**17CE3202 – WATER RESOURCES ENGINEERING**

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| **Course Category**  | Professional Core | **Credits**  | 3 |
| **Course Type**  | Theory | **Lecture - Tutorial - Practical**  | 2 - 2 - 0 |
| **Prerequisite**  | None | **Sessional Evaluation** | 40 |
| **Semester End Exam Evaluation** | 60 |
| **Total Marks**  | 100 |

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| **Course****Objectives** | 1. To understand the basic concept of the water resources engineering, hydrological cycle and occurrence of precipitation, runoff relationships.
2. To impart knowledge on evapotranspiration and infiltration concepts.
3. To understand the theory of developing various forms of hydrographs.
4. To study various methods to determine the frequency and intensity of floods.
5. To understand the aquifer parameters and its influence on movement and occurrence of groundwater.
6. To study about methods of irrigation and their efficiency based on availability of moisture and the practical conditions.
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| **Course Outcomes** | CO1 | Understand of the theories and principles governing the hydrologic processes. |
| CO2 | Determine loss due to evapotranspiration & infiltration.  |
| CO3 | Determine the runoff due to precipitation and develop runoff hydrographs. |
| CO4 | Develop Unit hydrograph and synthetic hydrograph to estimate flood magnitude. |
| CO5 | Determine aquifer parameters and yield of wells. |
| CO6 | Explain the basic concepts of irrigation engineering. |
| **Course Content** | **UNIT – I****INTRODUCTION:** Definition and scope– Hydrologic cycle– Sources of hydrological data. **PRECIPITATION:** Forms of precipitation – Measurement of precipitation –Rain gauge network – Preparation and presentation of rainfall data – Mean precipitation of rainfall data – Depth-Area-Duration relationship – Frequency of point rainfall Maximum Intensity/Depth-Duration-Frequency relationship – Probable maximum Precipitation (PMP).**UNIT – II****ABSTRACTIONS FROM PRECIPITATION:** Evaporation process – Evaporimeters – Empirical evaporation equations – Analytical methods of evaporation Estimation – Transpiration. Evapotranspiration – Measurement of Evapotranspiration, Evapotranspiration equations – Potential evapotranspiration and Actual Evapotranspiration – Infiltration – Factors affecting infiltration – Infiltration indices.**UNIT – III****RUNOFF:** Runoff characteristics – Factors affecting runoff – Catchment characteristics – Flow-duration curve – Flow-mass curve.**HYDROGRAPHS:** Components of hydrograph – Base flow separations –Unit hydrograph – Derivation of Unit hydrograph – Unit hydrograph of different durations – Use and limitations of UH – Duration of the Unit hydrograph – S-Unit hydrograph – Instantaneous Unit hydrographs.**UNIT – IV****FLOODS:** Introduction– Rational method– Empirical formulae – Unit hydrograph method – Flood frequency studies – Gumbel’s method – Log-Pearson type III distribution – Partial duration series – Regional flood – Frequency analysis – Data for frequency studies – Design flood – Design storm – Risk, reliability and safety factor.**UNIT – V****GROUNDWATER:** Introduction – Forms of subsurface water – Saturated formation – Aquifer properties – Geologic formations as aquifers – Equation of motion – Wells – Steady flow into a well – Open wells – Unsteady flow in a confined aquifer – Well loss – Specific capacity – Sea-water intrusion – Recharge.**UNIT – VI****IRRIGATION:** Necessity and importance – Principal crops and crop seasons – Types – Methods of application – Soil-water – Plant relationship – Soil moisture constants – Consumptive use – Estimation of consumptive use – Crop water requirement – Duty and delta – Factors affecting duty – Depth and frequency of irrigation – Irrigation efficiencies – Water logging and causes – Standards of quality for irrigation water – Crop rotation. |
| **Textbooks****and** **References** | **TEXTBOOKS:**1. ‘Engineering Hydrology’ by Subramanya. K, Tata McGraw-Hill Education Pvt. Ltd, (2013), New Delhi.
2. ‘Engineering Hydrology’ by Jayarami Reddy P, Laxmi Publications Pvt. Ltd., (2013), New Delhi.
3. ‘Irrigation water resources and water power engineering’ by P.N.Modi, Standard book house publication.
4. ‘Applied hydrology by Chow. V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt. Ltd., (2011), New Delhi.

**REFERENCES:**1. Duggal. K.N. and Soni. J.P., “Elements Of Water Resources Engineering”, New Age International Publishers, 2005
2. Asawa, G.L., “Irrigation Engineering”, NewAge International Publishers, New Delhi, 2000.
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