

K L UNIVERSITY
WATER RESOURCES ENGINEERING (09-CE305)

SYLLABUS

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UNIT – 1 Surface and Ground Water Resources

Distribution of water over earth, characteristics of rainfall in India, major river basin of India, surface water and ground water potential

HYDROLOGY: Definition, Hydrologic cycle; Precipitation; Measurement of precipitation, Rain gauge network, Classification of storms, Detection of heterogeneity in rainfall records, Estimation of missing data, Mean rainfall over an area, frequency of point rainfall, Interception, Evaporation, Depression storage, Infiltration, Infiltration index, Runoff; Factors affecting runoff; Computation of run-off, Estimation of design peak rate of runoff.

HYDROGRAPHS: Introduction, Effect of basin shape on hydrograph, components of hydrograph, Unit hydrograph; use of unit hydrograph, Application of the unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; Application of unit hydrograph to construction of a flood hydrograph resulting from two or more periods of rainfall; Construction of unit hydrograph of different unit duration from a unit hydrograph of some given unit duration; Method of super position, S-hydrograph.

UNIT- II Ground Water Hydrology: Introduction; Forms of sub-surface water; Water table; Types of aquifers Aquifer; Aquitard, Aquicludes; Aquifuge; Specific yield; Specific retention; Darcy's Law, Well hydraulics; Steady radial flow to a well–Dupuit's theory for confined and unconfined aquifers; Tube wells; Open wells; Well shrouding and well development; Yield of an open well–Constant level pumping test, Recuperation test.

Soil-Water-Plant Relationship: Introduction, Composition of soil, soil texture and soil structure, Water holding capacity of soil, Soil types, Classification of soil water, Soil moisture tension, Soil moisture stress, Soil moisture Constants: Saturation capacity, Field capacity, Moisture equivalent, Permanent wilting point, temporary wilting, ultimate wilting, Available moisture, Readily available moisture; Salt problems in soil and water, reclamation of salt affected soils.

UNIT- III Water Requirement of Crops

Limiting soil moisture conditions; gross command area; culturable command area; culturable cultivated and uncultivated area; kor depth and kor period; Crop period and Base period, Duty and Delta of crop, relation between duty and delta; factors affecting duty; methods of improving duty, Crop seasons and crops of India, consumptive use of water (evapo-transpiration); Consumptive irrigation requirement, Net irrigation requirement, Estimating depth and frequency of irrigation; irrigation efficiencies, Irrigation methods, types of irrigation system,

Irrigation Channels: Classification of canal; Canal alignment; Intensity of irrigation, Net and Gross sown area, Net and Gross irrigated areas, Time factor, capacity factor, Inundation canals; Cross-section of an irrigation channel; Balancing depth; Borrow pit; Spoil bank; Land width; Maintenance of irrigation channels; Silt theories–Kennedy's theory, Lacey's regime theory.

UNIT- IV Reservoir Planning

Introduction; Investigations for reservoir planning; Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Determination of safe yield from a reservoir of a given capacity; Sediment flow in streams; Reservoir sedimentation; Life of reservoir; Reservoir

sediment control; flood routing; Methods of flood routing-Graphical Method (Inflow – storage discharge curves method), Trial and error method.

Dams in General: Introduction; Classification; Gravity dams, Arch dams, Buttress dams, Steel dams, Timber dams, Earth dams and rock fill dams; Physical factors governing selection of type of dam and selection of site for a dam.

UNIT- V Earth Dams

Introduction; Types of earth dams; Causes of failure of earth dams; Criteria for safe design of earth dams; Section of an earth dam; Design to suit available materials; Seepage analysis Seepage control measures; Slope protection.

Gravity Dams: Introduction; Forces acting on a gravity dam; Combination of loading for design; Modes of failure and criteria for stability requirements; Stability analysis; Elementary profile of a gravity dam; Practical profile of a gravity dam; Limiting height of a gravity dam; High and low gravity dams; Design of gravity dams–single step method.

TEXT BOOKS:

1. Engineering hydrology by K.Subramanya, Tata McGraw Hill ,New Delhi.
2. Irrigation Engineering and Hydraulic Structure by S. K. Garg; Khanna Publishers, Delhi.

REFERENCE BOOKS:

1. Irrigation Water Resources and Water Power Engineering by, P.N. Modi, Standard book house, New Delhi.
2. Elementary Hydrology by V.P.Singh, PHI Publishers, New Delhi.
3. Applied Hydrology by Ven Te Chow, McGraw-Hill Book Company.

LIST OF EXPERIMENTS

1. Analysis of rainfall data using Microsoft Excel.
2. Identification of the normal years, wet years, dry years and rainy months of a raingauge station for the N year rainfall data using Microsoft Excel.
3. Detection of heterogeneity in rainfall records and correction of rainfall records by double mass curve method using Microsoft Excel.
4. Estimation of mean rainfall over an area by Thiessen polygon and Kriging method using Arc GIS software.
5. Estimation of mean rainfall over an area by Finite element method using Microsoft Excel.
6. Frequency analysis of the rainfall event by plotting position method and least square technique using Microsoft Excel.
7. Hydrograph analysis by superposition method using Microsoft Excel.
8. Hydrograph analysis by S-curve method using Microsoft Excel.
9. Determination of aquifer constant of a confined aquifer with the unsteady state pumping test data by Theis matching technique
 - (a) Using graphical procedure.
 - (b) Using Aquitest Software.
10. Hydrological Modeling of a Catchment using AWBM model (Australian water balance method) of Rainfall Runoff Library.