

# DEPARTMENT OF AGRICULTURAL ENGINEERING

## TEACHING SCHEME AND EXAMINATION MARKS

**YEAR :- 2020-21**

### First Semester

| S. No.   | Subject Name   | Subject Code | PERIODS |   |   | EVALUATION SCHEME |    |       |    | END SEMESTER |    | Total      | Credit    |
|--|--|--------------|---------|---|---|-------------------|----|-------|----|--------------|----|------------|-----------|
|  |  |              | L       | T | P | CT                | TA | Total | PS | TE           | PE |            |           |
| 1  | Engineering Mathematics-I                            | BT-114       | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 3         |
| 2  | Engineering Physics                                  | BT-115       | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 3         |
| 3  | Principles of Soil Science                           | BT-116       | 2       | 1 | 0 | 15                | 10 | 25    | -  | 50           | -  | 75         | 2         |
| 4  | Workshop Technology and Practices                    | BT-117       | 2       | 1 | 0 | 15                | 10 | 25    | -  | 50           | -  | 75         | 2         |
| 5  | Environmental Science and Disaster Management        | BT-118       | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 3         |
| 6  | Communication Skills and Personality Development     | BT-119       | 2       | 1 | 0 | 15                | 10 | 25    | -  | 50           | -  | 75         | 2         |
| 7  | Engineering Physics Lab                              | BT-165       | 0       | 0 | 2 | -                 | -  | -     | 20 |              | 30 | 50         | 1         |
| 8  | Principles of Soil Science Lab                       | BT-166       | 0       | 0 | 2 | -                 | -  | -     | 20 |              | 30 | 50         | 1         |
| 9  | Workshop Technology & Practices Lab                  | BT-167       | 0       | 0 | 2 | -                 | -  | -     | 20 |              | 30 | 50         | 1         |
| 10   | Communication Skills and Personality Development Lab | BT-169       | 0       | 0 | 2 | -                 | -  | -     | 20 |              | 30 | 50         | 1         |
| 11   | Engineering Drawing Lab                              | BT-168       | 0       | 0 | 4 | -                 | -  | -     | 25 |              | 50 | 75         | 2         |
| <b>Grand Total of Theory &amp; Practical Total</b> |  |              |         |   |   |                   |    |       |    |              |    | <b>950</b> | <b>21</b> |

# **Engineering Mathematics-I**

## **UNIT-1**

Differential calculus

Asymptotes- curves and curvature, partial differentiation - Euler's theorem, total differential coefficient.

## **UNIT-II**

Taylor's theorem for two variables, maxima and minima, Lagrange's multiplier

## **UNIT-III**

Integral calculus: Application of integral calculus, area enclosed by curves, length of arc. Volume and surface of solids of revolution, Evaluation of double and tripple integrals

## **UNIT-IV**

Gamma and Beta functions- Dirichlet's integral. Simple tests of convergence of integrals

## **UNIT-V**

Infinite series:Convergence and divergence of series, tests of convergence, Alternating series, Absolutely and conditionally convergent series, uniform convergence.

# ENGINEERING PHYSICS-I

## UNIT-1

Surface tension- angle of contact, excess of pressure inside a spherical surface, capillary rise, determination of surface tension by Jaegers' method. Viscosity- Streamline and turbulent motion, coefficient of viscosity, critical velocity, Poiseuille's equation for flow of liquid through a tubes, viscometer.

## UNIT-II

**Interference**- thin films- testing of the optical planeness of surfaces, Youngs' double slit experiment- coherent sources- lasers, intensity in youngs' experiment, interference in thin films, Newton's ring and Michelson interferometer.

**Diffraction**- Fraunhofer- diffraction at single slit, diffraction at a circular aperture, diffraction at double slit, diffraction gratings, resolving and dispersive power of a grating.

## UNIT-III

**Polarisation**- Production and detection of circularly and elliptically polarised light. Quarter and half wave plates, optical activity, specific rotation, Lontz half shade polarimeter. Determination of specific rotation and strength of sugar solution.

**Lasers**- Coherence temporal and spatial, Einstein's coefficient, spontaneous and stimulated emission, population inversion, laser gain, (pumping), spectral narrowing in lasers, coherence length, different types of laser source and their applications.

## UNIT-IV

Crystal structure - Seven systems of crystals. Bravais space, lattice, crystal structure (bcc, fcc and sc), lattice dimensions, lattice planes, miller indices and their significance, x-ray absorption of X-rays diffraction- Bragg's law, Bragg's X-ray spectrometer. Nuclear radiations - Interaction of nuclear radiation with matter, scattering of charged particles from nucleus. Detection of radiation using G.M. counter and scintillation counter, radiation hazards, dosimetry.

## UNIT-V

Quantum theory - Wave particle duality uncertainty principle, Schrodinger equation and its application to particle in box and harmonic oscillator. Ultrasonics- production, application in ranging, cleaning and drilling. Production and measurement of vacuum- Mechanical pumps (rotary vacuum pump), diffusion and condensation pumps, Gettstand measurement; Manometer, mcLeod gauge, piram gauge. Measurement of temperature- Thermo e.m.f, measurement of thermo e.m.f. by potentiometer, higher temperature measurement by using pyrometers and resistance thermome

# **PRINCIPLE OF SOIL SCIENCE**

## **UNIT-1**

Definition of soil, Rocks and minerals. Soil formation and classification. Soil survey methods. Land use capability and mapping. Major soil types of India,

## **UNIT-1I**

soil texture, classification of soil particles and their determination, bulk density, particle density and porosity, soil structure, types of soil structure and management,

## **UNIT-1II**

forms of soil water, retention and movement, saturated and unsaturated flow. Soil moisture contents, soil temperature and soil air.

## **UNIT-1V**

Soil colloids, cation and anion exchange in soils, soil reactions and buffering capacity. Soil humus and its formation, C:N ratio. Saline and alkali soils and their reclamations. Significance of macro and Micro nutrients, Soil and water testing, Soil fertility management. Important fertilizers.

# **Environmental Science and Disaster Management**

## **Unit-I**

**Environmental Studies:** Scope and importance. Natural Resources: Renewable and nonrenewable resources Natural resources and associated problems.

## **Unit-II**

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ecosystems: Concept, Structure, function, Producers, consumers, decomposers, Energy flow, ecological succession, food chains, food webs, ecological pyramids. Introduction, types, characteristic features, structure and function of the forest, grassland, desert and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

## **Unit-III**

Biodiversity and its conservation:- Introduction, definition, genetic, species & ecosystem diversity and bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies.

## **Unit-I V**

Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.

## **Unit-V**

**Disaster Management:** Natural Disasters and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

# **Communication Skills and Personality Development**

## **UNIT I**

Communication skills: Structural and functional grammar; Meaning and process of communication; Verbal and nonverbal communication; Listening and note taking; Writing skills; Oral presentation skills; Field diary and lab record; Indexing, footnote and bibliographic procedures; Reading and comprehension of general and technical articles;

## **UNIT II**

Precise writing, summarizing, abstracting; Individual and group presentations; Impromptu presentation; Public speaking; Group discussion and interviews; Organizing seminars and conferences.

## **UNIT III**

Voice modulation basics and their usage for meaningful impact on people; Attributes of an effective leader; Stress and conflict management; Time management: Personal organization, prioritizing and balancing; Cosmopolitan culture; Impact of non verbal communication; Science of body language; Role of team work.

# **WORKSHOP TECHNOLOGY AND PRACTICES**

## **UNIT-I**

Carpentry shop- Seasoning and preservations of timber, glues, paints, varnishes and polish.

## **UNIT-II**

Foundry- Nature of work done in foundry shop, preparation of sands like - Green, dry sand, molasses sand, hand tools and equipments used in a foundry shop, moulding, casting, patterns types, materials and allowances, moulding sands and moulding methods, casting practices, casting defects,

## **UNIT-III**

Welding shop- Submerged arc welding, plasma welding, TIG and MIG welding, tools and equipments welding faults. Precaution taken while welding

## **UNIT-IV**

Machine shop- Introduction of computer in machine shop, necessity of numerical controlled machines, parts of NC machines, features of NC machines, advantage of NC machine over conventional milling machines, NC programming, computer numerical control machines, its advantage over NC machines, difference between CNC and DNC machines and its features,

## **Engineering Graphics Lab**

Construction and use of scales lettering, construction of plane geometrical figures, parabola, hyperbola and ellipse, special plane curves, cycloid, epicycloid, hypocycloid, involutes and spirals, helix and simple loci. Orthographic projection of points, lines, the traces and inclination, projection of solids like prism, cylinder, cone, pyramid, intersection and development of solids.

Construction of isometric scales, isometric projections of simple objects. Selection of solids and development of surfaces.

Forms of screw threads- BSW- square-metric, representations of threads, bolts, headed countersunk-stud, screws, and set screws, nuts- hexagonal- square keys- types, taper sunk, taper- hollow, saddle- flat, saddle-round- gib head- feather and woodruff keys, spline shaft.

Bearings- types-journal- solid- bushed and plummer block- pulley assembly, drawings of tailstock-plummer block end simple agricultural implements.

**DEPARTMENT OF AGRICULTURAL ENGINEERING**  
**TEACHING SCHEME AND EXAMINATION MARKS**  
**YEAR :- 2020-21**

**Second Semester**

| S. No.                                       | Subject Name   | Subject Code | PERIODS |   |   | EVALUATION SCHEME |    |       |    | END SEMESTER |    | Total      | Credit    |
|--|--|--------------|---------|---|---|-------------------|----|-------|----|--------------|----|------------|-----------|
|  |  |              | L       | T | P | CT                | TA | Total | PS | TE           | PE |            |           |
| 1.   | Engineering Chemistry                                | BT-214       | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 3         |
| 2.   | Engineering Mechanics                                | BT-215       | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 4         |
| 3.   | Engineering Mathematics – II                         | BT-216       | 3       | 0 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 3         |
| 4.   | Surveying & Leveling                                 | BT-217       | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 4         |
| 5.   | Thermodynamics, Refrigeration & Air-Conditioning     | BT-218       | 2       | 0 | 0 | 15                | 10 | 25    | -  | 50           | -  | 75         | 2         |
| 6.   | Introduction to Agronomy & Horticulture              | BT-219       | 2       | 0 | 0 | 15                | 10 | 25    | -  | 50           | -  | 75         | 2         |
| 7.   | Engineering Chemistry Lab                            | BT-264       | 0       | 0 | 2 | -                 | -  | -     | 20 |              | 30 | 50         | 1         |
| 8.   | Engineering Mechanics Lab                            | BT-265       | 0       | 0 | 2 | -                 | -  | -     | 20 |              | 30 | 50         | 1         |
| 9.   | Surveying & Leveling Lab                             | BT-267       | 0       | 0 | 2 | -                 | -  | -     | 20 |              | 30 | 50         | 1         |
| 10.  | Thermodynamics, Refrigeration & Air-Conditioning Lab | BT-268       | 0       | 0 | 2 | -                 | -  | -     | 20 |              | 30 | 50         | 1         |
| <b>Grand Total of Theory &amp; Practical</b> |  |              |         |   |   |                   |    |       |    |              |    | <b>950</b> | <b>22</b> |

## ENGINEERING CHEMISTRY

### UNIT-I

Water- Hardness, determination of hardness by compleximetric (EDTA) method, degree of hardness, Chloride dissolved oxygen, dissolved carbondioxide and sulphate, calorimetric methods for the determination of pH, control of pH of water used in industry Chemical

### UNIT-II

Fuels- Classification of fuels, solid fuels, coal- origin and its classification, proximate and ultimate analysis of coal. Significance of constituents, Gross and net calorific values, Determination of Calorific value by Bomb Calorimeter. Liquid Fuels- Advantages, Petroleum- origin, classification, refining of Petrol, Gasoline, knocking- octane number, chemical structure and knocking- Anti-knock agents, cracking. Gaseous Fuels- Advantages, manufacture, composition and calorific value of Coal gas and oil gas. Determination of Calorific value of gas by Junker's Calorimeter. Fuel gas analysis by Orsat apparatus. Calculations based on combustion.

### UNIT-III

Corrosion- Definition and its significance, theories of corrosion, Galvanic cell and concentration cell. Pitting and stress corrosion, Protection of corrosion. Use of inhibitors and passivation. Alloying, protective coatings - Metallic, inorganic and Organic. Cement- Manufacture of Portland cement, vertical shaft kiln technology, Chemistry of setting and hardening. Refractories- Definition, Properties, Classification, Properties of Silica and Fireclays refractories. Glass- preparation, varieties and uses.

### UNIT-IV

**Polymers:** Plastics- Types of Plastics, Compounding of plastics and their fabrication. Rubber- Natural rubber, vulcanisation, elastomers and their uses. Fibers- Natural and synthetic fibers and use of Nylon, Terylene and Rayon. Lubricants- Classification, types of lubrication, properties and tests. (Viscosity and viscosity index. Flash and Fire point, cloud and pour point Emulsification)

### UNIT-V

Chemical Kinetics- Order and molecularity of reaction, first and second order reaction. Derivation of equations for first order and second order reactions. Determination of order of reaction. Energy of activation and Arrhenus equation. Numericals of first and second order reactions.

# **ENGINEERING MECHANICS**

## **UNIT-I**

Fundamentals of engineering mechanics, vector and scalar quantity. Conditions of equilibrium, Applications of principle of moments and couples. Study of coplaner and non coplaner force systems using analytical, vector and graphical approach.

## **UNIT-II**

Internal forces in frames and trusses. Reactions of supports of frame. Free body diagram related problem. Analysis of frame, method of sections. Principle of virtual work.

## **UNIT-III**

Application of laws of friction, wedge and block, screw jacks and brakes. Machines, reversible machine and non-reversible machine. Law of machine. Velocity ratio, mechanical advantage and efficiency of simple lifting machines.

## **UNIT-IV**

Linear motion, velocity, acceleration. Projectile. Angular and curvi-linear motion. Laws of motion, relative velocity, rotational and translation motion. Centre of gravity, centroid, Moment of Inertia, radius of gyration, Newton's laws of motion. Work, power and Energy.

## **UNIT-V**

Laws of conservation of energy and momentum. Collision of elastic bodies. Loss of kinetic energy on impact. Centrifugal and centripetal forces, super elevation, Governors, Simple harmonic motion, rope and belt drive, transmission of power by belts.

## ENGINEERING MATHEMATICS –II

### UNIT-I

**Vector calculus:** Differentiation of vectors- directional derivatives, line, surface and volume integrals statement of Gauss, Green's and Stake's theorems and their application.

### UNIT-II

**Differential equations:** Differential equations of first order first degree- Linear differential equations with constant coefficients- Homogeneous equations with variable coefficients.

### UNIT-III

Application to practical problems, BesseFs and Legendres differential eqns, partial differential equations.

### UNIT-IV

**Matrices:** Basic properties transpose, adjoints inverse and rank of a matrix. Solution of evaluation. Elementary transformation-characteristic equation, Cayley- Hamilton theorem.

# **SURVEYING AND LEVELLING**

## **UNIT-I (*Surveying*)**

Principle and basic concepts of surveying Plans and maps• Classification of surveying• Basic measurements• Units of measurement• Types of Scales• Recording the measurement• Principal of chain surveying• Types of Chains• Types of Ranging and Chaining• Chain and tape errors• & corrections Selection of survey station and lines• Offset measurement• Cross Staff Optical Square- Prism Square• Obstacles in chaining and ranging•

## **UNIT-II (*Traversing*)**

Methods of traversing• Prismatic compass• Surveyors compass• Angle and bearing• Quadrantal system• Local attraction• Dip of angle• magnetic declination• Plotting a traverse survey• Errors In compass survey• Bow ditch's rule• Transit rule•

## **UNIT-III (*Plane Tabling*)**

Plane tabling instruments and accessories• Methods and principal• Two points problem• Three points problem• Errors in plane tabling• Planimeter Sextant Band level, Abney level• Clinometer, Pentameter• Computation of areas methods•

## **UNIT-IV (*Leveling*)**

Definition , Basic principal of levelling• Benchmark• Types of levels optical• Principal causes telescopes sensitivity of bubble tubes• Leveling staff• Temporary adjustment, Permanent adjustment of levels• Field book entries• Reduction of levels missing entries ,• Types of levelling• Simple and differential levelling• Check leveling• & reciprocal leveling Precise levelling• profile leveling•

## **UNIT-V**

Theodolite traversing• Theodolite Surveying • Ranging by theodolite• Temporary• & Permanent adjustment of theodolite.

# **Thermodynamics, Refrigeration & Air-Conditioning**

## **UNIT-I**

Thermodynamics properties, closed and open system, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of first law in heating and expansion of gases in non-flow processes. First law applied to steady flow processes. Carnot cycle, Carnot theorem. Entropy, physical concept of entropy, change of entropy of gases in thermodynamics process. Otto, diesel and dual cycles.

## **UNIT-I**

Principles of refrigeration, - units, terminology, production of low temperatures, air refrigerators working on reverse Carnot cycle and Bell Coleman cycle. Vapour refrigeration-mechanism, P-V,P-S,P-H diagrams, vapor compression cycles, dry and wet compression, super cooling and sub cooling. Vapour absorption refrigeration system. Common refrigerants and their properties. Design calculations for refrigeration system Cold storage plants.

## **.UNIT-III**

Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement, psychometric chart and its use, elementary psychometric process. Air conditioning – principles –Type and functions of air conditioning, physiological principles in air conditioning, air distribution and duct design methods, fundamentals of design of complete air conditioning systems – humidifiers and dehumidifiers – cooling load calculations, types of air conditioners – applications.

# **Introduction to Agronomy & Horticulture**

## **UNIT-I**

Agronomy, scope and its role in crop production-Major Field crops of India classification, area, distribution and productivity of major Field crops. Farming and cropping systems mono, sole and multiple cropping, relay, sequential and inter cropping.

## **UNIT-II**

Tillage- definition objectives – types of tillage- tillage implements – tilth - characteristics of good tilth – Soil productivity and fertility- Crop nutrition – nutrients –classification – Nutrient sources organic manures –fertilizers – bio fertilizers- Integrated Nutrient Management-Importance of water in plant growth- Soil properties influencing moisture availability – texture, structure and organic matter status

## **UNIT-III**

Weed control – definition and characteristics of weeds, classification of weeds – damages due to weeds - benefits of weeds. -Control vs prevention of weeds – methods of weed control-Classification of herbicides–Integrated weed management.

## **UNIT-IV**

Soil and its management-Definitions and importance of horticulture- Economic importance and classification of horticultural crops and their culture and nutritive value- area and production- exports and imports- fruit, vegetables, plantation and spice crops-soil and climate–principles-planning and layout- management of orchards- planting systems and planting densities- Principles and methods of pruning and training of fruit, plantation crops use of growth regulators in horticulture crops-Horticultural zones of state and country.

# DEPARTMENT OF AGRICULTURAL ENGINEERING

## TEACHING SCHEME AND EXAMINATION MARKS

**YEAR :- 2020-21**

### Third Semester

| S. No.                                       | Subject Name  | Subject Code | Periods |   |   | Evaluation Scheme |    |       |    | End Semester |    | Total      | Credit    |
|--|---|--------------|---------|---|---|-------------------|----|-------|----|--------------|----|------------|-----------|
|  |   |              | L       | T | P | CT                | TA | Total | PS | TE           | PE |            |           |
| 1.   | Engineering Mathematics - III                         | BT – 327     | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 4         |
| 2.   | Strength of Materials                                 | BT – 328     | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 3         |
| 3.   | Principles of Horticulture Crops and Plant Protection | BT – 329     | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 4         |
| 4.   | Web designing and Internet Applications               | BT – 330     | 2       | 1 | 0 | 15                | 10 | 25    | -  | 50           | -  | 75         | 2         |
| 5.   | Heat & Mass Transfer                                  | BT – 331     | 2       | 1 | 0 | 15                | 10 | 25    | -  | 50           | -  | 75         | 2         |
| 6.   | Electrical Machines and Power Utilization             | BT – 332     | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150        | 4         |
| 7.   | Web designing and Internet Applications Lab           | BT – 380     | 0       | 0 | 2 | -                 | -  | -     | 20 | -            | 30 | 50         | 1         |
| 8.   | Heat & Mass Transfer Lab                              | BT – 381     | 0       | 0 | 2 | -                 | -  | -     | 20 | -            | 30 | 50         | 1         |
| 9.   | Electrical Machines and Power Utilization Lab         | BT – 382     | 0       | 0 | 2 | -                 | -  | -     | 20 | -            | 30 | 50         | 1         |
| <b>Grand Total of Theory &amp; Practical</b> |   |              |         |   |   |                   |    |       |    |              |    | <b>900</b> | <b>22</b> |

## **ENGINEERING MATHEMATICS –III**

### **UNIT-I**

#### **Laplace transforms**

Standard unit step functions, periodic functions - convolution theorem, application of ordinary differential equations with constant coefficients.

### **UNIT-II**

#### **Complex variables**

Analytic functions - Cauchy Riemann equations- complex integration. Cauchy fundamental theorem - residues - residue theorem- Cauchy Lemma and Jordenslemma contour integration,

### **UNIT-III**

Fourier series- Dirichlet's condition, Errors and approximation in numerical computations.

### **UNIT-IV**

Method of finite differences- finite difference operators- integration - first and second order linear finite difference equations with constant coefficients. Interpolation methods for solving simultaneous linear algebraic equations.

## **Principles of Horticulture Crops and Plant Protection**

### **UNIT-I**

Scope of horticultural. Soil and climatic requirements for fruits, vegetables and floriculture crops, improved varieties,

### **UNIT-II**

Criteria for site selection, layout and planting methods, nursery raising, commercial varieties/hybrids, sowing and planting times and methods, seed rate and seed treatment for vegetable crops; macro and micro propagation methods, plant growing structures, pruning and training, crop coefficients,

### **UNIT-III**

Harvesting, grading and packaging, post harvest practices, Garden tools, management of orchard, Extraction and storage of vegetables seeds. Major pests and diseases and their management in horticulture crops.

## **STRENGTH OF MATERIALS**

### **UNIT-I**

Elasticity- stress and strain- elastic limit- Hooke's law- Young's modulus- stresses in bar due to its own weight, varying sections and uniformly tapering circular bars- primary and secondary strain- bulk and shear modulus and their relationship- volumetric strain in a body, Principle stresses and strains, Mohr's circle.

### **UNIT-II**

Temperature stresses, Resilience. Shear force and bending moment diagram for simply supported beams and cantilever beams centroid of different cross sectional laminae, moment of inertia, parallel axis theorem and perpendicular axis theorem- moment of inertia of different cross sectional laminae-.

### **UNIT-III**

Stresses in thin cylinder and spherical shells-derivation of equations for circumferential and longitudinal stresses in shells and their applications- combined bending and direct thrust- middle third rule- eccentricity of load- stability of dam profile,

### **UNIT-IV**

columns and struts assumptions made in Euler's theory- derivation of buckling load equation for both the ends hinged, one end fixed and the other end free- empirical formulae for columns,

### **UNIT-V**

Derivation of torsional equation- bending stress in beams- derivation of bending equation- shearing stresses in beams-derivation of shearing stresses equation- deflection- derivation of double order differential equation- Macanlay's method

## **Web designing and Internet Applications**

### **Unit-I**

Basic principles in developing a web designing, Planning process, Five Golden rules of web designing,

### **Unit-II**

Designing navigation bar, Page design, Home Page Layout, Design Concept. Basics in Web Design, Brief History of Internet, World Wide Web, creation of a web site, Web Standards, Audience requirement.

### **Unit-III**

Introduction to Java Script, variables & functions, Working with alert, confirm and prompt, Connectivity of Web pages with databases; Project.

## **HEAT AND MASS TRANSFER**

### **Unit-1**

Modes of heat transfer, thermal conductivity of materials, General differential equation of conduction, One dimensional steady state conduction through plane and composite walls, tubes and spheres without heat generation. Insulation materials, critical thickness of insulation.

### **Unit-2**

Introduction to Fins, Free and forced convection, Heat transfer coefficient in convection. Newton's law of cooling. Dimensional analysis of 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.

### **Unit.3**

Introduction to 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. Introduction to mass transfer, Fick's law, and mass transfer coefficients.

### **Unit 4**

Introduction to Heat Exchanger, types of heat exchangers, log mean temperature difference, heat exchanger performance, transfer units. Heat exchanger analysis restricted to parallel and counter flow heat exchangers

## **Electrical Machines and Power Utilization**

### **Unit-I**

Electro motive force, reluctance, laws of magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits, hysteresis and eddy current losses, Transformer: principle of working, construction of single phase transformer, EMF equation, phasor diagram on load, leakage reactance, voltage regulation, power and energy efficiency, open circuit and short circuit tests, principles,

### **Unit-II**

operation and performance of DC machine (generator and motor), EMF and torque equations, armature reaction, commutation, excitation of DC generator and their characteristics, DC motor characteristics, starting of shunt and series motor, starters, speed control methods-field and armature control, polyphase

### **Unit-III**

induction motor: construction, operation, phasor diagram, effect of rotor resistance, torque equation, starting and speed control methods, single phase induction motor: double field revolving theory, equivalent circuit, characteristics, phase split, shaded pole motors, various methods of three phase power measurement; power factor, reactive and apparent power,

### **Unit-IV**

Concept and analysis of balanced poly-phase circuits; Series and parallel resonance.

# DEPARTMENT OF AGRICULTURAL ENGINEERING

## TEACHING SCHEME AND EXAMINATION MARKS

**YEAR :- 2020-21**

### **Fourth Semester**

| S. No.                                       | Subject Name   | Subject Code | Periods |   |   | Evaluation Scheme |    |       |    | End Semester |    | Total       | Credit    |
|--|--|--------------|---------|---|---|-------------------|----|-------|----|--------------|----|-------------|-----------|
|  |  |              | L       | T | P | CT                | TA | Total | PS | TE           | PE |             |           |
| 1.   | Fluid Mechanics and open Channel Hydraulics          | BT – 428     | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150         | 4         |
| 2.   | Applied Electronics & Instrumentation                | BT – 429     | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150         | 4         |
| 3.   | Theory of Machines                                   | BT – 430     | 3       | 1 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150         | 4         |
| 4.   | Soil Mechanics                                       | BT – 431     | 2       | 1 | 0 | 15                | 10 | 25    | -  | 50           | -  | 75          | 3         |
| 5.   | Entrepreneurship Development and Business Management | BT – 432     | 3       | 0 | 0 | 30                | 20 | 50    | -  | 100          | -  | 150         | 3         |
| 6.   | Computer Programming and Data Structure              | BT – 433     | 2       | 1 | 0 | 15                | 10 | 25    | -  | 50           | -  | 75          | 3         |
| 7.   | Soil Mechanics Lab                                   | BT – 481     | 0       | 0 | 2 | -                 | -  | -     | 20 | -            | 30 | 50          | 1         |
| 8.   | Fluid Mechanics and open Channel Hydraulics Lab      | BT – 478     | 0       | 0 | 2 | -                 | -  | -     | 20 | -            | 30 | 50          | 1         |
| 9.   | Auto CAD Applications Lab                            | BT – 480     | 0       | 0 | 2 | -                 | -  | -     | 20 | -            | 30 | 50          | 1         |
| 10.  | Applied Electronics & Instrumentation Lab            | BT – 479     | 0       | 0 | 2 | -                 | -  | -     | 20 | -            | 30 | 50          | 1         |
| 11.  | Computer Programming and Data Structure Lab          | BT – 483     | 0       | 0 | 2 | -                 | -  | -     | 20 | -            | 30 | 50          | 1         |
| <b>Grand Total of Theory &amp; Practical</b> |  |              |         |   |   |                   |    |       |    |              |    | <b>1000</b> | <b>26</b> |

## **Fluid Mechanics and open Channel Hydraulics**

### **UNIT-I**

Properties of fluids: Ideal and real fluid. Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, centre of pressure, buoyancy, meta centre and meta centric height, condition of floatation and stability of submerged and floating bodies;

### **UNIT-II**

Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and stream lines, stream function, velocity potential and flow net. Types of fluid flow, translation, rotation, circulation and vorticity, Vortex motion; Dynamics of fluid flow, Bernoulli's theorem, venturimeter, orifice meter and nozzle, siphon; Laminar flow: Stress strain relationships, flow between infinite parallel plates both plates fixed, one plate moving, discharge, average velocity;

### **UNIT-III**

Laminar and turbulent flow in pipes, general equation for head loss Darcy, Equation, Moody's diagram, Minor and major hydraulic losses through pipes and fittings, flow through network of pipes, hydraulic gradient and energy gradient;

### **UNIT-IV**

Flow through orifices (Measurement of Discharge, Measurement of Time), Flow through Mouthpieces, Flow over Notches, Flow over weirs, Chezy's formula for loss of head in pipes, Flow through simple and compound pipes, Open channel design and hydraulics:

### **UNIT-V**

Chezy's formula, Bazin's formula, Kutter's Manning's formula, Velocity and Pressure profiles in open channels, Hydraulic jump; Dimensional analysis and similitude: Rayleigh's method and Buckingham's 'Pi' theorem, types of similarities, dimensional analysis, dimensionless numbers. Introduction to fluid machinery.

# **Applied Electronics & Instrumentation**

## **Unit-I**

Semiconductors. p—n junction. V—I characteristics of p—n junction. diode as a circuit element. rectifier. clipper. damper, voltage multiplier, capacitive filter. diode circuits for OR & AND (both positive and negative logic), bipolar junction transistor: operating point. classification (A, B & C) of amplifier. various biasing methods (fixed. self potential divider). h-parameter model of a transistor. analysis of small signal.

## **Unit-II**

CE amplifier. phase shift oscillator, analysis of differential amplifier using transistor. ideal OP-AMP characteristics. linear and non-linear applications of OP-AMP (adder. subtractor. integrator, active rectifier. comparator. differentiator. differential, instrumentation amplifier and oscillator).

## **Unit-III**

Zener diode voltage regulator. transistor series regulator. current limiting. OP-AMP voltage regulators. Basic theorem of Boolean algebra.

## **Unit-IV**

Combinational logic circuits(basic gates. SOP rule and Kmap). binary ladder D/A converter, successive approximation A/D converter, generalized instrumentation, measurement of displacement. temperature.

## **Unit-V**

velocity, force and pressure using potentiometer. resistance thermometer. thermocouples. Bourdon tube. LVDT. strain gauge and tachogenerator.

## **Theory of Machines**

### **Unit-I**

Elements, links, pairs, kinematics chain, and mechanisms. Classification of pairs and mechanisms. Lower and higher pairs. Four bar chain, slider crank chain and their inversions. Determination of velocity and acceleration using graphical (relative velocity and acceleration) method. Instantaneous centers. Types of gears. Law of gearing, velocity of sliding between two teeth in mesh. Involute and cycloidal profile for gear teeth. Spur gear, nomenclature, interference and undercutting.

### **Unit-II**

Introduction to helical, spiral, bevel and worm gear. Simple, compound, reverted, and epicyclic trains. Determining velocity ratio by tabular method. Turning moment diagrams, coefficient of fluctuation of speed and energy, weight of flywheel, flywheel applications.

### **Unit-III**

Belt drives, types of drives, belt materials. Length of belt, power transmitted, velocity ratio, belt size for flat and V belts. Effect of centrifugal tension, creep and slip on power transmission, Chain drives. Types of friction, laws of dry friction. Friction of pivots and collars. Single disc, multiple disc, and cone clutches. Rolling friction, anti friction bearings.

### **Unit-IV**

Types of governors. Constructional details and analysis of Watt, Porter, Proell governors. Effect of friction, controlling force curves. Sensitiveness, stability, hunting, iso-chronism, power and effort of a governor. Static and dynamic balancing. Balancing of rotating masses in one and different planes.

## **SOIL MECHANICS**

### **UNIT-I**

Introduction of soil mechanics, field of soil mechanics, phase diagram, physical and index properties of soil, classification of soils, effective and neutral stress, elementary concept of Boussinesq and Westergaard's analysis, new mark influence chart. Seepage Analysis;

### **UNIT-II**

Quick condition-two dimensional flow-Laplace equation, Velocity potential and stream function, Flow net construction. Shear strength, Mohr stress circle, theoretical relationship between principal stress circle, theoretical relationship between principal stress, Mohr coulomb failure theory, effective stress principle. Determination of shear parameters by direct shear test, triangle test & vane shear test. Numerical exercise based on various types of tests.

### **UNIT-III**

Compaction, composition of soils standard and modified proctor test, abbot compaction and Jodhpur mini compaction test field compaction method and control. Consolidation of soil: Consolidation of soils, one dimensional consolidation spring analogy,

### **UNIT-IV**

Terzaghi's theory, Laboratory consolidation test, 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,

### **UNIT-V**

Rankin'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 circle method, Taylor's stability number.

## **Entrepreneurship Development and Business Management**

### **Unit-I**

Entrepreneurship, management – Management functions – planning- Organizing -Directing motivation – ordering – leading – supervision-Communication and control – Capital – Financial management – importance of financial statements – balance sheet – profit and loss statement, Analysis of financial statements – liquidity ratios – leverage ratios, Coverage ratios – turnover ratios – profitability ratios, Agro-based industries – Project – project cycle – Project appraisal and evaluation techniques – undiscounted measures – payback period – proceeds per rupee of outlay, Discounted measures –

### **Unit-II**

Net Present Value (NPV) – Benefit-Cost Ratio (BCR) – Internal Rate of Return (IRR) – Net benefit investment ratio (N / K ratio) – sensitivity analysis-Importance of agribusiness in Indian economy International trade-WTO agreements – Provisions related to agreements in agricultural and food commodities. Agreements on agriculture (AOA) –

### **Unit-III**

Domestic supply, market access, export subsidies agreements on sanitary and phyto-sanitary (SPS) measures, Trade related intellectual property rights (TRIPS). Development (ED): Concept of entrepreneur and entrepreneurship Assessing overall business environment in Indian economy – Entrepreneurial and managerial characteristics- Entrepreneurship development Programmes (EDP)- Generation incubation and commercialization of ideas and innovations- Motivation and entrepreneurship development-

### **Unit-IV**

Globalization and the emerging business entrepreneurial environment- Managing an enterprise: Importance of planning, budgeting, monitoring evaluation and follow-up managing competition. Role of ED in economic development of a country- Overview of Indian social, political systems and their implications for decision making by individual entrepreneurs-

## **Unit-V**

Economic system and its implications for decision making by individual entrepreneurs- Social responsibility of business. Morals and ethics in enterprise management- SWOT analysis- Government schemes and incentives for promotion of entrepreneurship. Government policy on small and medium enterprises (SMEs)/SSIs/MSME sectors- Venture capital (VC), contract farming (CF) and joint ventures (JV), public-private partnerships (PPP)- Overview of agricultural engineering industry, characteristics of Indian farm machinery industry.

## **Computer Programming and Data Structure**

### **Unit-I**

Introduction and historical background: Review of computer technology; Processor, memory, secondary storage, display devices and other peripheral devices; Basic computer organization, future trends; Brief review of present-day applications, programming; Introduction to systems software, applications software and programming language;

Introduction to C: Structure of a C program, simple data types, declarations, operators and expressions; The assignment statement; Library functions; Control Structures: Conditional and iterative execution of statements; Importance of documentation; Nesting of control structures and the use of indentation to indicate nesting levels; Labels and the "go to" statement; Arrays; Single and multi-dimensional arrays: Character strings and string functions.

### **Unit-III**

Structures, unions and user-defined types; Operations on files: Concept of standard input and output files; Formatting of data on input and output; Use of include files; Introduction to high level languages; Primary data types and user defined data types, variables, typecasting, operators, building and evaluating expressions, standard library functions, managing input and output, decision making, branching, looping, arrays, user defined functions, passing arguments and returning values, recursion, scope and visibility of a variable, string functions, structures and union, pointers, stacks, push/pop operations, queues, insertion and deletion operations, linked lists.

### **Unit-IV**

Algorithms and flow-charts: Input processing- output model of a computer program; Role of the compiler and the integrated development environment. Functions: Scope rules; Argument passing by reference and by value; Storage classes; Use of function prototypes;

# DEPARTMENT OF AGRICULTURAL ENGINEERING

## TEACHING SCHEME AND EXAMINATION MARKS

**YEAR :- 2020-21**

### **Fifth Semester**

| S. No              | Subject Name  | Code No.     | Periods   |          |          | Evaluation Scheme |    |       |    | End Semester |    | Total      | Credit    |
|--------------------|---|--------------|-----------|----------|----------|-------------------|----|-------|----|--------------|----|------------|-----------|
|                    |   |              | L         | T        | P        | CT                | TA | Total | PS | TE           | PE |            |           |
| 1.                 | Watershed Hydrology   | BT – 528 (N) | 3         | 1        | 0        | 30                | 20 | 50    |    | 100          |    | 150        | 4         |
| 2.                 | Post Harvest Engineering of Cereals, Pulses & Oil seeds     | BT – 529 (N) | 3         | 1        | 0        | 30                | 20 | 50    |    | 100          |    | 150        | 4         |
| 3.                 | Machine Design  | BT – 530 (N) | 3         | 1        | 0        | 30                | 20 | 50    |    | 100          |    | 150        | 4         |
| 4.                 | Irrigation & Drainage Engineering                           | BT – 531 (N) | 3         | 1        | 0        | 30                | 20 | 50    |    | 100          |    | 150        | 4         |
| 5.                 | Tractor Systems Controls                                    | BT – 532 (N) | 3         | 1        | 0        | 30                | 20 | 50    |    | 100          |    | 150        | 4         |
| 6.                 | Watershed Hydrology Lab                                     | BT – 578 (N) | 0         | 0        | 2        |                   |    |       | 20 |              | 30 | 50         | 1         |
| 7.                 | Post Harvest Engineering of Cereals, Pulses & Oil seeds Lab | BT – 579 (N) | 0         | 0        | 2        |                   |    |       | 20 |              | 30 | 50         | 1         |
| 8.                 | Irrigation & Drainage Engineering Lab                       | BT – 581 (N) | 0         | 0        | 2        |                   |    |       | 20 |              | 30 | 50         | 1         |
| 9.                 | Mini Project/Internship **                                  | BT – 580 (N) | 0         | 0        | 2        |                   |    |       | 50 |              |    |            | 1         |
| <b>Grand Total</b> |   |              | <b>15</b> | <b>5</b> | <b>8</b> |                   |    |       |    |              |    | <b>950</b> | <b>24</b> |

\*\* The Mini Project or Internship (4weeks) conducted during summer break after IV<sup>th</sup> Semester and will be assessed during V<sup>th</sup> Semester.

## **Watershed Hydrology**

### **Unit-I**

Hydrologic cycle, precipitation and its forms, rainfall measurement and estimation of mean rainfall, frequency analysis of point rainfall. Mass curve, hyetograph, depth-area-duration curves and intensity-duration-frequency relationship.

### **Unit-II**

Hydrologic processes-Interception, infiltration –factors influencing, measurement and indices. Evaporation - Estimation and measurement. Runoff - Factors affecting, measurement, stage - discharge rating curve, estimation of peak runoff rate and volume, Rational method, Cook's method and SCS curve number method.

### **Unit-III**

Geomorphology of watersheds – Linear, aerial and relief aspects of watersheds- stream order, drainage density and stream frequency. Hydrograph - Components, base flow separation, unit hydrograph theory, S-curve, synthetic hydrograph, applications and limitations. Stream gauging - discharge rating curves, flood peak, design flood and computation of probable flood.

### **Unit-IV**

Flood routing – channel and reservoir routing. Drought – classification, causes and impacts, drought management strategy.

## **Post Harvest Engineering of Cereals, Pulses & Oil seeds**

### **Unit-I**

Cleaning and grading, aspiration, scalping; size separators, screens, sieve analysis, capacity and effectiveness of screens. Various types of separators: specific gravity, magnetic, disc, spiral, pneumatic, inclined draper, velvet roll, colour sorters, cyclone, shape graders. Size reduction: principle, Bond's law, Kick's law, Rittinger's law, procedure (crushing, impact, cutting and shearing), Size reduction machinery: Jaw crusher, Hammer mill, Plate mill, Ball mill.

### **Unit-II**

Material handling equipment. Types of conveyors: Belt, roller, chain and screw. Elevators: bucket, Cranes & hoists. Trucks (refrigerated/ unrefrigerated), Pneumatic conveying. Drying: moisture content and water activity; Free, bound and equilibrium moisture content, isotherm, hysteresis effect, EMC determination, Psychrometric chart and its use in drying,

### **Unit-III**

Drying principles and theory, Thin layer and deep bed drying analysis, Falling rate and constant rate drying periods, maximum and decreasing drying rate period, drying equations, Mass and energy balance, Shedd's equation, Dryer performance, Different methods of drying, batch-continuous; mixing-non-mixing, Sunmechanical, conduction, convection, radiation, superheated steam, tempering during drying, Different types of grain dryers: bin, flat bed, LSU, columnar, RPEC, fluidized, rotary and tray.

### **Unit-IV**

Mixing: Theory of mixing of solids and pastes, Mixing index, types of mixers for solids, liquid foods and pastes. Milling of rice: Conditioning and parboiling, advantages and disadvantages, traditional methods, CFTRI and Jadavpur methods, Pressure parboiling method, Types of rice mills, Modern rice milling, different unit operations and equipment.

### **Unit-V**

Milling of wheat, unit operations and equipment. Milling of pulses: traditional milling methods, commercial methods, pre-conditioning, dry milling and wet milling methods: CFTRI and Pantnagar methods. Pulse milling machines, Milling of corn and its products. Dry and wet milling. Milling of oilseeds: mechanical expression, screw press, hydraulic press, solvent extraction methods, preconditioning of oilseeds, refining of oil, stabilization of rice bran., Extrusion cooking: principle, factors affecting, single and twin screw extruders. By-products utilization.

## **Machine Design**

### **Unit-I**

Meaning of design, Phases of design, design considerations. Common engineering materials and their mechanical properties. Types of loads and stresses, theories of failure, factor of safety, selection of allowable stress.

### **Unit-II**

Stress concentration. Elementary fatigue and creep aspects. Cotter joints, knuckle joint and pinned joints, turnbuckle. Design of welded subjected to static loads.

### **Unit-III**

Design of threaded fasteners subjected to direct static loads, bolted joints loaded in shear and bolted joints subjected to eccentric loading. Design of shafts under torsion and combined bending and torsion. Design of keys. Design of muff, sleeve, and rigid flange couplings. Design of helical and leaf springs.

### **Unit-IV**

Design of flat belt and V-belt drives and pulleys. Design of gears. Design of screw motion mechanisms like screw jack, lead screw, etc. Selection of anti-friction bearings.

## **Irrigation & Drainage Engineering**

### **Unit I**

Definition, need of irrigation, Purpose of irrigation, importance of irrigation, sources of irrigation water, present status of development and utilization of different water resources of the country; common irrigation terminology.

### **Unit II**

Soil-water- plant-relationship, soil properties influencing irrigation management, soil water movement, concept of evapo-transpiration, soil moisture constants, measurement of soil moisture, depth of irrigation, frequency of irrigation, irrigation scheduling.

### **Unit III**

Water and irrigation requirement of crops, measurement of irrigation water, weir, notches, flumes and orifices and other methods; water conveyance, irrigation efficiencies.

### **Unit IV**

Irrigation methods of water application, border, check basin, furrow and contour irrigation; sprinkler and drip irrigation method, merits, demerits, selection and layout.

### **Unit V**

Water logging- causes and impacts; drainage, need of drainage, Purpose of drainage, importance of drainage objectives of drainage, types of surface drainage, design of surface drains; sub-surface drainage: purpose and benefits, conjunctive use of fresh and saline water.

## **Tractor Systems Controls**

### **Unit-I**

Study of need for transmission system in a tractor. Transmission system – types, major functional systems. Study of clutch – need, types, functional requirements, construction and principle of operation. Familiarization with single plate, multi-plate, centrifugal and dual clutch systems. Study of Gear Box – Gearing theory, principle of operation, gear box types, functional requirements, and calculation for speed ratio.

### **Unit-II**

Study of differential system – need, functional components, construction, calculation for speed reduction. Study of need for a final drive. Study of Brake system – types, principle of operation, construction, calculation for braking torque. Study of steering system – requirements, steering geometry characteristics, functional components, calculation for turning radius.

### **Unit-III**

Familiarization with Ackerman steering. Steering systems in track type tractors. Study of Hydraulic system in a tractor – Principle of operation, types, main functional components, functional requirements.

### **Unit-IV**

Familiarization with the Hydraulic system adjustments and ADDC. Study of tractor power outlets – PTO. PTO standards, types and functional requirements. Introduction to traction. Traction terminology. Theoretical calculation of shear force and rolling resistance on traction device. Study of wheels and tyres

– Solid tyres and pneumatic tyres, tyre construction and tyre specifications. Study of traction aids. Study of tractor mechanics – forces acting on the tractor. Determination of CG of a tractor.

### Unit-V

Determination and importance of moment of inertia of a tractor. Study of tractor static equilibrium, tractor stability especially at turns. Determination of maximum drawbar pull. Familiarization with tractor as a spring-mass system. Ergonomic considerations and operational safety. Introduction to tractor testing. Deciphering the engine test codes.

| <b>DEPARTMENT OF AGRICULTURAL ENGINEERING</b><br><b>TEACHING SCHEME AND EXAMINATION MARKS</b><br><b>YEAR :- 2020-21</b> |   |              |           |          |          |                   |    |       |    |              |    |            |           |
|---|---|--------------|-----------|----------|----------|-------------------|----|-------|----|--------------|----|------------|-----------|
| <b>Sixth Semester</b>   |   |              |           |          |          |                   |    |       |    |              |    |            |           |
| S.No.   | Subject Name  | Code No.     | Periods   |          |          | Evaluation Scheme |    |       |    | End Semester |    | Total      | Credit    |
|   |   |              | L         | T        | P        | CT                | TA | Total | PS | TE           | PE |            |           |
| 1.  | Farm Machinery and Equipment – I                    | BT – 631 (N) | 3         | 1        | 0        | 30                | 20 | 50    |    | 100          |    | 150        | 4         |
| 2.  | Post Harvest Engineering of Horticultural Crops     | BT – 632 (N) | 3         | 1        | 0        | 30                | 20 | 50    |    | 100          |    | 150        | 4         |
| 3.  | Soil and Water Conservation Engineering             | BT – 633 (N) | 3         | 1        | 0        | 30                | 20 | 50    |    | 100          |    | 150        | 4         |
| 4.  | Fundamental of Renewable Energy Sources             | BT – 634 (N) | 3         | 1        | 0        | 30                | 20 | 50    |    | 100          |    | 150        | 4         |
| 5.  | Building Construction and Cost Estimation           | BT – 635 (N) | 3         | 1        | 0        | 30                | 20 | 50    |    | 100          |    | 150        | 4         |
| 6.  | Farm Machinery and Equipment – I Lab                | BT – 681 (N) | 0         | 0        | 2        |                   |    |       | 20 |              | 30 | 50         | 1         |
| 7.  | Post Harvest Engineering of Horticultural Crops Lab | BT – 682 (N) | 0         | 0        | 2        |                   |    |       | 20 |              | 30 | 50         | 1         |
| 8.  | Soil and Water Conservation Engineering Lab         | BT – 683 (N) | 0         | 0        | 2        |                   |    |       | 20 |              | 30 | 50         | 1         |
| <b>Grand Total</b>  |   |              | <b>15</b> | <b>5</b> | <b>6</b> |                   |    |       |    |              |    | <b>900</b> | <b>23</b> |

## **Farm Machinery and Equipment – I**

### **UNIT-I**

Introduction to farm mechanization. Classification of farm machines. Unit operations in crop production. Identification and selection of machines for various operations on the farm. Hitching systems and controls of farm machinery. Calculation of field capacities and field efficiency. Calculations for economics of machinery usage, comparison of ownership with hiring of machines. Introduction to seed-bed preparation and its classification.

### **UNIT-II**

Familiarization with land reclamation and earth moving equipment. Introduction to machines used for primary tillage, secondary tillage, rotary tillage, deep tillage and minimum tillage. Measurement of draft of tillage tools and calculations for power requirement for the tillage machines.

### **UNIT-III**

Introduction to tillage machines like mould-board plough, disc plough, chisel plough, sub-soiler, harrows, cultivators, Identification of major functional components. Attachments with tillage machinery. Introduction to sowing, planting & transplanting equipment.

### **UNIT-IV**

Introduction to seed drills, no-till drills, and striptill drills. Introduction to planters, bed-planters and other planting equipment. Study of types of furrow openers and metering systems in drills and planters. Calibration of seed-drills/ planters. Adjustments during operation. Introduction to materials used in construction of farm machines.

## **UNIT-V**

Heat treatment processes and their requirement in farm machines. Properties of materials used for critical and functional components of agricultural machines. Introduction to steels and alloys for agricultural application. Identification of heat treatment processes specially for the agricultural machinery components.

## **Post Harvest Engineering of Horticultural Crops**

### **UNIT-I**

Importance of processing of fruits and vegetables, spices, condiments and flowers. Characteristics and properties of horticultural crops important for processing, Peeling: Different peeling methods and devices (manual peeling, mechanical peeling, chemical peeling, and thermal peeling), Slicing of horticultural crops: equipment for slicing, shredding, crushing, chopping, juice extraction, etc., Blanching: Importance and objectives; blanching methods, effects on food (nutrition, colour, pigment, texture), Chilling and freezing:

### **UNIT-II**

Application of refrigeration in different perishable food products, Thermophilic, mesophilic & Psychrophilic micro-organisms, Chilling requirements of different fruits and vegetables, Freezing of food, freezing time calculations, slow and fast freezing, Equipment for chilling and freezing (mechanical & cryogenic), Effect on food during chilling and freezing, Cold storage heat load calculations and cold storage design, refrigerated vehicle and cold chain system,

### **UNIT-III**

Dryers for fruits and vegetables, Osmo-dehydration, Packaging of horticultural commodities, Packaging requirements (in terms of light transmittance, heat, moisture and gas proof, micro organisms, mechanical strength), Different types of packaging materials commonly used for raw and processed fruits and vegetables products, bulk and retail packages and packaging machines,

### **UNIT-IV**

Handling and transportation of fruits and vegetables, Pack house technology, Minimal processing, Common methods of storage, Low temperature storage, evaporative cooled storage, Controlled atmospheric storage, Modified atmospheric packaging, Preservation Technology, General methods of preservation of fruits and vegetables,

#### **UNIT-V**

Brief description and advantages and disadvantages of different physical/ chemical and other methods of preservation, Flowcharts for preparation of different finished products, Important parameters and equipment used for different unit operations, Post harvest management and equipment for spices and flowers, Quality control in fruit and vegetable processing industry. Food supply chain.

### **Soil and Water Conservation Engineering**

#### **UNIT-I**

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures.

#### **UNIT-II**

Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping.

#### **UNIT-III**

Contour bund. Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques.

#### **UNIT-IV**

Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

## **Fundamental of Renewable Energy Sources**

### **UNIT-I**

Concept and limitation of Renewable Energy Sources (RES), Criteria for assessing the potential of RES, Classification of RES, Solar, Wind, Geothermal, Biomass, Ocean energy sources, Comparison of renewable energy sources with non renewable sources.

### **UNIT-II**

Solar Energy: Energy available from Sun, Solar radiation data, solar energy conversion into heat through, Flat plate and Concentrating collectors, different solar thermal devices, Principle of natural and forced convection drying system, Solar Photo voltaics: p-n junctions. Solar cells, PV systems, Stand alone, Grid connected solar power station, Calculation of energy through photovoltaic power generation and cost economics.

### **UNIT-III**

Wind Energy: Energy available from wind, General formula, Lift and drag. Basis of Wind energy conversion, Effect of density, Frequency variances, Angle of attack, Wind speed, Types of Windmill rotors, Determination of torque coefficient, Induction type generators, Working principle of wind power plant.

### **UNIT-IV**

Bio-energy: Pyrolysis of Biomass to produce solid, liquid and gaseous fuels. Biomass gasification, Types of gasifier, various types of biomass cook stoves for rural energy needs. Biogas: types of biogas

plants, biogas generation, factors affecting biogas generation and usages, design consideration, advantages and disadvantages of biogas spent slurry.

## **Building Construction and Cost Estimation**

### **UNIT-I**

Building Materials: Rocks, Stones, Bricks Properties and varieties of Tiles, Lime, Cement, Concrete, Sand. Glass, Rubber, Plastics, iron, Steel, Aluminium, Copper, Nickel. Timber.

### **UNIT-II**

Building components: Lintels, Arches, stair cases, Different types of floors, Finishing: Damp Proofing and water proofing, Plastering, pointing, white washing and distempering – Painting, Building design, Design procedures, Technology, building construction,

### **UNIT-III**

Types of agricultural buildings and related needs, application of design theory and practice to the conservation, sloped and flat roof buildings, construction economics: Preliminary estimates, Detailed Estimates of Buildings source of cost information, use of cost analyses for controlling design, Factors affecting building costs; cost evaluation of design and planning alternatives for building and estate development,

### **UNIT-IV**

Measurement and pricing, Economic methods for evaluating investments in buildings and building systems: cost-in-use, benefit-to-costs and savings-to-investment ratios, rate of return, net benefits, payback

**TEACHING SCHEME AND EXAMINATION MARKS**  
**YEAR :- 2020-21**

**Seven Semester**

**THEORY**

| S. No. | Subject   | Code No.                 | Max. Marks | External | Internal |
|--------|---|--------------------------|------------|----------|----------|
| 1      | Farm Machinery Design                                     | BT-731(N)                | 150        | 100      | 50       |
| 2      | Dairy And Food Engineering                                | BT-732(N)                | 150        | 100      | 50       |
| 3      | Ground Water Well & pump Engineering                      | BT-733(N)                | 150        | 100      | 50       |
| 4      | Renewable energy  | BT-734(N)                | 75         | 50       | 25       |
| 5      | Soil & Water Conservation Structure                       | BT-735(N)                | 75         | 50       | 25       |
| 6      | Elective –I<br>Food Engineering /<br>Watershed Management | BT-736(N)/<br>BT -737(N) | 75         | 50       | 25       |

**PRACTICAL**

| S. No | Practical                                | Code No.  | Max. Marks | External | Internal |
|-------|--|-----------|------------|----------|----------|
| 1     | Dairy And Food Engineering Lab           | BT-782(N) | 50         | 30       | 20       |
| 2     | Project                                  | BT-784(N) | 100        | -        | 100      |
| 3     | Training Seminar                         | BT-781(N) | 75         | -        | 75       |
| 4     | Ground Water Well & pump Engineering Lab | BT-783(N) | 50         | 30       | 20       |
| 5     | General Proficiency                      | GP        | 50         | -        | 50       |

**Grand Total of Theory & Practical = 1000**

## **FARM MACHINERY DESIGN**

### **UNIT-I**

Materials of construction of farm machinery and their properties.

### **UNIT-II**

Design of power transmission components and systems in agricultural machines; fits and tolerances.

### **UNIT-III**

Design parameters of agricultural implements; force analysis of primary tillage tools and their hitching systems.

### **UNIT-IV**

Design considerations of reapers, mowers, harvesters and threshing equipment.

### **UNIT-V**

Application of design methods to the systems of selected farm machinery; bill of materials and construction cost in project design.

## **GROUND WATER, WELLS AND PUMPS**

### **UNIT I**

Occurrence and movement of ground water, aquifer and its types, classification of wells, steady and transient flow into partially, fully and non-penetrating tube wells and open wells, familiarization of various types of bore wells common in the State.

### **UNIT II**

Design of open well, groundwater exploration techniques, methods of drilling of wells, percussion, rotary, reverse rotary, design of assembly and gravel pack, installation of well screen, completion and development of well, groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow' s etc. Their recovery method, well interference, multiple well systems.

### **UNIT III**

Surface and subsurface exploitation of ground water potential, quality of ground water, artificial groundwater recharge planning, modeling, ground water project formulation.

### **UNIT IV**

Pumping Systems: Water lifting devices; different types of pumping machinery, classification of pumps, component parts of centrifugal pumps; pump selection, installation and troubleshooting.

### **UNIT V**

Design of centrifugal pumps, performance curves, effect of speed on head capacity, power capacity and efficiency curves, effect of change of impeller dimensions on performance characteristics.

## **DAIRY AND FOOD ENGINEERING**

### **UNIT-I**

Properties of dairy food products.

### **UNIT-II**

Unit operation of various dairy and food processing Systems.

### **UNIT-III**

Process flow charts for product manufacture.

### **UNIT-IV**

Working principles of equipment for receiving, pasteurisation, sterilisation, homogenisation,

### **UNIT-V**

Filling and packaging, butter manufacture, evaporation, drying, freezing, juice extraction, filtration, membrane separation, thermal processing, plant utilities requirement.

## **RENEWABLE ENERGY**

### **UNIT-I**

Introduction to conventional and non-conventional energy sources, Patterns of fuel consumption, potential of solar, wind, biogas, biomass, geothermal and other renewable energy sources.

### **UNIT-II**

Characteristics of the sun, the solar constant. Heat transfer for solar energy utilization, solar refrigeration, Heat conduction through plate, typical fin problem. Radiative heat transfer coefficient, beam and diffuse radiation, Determination of solar time and problems related to it. Introduction to solar energy measuring instruments. Introduction to solar gadgets viz., Solar Cooker, Water Heater, Drier, Still, PV system.

### **UNIT-III**

Aerobic and anaerobic bio-conversion process, principles and raw materials, properties of biogas, Benefits of biogas viz., Manure, domestic fuel, sanitation and health, motive power, numerical problems on selection of size of biogas plants. Biogas appliances

### **UNIT-IV**

Production of Biomass, broad classification, conversion of solid, liquid and gaseous fuels. Pyrolysis, gasification and their economics. Wind energy potential, study of various types of wind machines

## **SOIL & WATER CONSERVATION STRUCTURES**

### **UNIT-I**

Introduction, Classification of structure & their functional requirements, types of open channel flow, energy equation, momentum principles, specific energy, specific force.

### **UNIT-II**

Hydraulic jump, its types and applications, energy dissipation, jump efficiency, relative loss of energy, runoff measuring structure, H – Flume, Parshall Flume, weirs.

### **UNIT-III**

Drop spillway-its functional use etc. drop spillway - hydrologic design, drop spillway - hydraulic design, drop spillway - structural design, free board & wave freeboard.

### **UNIT-IV**

Chute spillway, drop inlet spillway Farm ponds.

## **FOOD ENGINEERING**

### **UNIT-I**

Heat processing methods of applying heat to food, sterilization, thermo bacteriology, evaporation, evaporator capacity, overall heat transfer – co efficient evaporator economy, capacity, Extrusion cooking.

### **UNIT-II**

Multiple effect system dehydration and drying, free moisture, equilibrium moisture content and water activity. Estimation BET equation

### **UNIT-III**

Classification of dryers, tray drum and spray drier for liquids and pastes, freeze drying, vacuum drying, concentration, freeze concentration, membrane concentration, freezing frozen products.

### **UNIT-IV**

Preservation techniques, low temperature preservation, irradiation- of foods, microwave heating, dielectric heating of foods.

**TEACHING SCHEME AND EXAMINATION MARKS  
YEAR :- 2020-21**

**Eight Semester**

**THEORY**

| S. No. | Subject  | Code No.                | Max. Marks | External | Internal |
|--------|--|-------------------------|------------|----------|----------|
| 1      | Irrigation & Drainage Equipment Design           | BT-831(N)               | 150        | 100      | 50       |
| 2      | Process Equipment Design                         | BT-832(N)               | 150        | 100      | 50       |
| 3      | Advance Farm Power                               | BT-833(N)               | 150        | 100      | 50       |
| 4      | Elective-II (MICAD)/<br>Food Industry Management | BT-834(N)/<br>BT-835(N) | 75         | 50       | 25       |

**PRACTICAL**

| S. No | Practical                              | Code No.  | Max. Marks | External | Internal |
|-------|--|-----------|------------|----------|----------|
| 1     | Irrigation & Drainage Equipment Design | BT-881(N) | 50         | 30       | 20       |
| 2     | Process Equipment Design               | BT-882(N) | 50         | 30       | 20       |
| 3     | Project                                | BT-883(N) | 325        | 225      | 100      |
| 4     | General Proficiency                    | GP        | 50         | -        | 50       |

**Grand Total of Theory & Practical = 1000**

## **Irrigation and Drainage Equipment Design**

### **UNIT-I**

Design of irrigation wells - openwell and tube well-well diameter, thickness of casing pipe and screens, openings of well screen, gravel packing design.

### **UNIT-II**

Indigenous water lifting devices and their design, reciprocating and centrifugal pumps- design of components, power requirement, pump characteristics, pump selection and installation.

### **UNIT-III**

Design of sprinkler irrigation - components, size of pipes, nozzles and matching pumping system.

### **UNIT-IV**

Design of drip irrigation- components, size of pipes, emitters, drippers and fertigation unit.

### **UNIT-V**

Design of sub surface drainage system- tube diameter and perforation, filter design, outlet design and pumping unit.

## **PROCESS EQUIPMENT DESIGN**

### **UNIT-I**

Application of design engineering for processing equipments

### **UNIT-II**

Design parameters, codes and materials selection.

### **UNIT-III**

Design of handling and milling equipments, dryers.

### **UNIT-IV**

Heat exchangers, Pressure vessels, Optimisation of design with respect to process efficiency, energy and cost; Application of computer techniques in design optimization.

## **ADVANCED FARM POWER**

### **UNIT-I**

Tractor performance characteristics; torque, speed, power and specific fuel consumption;

### **UNIT-II**

Traction theory; chassis mechanics stability; steering and turning, Ackerman's steering geometry.

### **UNIT-III**

Tractor hitches and hydraulic systems; tractor testing and controls.

### **UNIT-IV**

Human factors in tractor design and operational safety.

## **FOOD INDUSTRY MANAGEMENT**

### **UNIT-I**

Definition and classification of food industries- responsibilities qualities of management, characteristics and labor efficiency, wages and incentives decision making and production management

### **UNIT-II**

Production planning- production control manufacturing systems ,job production ,batch ,mass production and process charts, routing and scheduling ,time and motion study, line of balance technique.

### **UNIT-III**

Inventory control- types of inventory, economic lot size ,raw materials management- economic order quantity ,ABC Analysis ,plant location ,factors- plant layout- types ,advantages- characteristics of an efficient layout-techniques of plant layout

### **UNIT-IV**

Product selection and development - Introduction of new product, stages of product development, specialization, diversification sales forecasting techniques, investment and replacement, concept of present value future worth and internal rate of return, quality control and inspection, acceptance sampling, control charts, variable and attributes, optimization techniques in transportation.

