HYDROLOGY AND WATER RESOURCES ENGINEERING

V Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACECI5	Core	3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

Prerequisite: Fluid Mechanics

I. COURSE OVERVIEW:

Hydrology and water resources engineering is concerned with quantitative study of the hydrological cycle on and below the earth surface. This course deals with supply and feed for surface, sub-surface water bodies, methods of irrigation and their challenges in water table management and improving crop production. Further, the knowledge of the course is useful for designing innovative systems and equipment for planning, development and management of water resources.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The fundamentals of hydrological cycle on and below the surface of the earth.
II. The concept of ground water engineering and analytical techniques in ground water flow.
III. The principles of irrigation types, methods and design-discharge required based on canal networks.
IV. The construction of hydraulic structures based on data from design-flood flow.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Interpret** the components of water cycle and its measurement for evolving the effects of hydrology.	Understand
CO 2	**Summarize** the factors effecting the rate of evaporation and infiltration for reducing the water loss in the environment	Understand
CO 3	**Develop** a unit hydrograph based on stream flow data for preventing hydraulic system flood problems.	Apply
CO 4	**Illustrate** the geological formations capable of storing and transporting groundwater and radial movement for improving the yield of water table in the aquifers.	Understand
CO 5	**Identify** the basic requirements of irrigation and various techniques to supply water improving the production of crops.	Apply
CO 6	**Classify** the various hydraulic structures such as, dams, spillways and canals on the basic of hydraulic design Considerations for Storing and transporting water efficiently and economically.	Analyze

III.COURSE SYLLABUS:

MODULE –I: HYDROLOGICAL CYCLE AND PRECIPITATION (9)

Introduction to hydrologic cycle, Water – budget equation. Precipitation - forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, Depth-Area-Duration (DAD) relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

MODULE -II: ABSTRACTIONS FROM PRECIPITATION (9)

Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations, Potential evapotranspiration, actual evapotranspiration, infiltration, infiltration capacity, measurement of infiltration.

MODULE -III: SURFACE AND SUB – SURFACE RUNOFF (9)

Surface Runoff - Runoff volume, SCS – CN method of estimating runoff volume, flow – duration curve, flow-mass curve, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, and unit hydrograph.

Sub – surface runoff - forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.

MODULE -IV: WATER WITHDRAWLS AND DISTRIBUTION SYSTEMS (9)

Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle /drip irrigation. Canal systems – Design of channels – Kennedy's and Lacey's theory of regime channels.

MODULE -V:DAMS AND SPILLWAYS (9)

Dams - Gravity dams - forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Embankment of dams - Classification, design considerations. Arch and buttress dams. Spillways - components of spillways, types of gates for spillway crests. Reservoirs - Types, capacity of reservoirs, yield of reservoir, selection of suitable site for reservoirs.

IV. TEXTBOOKS:

1. Jayarami Reddy, "Engineering hydrology", McGraw Hill Education, 4th Edition, 2017.
2. B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Pande Brij Basi Lal, "Irrigation and Water Power Engineering", Laxmi publications Pvt. Ltd., New Delhi, 16th Edition, 2016.

V. REFERENCE BOOKS:

1. V. P. Singh, "Elementary Hydrology", PH1 publications, 1st Edition, 1991.
2. Dr.G.Venkata Ramana, "Water Resources Engineering-I", Academic Publishing Company, 1st Edition, 2012.
3. D.K.Majumdar, "Irrigation Water Management – Principles and Practice", Prentice Hall of India, 2ndEdition, 2014.

VI. WEB REFERENCES:

1. guides.lib.vt.edu/subject, guides/cee/environmental, water engineering
2. https://en.wikipedia.org/wiki/Water_resources
3. https://www.nae.edu/.../Expansion of Frontiers of Engineering /Water, Resource
4. https://books.google.co.in/books?isbn=0470460644

VII. E-TEXT BOOKS:

1. https://www.civilenggforall.com/p/water,resources,engineering.html
2. https://books.askvenkat.com/water,resources,engineering,1,textbook,pdf
3. https://www.amazon.in/Water,Resources,Engineering,Larry,Mays/dp/047
4. https://www.respwritunac.hatenablog.com/entry/2016/05/20/044146