6CE125 Hydrology and Open Channel Flow

L-T-P-Cr: 3-1-0-

4 Prerequisite:A Pass grade or having obtained at least 75% of the classes conducted or a least 60% attendance and a minimum of 40% marks in the course (s) Fluid Mechanicsand Hydraulics (CE105).

Objective: To impart knowledge and skills for all the hydrological and meteorological processes- precipitation, evaporation, infiltration, and runoff. It will also impart knowledge for the types of flow in the open channel.

Theory: 1. Introduction, hydrologic cycle and their processes and water budget equation, Drainage basin, Catchment Characteristics. 1 Lectures

2. Precipitation Gauges and data: Types of precipitation, measurement and processing of rainfall, Depth-Area-Duration and intensity-duration frequency relations, Probable maximum precipitation. 4 Lectures

3. Abstractions from precipitation: Evaporation and factors affecting evaporation; measurement, and estimation; Evapotranspiration and factors affecting, measurement and estimation; Infiltration process, measurement and estimation, Infiltration Indices. 6 Lectures

4. Stream flow measurements: measurement of stage, velocity and discharge; Stage-discharge relationship. 2 Lectures

5. Runoff and Hydrographs: Runoff and its characteristics, Rainfall-Runoff correlations, Flow duration curve, Flow-Mass curve, Hydrograph, Factors.

affecting hydrograph, Unit hydrograph, its analysis, S-curve hydrograph, Synthetic and instantaneous unit hydrographs. 7 Lectures

6. Introduction to Groundwater flow: Forms of subsurface flow, aquifer properties and Darcy’s laws and basics Flow equations. 2 Lectures

7. Basic concepts of Open Channel flow: Open Channels and their properties; Specific Energy, Critical flow, channel transitions. 4 Lectures

8. Uniform flow: Theoretical uniform flow equations including Chezy, Darcy-Weishbach and Mannings formula and computations; hydraulically efficient channel sections. 5 Lectures

9. Gradually varied flow: Differential Equation; flow profile classification and computation methods stand. 5 Lectures

10. Rapidly varied flow: Hydraulic jump; Momentum equation; classification; characteristics and elements; Use of jump as an energy dissipater. 4 Lectures

11. Introduction to Unsteady Flow. 2 Lectures Text Books: 1. Engineering Hydrology by K. Subramanya,Tata McGraw-Hill Pub., New Delhi. 2. Hydrology by H.M. Raghunath, New Age Publication, New Delhi. 3. Engineering Hydrology by CSP Ojha, R Berndtsson and P K Bhunia, Oxford Univ New Delhi. 4. Flow in Open Channels by K.Subramanya, Tata McGraw Hill Pub. Co. Ltd., New Delhi. 5. Flow in Open Channels by K.G. Rangaraju, Tata McGraw Hill Pub. Co. Ltd., New Delhi. 6. Flow through Open Channel by Rajesh Srivastava, Oxford Publication.

Reference Books: 1. Applied Hydrology by V.T. Chow, McGraw Hill International, New York. 2. D.K. Todd, Groundwater Hydrology, John Wiley and Sons. 3. Open Channel Hydraulics by V.T. Chow, McGraw Hill International. 4. Open Channel Flow by M HanifChaudhary, PHI 5. Open Channel Hydraulics by R.H. French, McGraw Hill Book Co., New York. End Semester Examination (3 Hrs.): The duration of the examination will be 3 hours. The questions will be comprehensive, i.e. from the entire unit, may have subsections with theory and numerical exercises based upon the instructors discretion.

Expected Outcome: The student will be able to assess different hydrological processes e.g. precipitation, evaporation, infiltration, runoff and ground water. They will also be able to analyse the flow types in open channel.