ENGINEERING HYDROLOGY

PROF. SREEJA PEKKAT
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IIT Guwahati

INTENDED AUDIENCE : Undergraduate students in Civil Engineering

INDUSTRIES APPLICABLE TO : Basic civil engineering infrastructural companies.

COURSE OUTLINE :

This course on engineering hydrology aims to impart knowledge on the processes that secure the most valuable natural resource: WATER. It deals with the complex interaction and pathways of water connecting atmosphere, lithosphere and hydrosphere. This course will give an idea on how the hydrological science is mathematically quantified for engineering applications to manage water resources. The knowledge acquired in this course will be pre-requisite for different advanced level courses in post-graduate. The course starts with the explanation of hydrological processes related to atmosphere, surface and subsurface regime. This is followed by the explanation on hydrological analysis, which is mandatory for the design of hydraulic structures. The course ends with basic discussion on hydrological statistics important for dealing significant amount of data and its uncertainties, which forms the backbone of hydrological analysis.

ABOUT INSTRUCTOR :

Prof. Sreeja Pekkat is an Associate Professor in the Water Resources Planning and Management Division, Department of Civil Engineering, Indian Institute of Technology Guwahati. Since then she has taught the course on Engineering Hydrology multiple times till date. She received her Ph.D. degree from IIT Bombay. Her research interests include Urban Flood Modeling, Infiltration and Artificial Recharge, Climate Change, Transient Flow Analysis and River Mechanics. She has published around 30 peer reviewed journals and several conference/seminar proceedings. She was a recipient of the Prof. R. J. Garde Research Award-2017 by the Indian Society for Hydraulics (ISH) for outstanding research in the field of Water Resources. She is a member of ASCE and Indian Society for Hydraulics. She is a reviewer for several national and international journals.

COURSE PLAN :

Week 01: Introduction:
Course contents, Preliminary concepts, System concept, Reynolds transport theorem, Conservation laws

Week 02: Atmospheric Water:
Water vapor dynamics, Precipitable water, Precipitation, Types of precipitation, Terminal velocity

Week 03: Atmospheric Water:
Thunderstorm cell model, Forms of precipitation, Measurement and representation of rainfall data

Week 04: Atmospheric Water:
Evaporation, Evapotranspiration, Measurement and estimation

Week 05: Subsurface Water:
Unsaturated flow, Infiltration, Measurement and estimation of infiltration

Week 06:
Subsurface Water: Ponding time and infiltration after ponding
Surface Water: Catchment storage concept, Excess rainfall, Direct runoff, Overland flow

Week 07: Surface Water:
Measurement and representation of streamflow

Week 08: Hydrologic Analysis:
Linear system theory, Unit Hydrograph, Direct runoff hydrograph, S-Hydrograph

Week 09: Hydrograph Analysis:
Unit hydrographs of different durations, Instantaneous unit hydrograph, Synthetic unit hydrograph

Week 10: Hydrograph Routing:
Reservoir routing, Hydrologic channel routing

Week 11: Hydrologic Statistics:
Probability distribution and basic descriptive statistics, Frequency analysis, Extreme value analysis

Week 12: Hydrologic design:
Fundamentals of hydrologic design, Design storm, Design flood