CIPC3005 WATER RESOURCES ENGINEERING (3-0-0)

Course objectives

- To have knowledge on hydrologic cycle and estimation of different hydrological parameters
- To understand and calculate runoff over a catchment area
- To plan a reliable water supply for agriculture by designing, building, and managing systems
- To estimate Stream flow and design reservoirs
- To carry out flood-frequency studies, suggest flood control techniques and study of flood forecasting techniques

Module I

Hydrologic cycle, water budget equation, world water balance, history of hydrology and its applications in engineering, sources of data. Precipitation: Forms of precipitation, weather systems for precipitation, characteristics ofprecipitation on India, measurement, rain gauge network, preparation and presentation ofdata, mean aerial precipitation, depth–area-duration curve, intensity-duration-frequencycurve, probable maximum precipitation (PMP),design storm. Losses from precipitation: evaporation (process, measurement, empirical equations, analytical methods) evapotranspiration (process, measurements, empirical equations, PET) initial loss (interception, depression storage), infiltration (process, measurement, capacity values, indices).

Module II

Runoff: Factors affecting runoff, runoff characteristics of streams, Yield, flow duration curve, flow mass curve and its application, sequent peak algorithm, Hydrograph: Factors affecting hydrograph, components, base flow separation, effective rainfall hyetograph (ERH) Unit hydrograph: Derivation, derivation of UH of different durations, uses and limitations, distribution graph, synthetic unit hydrograph, instantaneous unit hydrograph

Module III

Irrigation Engineering: Definition, necessity, benefits, ill effects of irrigation, types and methods of irrigation, Water requirement of crops, duty, delta and base period, Kharif and Rabi Crops, Command area, Time factor, Crop ratio, Overlap allowance, Irrigation efficiencies. Different type of canals, types of canal irrigation, loss of water in canals. Canal lining – types and advantages. Shallow and deep to wells, yield from a well. Land reclamation, Characteristics of affecting fertility of soils, purposes, methods, description of land and reclamation processes. Major irrigation projects in India

Module IV

Streams & reservoir: Stream flow measurement,Measurement of stage, measurement of velocity (current meter and float), direct methods, indirect methods, rating curve and its extrapolation. Notches, weirs, control meters, Venture Flumes, Velocity area method, slope area method, capacity elevation curve of river, Weir and barrage, Types of reservoirs, storage zones, catchment yield & reservoir yield, reservoir capacity, mass curve of inflow and outflow, reservoir sedimentations and losses, selection of site for a reservoir, economic height of dam, hydrological reservoir routing-Trial & Error Method, Modified Pul's method and Goodrich Method.

Module V

Definition & causes of flood,Flood-frequency studies, Uses and limitations, Gumbel's method, Log-Pearson Type III distribution, partial duration series, regional flood-frequency analysis, risk, reliability and safety factor.

Flood routing: Basic equations, hydrologic reservoir routing, hydrologic channel routing, hydraulic flood routing method, conceptual methods of flood routing (Clark's method, Nash's model), flood control, flood forecasting

Course Outcomes:

After successfully studying this course, students will able to:

1. Develop knowledge on hydrologic cycle and forms of precipitation.
2. Report losses from precipitation and stage and velocity measurement techniques.
3. Explain runoff process and design flood computation.
4. Use flood hydrograph and its application.
5. Employ flood-frequency and flood routing methods.

Books:

- H.M.Raghunath, Irrigation Engineering, Wiley India Pvt., First edition
- K. Subramanya, P. J. Sharma, Engineering Hydrology, McGraw Hill Education, 6th Edition
- S. K. Garg,Irrigation Engineering and Hydraulic Structures,Khanna Publishers
- H.M. Raghunath, Hydrology: Principles, Analysis and Design, New Age International Private Limited, Fourth edition
- K.R. Arora, Irrigation ; Water Power And Water Resources Engineering, Standard Publisher Distributors
- P.N. Modi, Irrigation Water Resources and Water Power Engineering,Standard Book House, 11th edition
- K.N. Duggal, J.P. Soni, Elements of Water Resources Engineering,New Age International Private Limited