Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2019-2020

Course Handout Part II

06.01.2020

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **CE F321**
Course Title : **Engineering Hydrology**
Instructor-in-Charge : **Komaragiri Srinivasa Raju**
Chamber No. : **D - 107**

1. Scope and Objective of the Course:

Scope and Objective of the Course: This course provides an introduction to the hydrology as an earth science and its applications in water resources engineering.

The aim of this course is twofold: **1**. Provide a thorough understanding of the basics; **2.** Bring the students face-to-face with an application in Engineering Hydrology. In addition, every student is required to work on a project, as part of the course, involving an application related to Hydrology and allied fields. Further, the project work provides an opportunity to learn about the latest developments in this field. The unified approach will enable students to tackle the real life problems in more comprehensive manner and provide a broader view on the subject.

Course Outcomes: At the end of this course, the students will be able to:

1. Develop intensity-duration and maximum depth-duration curves
2. Apply Principles of Probability to Hydrological Problems
3. Apply Hydrograph concepts to Hydrological Problems
4. Develop Rainfall-Runoff Modelling Mechanism

Student Learning Outcomes (SLOs) assessed in this course **– (a), (c), (e).**

2(a) Textbook:

T1. Subramanya K., Engineering Hydrology, Tata McGraw hill, New Delhi. 2013.

T2. Modi, P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House, New Delhi, 2012.

(b) **Reference books**

R1. Patra, K.C. Hydrology and Water Resources Engineering, Narosa Publishing House, New Delhi, 2010.

R2. Rajesh Srivastava, Ashu Jain, Engineering Hydrology, McGraw Hill Education, 2017

R3. S.K.Garg, Hydrology and Water Resources Engineering, Khanna Publishers, 2010

R4. Hydrology and water resources engineering (NPTEL material available at https://nptel.ac.in/downloads/105105110/

3.Course Plan:

Lecture No.	Learning Objectives	Topics to be Covered	Chapter in the Text Book	SLO*
1-2	Differentiate between scientific hydrology and engineering/ applied hydrology; Enumerate various applications of hydrology; Recognize various physical processes in hydrological cycle.	*Introduction to hydrometeorology* Hydrologic cycle, Global water budget, History and Applications	T1 [Ch-1]	a
3-8	Outline the mechanism, and measurements of precipitation, Analyze rainfall data for estimation of areal average, consistency and network design; Intensity-duration and maximum depth-duration curves	*Precipitation measurement and analysis:* Forms of precipitation, Precipitation Characteristics in India, Measurement of Precipitation, Raingauge Network, Preparation of Data, Presentation of rainfall data, Mean Precipitation over an Area, Depth area duration relationships, Frequency of point rainfall, Maximum Intensity/Depth-Duration Frequency relationship	T1 [Ch-2]	a,c,e
9-11	Estimate the initial abstractions; Use various conceptual models for infiltration to compute the infiltration capacity rate, volume of infiltration; Estimate evaporation losses using meteorological data and field measurements; Explain the experimental setup for measuring abstractions.	*Hydrologic abstractions:* Evaporation, Evapotranspiration, Infiltration, Infiltration indices	T1 [Ch-3]	a,c,e
12-14	Enumerate and explain methods of discharge and stage measurement; Explain indirect methods of measurement of discharge; Develop rating curves	*Streamflow measurement;* Measurement of stage, Measurement of velocity, Stage-Discharge relationship,	T1 [Ch-4]	a,c,e
15-17	Identify various catchment characteristics and their influence on runoff; Estimate yield from a catchment; Compute direct runoff hydrograph; Develop the unit hydrograph; Develop regressive relationships	*Runoff* Runoff Process, Rainfall-Runoff Correlation, Flow duration curve, Flow mass curve	T1 [Ch-5]	a,c,e

	between components of unit hydrograph and catchment characteristics			
18-22	Description of various hydrographs and their role in water resources planning	*Hydrographs:* Factors affecting Hydrograph, Components of Hydrograph, Base flow separation, Effective Rainfall, Unit Hydrograph, Derivation of unit Hydrograph, Unit Hydrographs of different durations, Use and Limitations of Unit Hydrograph, Introduction to Synthetic Unit Hydrograph, Instantaneous Unit Hydrograph	T1 [Ch-6]	
23-26	Flood and its computations	*Floods* Rational Method, Empirical formulae, Flood Frequency studies, Gumbel's Method, Log-Pearson Type III distribution, Partial duration series, Design Flood, Design Storm, Risk and Reliability	T1 [Ch-7]	
27-30	Differentiate between lumped and distributed flow routing; Estimate parameters for linear reservoir and channel routing models	*Flood Routing* Basic equations, Hydrologic storage routing, Attenuation, Hydrologic Channel Routing, Introduction to Hydraulic Method of Routing	T1 [Ch-8]	a,c,e
31-33	Identify various aquifer parameter: Differentiate between different hydrogeological formations; Estimate the aquifer parameters under equilibrium flow conditions	*Ground water Hydrology* Forms of subsurface water, Saturated formation, Aquifer properties, Confined and unconfined aquifers in steady flow, Pumping tests	T1 [Ch-9]	a,c,e
34	Identify sources of sediment, different types of sediment loads	*Sediment Transport* Types of sediment loads, Movement of Sediment from Watersheds	T1[Ch-10]	a,c,e
35-36	Explain irrigation and its necessity, advantages, ill-effects, Water requirement of crops	*Introduction to Irrigation Engineering* Necessity of irrigation, Water requirement of crops including Duty, Delta, Irrigation efficiencies	T2[Ch -4]	a,c,e
37-42	Distinguish between water withdrawal and use; Identify the major uses of water; Explain major types of hydraulic structures in water resources engineering; Identify different forces acting on gravity dam	Introduction to dams, spillways, diversion head-works and distribution systems Classification of dams, factors affecting selection of gravity dam, Design of gravity dam Essential requirement of Spillway, Types of	T2[Ch-8,9,12,1314]	a,c,e

	Explain different types of spillways Different types of cross drainage works in canals; Identify different components of canal irrigation network	Spillways Types of diversion head works Classification of irrigation canals, Canal Alignment.		

***Student Learning Outcomes (SLOs):**
SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

(a) an ability to apply knowledge of mathematics, science and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

4.Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-Semester Test	90 Min	30	2/3, 11.00 -12.30 PM	Closed Book
Surprise Quiz * (At least 10)		15	Not Applicable	Open Book
Project (3 reviews)		15	Continuous	Open Book
Comprehensive	3 Hours	40	01/05 AN	Closed Book

*Out of n surprise quizzes, (n-2) surprise quizzes will be considered for evaluation

5.Chamber Consultation Hour: Monday 5-6 P.M

6. Notices: All notices concerning the course will be displayed on CMS/ Civil Engineering Department Notice Board

7. Make-up Policy: Make-up will not be entertained under any circumstances.

8. Academic honesty and academic integrity Policy: Academic honesty and academic integrity are to be maintained by all of the students throughout the Semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE