

## **AGRICULTURAL ENGINEERING**

### **1. FLUID MECHANICS**

Fluid properties and definitions. Flow kinematics, continuity momentum and energy equations applicable to fluid flow. Bernoulli's theorem, flow through conduits, flow through open channels. Hydraulic jump, flow through pipes and losses in pipe flows, siphons, pipe network, forces in pipe ends, hydraulic energy grade line, water hammer. General equation for head loss in pipes. Energy losses through pipe fittings. Measurement of discharge through pipes and open channel.

### **2. SURVEYING AND LEVELLING**

Classification of surveys, scales, accuracy; Measurement of distance by direct and indirect methods, optical and electronic devices, Measurement of directions, Prismatic compass, local attractions; Theodolites – types, Measurement of elevations, trigonometric levelling, contours, Establishment of control by triangulation and traversing. Measurements and observation, Computation of co-ordinates; Errors and their corrections of measurement of length, bearing horizontal and vertical angles and levelling operation. Correction due to refraction and curvatures, Map preparation by plane tabling and photogrammetry; Field astronomy, concept of global positioning system; Remote sensing concepts, map substitutes.

### **3. CROP PRODUCTION TECHNOLOGY**

Climate zone of West Bengal and its characteristics. Characteristic of crop seasons. Agronomic classification of crops and its distribution. Tillage, seed and sowing, interculture operation, harvesting, processing, storage and protection of crops. Concept of yields and yields components. Crop growth rate, seed production, processing and testing.

Soil forming rocks and minerals-origin, classification and composition. Weathering of rocks and minerals. Soil forming process. Factors of soil formation. Soil profile, soil as a medium of plant growth. Soil texture and structure, physical and chemical properties. Soil water composition, classification, soil moisture constant and functions.

### **4. SOIL AND WATER CONSERVATION ENGINEERING**

Mechanics of erosion. Estimation of soil loss. Wind erosion control. Biological control of erosion. Stream bank erosion. Design of grassed water way, graded and contour bunds, terraces. Permanent gully control structure-drop, drop inlet and chute spillways. Watershed management.

### **5. SOIL MECHANICS AND FOUNDATION**

Properties of soil, classification and inter-relationship; Definition of terms used; Soil testing in laboratory and in-situ; compaction behaviour, methods of compactions and their choice; permeability and seepage, flow nets, flow under hydraulic structures, uplift and quick sand condition inverted filters, unconfined and direct shear stress, tri-axial test, shearing resistance, Earth pressure theories, stability of slopes; compressibility and consolidation. Theories of consolidation, pressure distribution in soils, soil stabilisation, soil exploration and penetration test, pore water pressure.

Types of foundation, selection criteria, bearing capacity, settlement, laboratory and field tests, codal provisions in all types of shallow foundations. Foundation in expansive soils, swelling and its prevention. Design of retaining walls, wells, sheet piles.

### **6. WATERSHED HYDROLOGY**



Hydrologic cycle, precipitations – forms, rainfall measurement, mass curve, frequency analysis of point rainfall, plotting position, infiltration, evaporation – estimation and measurement, stream number, stream length, Runoff – factors affecting, measurement and estimation. Hydrograph – components, base flow separation. Unit hydrograph, synthetic unit hydrograph, flood routing.

## **7. GROUND WATER HYDROLOGY**

Geologic formations. Types of aquifers and wells. Ground water measurements, Hydraulics of wells. Aquifer properties. Determination of aquifer properties. Steady and unsteady flow through confined aquifers. Thesis method, Jacob's method. Well in interference.

## **8. FARM ENGINES AND TRACTORS**

Power availability on the farm from animate and inanimate sources of energy – their capacities and efficiencies; Tractor engine components and their constructions; Valve and valve timing mechanism; Working principles of engine systems – fuel and air supply, cooling, lubrication, ignition starting and electrical systems; Engine governing; Transmission system of wheel and track type tractors – clutch, brake, gearbox, differential, PTO, belt pulley, drawbar and final drive mechanism; Power tillers and small engines for farm operations; performance and cost analysis of farm tractors and power tillers.

## **9. TUBEWELLS AND WELL TECHNOLOGY**

Types of various tubewells; design and construction of wells; selection and placement of strainers; construction materials for wells and strainers; pipe joining methods; tubewell development by compressor and over pumping method; design of suitable pump of various types for development in the tubewell for lifting clear water; pump characteristic and selection of pump.

## **10. IRRIGATION AND DRAINAGE**

Irrigation canals layout and design, Regulation structures, Cross drainage works and canal outlets. Principles of design of small hydraulic structures – surface flows and sub-surface flows. Theories of Seepage and Design of Weir Barrages, Design of small earthen dams and solid masonry dam. Water logging – causes and remedial measures, Drainage of irrigated lands – surface and sub-surface. Estimation of spillway, design of flood discharge, principles of flood control, Stream bank erosion and its control.

## **11. BUILDINGS**

Kinds of building materials – their properties. Timber work, brickwork and R.C construction. Design of simple R.C structures. Roof truss. Design of storage structures. Estimation of building, roads and sheds. Specification and Quality Assurance and Control, Principles of construction. Planning and management, PERT & CPM.