; hydrograph; components, base flow separation, unit hydrograph theory - unit hydrograph of different durations, dimensionless unit hydrograph, distribution hydrograph, synthetic unit hydrograph, uses and limitations of unit hydrograph; head water flood control - methods, retards and their location; flood routing – graphical methods of reservoir flood routing; hydrology of dry land areas - drought and its classification; introduction to watershed management and planning.

Practical: Visit to meteorological observatory; Study of different types of rain gauges; Exercise on analysis of rainfall data; Double mass curve technique; Determination of average depth of rainfall and frequency analysis; Study of stage recorders and current meters; Exercise on estimation of peak runoff rate and runoff volume; Exercises on hydrograph and unit hydrograph; Exercises on design and location of retards for channel improvement; Exercises on flood routing problems.

6. Strength of Materials (SWE 109)

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| | L | P |
| Credits | 2 | + 1 |
| Contact Hours | 2 | + 2 |

Theory: Slope and deflection of beams using integration techniques, moment area theorems and conjugate beam method. Columns and Struts. Riveted and welded connections. Stability of masonry dams. Analysis of statically indeterminate beams. Propped beams. Fixed and continuous beam analysis using superposition, three moment equation and moment distribution methods.

Practical: To perform the tension test on metal specimen (M.S., C.I.), to observe the behaviour of materials under load, to calculate the value of E, ultimate stress, permissible stress, percentage elongation etc. and to study its fracture; To perform the compression test on; Concrete cylinders & cubes, C.I., M.S. & Wood specimens and to determine various physical and mechanical properties; To perform the bending test on the specimens; M.S. Girder, Wooden beam, Plain concrete beams & R.C.C. beam, and to determine the various physical and mechanical properties; To determine Young's modulus of elasticity of beam with the help of deflection produced at centre due to loads placed at centre & quarter points; To study the behaviour of materials (G.I. pipes, M.S., C.I.) under torsion and to evaluate various elastic constants; To study load deflection and other physical properties of closely coiled helical spring in tension and compression; To perform the Rockwell, Vicker's and Brinell's Hardness tests on the given specimens; To perform the Drop Hammer Test, Izod Test and Charpy's impact tests on the given specimens; To determine compressive & tensile strength of cement after making cubes and briquettes; To measure workability of concrete (slump test, compaction factor test); To determine voids ratio & bulk density of cement, fine aggregates and coarse aggregates; To determine fatigue strength of a given specimen; To write detail report emphasizing engineering importance of performing tension, compression, bending, torsion, impact and hardness tests on the materials

7. Heat and Mass Transfer (PFE 106)

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| | L | P |
| Credits | 1 | 1 |
| Contact Hours | 1 | 2 |

Theory: Introductory concepts, modes of heat transfer, thermal conductivity of materials, measurement. General differential equation of conduction. One dimensional steady state conduction through plane and composite walls, tubes and spheres with and without heat generation. Electrical analogy. Insulation materials, critical thickness of insulation. Fins, Free and forced convection. Newton's law of cooling, heat transfer coefficient in convection. Dimensional analysis of free and forced convection. Useful non dimensional numbers and empirical relationships for free and forced convection. Equation of laminar boundary layer on flat plate and in a tube. Laminar forced convection on a flat plate and in a tube. Combined free and forced convection. Introduction. Absorptivity, reflectivity and transmissivity of radiation. Black body and monochromatic radiation, Planck's law, Stefan-Boltzman law, Kirchoff's law, grey bodies and emissive power, solid angle, intensity of radiation. Radiation exchange between black surfaces, geometric configuration factor. Heat transfer analysis involving conduction, convection and radiation by networks. Types of heat exchangers, fouling factor, log mean temperature difference, heat exchanger performance, transfer units. Heat exchanger analysis restricted to parallel and counter flow heat exchangers. Steady state molecular diffusion in fluids at rest and in laminar flow, Flick's law, mass transfer coefficients. Reynold's analogy.

8. Operation & Maintenance of Farm Machinery-I (FPM 108)

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| | L | P |
| Credits | 1 | 1 |
| Contact Hours | 1 | 2 |

Theory: Selection of matching size of plough, tractor track wheel setting, adjustment of suctions, plough setting, quality and method of good ploughing, different problems and causes in ploughing, care and maintenance, preparation of rotavator for field operation, operational techniques and trouble shooting of secondary tillage implements, field operation, care and maintenance and trouble shooting of sowing, planting and plant protection machinery. Different makes & models of 4- wheeled tractors Tractor performance, tractive force, tractive efficiency, traction improvement, mechanics of tractor chassis: static equilibrium, stability, determination of center of gravity and moment of inertia, hydraulic system and control, three point linkage, transmission and drive trains, power estimation-field method, safe operation of tractor.

Practical: Introduction to various systems of a tractor viz. fuel, lubrication, cooling, electrical, transmission, hydraulic & final drive system. Familiarisation with tractor controls & learning procedure of tractor starting and stopping. Driving in forward and reverse gears. Driving safety rules. Hitching, adjustments, settings and field operation of farm machinery. Familiarisation with different makes & models of 4- wheeled tractors. Starting & stopping practice of the tractor. Familiarisation with instrumentation panel & controls; Road signs, traffic rules, road safety, driving & parking of tractor; Tractor driving practice forward & reverse driving practice; Tractor driving practice with two wheeled tractor trailer forward & reverse; Study and practising the hitching and dehitching of implements; Study operation and field adjustments of m.b. plough & disk plough; Field operation of trailing & mounted disk harrow; Field operation and adjustments of seed drill/planter/sprayer.

9. Agribusiness Management and Trade (AGS 103)

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| | L | P |
| Credits | 1 | 1 |
| Contact Hours | 1 | 2 |

Theory: Management concepts and principles, process of management, functions of management, concept of agribusiness and application of management principles to agribusiness, production, consumption, and marketing of agricultural products, agricultural processing, meaning and theories of international trade, WTO provisions for trade in agricultural and food commodities, India's contribution to international trade in food and agri – commodities

