Course Type	Course Code	Name of Course	L	T	P	Credit
DC	CEC306	**Water Resources Engineering**	3	0	0	9

Course Objective

To familiarize the students with the basic concepts in hydrology, open channel hydraulics and irrigation engineering.

Learning Outcomes

Upon successful completion of this course, students will be able to:

- Understand the concepts involved in hydrology, open channel hydraulics.
- Perform design and analysis of hydrologic and hydraulic systems.
- Know the different types of irrigation systems in practice.

Unit No.	Topics to be Covered	Lectures	Learning Outcome
1	**Hydrology** **Introduction:** World's water resources, basic concepts of hydrologic cycle and water budget. **Precipitation and Hydrologic Abstractions:** Measurement of precipitation, consistency of rainfall record, handling missing records, frequency analysis, Measurement and estimation of infiltration and Evapotranspiration. **Runoff, Hydrographs, Floods:** Runoff coefficients, surface run-off models, mass curve, hydrograph analysis, Direct runoff hydrograph, S-curve hydrograph, Unit hydrograph, reservoir capacity, floods, flood estimation and flood routing. **Subsurface hydrology:** Divisions of sub-surface water, Types of aquifers, Steady state flow in confined and unconfined aquifers, Darcy's law.	**18**	Understand the role of different components in the hydrologic cycle. Perform hydrograph analysis. Analyse simple sub-surface flow situations.
2	**Open Channel Flow** **Introduction:** Principles of open channel flows, Classification of open channel flow, Basic equations governing channel flows, Energy and momentum equations. **Uniform and critical flow computations:** Energy depth relationships, Specific energy, critical and normal depths, Chezy's and Manning's coefficients, Hydraulically efficient channel sections. **Non uniform flow:** Gradually and Rapidly varied flow, Hydraulic jump.	**17**	Understand the characteristics of flow .Analyse flow situations like critical, sub-critical and super-critical flow. Know the non-uniform flow concepts.
3	**Irrigation Engineering** **Water requirement of Crops:** Introduction, types and methods of irrigation, Crop period and Base period, Duty and Delta. **Irrigation appurtenances:** Lined and unlined canals, Dams and Spillways, Design of weirs on permeable foundation; Cross drainage structures.	**7**	Basic understanding of the water requirement of crops, methods of irrigation and irrigation appurtenances

Text Books:

1. Subramanya, K. (2017), 4th edition, Engineering Hydrology, Tata McGraw Hill, India
2. Subramanya, K. (2015), 4th edition, Flow in Open Channels, Tata McGraw Hill, India
3. Garg, SK. (2005), 19th edition, Irrigation Engineering and Hydraulic Structures, Khanna Publishers.

Reference Books:

1. D. R. Maidment, Ed., Handbook of Hydrology, McGraw-Hill, 1993
2. Chow, V.T., Maidment, D.R., Mays, L.W. (2010) Applied Hydrology, Tata McGrawHill Education Private Limited, India.