### Department of Agricultural Engineering PG Courses

<table>
<thead>
<tr>
<th>Professors/Equivalent</th>
<th>Vatsa D.K.; Goel A.K.; Sharma V.K.</th>
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<tbody>
<tr>
<td>Associate Prof./Equivalent</td>
<td>Gupta R.K.; Rana R.S.</td>
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<tr>
<td>Assistant Prof./Equivalent</td>
<td>Singh Sukhbir, Dadhich Hemant, Baghla Kanika</td>
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<tr>
<td>Programme</td>
<td>Minor courses for M.Sc. and Ph.D.</td>
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<tr>
<td>Field of specialization</td>
<td>Agricultural Engineering</td>
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<tr>
<td>Core courses</td>
<td>Not Applicable</td>
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#### Ag.Engg. 501 Soil and Water Conservation Engineering 2+1 (Sem I)

Soil erosion and factors affecting; universal soil loss equation; precipitation and runoff; prediction of peak flow; erosion control measures—strip cropping, bunding and terracing; stream bank protection; gully control structures; earthen embankments and farm ponds; measures to reduce seepage losses during conveyance and storage.

**Practical:** Study of rainfall and runoff measuring equipments; analysis of rainfall data and runoff hydrograph; design of contour and graded bunds; design and preparation of estimates for different soil conservation structures; measurement of seepage losses during conveyance and storage.

#### Ag.Engg. 502 Watershed Management 2+1 (Sem I)

Watershed a need for integrated approach in the hills, role of hydrograph in agricultural productivity, rainfall distribution, soil erosion - its measurement and control, universal soil loss equation and other soil erosion models, degradation of soil productivity due to soil erosion, rainfall simulators and scope of their use in soil erosion studies, sedimentation of reservoirs, catchment area treatment in river valley and irrigation projects, artificial groundwater recharge, water harvesting - various methods and structures, morphologic description of watershed, watershed based water management, economics of water management, participatory mode of water management.

**Practical:** Watershed delineation: watershed discretisation; assessment of inflow and outflow; measurement, calculation and interpretation of geomorphologic parameters; land and water use planning of watershed.

#### Ag.Engg. 503 Irrigation Engineering 2+1 (Sem I)

Sources of irrigation water; "kuhl" irrigation in hills; water conveyance and control structures; methods of measurement of irrigation water; irrigation efficiencies; design of surface, subsurface, sprinkler and drip irrigation systems; types of aquifers; construction and development of wells; well hydraulics; centrifugal pumps—principles of working, installation, characteristics curves and trouble shooting.

**Practical:** Measurement of irrigation water; design of irrigation channels; estimation of water requirement of crops; design of irrigation methods; operation and maintenance of sprinkler and trickle irrigation systems; installation and maintenance of centrifugal pumps.
Ag.Engg. 504 Watershed Hydrology 2+1 (Sem II)

Hydrologic system; elements of agricultural hydrology; concept of watershed; factors affecting behaviour of a watershed; problems and prospects of watershed management; overland flow phenomenon; collection of hydrologic data; runoff hydrograph and its interpretation; estimation of design runoff; rate and runoff volume from watersheds under different land uses; water harvesting; design of farm ponds.

Practical: Use of topographic maps for watershed identifications, preparation and interpretation of land use map, runoff estimation from rainfall and watershed information, hydrograph analysis, development of unit hydrograph and its use, measurement of stream flow and sediment flow, planning for watershed development.

Ag.Engg. 505 Structures For Soil and Water Management 2+0 (Sem II)

Design considerations-hydrologic, hydraulic and structural; soil conservation structures with reference to hills and mountains; different types of spillways; diversion, conveyance, regulation and control structures; drainage structures; design of water harvesting reservoirs; cost analysis.

Ag.Engg. 506 Drainage Engineering 2+0 (Sem II)

Need for drainage in agriculture; drainage surveys and investigations; drainage coefficient; surface drainage systems; design of drainage channels; tile drainage-depth and spacing of tiles; types of tile drainage systems; design of gravel envelope; supplemental structures; mole drainage; isobath and water table contour maps; drainage by pumping from wells.

Ag.Engg. 511 Selection and Management of Farm Machinery 2+0 (Sem I)

Farm tools and machinery for hills, machine performance parameters; common field machine operational patterns and their efficiencies; costs of using farm machinery-fixed, variable and timeliness; optimum selection of power source and matching implements; custom hiring of farm machinery, optimal equipment replacement policy; inventory control of spare parts; care, maintenance and repair of farm equipment.

Ag.Engg. 512 Land Development Machinery 2+0 (Sem I)

Basic principles of earth moving; relevant properties of soil for earth work; methods of levelling, grading and computation of earth work; earth moving machines-bulldozers, scrapers, excavators and dumpers; animal/power-tiller/tractor driven land grading equipment; cost estimation; selection, operation and maintenance of land development machinery.

Ag.Engg. 513 Seed Processing Machinery 2+0 (Sem II)

Basic seed flow patterns in seed processing plant; drying requirements of different seeds; cleaning and grading; seed treatment; seed testing and quality control; packaging and storage of seeds; planning and layout of seed processing plant; cost estimation.
Human factors in system development; energy liberation and transfer; work, energy and mechanical efficiency of human body; anthropometry and its applications; biomechanics automation; controls and related devices and their design considerations; the man-machine system concept; human behaviour models; thermal influences on human performance; case studies on ergonomics.

Importance of food processing and its present status in the country with special reference to hills, engineering principles of underlying processing operations in food (cereals, fruits and vegetables) industry; basic principles of food dehydration and drying; freeze drying, evaporation and drying equipment; size reduction, cleaning, mixing and separation, sorting and grading of food material; food preservation, packaging and storage; quality control; selection of equipment and its installation.

Functional planning and layout of farm stead in hills and mountains; farm buildings and livestock production facilities; storage structures for food, feed, farm machinery and crop inputs; application of thermal and structural design principles of farm buildings; specifications, cost estimation and economics of structures on the farm.

Biological materials; uniqueness in relation to other materials; physical characteristics-shape, size, volume, density, surface area, mechanical, electrical and thermal properties; aerodynamic characteristics and frictional properties; stress-strain-time effects; rheological models and applications; application of engineering properties in design and operation of agricultural equipment structures.

Renewable energy sources and their necessity; solar radiation; fundamentals of energy transfer; solar water heaters, dryers and cookers; photovoltaic cells; wind mills; smokeless chulhas, use in crops vegetables and fruit drying bioconversion of biological wastes; biogas plants-construction, operation and maintenance.

Practical: Measurement of solar radiation; determination of the efficiency of solar cookers; practical demonstration of different designs of smokeless chulhas; measurement of power from photovoltaic cells; evaluation of biogas plants.