

white washing, distempering and painting, steps for building construction, needs of different agricultural buildings, types and uses, types of roofs, slope and flat roof buildings.

Estimating and costing: Types of estimates, rough cost, detailed and supplementary estimate, preparation of cost estimate, cost analysis, schedule of rates, analysis of rates, factors affecting building costs, building codes, estate development.

Cost economics: Measurement and pricing, economic methods for evaluation of buildings, benefit cost calculation, rate of return period (payback period).

Suggested Readings

1. Duggal, S. K. 2012. *Building Material*. New Age International Publishers.
2. Dutta, B. N. 2000. *Estimating and Costing*. UBS publishers.
3. Punmia, B. C., Jain, A. K. and Jain, A. K. 1984. *Building Construction*. Laxmi Publications (P) Ltd., New Delhi.
4. Rangwala, S. C. 1994. *Engineering Materials*. Charotar Publishing House, Anand.
5. Sane, Y. S. 1964. *Planning and Designing of Buildings*. Engineering Book Publishing Co. Pune.

Watershed Hydrology

3 (2+1)

Objective

To make the students acquainted with the different hydrological processes, their methods of analysis so as to enable them to apply these for watershed development, water harvesting, minor irrigation, drought and flood control, etc.

Theory

Hydrologic cycle, components; Precipitation and its forms, rainfall measurement and estimation of mean rainfall, estimation of missing rainfall, optimum number of rain gauges.

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.

Geomorphology of watersheds – linear, aerial and relief aspects of watersheds- stream order, drainage density and stream frequency; Hydrograph - components, base flow separation, unit hydrograph theory, s-curve, synthetic hydrograph, applications and limitations.

Flood routing – channel and reservoir routing; Hydrology of dry land areas, Troll's climatic classification; Drought- classification, causes and impacts, drought management strategy.

Practical

Visit to meteorological observatory and study of different instruments; Study of optimal rain gauge network; Study of intensity - frequency - duration curves; Study of depth - area - duration

curve; Analysis of rainfall data and estimation of mean rainfall by different methods; Analysis of frequency of hydrologic data and estimation of missing data, test for consistency of rainfall records; Computation of infiltration indices; Computation of peak runoff and runoff volume by Cook's method and rational formula; Computation of runoff volume by SCS curve number method; Study of stream gauging instruments- current meter and stage level recorder; Study and determination of geomorphic parameters of watersheds; Study of runoff hydrograph and separation of base flow and surface flow ; Study of unit hydrograph; Study of synthetic hydrograph; Study of flood routing; Study of various discharge measuring devices.

Suggested Readings

1. Chow, V. T., Maidment, D. R. and Mays, L. W. 2010. *Applied Hydrology*. McGraw Hill, New York.
2. Das, G. 2000. *Hydrology and Soil Conservation Engineering*. PHI, New Delhi.
3. Garg, S. K. 1998. *Hydrology and Water Resources Engineering*. Khanna Publishers, Delhi.
4. Jaya Rami Reddy, P. 2011. *A Text Book of Hydrology*. University Science Press, New Delhi.
5. Linsley, R. K., Kohler, M. A., and Paulhus, J. L. H. 1984. *Hydrology for Engineers*. McGraw-Hill Publishing Co., Japan.
6. Mutreja, K. N. 1990. *Applied Hydrology*. Tata McGraw-Hill Publishing Co., New Delhi.
7. Panigrahi, B. and Panigrahi, K. 2016. *Engineering Hydrology*. New India Publishing Agency, New Delhi.
8. Raghunath, H. M. 2006. *Hydrology: Principles Analysis and Design*. 2nd Edition, New Age International (P) Limited Publishers, New Delhi.
9. Subramanya, K. 2008. *Engineering Hydrology*. 3rd Edition, Tata McGraw-Hill, New Delhi.
10. Suresh, R. 2005. *Watershed Hydrology*. Standard Publishers and Distributors, Delhi.
11. Varshney, R. S. 1986. *Engineering Hydrology*. Nem Chand and Brothers, Roorkee, U.P.

Soil and Water Conservation Engineering

3 (2+1)

Objective

To make the students acquainted with the different causes of soil erosion and water loss and the different measures for soil and water conservation

Theory

Soil erosion: Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion.

Water erosion: Mechanics and forms- splash, sheet, rill, gully, ravine and stream bank erosion; Gullies: classification, stages of development; Soil loss estimation- Universal soil loss equation (USLE) and modified USLE. Rainfall erosivity- estimation by $KE > 25$ and EI_{30} methods; Soil erodibility- topography, crop management and conservation practice factors; Measurement of soil erosion- Runoff plots, soil samples.

Water erosion control measures: Agronomical measures, contour farming, strip cropping, conservation tillage and mulching; Engineering measures- bunds and terraces, bunds: contour and