HYDROLOGY AND WATER RESOURCES ENGINEERING

VI Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACEB18	Core	2	1	-	3	30	70	100
Contact Classes: 30	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

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.

COURSE OUTCOMES:

CO 1 **Interpret** the components of water cycle for evolving the effects of hydrology.
CO 2 Develop a unit hydrograph based on stream flow data for preventing hydraulic system flood problems.
CO 3 **Summarize** the different aquifer properties and their usesfor the construction of a well.
CO 4 **Illustrate** the concepts of radial movement of ground water beneath the earthfor yielding the water table
CO 5 **Interpret** the geological formations capable of storing and transporting groundwaterfor water table management
CO 6 **Recall** groundwater flow equations to confined and unconfined aquifersfor the measurement of the well yield.
CO 7 **Identify** the types of irrigation and various techniques for improving the production of crops
CO 8 **Categorize** the appropriate methods to design a channel for transporting water efficiently and economically
CO 9 **Summarize** the importance of hydraulic structures, their components and functions to obtain valuable inputs used for hydroelectric, residential, agricultural, and industrial applications

MODULE - I	HYDROLOGICAL CYCLE AND PRECIPITATION	Classes: 09

Introduction to hydrologic cycle, Water – budget equation. Precipitation - forms of precipitation, characteristics ofprecipitationinIndia,measurementofprecipitation,raingaugenetwork,meanprecipitationoveranarea,Depth-Area-Duration (DAD) relationships, maximumintensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data inIndia.

MODULE -II	ABSTRACTIONS FROM PRECIPITATION	Classes: 09

Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations,Potentialevapotranspiration,actualevapotranspiration,infiltration,infiltrationcapacity, measurement of infiltration.

MODULE -III	SURFACE AND SUB – SURFACE RUNOFF	Classes: 08
Surface Runoff - Runoff volume, SCS – CN method of estimating runoff volume, flow – durationcurve, 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 andunconfined aquifers, aquifer tests.		
MODULE- IV	**WATER WITHDRAWLS AND DISTRIBUTION SYSTEMS**	**Classes: 09**
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,sprinklerandtrickle/ drip irrigation. Canal systems – Design of channels – Kennedy's and Lacey's theory of regime channels.		
MODULE -V	**DAMS AND SPILLWAYS**	**Classes: 10**
Dams - Gravity dams - forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Embankment 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 forreservoirs.		

Text Books:

1. Jayarami Reddy, "Engineering hydrology", McGraw Hill Education, 4th Edition,2017.
2. B.C.Punmia,AshokKumarJain,ArunKumarJain,PandeBrijBasiLal,"IrrigationandWaterPower Engineering", Laxmi publications Pvt. Ltd., New Delhi, 16th Edition, 2016.

Reference Books:

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

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/.../ExpansionofFrontiersofEngineering/Water,ResourceE
4. https://books.google.co.in/books?isbn=0470460644
5. https://www.elsevier.com/journals/advances,in,water,resources/0309,1708

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