AGPC3001 HYDROLOGY, SOIL AND WATER CONSERVATION ENGINEERING (3-0-0)

Course Objectives

1. The fundamental principles of hydrology, including the hydrologic cycle, precipitation, infiltration, evaporation, and runoff.
2. The causes, types, and effects of soil and water erosion, and apply methods like USLE, MUSLE, and RUSLE for soil loss estimation.
3. Evaluate gully and ravine formation processes and design appropriate reclamation measures using vegetative and engineering methods.
4. Assess sedimentation issues in reservoirs, measure sediment load, and propose control strategies to mitigate storage loss.
5. Design water harvesting and soil conservation structures such as farm ponds, check dams, and spillways for sustainable land and water management.

Module-I (09 hour)

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. 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.

Module-II (10 hour)

Soil and water erosion – introduction, causes and types, factors affecting and effects of erosion; Soil loss estimation – universal soil loss equation (USLE) and determination of their various parameters; application and limitations of USLE; Modified soil loss equation (MUSLE) and RUSLE; Rainfall erosivity – estimation of erosivity from rainfall data by KE>25 and EI30 methods; Soil erodibility - topography, crop management and conservation practice factors; Measurement of soil erosion by runoff plots and by soil samples; Water erosion – mechanics and factors affecting er erosion; forms of water erosion, Gullies and their classification, stages of gully development; Water erosion control measures– agronomical measures, tillage practices and conservation tillage; Mulching; Engineering measures and their planning and layout, Contour stonewall and trenching and their suitability for use;

Module-III (07 Hours)

Gully and ravine reclamation Principles of gully control - vegetative measures, brush wood dams, loose rock fill dams; Temporary structures of gully control, permanent gully control structures; Grassed waterway Wind erosion and control measures, Land use capability classification objectives of classification, capability, limitation, land capability unit, land capability sub-classes; Land use capability classification by United States Department of Soil Conservation Service, limitations of different LUCC;

Module-IV (07 Hours)

Sedimentation in tanks and reservoirs Sedimentation, sources of sedimentation, factors responsible for sedimentation; effects of sedimentation, types of sediment load, sediment transportation, sediment delivery ratio, trap efficiency; Estimation of sedimentation, bed load estimation, suspended load sampling; Measurement of sedimentation - can type, bottle type, bed load sampling, box type, pan type, pit type; Sedimentation in reservoirs - factors affecting sedimentation, rate of reservoir sedimentation, silt monitoring and storage loss in tanks and reservoirs, reservoir sedimentation control.

Module-V (07 Hours)

Water Harvesting and Soil conservation Structures Water harvesting techniques and structures- farm ponds, percolation ponds, nala bunds, tanks and sub surface dykes; soil erosion control structures - check dams, drop, chute and drop inlet spillways - design requirements, planning for design and design procedures

Course Outcomes (COs)

CO1: Remember key concepts of hydrology, including precipitation measurement, infiltration indices, and runoff estimation methods (e.g., Rational Method, SCS Curve Number).

CO2: Apply the Universal Soil Loss Equation (USLE) and its variants to estimate soil erosion under different environmental conditions.

CO3: Analyze rainfall erosivity using KE>25 and EI30 methods and correlate it with soil erodibility factors.

CO4: Design gully control structures (e.g., brushwood dams, grassed waterways) and evaluate their effectiveness in erosion control.

CO5: Evaluate sedimentation processes in reservoirs, calculate trap efficiency, and recommend measures to reduce sediment deposition. Create plans for water harvesting structures (e.g., farm ponds, nala bunds) and soil conservation measures (e.g., contour trenches, check dams) based on site-specific requirements.