

## **Subject Name: DRAINAGE ENGINEERING (1+1)**

### **KEYWORDS**

**(Name of Course Developer: Prof. Madan Kumar Jha, AgFE Department, IIT Kharagpur, Kharagpur – 721 302)**

#### **Module 1: Basics of Agricultural Drainage**

**Keywords:** Types of drainage, Surface waterlogging, Subsurface waterlogging, Effects of waterlogging, Salinity, Sodicity, Drainage problem, Surface drainage, Subsurface drainage, Vertical drainage.

#### **Module 2: Surface and Subsurface Drainage Systems**

**Keywords:** Field drain, Field lateral, Land grading, Cut/fill ratio, Plane method, Profile method, Drainage design, Types of subsurface drainage, Pipe drain, Composite drainage system, Drainage coefficient, Gravity outlet, Hydraulic conductivity, Drainable porosity.

#### **Module 3: Subsurface Flow to Drains and Drainage Equations**

**Keywords:** Steady-state drainage equations, Unsteady-state drainage equations, Application of drainage equations, Glover-Dumm equation, De Zeeuw-Hellinga equation, Dupuit-Forchheimer assumptions, Reaction factor, Hooghoudt equation, Equivalent depth, Ernst equation, Donnan equation, Drainage criteria, Relief well, Inceptor drain, Mole drain.

## **Module 4: Construction of Pipe Drainage Systems**

**Keywords:** Drain materials, Drain envelopes, Types of drain pipes, Trencher, Trenchless drainage machine, Grade control, Vertical plough, V-plough, Collector drain, Backfilling.

## **Module 5: Drainage for Salt Control**

**Keywords:** Electrical Conductivity (EC), Sodium hazard, Sodium Adsorption Ratio (SAR), Exchangeable Sodium Percent (ESP), Salinisation, Sodification, Salinity of irrigation water, Vertical drainage system, Tubewell drainage, Biodrainage, Multiple well-point system, Salt balance, Leaching requirement, Primary salinity, Secondary salinity, Salt-affected soil, Gypsum requirement, Lime requirement, Acid soil, RAJAD project, Conjunctive use of surface water and groundwater, Salt management, On-farm development.

## **Module 6: Economics of Drainage**

**Keywords:** Tangible benefits, Intangible benefits, Discounting factor, Present worth factor, Inflation factor, Net present value, Benefit-cost ratio, Internal rate of return, Capital recovery factor, Economic indices.