B.Tech
AGRICULTURAL ENGG.

Semester III

Subject Code	Name of Subject	Teaching Period			credits
		L	T	P	
03BAG101	FLUID MECHANICS	3	1	0	4
03BAG102	FOOD ENGINEERING	3	0	0	3
03BAG103	AGRONOMY	3	0	0	3
03BAG104	STRENGTH OF MATERIAL	3	1	0	4
03BAG105	HEAT AND MASS TRANSFER	3	0	0	3
03BAG106	FARM MACHINERY-I	3	0	0	3
Practical					
03BAG201	FLUID MECHANICS LAB	0	0	4	2
03BAG202	FOOD ENGINEERING LAB	0	0	4	2
03BAG203	AGRONOMY LAB	0	0	2	1
03BAG204	STRENGTH OF MATERIAL LAB	0	0	4	2
03BAG205	FARM MACHINERY -I LAB	0	0	2	1
03BAG301	DISCIPLINE AND CO-CURRICULAR ACTIVITY	0	0	4	1
Total		18	2	20	29

Semester IV

Subject Code	Name of Subject	Teaching Period			credits
		L	T	P	
04BAG101	APPLIED HYDROLOGY	3	1	0	4
04BAG102	CIVIL ENGINEERING-II	3	1	0	4
04BAG103	SOIL MECHANICS	3	1	0	4
04BAG104	SOIL SCIENCE	3	0	0	3
04BAG105	AGRICULTURAL PROCESSING	3	0	0	3
04BAG106	AGRICULTURAL ECONOMICS & EXTENTION PRACTICES	3	0	0	3
Practical					
04BAG201	APPLIED HYDROLOGY LAB	0	0	4	2
04BAG202	CIVIL ENGINEERING-II LAB	0	0	2	1
04BAG203	SOIL MECHANICS LAB	0	0	2	1
04BAG204	SOIL SCIENCE LAB	0	0	2	1
04BAG205	AGRICULTURAL PROCESSING LAB	0	0	2	1
04BAG206	AGRICULTURAL ECONOMICS & EXTENTION PRACTICES LAB	0	0	2	1
04BAG301	DISCIPLINE AND CO-CURRICULAR ACTIVITY	0	0	4	1
Total		18	3	18	29

SEMESTER V

Subject Code	Name of Subject	Teaching Period			credits
		L	T	P	
05BAG101	FARM POWER	3	0	0	3
05BAG102	RENEWABLE ENERGY	3	0	0	3
05BAG103	POST HARVEST TECHNOLOGY	3	0	0	3
05BAG104	SOIL AND WATER CONSERVATION ENGINEERING	3	1	0	4
05BAG105	STRUCTURAL DESIGN	3	0	0	3
05BAG106	ESTIMATING AND COSTING	3	0	0	3
Practical					
05BAG201	FARM POWER Lab	0	0	3	2
05BAG202	RENEWABLE ENERGY Lab	0	0	2	1
05BAG203	POST HARVEST TECHNOLOGY Lab	0	0	2	1
05BAG204	SOIL AND WATER CONSERVATION ENGINEERING Lab	0	0	2	1
05BAG205	STRUCTURAL DESIGN Lab	0	0	2	1
05BAG206	ESTIMATING AND COSTING Lab	0	0	2	1
05BAG207	PRACTICAL TRAINING	0	0	4	2
05BAG301	DISCIPLINE AND EXTRA CURRICULAR ACTIVITY	0	0	4	1
	TOTAL	18	1	21	29

SEMESTER VI

Subject Code	Name of Subject	Teaching Period			credits
		L	T	P	
06BAG101	INSTRUMENTATION IN AGRO PROCESSING SYSTEM	4	0	0	4
06BAG102	ELECTRICAL MACHINES	3	1	0	4
06BAG103	DESIGN AND MANAGEMENT OF FARM MACHINES	4	0	0	4
06BAG104	FARM MACHINERY –II	3	1	0	4
06BAG105	AGRI. STATISTICS	3	0	0	3
06BAG106	WELLS AND PUMP	3	0	0	3
Practical					
06BAG201	INSTRUMENTATION IN AGRO PROCESSING SYSTEM Lab	0	0	2	1
06BAG202	ELECTRICAL MACHINES Lab	0	0	2	1
06BAG203	DESIGN AND MANAGEMENT OF FARM MACHINES Lab	0	0	3	2
06BAG204	FARM MACHINERY –II Lab	0	0	2	1
06BAG205	WELLS AND PUMP Lab	0	0	2	1
06BAG301	Discipline And Extra Curricular Activity	0	0	4	1
	TOTAL	20	2	15	29

SEMESTER VII

Subject Code	Name of Subject	Teaching Period	credits		
		L	T	P	
07BAG101	MICRO PROCESSOR AND LOGIC CIRCUITS	3	1	0	4
07BAG102	REFRIGERATION AND AIR CONDITIONING	3	1	0	4
07BAG103	DAIRY AND FOOD ENGINEERING	3	0	0	3
07BAG104	IRRIGATION ENGINEERING	3	0	0	3
07BAG105	LAND DEVELOPMENT AND GRADING	3	0	0	3
07BAG106	DRAINAGE ENGINEERING	3	0	0	3
Practical					
07BAG201	MICRO PROCESSOR AND LOGIC CIRCUITS LAB	0	0	2	1
07BAG202	REFRIGERATION AND AIR CONDITIONING LAB	0	0	2	1
07BAG203	DAIRY AND FOOD ENGINEERING LAB	0	0	3	2
07BAG204	IRRIGATION ENGINEERING LAB	0	0	2	1
07BAG205	DRAINAGE ENGINEERING LAB	0	0	2	1
07BAG206	PRACTICAL TRAINING	0	0	4	2
07BAG301	DISCIPLINE AND EXTRA CURRICULAR ACTIVITY	0	0	4	1
	TOTAL	18	2	19	29

SEMESTER VIII

SUBJECT CODE	NAME OF SUBJECT	TEACHING PERIOD			CREDITS
		L	T	P	
08BAG101	HYDRAULIC DRIVES AND CONTROL	3	1	0	4
08BAG102	WATER SHED MANAGEMENT ENGINEERING	4	0	0	4
08BAG103	OPERATIONS RESEARCH	3	1	0	4
08BAG104	PACKAGING TECHNOLOGY	4	0	0	4
08BAG105	COMPUTER ORIENTED NUMERICAL METHODS	4	0	0	4
PRACTICAL					
08BAG201	WATER SHED MANAGEMENT ENGINEERING LAB	0	0	2	1
08BAG202	COMPUTER ORIENTED NUMERICAL METHODS	0	0	2	1
08BAG203	SEMINAR & TOUR	0	0	4	2
08BAG204	PROJECT	0	0	4	4
08BAG301	DISCIPLINE AND EXTRA CURRICULAR ACTIVITY	0	0	4	1
	TOTAL	19	2	17	29

III SEMESTER

FLUID MECHANICS

Course/Paper: 03BAG 101
BAG Semester III

UNIT - 1

Basic Definitions and Fluid Properties ; Definition of Fluid, Incompressible and compressible fluids, Fluid as a continuum, Mass, Density, specific weight, relative density, specific volume, Bulk modulus, velocity of sound Ideal fluid Viscosity. Newtonian and Non -
Newtonian fluid, Kinematics viscosity, Effect of temperature and pressure on viscosity, surface tension capillarity, vapour pressure and cavitations.
Fluid Static's : General differential equation, Hydrostatics Manometry, Fluid forces on submerged surfaces. Curved surfaces, Aerostatics, Isothermal atmosphere, polytropic atmosphere. The international standard atmosphere, static stability The international standard atmosphere submerged bodies. Floating bodies.

UNIT – 2

Kinematics and conservation of Mass : Flow classifications. Fluid velocity and acceleration, streamlines and the stream function. Pathlines and streak lines. Deformation of a fluid element, verticity and circulation. Irrotational and Rotational flow. Flownet, Laplace equation. Conservation of mass and the continuity equation for three dimensions.
Fluid Momentum : The Momentum theorem Applications of the momentum theorem Equation of motion, Euler's equation of motion Integration of Euler's equation of motion. Bernoulli's equation. Applications of Bernoulli's Pitot tube, Equation of motion for Viscous fluid, Navier Stoke's equation.

UNIT – 3

Orifice discharging free, Jet, vena contracts, co-efficient of contraction, velocity and discharge, coefficient of resistance. Orifices and mouthpieces Nozzles and weirs. Flow Through Pipes : Reynold's experiment Darcy's Weisback equation. Loss of head due to sudden enlargements, contraction, entrance, exit obstruction, bend, pipe fittings. Total and Hydraulic grandient lines, Flow through pipe line. Pipes in series, parallel Transmission of power through pipes.

UNIT – 4

Laminar Flow: Simple solution of Navier Stokes equations. Hagen – Poiseuille flow. Plans Poiseuille flow and coutte flow.
Turbulent Flow; Variation of friction factor with Reynold's number. The Prandt Mixing length hypothesis applied to pipe flow, velocity distribution in smooth pipes, sough pipes. The Universal pipe friction laws, Colebrook. White formula.
Dimensional Analysis: Buckingham variables, Model Similitude, Force ratio, Reynolds, Froude's Mach, Weber and Euler numbers and their applications. Undistorted model distorted model scale effect.

UNIT – 5

The Boundary Layer: Description of the boundary layer. Boundary Layer thickness boundary layer separation and control. The Prandtl boundary layer equation. Solution for cominar boundary layer. The momentum

equation for the boundary layer. The flat plate in uniform free stream with no pressures gradients. Approximate momentum analysis laminar boundary

Aero foils Theory. Flow round a body; Drag skin friction drag, pressure drag, combined skin friction & pressure

drag (Profile drag) wave drag, lift induced drag. Flow past sphere & Cylinder

References

a) Engineering Fluid Mechanics : K.L.Kumar, Eurasia Publishing House Pvt Ltd
b) Fluid Mechanics and Machines : F.M. White ,John Wiley & Sons
c) Fluid Mechanics and Machines: A.K. Jain
d) Fluid Mechanics: V.L. Streeter, Mc Graw Hill
e) Fluid Mechanics and Hydraulic Machines: R.K. Bansal, Laxmi Publication New Delhi
f) Fluid Mechanics With Applications : S.K.Gupta V.Gupta, New Age Publications
g) Fluid Mechanics for Chemical engineers : Noel de Nevers ,Mc Graw HillII Edition Fluid mechanics for chemical engineers: James O wikes and stacy G Bikes, Prentice Hall PTR (International seriesin chemical engineering)

FOOD ENGINEERING

Course/Paper: 03BAG 102
BAG Semester III

Introduction to units and dimensions: Dimensions, system of measurement, dimensional analysis, significant figures, rounding and errors in measurement.

Introduction to mass and energy balances: Conservation of mass, conservation of energy and related basic problems.

Fluid flow in food processing: Properties of fluids, transport system, viscosity, handling system for Newtonian liquid, mechanical energy balances, flow measurement.

Flow past immersed bodies: Drag, drag coefficient, motion of particle through fluid mechanics of particle motion, equation for one dimensional motion of particle through fluid hindered settling of particle.

Heat transfer in Food processing: System for heating and cooling of food products, thermal properties of food, mode of heat transfer, application of steady state heat transfer, types of heat exchanger, classification and their application, basic heat exchanger calculations.

Psychrometry: Introduction, properties of dry air, properties of water vapor, properties of air vapor mixture, psychrometry chart and its application such as mixing of two air stream specifying flow rates, humidity and temperature control.

References

1. Singh, R.P. and Heldman, D. R 3rd Ed. Introduction to food engineering. Academic press, New York
2. Verma, R.C. and Jain S.K. Fundamentals of food engineering, Himanshu Publications, NewDelhi

AGRONOMY

Course/Paper: 03BAG 103
BAG Semester III

Definition and scope of agronomy, classification of crops based on: Growing seasons, plant life cycle, economic use, special utilization and botanical classification, effect of weather elements on crop growth and development.

Tilth and its characteristics, tillage, meaning, scope, objectives and types at tillage including minimum and no tillage.

Cropping system: Mono, double and multiple cropping, relay cropping, inter cropping and mixed cropping, Definition of weeds, losses caused by weeds, Method of weed control, soil fertility and productivity differentiation.

Study of following crops with reference to area, production and productivity in Rajasthan, soil and climatic requirements, seedbed preparation, improved varieties, seed rate, time and method of sowing, manuring, fertilization, intercultural and weed control, irrigation, crop protection, cereals- wheat, maize and Bajra, pulses-Bengal gram, kharif pulses (Green gram, Black gram & cowpea). Oil seeds- Groundnut, mustard. Special crops- cotton, sugarcane and potato. Fodder crops- Berseem.

References

1. Gopal Chand de,. Fundamentals of Agronomy, Oxford & IBH Publishing Co., New Delhi.
2. Chidda Singh, Modern Techniques of raising field crops, Oxford & IBH Publishing Co., New Delhi.
3. T.Y. Reddy and G.H. Sankara Reddy, Principle of Agronomy, Kalyani Publishers Ludhiana.

STRENGTH OF MATERIAL

Course/Paper: 03BAG 104
BAG Semester III

Concept of simple stress, strain, direct stress, shear strain, free body diagram, concept of uniform and non-uniform sections, strain in uniform tapering section, Lateral strain Poisson's ratio and change in dimensions of different shapes. Elastic constants, their relationship and volume changes. Temperature stresses, composite section and their equation formulations. Use of energy principle in solving problems stress and strain due to gradual, sudden application of forces, impact and shock loading, resilience, modulus of resilience complex stress, derivation of formulas for different cases. Mohr circle and its application in solving complex stress problem. Comparison of analytical and graphical solution of complex stress problem.

Introduction of bending moment and shear force, Use of these diagrams and how to draw them. Different loading conditions end conditions; different types of beams and their uses them. Different loading conditions end conditions, different types of beams and their uses and effect on B.M. and S.F. due to change in loading and end conditions. Cantilevers and simply supported beams with different loading and their combinations to draw. B.M. & S.F. diagram, on uniform section, Variable loading and single over hang beam problems.

Theory of simple bending, bending equation and its use in solution of numerical problems, centre of gravity, moment of inertia, parallel and perpendicular axis theorem and its uses for determining M.I. of various shapes of structural sections, Section modulus, strength of section, drawing of bending stress diagrams.

Concept of shear stress, drawing of shear stress
distribution diagrams.

Torsion equation, its derivation and analogy to bending equation, Concept of polar moment of inertia, torsional rigidity and relationship between H.P. and torque design of circular shaft, solid and hollow shaft.

Concept of compression member, long and short column, end conditions of column, assumption, limitation and derivation of Euler's formula and its use for various end condition.

References

1 Strength of Materials : B.C Poonamia and Ramamurtham, Dhanpatrai Publishers Delhi

2 Mechanics of solid : S.H.Crandell, N.C.Dahi and T.J. Lardner, Mc Graw Hill International Edition

3 Strength of Materials: G.H. Ryder, ELBS Publications co ltd

4 Elements of Strength of Material :J.P. Tinnoshnko and G.H.Young, Affiliated East west Press New Delhi

5 Solid Mechanic : GMA Kazmi, Tata Mc-Graw Hill Publishing Ltd., New Delhi Mc Graw Hill Publishing co Ltd New Delhi

HEAT AND MASS TRANSFER

Course/Paper: 03BAG 105
BAG Semester III

Introductory concept, modes of heat transfer, thermal conductivity of materials, measurement.

Conduction: General differential equation of conduction. One dimensional steady state conduction through plane and composite walls, tubes and spheres with without heat generation. Electrical analogy. Insulation material, critical thickness of insulation. Fins.

Convection: free and forced convection. Newton's low of cooling, heat transfer coefficient in convection. Dimensional analysis of free and forced convection. Useful non dimensional numbers and empirical relationship for free and forced convection. Equation of laminar boundary layer on a flat plate and in a tube. Laminar forced convection on a flat plate and in a tube. Combined free and forced convection.

Radiation: 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.

Heat exchangers: 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.

Introduction to Mass Transfer: Steady state molecular diffusion in fluids at rest and in laminar flow. Flick's law, mass transfer coefficient. Reynold's analogy.

References

1. S.Domkundwar: A Course in Heat & Mass Transfer, Dhanpat Rai & Sons, Delhi.
2. SP Sukhatme: a text book on heat transfer coefficient.

FARM MACHINERY-I

Course/Paper: 03BAG 106
BAG Semester III

Introduction to various farm operation, implement types. Introduction to field capacity and efficiency- simple numerical problems. Tillage objective, primary tillage implements, plough-desi, mouldboard and disc plough. Subsoiler, rotary tiller and puddler .econdary tillage implements- disc and drag harrow. Force analysis and simple numerical problems on force analysis on M.B. plough, disc plough, disc harrow.

Hitch system hitching of tillage implements, vertical hitching situation, horizontal-hitching situation, three-point hitch.

Crop planting method and equipment, metering mechanism, furrow openers, covering devices, calibration of seed drills and planters, numerical problem on seed drill and planters.

Introduction to transplanter and sugarcane planter. Metering mechanism for fertilizer applications. Method of intercultural operations, equipments for intercultural operations. Plant protection equipment- Sprayer- type and construction, Atomising devices, Dusters- type and construction. Pumps- factor affecting the performance, Calibration, Numerical problems on calibration.

References

1. Bainer,R. Barger, E.L. and R.A. Kepner –Principle of farm machinery. John Wiley & Sons, inc, New York,

2. Shrivastava A.C. et al, Principle of farm machinery ASAE publications.
3. Smith, H.P.- Farm machinery and equipments, Tata Mc- Graw Hill Publishing co. Ltd., New Delhi
4. FAO, Bulletin, Elements of Agricultural Machinery , volume I

FLUID MECHANICS (PRACTICAL)

Course/Paper: 03BAG 201
BAG Semester III

1. Study and use of pressure gauges & manometers.
2. Determination of Cc, Cv and Cd for orifices.
3. Calibration of a venturimeter.
4. Calibration of notches.
5. Determination of friction factor for pipes.
6. Velocity distributions in channel cross section.

FOOD ENGINEERING(PRACTICAL)

Course/Paper: 03BAG 202
BAG Semester III

1. Measurement of thermal properties of foods
   (a) Specific heat
   (b) Thermal conductivity
   (c) Thermal diffusivity
2. Determination of flow parameters of Newtonian fluids by viscometer.
3. Determination of flow parameters of non-Newtonian fluids by viscometer.
4. Design of pumping system for food processing plants.
5. Studies of heat exchangers
   (a) Vat type
   (b) Tubular
   (c) Surface type
6. Heat transfer calculation in food processing (heat exchanger, dehydration etc.)
7. Computation of properties of air water vapour mixture.
8. Use of psychometric chart for determination of various properties of air-water vapour mixture.
9. Determination of heat transfer coefficient in food processing plants
   (a) Conductive heat transfer coefficient
   (b) Convective heat transfer coefficient

AGRONOMY(PRACTICAL)

Course/Paper: 03BAG 203
BAG Semesrer III

1. Preparation of charts and maps showing major agro climatic zones, rainfall pattern in Rajasthan.
2. Identification of crops seeds and plants.
3. Identification of fertilizers manured and weeds.
4. Preparation of seedbed of maize, potato and sugarcane.
5. Preparation of seedbed of wheat, Bengal gram, Berseem etc.
6. Workout the purity, germination and real value of seed sample.
7. Calculate the fertilizer requirement, plant population, seed rate crop yield etc.

STRENGTH OF MATERIAL(PRACTICAL)

Course/Paper: 03BAG 204
BAG Semester III

1. Study of universal testing machine, its parts and functions.

2. Operation of U.T.M. fixing of specimen for different testing.
3. Determination of toughness test of mild steel, brass and aluminium by charpy test.
4. Determination of toughness test by Izod test for wood, aluminium & brass.
5. Study of torsion testing machine.
6. Determination of hardness of given materials.

FARM MACHINARY-I(PRACTICAL)

Course/Paper: 03BAG 205
BAG Semester III

1. Field study of desi plough.
2. Field study of mould board plough.
3. Field study of Disc harrow
4. Field study of Cultivator
5. Field study of Rotavator.
6. Study of Components of seed drill.
7. Calibration of fluted roller seed drills.
8. Study of Maize planter.
9. Study of hand operated rotary duster.
10. Study of Knapsack sprayer.

APPLIED HYDROLOGY

Course/Paper: 04BAG 101
BAG Semester IV

Solar and earth radiation, solar constant, solar radiation at the surface of the earth, heat balance of earth's surface and atmosphere, measurement of radiation types of instruments.

Temperature in atmosphere Lapse rate, adiabatic lapse rate, adiabatic saturation, lapse rate natural equilibrium, temperature data terminology, factor influencing measurement of temperature. Humidity, properties of water vapour terminology on humidity, measurement of humidity. Wind measurement of wind geographic and time variation of wind.

Hydrology hydrologic cycle, formation of precipitation, form of precipitation, type of precipitation, Presentation of rainfall data mass curve hyetograph and point rainfall mean precipitation over an area arithmetic mean method Thiessen mean method and Isohyetal method, Frequency of point rainfall and plotting position.

Evaporation Process, factor affecting it, measurement of evaporation transpiration and evapotranspiration,

definition and factor affecting them. Initial loss Interception, depression storage, infiltration and

infiltration indices.

Runoff definition factor affecting it, measurement and estimating of runoff by rational cooks, SCS method, and watershed characteristics affecting runoff.

Stream flow measurement by water stage recorder, current meter and gauges, stage discharge relation and extension of rating curves.

Stream flow hydrographs Factor affecting flood hydrograph, component of hydrograph, stream flow recession, hydrograph separation. Unit hydrograph definition and its derivation, unit hydrograph of different duration, method of superposition and S-curve.

References

1. Linsley, R.K., Kohler, M.A. and Paulhus, J.L.H.. Hydrology for Engineers, McGraw Hill International Book Company, London.
2. Raghunath, H.M.. Hydrology, Wiley Eastern Ltd., New Delhi.
3. Subramanya, K. Engineering hydrology, Tata McGraw Hill Publishing Company Ltd., New Delhi.

CIVIL ENGINEERING-II

Course/Paper: 04BAG 102
BAG Semester IV

Plane *table* surveying : description, construction and use of various accessories and centering leveling and orientation.

Method of plane *table* : Radiation, intersection, Traversing & resection. Two-point problem and their solution by different methods, Three point problem and their solution by different method, Great circle method and advantages and disadvantages of plane *table*.

Description, construction and use of theodolite, temporary adjustments of theodolite, fixing, centeing,leveling and elimination of parallax. Permanent adjustment of theodolite various axes and their relationship. Principle of tacheometric survey and its field application, constant of tachometer, staff held vertical and inclined, use of analytical contours, contouring of R.L. and use of stadia cross wires.

Contour, contouring and their characteristics, methods of contour surveying by theodolites, methods of contour surveying by tachometer, contour drawing by different methods.

Area calculation of regular boundaries by mathematical formulas, use of trapezoidal and Simpson's formula, their limitations, Planimeter: its construction, use and theory, area calculations, use of zero circle and solution of numerical problems.

Computation of volumes, Earthwork calculations. Level, two level and three level sections, calculation of volume by the use of contours and their uses in computing the reservoir capacity.

References

Suryeying I : B.C Punmia,Laxmi Publication
Suryeying I : K.L.Arora,Standerd book House

SOIL MECHANICS

Course/Paper: 04BAG 103
BAG Semester IV

Introduction of soil mechanics, field of soil mechanics, phase diagram physical and index properties of soil classification of soils, general classification based on partical size, textural classification and I.S. Soil classification system stress condition in soils, effective and neutral stress, elementary concept of Bousinesque and wester- guards analysis, New mark influence chart.

Shear strength, Mohr stress circle, theoretical relationship between principle stresses circle, theoretical relationship between principle stresses Mohr- coulomb failure theory, effective stress principle. Determination of shear parameters by direct shear b circle, theoretical relationship between principle stresses ox, triaxial, unconfined compression and vane shear test. Numerical exercises based on various types of tests.

Compaction composition of soils, standard and modified proctor text, Abbot compaction and Jodhpur mini

compaction text field compaction method and control.

Consolidation of soil: consolidation of soils, one dimensional consolidation spring analogy, Terzaghi's theory o one dimensional consolidation Laboratory consolidation text, calculation of void ratio and coefficient of volume change, Taylor's and casagrande's method, determination of coefficient of consolidation.

Earth pressure: Plastic equilibrium in soils, active and passive states, Rankine's theory of earth pressure, Active and passive earth pressure for cohesive soils, simple numerical exercises.

Stability of slopes: Introduction to stability analysis of infinite and finite slopes friction circles method Taylor's stability number (preliminary exercise).

Bearing capacity: Definition, elementary concept of Rankine's and Terzaghi's analysis. Effect of water *table*, plate load test, standard penetration text
(introduction) Bearing capacity by building codes, simple
numerical exercise.

Site Investigation: Site Investigation,
subsoil exploration.

Sampling: field and
laboratory test.
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References

1. Punmia B.C. & Jain A.K.-soil mechanics & foundations, Laxmi Publication Pvt. Ltd. 7/21, Ansari road, Dariya ganj, New Delhi-110002.

SOIL SCIENCE

Course/Paper: 04BAG 104
BAG Semester IV

Soil physical properties: Soil texture, classification of soil particles & mechanical analysis, soil textural class & their determination.

Bulk density, particle density & pore space of soil, Soil consistence, cohesion, adhesion, plasticity, Atterberg limits & their significance, soil colour.

Soil structure: type of soil structure & management of soil for improvement of soil structure.

Soil water form of soil water energy concept of water retention, the movement of soil water, saturated & unsaturated flow, soil moisture constants.

Soil air: composition of soil air mechanism of gaseous exchange, air capacity, aeration in relation to soil & crop management, soil temperature, specific heat of soil.

Soil chemistry: soil colloiods, properties of important clay minerals, cation & anions exchange phenomenon in soils, soil reaction & buffering chemistry, capacity of soils, microbial population of soil, soil organic matter & its decomposition, soil humus its formation & structure carbon nitrogen ratio. Nitrogen transformation in soil.

Soil fertility: mineral nutrients in soil & their utilization plants, significance of macro & micro elements in plants nutrition, diagnostic techniques &
nutritional needs of crop, soil testing & interpretation of soil, test values
quality of irrigation water.

Fertilizer: manufacturer properties & composition of chief nitrogenous phosphate & mixed fertilizers & their mode of action in soil.

References

1. M.M. Rai,. Principles of soil science. S.G. Wasani for MacMillan India Ltd., New Delhi.

AGRICULTURAL PROCESSING

Course/Paper: 04BAG 105
BAG Semester IV

Material handling Scope & importance of material handling, belt conveyor- characteristics, detail and design, idler & their spacing, belt tension, tripper, bucket elevator, discharge method, head and boot section, elevator legs and belt, bucket, drive mechanism, Screw conveyor detail, shape of conveyer trough, loading factor, capacity and power requirement.

Pneumatic conveyor, pneumatic conveying systems, vertical and horizontal movements, acceleration, turning at bends, feeding device.

Cleaning, sorting and grading device Function of cleaning and cleaning methods, equipment for cleaning grading and sorting, Screen terminology, type of screens, screen openings, ideal and actual screens, Separation based on size, air screen cleaner, disc separator, indented cylinder separator, spiral separator, specific gravity separator, Cyclone separator and washers.

Size reduction - Grain shape, average size,
screen analysis.

Fineness modulus, principle of size reduction, Crushing efficiency and energy requirements, Rittinger's, Kick's and bond's, size reduction procedures, size reduction machinery like crushers, grinders, fine grinder and cutting machine, size reduction machines, operation and performance characteristics of size reduction machines.

Drying- Moisture content and its removal, Utilities of drying, moisture content determination direct and indirect methods, EMC & its importance, Principle of drying,

Rate of drying, drying curves- constant and falling rate periods,
critical moisture content,

Drying of non porous solids and diffusion theory, drying of porous solids and flow by capillary rise,
Calculation of drying time under constant drying conditions.

References

1. Sahay, KM and Singh KK ,Unit operations of Agril. Processing, Vikas Publishing House Pvt. Ltd., New Delhi.
2. Mccabe W.L., Smith, J.C. and Harriot P . Unit Operation of Chemical Engineering, McGraw Hill Book Co.

AGRICULTURAL ECONOMICS AND EXTENTION PRACTICES

Course/Paper: 04BAG 106
BAG Semester IV

Theory(Ag. Economics)

Basic Economics definitions, difference between material welfare and science of choice definition. Use of agricultural economics in Agricultural
Engineeri
ng.

Meaning of demand, of demand curve, law demand, factors of demand, Meaning of supply, supply curve, supply schedule, law of supply, factors of supply. Concept of perfect market price determination under perfect market by interaction of demand and supply curve.

Meaning of farm management, decision making principle which are used in Agricultural Engineering, Added cost and added return principle (Law of variable proportion), cost principle, least cost or factors substitution principle, Law of equi. Marginal or opportunity cost principle Substitution between products principles, time comparison principle.

Methods of collection of farm level data Calculation of production efficiency calculation of crop yield index, cropping intensity, and cost of cultivation and cost of production.

Project appraisal techniques in Agricultural Engineering benefit cost ratio Internal rate o return and play back period Net present value.

References

1. Dewett, K.K., Varma, J.D. . Elementary economic theory, Publisher S. chandra & Co. Ltd., Ram Nagar, New Delhi- 110055.
2. Johl, R.R. and Kapur, T.R. . Fundamentals of farm Business Management, Publisher – Kalyani Publishers – Delhi.

APPLIED HYDROLOGY(PRACTICAL)

Course/Paper: 04BAG 201
BAG Semester IV

1. Familiarization withmeteorological observatory.
2. Study of metrological instruments.
3. Recording of meteorological data in the observatory.
4. Analysis of climatological data.
5. Stream flow measurement by water stage recorder and current meter.
6. Problem on mean precipitation, rain gauge network, estimation of missing data.
7. Problem of runoff estimation by rational methods, cooks method and SCS method.
8. Derivation of unit hydrograph, S-curve, etc.

CIVIL ENGINEERING-II(PRACTICAL)

Course/Paper: 04BAG 202
BAG Semester IV

1. Setting up of plane *table*, use of various accessories and practice for orientation and change of point.
2. Radiation and intersection method of plane tabling.
3. Traversing and re- section method
4. Two point problem and its solution, three point problem and its solution.
5. Contouring by plane *table* method.
6. Conducting contour survey in different area and their compilation.
7. Study of theodolite, fixing on stand and temporary adjustment, permanent adjustment of theodolite and their checking.
8. Horizontal and vertical angle measurement by theodolite.
9. Contouring by grid method.

SOIL MECHANICS(PRACTICAL)

Course/Paper: 04BAG 203
BAG Semester IV

1. Sieve analysis of soils.
2. Hydrometer analysis for grain size distribution in soils.

3. Field density determination by core cutter.
4. Field density determination by sand replacement methods.
5. Determination of maximum dry density and optimum moisture content by
   a)Standard
   b)Mini compaction
   c)Abbotcompactin
6. Determination of Atyterberg's limits of soils.
7. Unconfined compression test.
8. Study & use of sampling equipments.

SOIL SCIENCE(PRACTICAL)

Course/Paper: 04BAG 204
BAG Semester IV

1. To determine field capacity of soil.
2. To determine Particle density of soil.
3. To determine Bulk density of soil.
4. To determine mechanical composition of soil.
5. To determine maximum water holding capacity of soil.
6. Rapid soil test methods and interpretation of soil and water test data.

AGRICULTURAL PROCESSING(PRACTICAL)

Course/Paper: 04BAG 205
BAG Semester IV

1. Study and design of conveyors
   (a) Belt
   (b) Chain
   (c) Screw and
   (d) Bucket elevator
2. Study of separation equipment
   (a) Cleaner and grader
   (b) Cyclone separator
3. Study of various size reduction equipment
   (a) Hammer mill
   (b) Attrition mill
   (c) Micro pulverizer
4. Study of various dryers
   (a) Solar cabinet
   (b) Tray dryer
   (c) Fluid bed dryer
5. Moisture content determination of cereal, pulses and oil seeds and calibration of moisture meter.
6. Visit to PHT and RES laboratory.

AGRICULTURAL ECONOMICS AND EXTENTION PRACTICES(PRACTICAL)

Course/Paper: 04BAG 206
BAG Semester IV

1. Familiarization with A.V. equipments and material like OHP and slide projector.
2. Preparation and presentation of simple visual aids like chart, flipbook, flannel graph etc.

3. Ext. work carried out by Deptt. Of agri. IWDP, Soil conservation, Directorate of Extension, NGO visit.
4. Preparation of plan of work based on the identified problem in village.
5. Visit to DRDA, National Bank, C.C.B., R.R.B., etc.
6. visit to basic village institution and AG. Engg. Oriented programme.

V SEMESTER

FARM POWER

Course/Paper: 05BAG 101
BAG Semester V

Conventional source of farm power, classification of tractors, status of tractor & power tiller industry in India.

Introduction of tractor system, IC engine fuels their properties, alternate fuels, Diesel and engine, Numerical problems on combustions.

Engine construction and parts, piston, cylinder crank shaft, cam shaft, cams, valves & valve operations, Compression ration, firing order, Flywheel, engine balancing, Fuel injection system of IC engine, Combustion chamber, Numerical problems on fuel injection.

Air intake & exhaust system – air cleaners, mufflers, and super charges.

Engine governing system – centrifugal & pneumatic governors.

Engine cooling system – coolants, air & water cooling and temperature control, Numerical problems on cooling load, Engine lubrication system, types of lubricants, properties and classification.

Electrical system – battery, starting system & charging system, clutch function, single & multiple clutch, construction and working, Numerical problem on clutch system.

Transmission system, gearbox, selective sliding, constant mesh, planetary, torque converters, numerical problems, Differential and final drive and power take off.

Steering systems – Mechanical & hydraulic, Numerical on steering geometry.

Brake system – mechanical & hydraulic, hydraulic system of tractor, automatic position and draft control system. Hitch types and standards, Mechanics of tractor chassis, weight transfer, weight distribution and stability and grade & non parallel pull, turning at high speed, center of gravity determination, Numerical problems.

Traction, traction mechanics & performance of tractive device, Tyre classification, Traction aids, numerical problems, introduction to tractor ergonomics.

References

1. Rai & Jain – Farm Tractor Maintenance and repair, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2. Jones, F.R., - Farm Gas Engines & Tractor- Mc. Graw Hill Book Company New York.
3. Liljedahl, B.J., Turnquist, P.K. Smith, W.D. and Hoki Vaketo. Tractor ND their Power units. John Wiley & Sons., New York,.

RENEWABLE ENERGY

Course/Paper: 05BAG 102
BAG Semester V

Energy, Non- conventional energy sources; role of energy in economic development energy consumption patterns.
Solar energy (sources, its advantages, availability. Heat transfer processes applicable to solar energy, solar radiation and its analysis. Instruments to basic flat plate and focusing collectors. Solar thermal energy technology application: Solar cooker and water Heater, solar dryers, solar green House, Active/passive Heating, stills, solar photovoltaic technology.
Biogas- Its application and importance, Biogas plant (types, size their features, merits and demerits) Utilization of biogas spent slurry.
Biomass- Introduction to biomass as source of energy and its advantages, biomass classification. Characteristics of biomass (proximate analysis and ultimate analysis).
Harvesting of biomass (coppicing, pollarding, lopping, pruning, thinning)
Biomass conservation technologies (thermo chemical, biochemical and agrochemical technology, Briquetting, biomass gasification technology.
Improved cookstoves - Fundamental & types. Techno- economic analysis of renewable energy sources and comparison with conventional energy sources.
Wind energy- Basic principle of wind energy conversion, site selection consideration, Basic components of wind energy conversion system, Type of wind machine.

References

1. Rai, G.D. Non – conventional energy sources, Khanna publishers, New Delhi.
2. Mathur A.N. & Rathore N.S.; Renewable energy sources, Bohra Ganesh Publication, Udaipur.

POST HARVEST TECHNOLOGY

Course/Paper: 05BAG 103
BAG Semester V

Grain structure: chemical composition, effect of temperature on quality of grain, physical, thermal and aerodynamic properties.
Principles of parboiling of paddy and wheat: Physico-chemical changes during parboiling, effect of parboiling on milling, Nutritional and cooking qualities of rice.
Cleaning and separation: Effectiveness of separation, husking of grain, factor affecting the effectiveness of husking, Grinding and effectiveness of grinding machinery used in cereals grinding.
Rice milling: Modern rice milling, General principles of cleaning, Open double sieve cleaner and single scalper drum cleaner, Principle of rubber roll Sheller (Japan), Vertical whitening Machining.
Milling of corn: composition and structure, wet and dry milling, Milling of wheat – Introduction, Traditional and modern flour milling, Milling of pulses- Introduction, structure and composition, traditional pulses milling method, modern milling of pulses. Wet and dry milling, milling of green gram, Bengal gram, black gram CFTRI method of pulse milling.

Storage of grains: Introduction to storage, importance and fundamental requirement of storage, introduction to food grain storage structure, like Bukhari, Morai and kothar, bag storage structure and modern storage systems.

References

1. Chakravorty, A. . Post Harvest Technology of cereals, pulses and oil seeds. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

SOIL AND WATER CONSERVATION ENGINEERING

Course/Paper: 05BAG 104
BAG Semester V

Brief history of soil erosion through out the world, types of erosion- geological accelerated raindrop sheet, rill, gully. Wind stream bank slip and coastal.

Soil erosion principles, Effect or losses of soil erosion, Causes of soil erosion factors affecting erosion, climate, soil, type, vegetation, topography, mechanics of raindrop erosion- raindrop erosion, characteristics of raindrop, mechanics of over land flow.

Stream channel erosion, sediment movement by suspension, saltation and bed load soil detachment. Sediment transportation- definition, importance, classification, mechanics of sediment transportation.

Estimation of soil loss by universal soil loss equation estimating each factor, Measurement of soil loss by runoff plots, multi slot divisor and Coshocton wheel silt sampler.

Factor influencing wind erosion, Mechanics of wind erosion- initiation of movement transportation and deposition, suspension, saltation, surface creep Drifting of sand, formation of sand dunes, fixing of shifting sands, sand dune and afforestation, Control measures- vegetation, tillage practices, mechanical conserving soil moisture, controlling soil factors.

Water erosion control measures, Classification, design, construction and maintenance and contour bund, broad base graded bund and bench Classification of gullies gully formation, waterfall erosion, channel erosion, state of gully development, temporary gully control measures, function and construction of check dames, brush dam, (pole, single row, double row type) plank or slab dam, loose rock dam, log and pole dam.

Permanent gully control structures, Classification and; nomenclature of component parts of structure and their function, selection of structure, Design of drop spillways, chute spillways and drop inlet spillway.

Water storage structure: Farm ponds and reservoirs components of farm ponds and their utility; site selection, design of embankment – type, foundation condition and cross section, suitability of material, seepage through embankment- free board and wave protection, suitability of embankment, foundation treatment, drainage, side slopes and berms, compaction and settlement, spillways for farm pond, construction – optimum moisture content, core, repair and maintenance.

Water harvesting techniques – rainwater harvesting, runoff inducement, micro catchment.

Watershed planning and management – Objective of watershed management and selection of priority area watershed work plan description of watershed, watershed problem and proposed management programme. Benefit cost ratio of soil conservation project.

Role of forestry in soil conservation. Box cum pit, Gradoni, staggered trenching, contour trenching (types, alignment and construction) Development of silvipestrol system, Agro forestry- definition and method of agro forestry.

References

1. V.V.N. Murty. Land and water management engineering, Kalyani Publishers, New Delhi.

STRUCTURAL DESIGN

Course/Paper: 05BAG 105
BAG Semester V

Reinforced cement concrete Structures:

Reinforced concrete Structures- Grades of concrete and characteristics strength, Permissible stresses in concrete and steel reinforcement.

Modular ratio, singly reinforced beam, fundamental assumption, equivalent area of sections, neutral axis and moment of resistance. Balanced, under- reinforced, over reinforced sections. Types of problem in singly reinforced beams. Slabs spanning in one direction.

Shear stress in R.C. beams, effect of shear, reinforcement for shear. I.S. recommendations. Bond, anchorage, development length.

Doubly reinforced beam: neutral axis, moment of resistance. Type of problems. T- Beams dimensions, neutral axis. Lever arm, moment of resistance with or without web compression. Types of problems in T- beams.

Cantilever: Design of simple cantilever.

Two way slabs: supported on four edges with corner not held down and carrying U.D.L.

Axially loaded columns: long and short columns. Types of column, load carrying capacity I.S. recommendation, design of column with lateral and spiral reinforcement.

Steel structures

Common steel sections, selection criterion for beams and columns.

Design of beams: Assumption in the theory of bending, design of laterally restrained beams, with checks for shear, deflection; web buckling and cripping, Design steps, problems.

Columns: Classification of columns, types of sections, strength of column, design of axially loaded columns. Compound columns. Design of compound column.

Lacing and battening: Design of lacing, design of battening, column bases, slab bases, Design of slab with concrete block, problems.

References

1. Punnia B.C. Reinforced Concrete structures, Vol. I, standard Publishers and Distributors, Delhi .

ESTIMATING AND COSTING

Course/Paper: 05BAG 106
BAG Semester V

Objects & general principles to be followed for estimating & costing, Rules & method of measurement, procedure for estimating, estimates, types of estimates, when & where prepared General consideration for preparing report to be submitted with estimate. Various item of work in building construction.

Specification: brief and detailed one, detailed specification for building works, detailed specification for canal & road works.

Analysis of rates: General concept of rates, requirement of items for preparation of rate of particular item. Overhead cost & task of labour as per N.B.O. Quality calculation of material for particular item.

Various formulae for calculation of quality of concrete bricks & R.C.C. works. Calculations of quality in Road works, Earthwork calculation of canal work, Earth works calculation of roadwork for level & side hill section (two level) only.

Balancing depth o canal lines in canal, material & uses. Use of L- section & Cross- section for earth work calculations.

Organisation of engineering Department: General discussion of P.W.D accounting & procedure of works Classification of works, Contract & contract documents, Tender Notice – how to invite tender notice. Opening of tender & various conditions to accept it. Running & final bill, Earnest money, security money & measurement book.

References

1. Dutta B.N. Estimating and costing in civil engineering, Theory and practice, Publishing Distributors Ltd., New Delhi.

FARM POWER (Practical)

Course/Paper: 05BAG 201
BAG Semester V

1. Construction and maintenance of stationary and moving parts of an engine.
2. Study and adjustment of valve system.
3. Determination of viscosity of fuel and lubrication oil.
4. Study of air cleaner system.
5. Study and adjustment of thermostat and water cooling system.
6. Study of electrical system of tractor.
7. Study of clutch system.
8. Study of differential and final drives system of tractor.
9. Study of brake system.
10. Study of hydraulic system of a tractor.

RENEWABLE ENERGY (Practical)

Course/Paper: 05BAG 202
BAG Semester V

1. Study of a box type solar cooker.
2. Study of a solar distillation plant.
3. Study of direct and indirect solar dryer.
4. Study of a KVIC biogas plant.
5. Study of a Deenbandhu biogas plant.
6. Study of a biogas gasifier.

POST HARVEST TECHNOLOGY (Practical)

Course/Paper: 05BAG 203
BAG Semester V

1. Study of CIAE cleaner.
2. Study of mechanical oil expeller.
3. Study of burr mill.
4. Study of hammer mill.
5. Study of CFTRI dal mill
6. Study of traditional rice milling equipment.
7. Study of modern rice milling unit.
8. Study of traditional pulse milling equipment.

SOIL AND WATER CONSERVATION ENGINEERING (Practical)

Course/Paper: 05BAG 204
BAG Semester V

1. Visit to soil conservation sites around Ajmer.
2. Soil loss estimation.
3. Design problems on soil conservation structures viz.
    (a) Contour bunds
    (b) Graded bunds
    (c) Bench terraces
    (d) Grassed waterways and waste weirs.
4. Design of permanent gully control structures viz.
    (a) Drop spillway
    (b) Chute spillway
    (c) Drop inlet spillway
5. Design of water storage structure viz.
    (a) Farm pond
    (b) Anicut
    (c) Khadin

STRUCTURAL DESIGN (Practical)

Course/Paper: 05BAG 205
BAG Semester V

R.C.C.

1. Design of singly R.C.C. beam.
2. Design of doubly R.C.C. beam.
3. Design of T- beam.
4. Design of one-way R.C.C. slab.
5. Design of Axially loaded R.C.C. column.

STEEL

6. Design of laterally restrained R.S. beam.
7. Design of Axially loaded R.S. beam.
8. Design of R.S. compound column.
9. Design of lacing & battening.
10. Design of base slab and concrete block.

ESTIMATING AND COSTING (Practical)

Course/Paper: 05BAG 206
BAG Semester V

1. Long wall & short wall method of estimation.
2. Centre line method of estimation.
3. Detailed estimate of small residential building (two roomed).
4. Earthwork in excavation & masonary in foundation upto plinth.
5. Earthwork calculation for road work.
6. Earthwork calculation for canal works in embankment & cutting.

PRACTICAL TRAINING (AFTER 4TH SEM EXAM)

Course/Paper: 05BAG 207
BAG Semester V

30 Days practical training in farm machinery or
Food processing industry /Dairy. Evaluation will be done on the basis of report and its presentation.

VI SEMESTER

INSTRUMENTATION IN AGRO PROCESSING SYSTEM

Course/Paper: 06BAG 101
BAG Semester VI

Measurement: Introduction, significance of mechanical measurement, fundamental, method of measurement, direct comparison, indirect comparison.
Generalized measuring system, sensing, transducing stage; signal conditioning stage,

Terminating stage displacement form, digital form, calibration, unit of measurement and dimensions.
Standards of measurements: Introduction, international system of units, basic and supplementary units, standard of length, temperature and mass standard, electrical units.
Treatments of uncertainties: introduction, nomenclature, Accuracy, precision, uncertainty, true value, indicated value, range, standard derivation, Errors – systematic errors, random errors, illegitimate errors.
Measurement of humidity: Aspirated and sling psycrometer, hair hygrometer.
Measurement of pressure: Introduction, types of pressure, Transducent liquid column, pressure measuring device – U tube, inclined type manometer, well type manometer, bourdon tube pressure gauge.
Measurement of flow: Introduction, flow measurement method, quantitative methods. Rate device or secondary methods, ventury, flow nozzle orifice variable area meter (Rota meter), velocity probes.
Measurement of temperature: Introduction, use of Bimaterials, Liquid glass thermometer, types of liquid in glass thermometer, Thermocouple. Introduction, laws of thermocouples, thermocouple material, construction measurement, connection in series and parallel, Error in measurement.
Measurement of strain: Introduction, electric resistance strain gauge, Selection installation factor for bonded metallic strain gauge.

References

1. Thomas G. Berkwith, N. Lewis buck Roy, Mechanical measurement, D. Maragon Narosa Publishing House, New Delhi.

ELECTRICAL MACHINES

Course/Paper: 06BAG 102
BAG Semester VI

D.C. Machines:
Armature winding: Fundamentals winding terms, classification of winding; simple lep & wave winding, multiplex winding, dummy coils & equalizing connections, calculations.
Armature reaction: Armature & field m.m.f.s., cross & demagnetizing effect of armature reaction & their calculations.
Commutation: Meaning of commutation, action of commutator, types of commutation, effect of armature reaction, leakage flux, position of brushes, brush contact resistance, causes of bad commutation, method of improving commutation.
Generators: e.m.f. Equation, types of field excitation, characteristics and parallel running of shunt, series & compound generators.
Motors: Back e.m.f., torque equation, characteristics of shunt, series & compound motors; motor starters, speed control by field control & armature voltage control.
Efficiency & testing: Losses of efficiency, condition for maximum efficiency, estimation of losses by Swinburne's test & Hopkinsons test, separation of losses.
Transformers: Types of cores, winding, bushes & accessories, equivalent circuit, phaser diagram, open circuit, short & polarity tests, regulation.

Efficiency, condition of maximum efficiency, all day efficiency, separation of losses, parallel operation, Auto- transformers, calculations.

References

1. Theraja, B.L. and A.K. Theraja, A textbook of electrical technology, nirja Construction and development Co. (P) Ltd., New Delhi,.

DESIGN AND MANAGEMENT OF FARM MACHINES

Course/Paper: 06BAG 103
BAG Semester VI

Farm mechanization –myths, scope, government policies and problem in India.
Economics performance of agricultural machines, capacity, concept for predicting capacity of row crop machines, ploughing method. Field efficiency, factor affecting field efficiency, quality performance, testing, and problem related to its power performance.
Machinery selection: size selection, replacement of machine, timeliness of operation, optimum depth and problem related to them.
Power selection; selecting proper level and problem related to it. Safety aspects of operation of farm machines. Replacement of farm machinery.
Tractor power, tractor power measurement, tractor engine performance PTO performance. Drawbar performance fuel consumption, power requirement, operator performance, amount value and labour cost determination cost analysis of farm operation, way to reduce the cost of operation machines.
Optimization technique in farm operation, Application of computers in management of farm machines.

References

1. Hunt, D. – Farm power and machinery management, lowa state University press, .
2. Zeid, K. (2000),CAD/CAM Theory and practice. Tata McGraw Hill, New Delhi.

FARM MACHINERY II

Course/Paper: 06BAG 104
BAG Semester VI

Principle of cutting, sickles – types, geometrical parameters of sickle.
Harvesting equipments, Mower – type of mower; cutter bar, mower parts, construction & operation, Adjustments force on reciprocating parts and numerical problems.
Attachments the cutter bar, trouble shooting, path traced by reciprocating knife, cutting pattern of knife.
Grain harvesting, type and different functional units of combine, operation, adjustment, different losses. Numerical problems on losses.
Vertical conveyor, Reaper, description and working, forage chopping and handling: types of field forage harvesters, part of forage harvesters, Attachments, maintenance, trouble shooting. Selection of forage harvester, numerical problems.

Threshing – Principle of threshing, types, brief description and operation of threshing mechanism, effect of various parameters of thresher on threshing operation, losses and numerical problems.
Corn pickers, shellers and balers.
Root crop harvesting – sugar beat, groundnut and potato.
Fruits and vegetables mechanization: tree shaker aero blast sprayer, manually operated tools for harvesting.
Special machines for specific operation: introduction to post hole digger, straw reaper, manure spreader.

References

1. Smith, H.P. – Farm power and equipment, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2. FAO, Bulletin, Elements of agricultural machinery, volume II,.
3. Shrivastava A.C. et al, Principle of farm machinery, ASAE publications.

AGRI. STATISTICS

Course/Paper: 06BAG 105
BAG Semester VI

Computation of arithmetic, Geometric and harmonic means, from raw data and frequency distribution, computation of mode and median from raw data and frequency distribution.
Computation of standard deviation and coefficient of variation from raw data and frequency distribution computation of the correlation coefficient from paired observation. Fitting of the equation to the line of regression.
Chi- square test for independence of attributes in case of 2*2 contingency table and Yates correction for continuity.
Chi- square test for independence of attributes in case of r*s contingency table chi- square test for goodness of fit.
Fitting of bionominal distribution.

References

1. Gupta, S.C. Fundamental of statistics.

WELLS AND PUMP

Course/Paper: 06BAG 106
BAG Semester VI

Types of water bearing formation- unconfined confined aquifer period water table, hydrologic properties of water bearing formation.
Darcy's law as applicable to ground water flow hydraulic of wells- steady state flow into a well in confined and unconfined aquifer (Thesis equation).
Exploration of ground water- geological methods geophysical method, electrical resistively method, seismic method and water witching.
Design of irrigation wells, design of open wells, and diameter of open well, depth of well, thickness of well lining, design of well curbs, construction of open well.

Design of tube well- Well diameter, thickness of casing pipe and screen, well screen, gravel packing design and thickness. Well losses, well efficiency.
Well construction procedure- construction of open well, boring and deepening of open well. Constructions of driven, jetted and drilled tube well. Wells drilling methods and their choice Installation of well casing and screen, well development method, testing wells for draw down and yield.
Indigenous water lifts, wind powered and water powered water lifts, positive displacement pumps, Variable displacement pumps, (Terminology), centrifugal pumps, vertical turbine pumps, Submersible, propeller and other types of pumps.
Selection of pumps power requirements efficiency and economics of irrigation pumping plants.

References

1. Michael, A.M. , Irrigation theory and practice, Vikas publishing House, Pvt.Ltd, Delhi.

INSTRUMENTATION IN AGRO PROCESSING SYSTEM (Practical)

Course/Paper: 06BAG 201
BAG Semester VI

1. Measurement of pressure using U-tube manometer.
2. Measurement of pressure using Bourdon's gauge.
3. Measurement of flow rate using rotameter.
4. Study of flow rate orifice device.
5. Study of flow rate ventury device.
6. Measurement of temperature using liquid in glass thermometer.
7. Measurement of temperature using thermo couple.
8. Measurement of relative humidity using sling psychrometers.
9. Measurement of relative humidity using hair hygrometer.

ELECTRICAL MACHINES (Practical)

Course/Paper: 06BAG 202
BAG Semester VI

1. To determine efficiency development of a D.C. shunt motor by swinburne's test.
2. To draw speed control characteristics of a D.C. shunt motor by field control method.
3. To draw open circuit characteristics of a separately excited D.C. shunt generator.
4. To determine regulation of a single phase transformer by direct loading.
5. To determine efficiency & regulation of a single phase transformer by open circuit & short circuit test.
6. To perform parallel operation on two single phase transformer of same transformation ratio.

DESIGN AND MANAGEMENT OF FARM MACHINES (Practical)

Course/Paper: 06BAG 203
BAG Semester VI

Introduction to computer added design, geometric modeling and interactive graphics, computer aided analysis and synthesis of common mechanical components, Application of CAD software packages.
Preparation of engineering drawing of machine/ implement components.

FARM MACHINERY II (Practical)

Course/Paper: 06BAG 204
BAG Semester VI

1. Study of vertical conveyor reaper.
2. Study of components of a thresher.
3. Study of components of a combine.
4. Study of forage chopper.
5. Study of mower.
6. Adjustment of mower.

WELLS AND PUMP (Practical)

Course/Paper: 06BAG 205
BAG Semester VI

1. Study of indigenous water lifting devices.
2. Study of different types of pumps, their components, specification etc. in laboratory.
3. Pumping test for determination of hydraulic properties of aquifer.
4. Study of various component of drilling construction.
5. Problem on design of well; Thickness of wall, well crab, diameter of well.

VII SEMESTER

MICRO PROCESSOR AND LOGIC CIRCUITS

Course/Paper: 07BAG 101
BAG Semester VII

Computer number system and codes: Number system and their conversion, negative numbers representation, Binary coded Decimal number, excess –3 BCD codes, gray codes representation.
Logical operations, logic gates and Boolean Algebra: Truth table, logical operation and logic circuits, Realizing circuits from Boolean Expressions, derived logical function and gates : The NAND gate, the NOR gate, the exclusive- OR or XOR gate, The exclusive – nor, or XNOR gate, Boolean algebra, Boolean algebra theorem, De Morgan's theorem, Duality theorem, Universal gates Deriving the XOR function, Reducing Boolean expression by algebraic reduction.
Principles of combinational logic circuits: Minterm and maxterm designations, canonical forms, Karnaugh map: Karnaugh map up to 4 variables, simplification of Boolean expression using K-

map in POS and SOP form, incompletely specified functions (Don't care terms). Arithmetic circuits: Adders, sub tractor, Digital comparator, Decoders, encoders, multiplexers.

Sequential logic circuits: Latches, Flip- flops: SR (set-reset) Flip- flop, Edge- Detector circuits, Master- slave S-R flip –flop, J-K flip –flop, Master- slave J-K flip- flop, D flip- flop T flip –flop. Introduction to register.

Microprocessor: Introduction to microprocessor, basic concept of 4-8-16-32-64 bit up's. Evolution of microprocessors. Internal architecture and pin configuration of 8085A, Interrupt system of 8085A, instruction set of the 8085, Addressing modes of 8085A. Simple Assembly language programming of 8085A.

Interfacing memory and I/O Devices: Address space partitioning; Address map; Address decoding, memory mapped I/O scheme, I/O mapped I/O scheme. Memory interfacing, Dta transfer schemes, Interrupts of 8085, multiple interrupts; Direct Memory access. Functional Application of microprocessors in agriculture engineering.

References

1. Aditya P. Mathur, Introduction to microprocessor, 3rd ed., Tata McGraw- Hill Publishing Company limited, New Delhi,
2. Dharm Singh, Introduction to Digital logic design, Yash publishing House, Bikaner,

REFRIGERATION AND AIR CONDITIONING

Course/Paper: 07BAG 102

BAG Semester VII

Introduction: Second law of thermodynamics applied to refrigeration. Reversed Carnot cycle, coefficient of performance. Unit of refrigeration.

Vapour compression system: Theoretical vapour compression cycle. Derivations of actual cycle from ideal cycle, under cooling, dry and wet compression. Compressors, expansion valves, evaporators and condensers.

Vapour absorption system: vapour absorption refrigeration system and components.

Refrigerants: Desirable properties of ideal refrigerant. Classification of refrigerants. Important refrigerant like ammonia, freons. Secondary refrigerants like water and brine.

Psychrometry: Thermodynamic properties of moist air, perfect gas relationship for approximate calculation. Adiabatic saturation process. Wet bulb temperature and its measurement. Psychrometric chart and its use. Elementary psychrometric processes.

Air conditioning: types of air conditioning systems, concept of thermal comfort, basics of load estimation and space air distribution.

Cooling and dehumidification: Chilled water spray, surface cooling and dehumidification, sensible cooling with dry coils, direct expansions wet coils. Evaporative cooling. Design of cold storage for perishable products using sensible and latent cooling loads, electrical appliances load, and respiration load.

References

1. S domkundwar and S.C. Arora: Refrigeration and air conditioning, Dhanpat Rai & sons, Delhi.

DAIRY AND FOOD ENGINEERING

Course/Paper: 07BAG 103
BAG Semester VII

Thermal processing: decimal reduction time, thermal death time, spoilage probability.
Cream and butter handling equipment: Churning equipment, principle of churning, churn construction; types of churn, principle of continuous butter making, centrifugal cream separator.
Pasteurization equipment: Definition of pasteurization, long hold or vat pasteurization; agitation and control in vat pasteurizers, advantages and disadvantages, plate heat exchanger, HTST pasteurization and control, UHT pasteurization.
Evaporation: Atmospheric concentrators, vaccum pan, codenser, single and multiple effect evaporators, properties of liquid foods in evaporation, calculation of energy consumption in evaporators, performance evaluation of evaporators, vapour recompression system.
Drying equipments: Milk dryer, drum or roller dryer, spray dryer, atomization system, cyclone separator, bag filters, heat balance of drying equipment, equipments for instantizing milk powder.
Freezing of foods: Freezing of foods, freezing point depression, and calculation of freezing rate using plank's equation, freezing equipments, air blast freezer, plate freezer, and immersion freezer.
Homogenization: Effect of homogenization of milk, standard for homogenization, homogenization valve and pump, theory of homogenization, energy requirements, efficiency of homogenization.
Water activity: Role of water and water activity of foods, method of determination of water activity, control of water activity by addition of solutes and dehydration.

References

1. Tufail Ahmed,Dairy plant engineering and management. Kitab Mahal, New Delhi.
2. Farrall, A.W. Engineering for dairy and food products; Robery, E. Krieger_ Publishers Company, New York.

IRRIGATION ENGINEERING

Course/Paper: 07BAG 104
BAG Semester VII

Water resources development and utilization terminology and basic concept in water resources.
Physical properties of soils, infiltration, soil water potential, soil moisture constant and characteristics curve, Measurement of soil moisture, Rooting characteristics and moisture use of crops.
Consumptive use- terminology and determination by direct methods, determination of consumptive use by climatological methods.
Determination of reference crop evapotranspiration by climatological methods, selection of crop coefficients and irrigation requirements.
Irrigation efficiencies, Effective rainfall, irrigation scheduling and water management procedure for principal crops.
Measurement of irrigation water by volumetric, velocity area and tracer methods.

Measurement of irrigation water by weir, orifices, flumes.
Open channels- design, lining material, precast concrete channel water control and diversion structures.
Border method – Adaptability, limitation, design and evaluation.
Furrow method- Adaptability, limitation, design and evaluation.
Basin method- Adaptability, limitation, design and evaluation.
Sprinkler method- Adaptability, limitation, design and evaluation.
Drip irrigation system- Adaptability, limitation, design and evaluation.

References

1. A.M., Michael,. Irrigation theory and practice, Vikas Publishing House Pvt, Ltd., New Delhi.

LAND DEVELOPMENT AND GRADING

Course/Paper: 07BAG 105
BAG Semester VII

Land leveling – Criteria for land leveling, plane profile, plan inspection and contour adjustment methods, land leveling design problem related to land leveling design and earth work calculation.
Engineering fundamentals related to earth- moving machinery. Earth moving and excavation machines classification and application of bulldozers, advantages and disadvantages, straight and angle bulldozers, moving earth with bulldozer and estimation of output of a bulldozer numerical problems.
Land clearing equipments, power shovel; construction and operation of power shovel size selection of power shovel factors affecting the output of a power shovel, numerical problems on output of a power shovel.
Scraper: types, construction and operation of scrapers, size of the scraper, cycle time production rates of scrapers, numerical problems, load- growth curve, estimation of output of a scraper.
Dragline: Types of dragline, size, basic parts and operation of a dragline, output of a dragline, estimation of output, effect of different factors on output, numerical problems.
Clamshell: Basic parts and operation of a clamshell, application, size and output of a clamshell.
Motor grader: Construction and operation of motor grader, application, basic adjustment parameters of motor grader, output of motor grader, job planning and management: project network analysis, Definition of terms used in critical path method (CPM), critical path scheduling, AOA diagram numerical problems, advance network analysis technique, time grid diagram, computerized scheduling.
Loaders: types, size and production rates, trenching machines; types construction and operation of wheel and ladder type trenching machines, selection of suitable equipment for excavating trench and production rates of trenching machines.
Compactors: Properties- swell and shrinkage types of compacting equipment and construction details.

References

1. Peurifoy, R.L. – Construction, planning, Equipment and method.
2. Singh Jagman – Heavy construction, planning, equipment and methods.

3. Michael, A.M. – Irrigation theory and practices.

DRAINAGE ENGINEERING

Course/Paper: 07BAG 106
BAG Semester VII

Draining Needs and benefits of drainage. Soil properties influencing drainage, EC, pH Textural Classification of Soil.
Statics of soil water, Dynamics of Soil water, fundamental of Seepage analysis.
Hydraulic conductivity and measurements in field above water table, estimation of hydraulic conductivity by Soil parameters.
Types of drainage surface subsurface, planning and investigation of surface drainage.
Design of surface drainage, Planning and investigation of subsurface drainage, Design subsurface drainage, Influence of drain openings and perforation on discharge, Design of filters.
Selection of drainage material special methods of drainage, e.g. vertical Drainage, mole drainage wells Recycling of drainage water. Watercourses of salt development in soil Reclamation of saline and alkali soils.

References

1. Schwab, G.O., Fervent, R.K., Edminster T.W. and K.K. Barner ,Soil and water conservation engineering, Fourth Edition & Wiley & sons, New York.
2. Luthin J.N.,. Drainage engineering, Wiley eastern private Ltd., New Delhi.

MICRO PROCESSOR AND LOGIC CIRCUITS (Practical)

Course/Paper: 07BAG 201
BAG Semester VII

1. Identification of logic gates.
2. Verification of the truth table of various gates.
3. Design S-R flip flop using NAND gate and verify of the truth table of S-R gate.
4. Verification of truth table of J-K flip flop.
5. Design a half adder and a full adder.
6. Implement 2*1 Multiplexer.

REFRIGERATION AND AIR CONDITIONING (Practical)

Course/Paper: 07BAG 202
BAG Semester VII

1. Study of vapour compression and vapour absorption system.

2. Study of electrolux refrigerator.
3. Study and determining COP of water cooler.
4. To determine COP of vapour compression refrigeration rig.
5. Study of leak detection device.
6. Study of evaporative cooling system.

DAIRY AND FOOD ENGINEERING (Practical)

Course/Paper: 07BAG 203
BAG Semester VII

1. Introduction of various properties of milk.
2. Determination of EMC.
3. Study of Heat exchangers.
4. Study of a Homogenizer.
5. Study of HTST pasteurization system and vat pasteurizer.
6. Study of falling film evaporator.
7. Study of spray dryer.
8. Study of sanitary pumps.

IRRIGATION ENGINEERING (Practical)

Course/Paper: 07BAG 204
BAG Semester VII

1. Determination of soil moisture by different method viz., Gravimetric, tensiometer, Electrical resistance meter, Rapid moisture meter and also by feel and appearance methods.
2. Determination of physical properties of soil related to irrigation – Bulk density, porosity, Field capacity, wilting point, etc.
3. Study of infiltration characteristics of soils.
4. Measurement of discharge through Weirs, Orifices and flumes.
5. Fabrication of precast concrete channels.
6. Determination of water conveyance efficiency in case of an unlined channel.

DRAINAGE ENGINEERING (Practical)

Course/Paper: 07BAG 205
BAG Semester VII

1. Determination of porosity, void ratio and drainable porosity of soil.
2. Determination of textural classification of soil by sieve analysis (sand fraction).
3. Determination of particle size distribution of soil by wet analysis (silt and clay fraction).
4. Determination of hydraulic conductivity in lab by constant head method.
5. Determination of hydraulic conductivity in lab by falling head method
6. Determination of hydraulic conductivity in lab by field below water table (auger hole method).

7. Determination of hydraulic conductivity in lab by field above water table.(Inverse auger hole method).

PRACTICAL TRAINING (AFTER 6TH SEM EXAM)

Course/Paper: 07BAG 206
BAG Semester VII

30 Days practical training in food processing industry/dairy or Farm machinery(other than training taken after 4th sem). Evaluation will be done on the basis of report and its presentation.

VIII SEMESTER

HYDRAULIC DRIVES AND CONTROL

Course/Paper: 08BAG 101
BAG Semester VIII

A Hydraulic principle, hydraulic pumps- types, circuit and drives. Hydraulic valves- pressure control valves flow control valves. Directional control valves, cartridge valves and mobile hydraulic valves. Hydraulic cylinder- displacement, single and double acting, acceleration and deceleration of cylinder loads, cylinder mounting and strength calculations.
Semi rotary actuator – types and control.
Hydraulic motors and circuit, hydraulic fluids properties and future development, leakage control in hydraulic system, control system proportional valves.
Open center system and closed center system in tractor hydraulics.
Hydraulic applications: Hydrostatic- transmission, hydrokinetic- transmission, Hydraulic brake system, Hydraulic power steering, depth and draft control system in tractor hydraulic.

References

1. Michael, J.P., and John, G.A. Power Hydraulics, prentice hall, New York,
2. Fundamentals of service' FOS', Hydraulic, John Deere and company, Moline.

WATER SHED MANAGEMENT ENGINEERING

Course/Paper: 08BAG 102
BAG Semester VIII

Watershed concept and identification – concept and objectives of watershed management, watershed problem and their management.
Delineation of watershed by G.T. sheets, Classification of watershed, identification of priority watershed.
Land use capability classification from the rating table and under the field condition, Land capability classification scheme and land capability sub class and units.
Geomorphological characteristics of the watershed – drainage density, stream density, drainage length, stream order.

Stage discharge relationship and extrapolation of rating curve. Procedure, design details, construction and installation of multislot divisor, Coshocton wheel, H flume for measurement of runoff and soil loss from small plots, procedure design detail.
Site selection and installation of silt observation posts(SOPs), sediment sampling, frequency of sampling, selecting of sampling points, Observation and collection of sediment samples from salt observation post, procedure and analysis of sediment samples, computation of runoff and sediment yield of watersheds, Preparation and management of watershed work plan – Description of the watershed problem and recommended management practices.
Evaluation of effect of conservation measures in the watershed, Evaluation of the effects of watershed, development works on cropping pattern and productivity, runoff and sediment losses, land use changes, social, economical and ecological changes.

References

1. Subramanya K., Engineering Hydrology, Tata MacGraw Hill publishing company Ltd., New Delhi.
2. Murty, V.V.N., Land and water management engineering, Kalyani Publishers, New Delhi.
3. Singh Gurmel, Venkataraman C. Sastri G and Joshi,. Manual of soil & water conservation practices, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

OPERATIONS RESEARCH

Course/Paper: 08BAG 103
BAG Semester VIII

Introduction and importance of OR; Meaning and classification of models; Linear programming; Mathematical formulation, Graphical solution, simplex method; Degeneracy and duality; Transportation type problem, assignment problem; concept of waiting line and simple problems, project management by PERT/CPM method.

References

1. Sharma, S.D. – Operations research, Pragati prakashan, Meerut,
2. Goel and Mittal, - operation Research, Pragati prakashan, Meerut,
3. Sharma JK –Operation Research theory & Application, Macmillan India Ltd.

PACKAGING TECHNOLOGY

Course/Paper: 08BAG 104
BAG Semester VIII

Physical properties of foods - Material sorption equilibrium and water activity of foods influencing food packaging.

Food packaging materials – Types and definition of packaging, function of packaging, classification of packaging, packaging forms and materials.

Flexible Packaging – Paper and paperboards; types of paper: bond paper, tissue paper, litho paper, Kraft paper, glassy paper, and parchment paper.

Characteristics of paper, laminate materials of grain paper, classification of paper board containers, folding cartons, rigid box and paper cups, Surface coating of paper board, cartons printing, letterpress, offset, litho and gravure printing, quality testing of paper.

Metal containers – Features of metal containers, tinplate, Aluminium: advantage and disadvantages of aluminium, testing of aluminium foil, three piece can, soldered side seam can, cemented side – seam can, welded side- scan, two piece can, easy open ends, internal corrosion and can lacquering, method of evaluation of lacquer.

Glass containers - Properties of glass, type of glass, types of glass container, fprming glass bottles, properties of glass bottle such as internal pressure strength. Impact strength. Thermal shock resistance, colour.

Shelf life prediction – Factors in prediction process, spoilage mechanism, Basic prediction data and prediction techniques.
Disposal method for waste material.

References

1. Griffin, R.C., Sacharow, S. and Brody, A.L.. Principles of package development, 2nd, AVI Publication, Van Nostrand Reinhold Company, New York.
2. Kadoya, T.. Food Packaging. Academic press, Inc. San Diego, California.

COMPUTER ORIENTED NUMERICAL METHODS

Course/Paper: 08BAG 105
BAG Semester VIII

Errors and significant digits, Roots of algebraic equations Bisection method, secant method, Newton Raphson method, Graff's root- squaring method, Iterated synthetic division with quadratic factors method for finding complex roots,
Solutions of systems of equations (Gauss elimination, Gauss Jordan, and Partition method for linear system of equations, power method for partition, method for linear system of equations, power method for finding eigen values), Forward, backward , central and Divided differences, Newton's formula of interpolation for equal and unequal intervals. Lagrange's interpolation formula, Stirling's and Bessell's formula,
Numerical differentiation, Numerical Integration:- Trapezoidal, Simpson's rule and Gaussian integration (only formula applications) Differential equations and their solutions. Numerical methods for ordinary differential equations (Picard method, Taylor series method, Euler's method, Ranga Kutta Method, Predictor- corrector method, Adams- Bashforth method).

References

1.S.S. Sastry: Introductory Methods of Numerical analysis, PHI.
2 M.K.Jain, S.R. K. lyengar, and R.K.Jain: Numerical methods for scientific and engineering computation, New Age International (P) limited,

WATER SHED MANAGEMENT ENGINEERING (Practical)

Course/Paper: 08BAG 201
BAG Semester VIII

1. Computation of runoff and sediment yield of small watershed.
2. Determination of land capability classes under field conditions with the help of land capability rating table.
3. Delineation of micro watershed from G.T. sheets
4. Analysis of stage hydrograph and computation of discharge.
5. Data collection for planning and design of a selected micro watershed.
6. Visit of a treated watershed around Ajmer.
7. Analysis of stage hydrographs and computation of discharge.

COMPUTER ORIENTED NUMERICAL METHODS (Practical)

Course/Paper: 08BAG 202
BAG Semester VIII

1. To develop computer program to determine roots of a given equation using method of
_ .a. False position
_ .b. Newton -Raphson method,
2. To develop computer programs for solution of system of simultaneous linear equations using:
_ .a. Gauss Elimination Technique, without and with specified boundary conditions, for full as well as bounded symmetric and unsymmetrical matrices
_ .b. Gauss Shield iterative technique Successive over Relaxation(S.O.R) Technique
1. 3. Linear and Non-Linear curve fitting technique
2. 4. Numerical Integration with Simpson's rule and Gaussian Integration
3. 5. Solution of ordinary differential equations by (i) Eular Method (ii) Runge-Kutta Method (iii) Taylor Series Methods
4. 6. Solution of partial differential equations using S.O.R. Technique with special reference to heat conclusion equation.