

M. Tech. Water Resource Engineering 2nd Semester

S. No.	Course Code	Course Title	L	T	P	C
1	MA-502	Simulation & Modeling	2	1	0	3
2	CE-544	Ground Water Hydrology	3	0	0	3
3	CE-545	Watershed and Wetland Hydrology	3	0	0	3
4	CE-546	Modeling and GIS Lab	0	0	3	2
5	-	Program Elective-III	3	0	0	3
6	-	Program Elective-IV	3	0	0	3
7	-	Open Elective II	-	-	-	3
Total			X	X	X	20

L=Lecture hours/week P=Practical hours/week T=Tutorial hours/week  
C=Credits

M.Tech. in Water Resource Engineering

II Semester

CE 544 Ground Water Hydrology Cr. 3: (3-0-0)

Fundamentals of Groundwater Flow :Occurrence of Ground Water, Vertical Distribution of G.W. Darcy's Law, Permeability, Porosity, Anisotropic Aquifers, Differential equations of G.W. flow. Potential Flow: Flownets, Boundary conditions, Flow-net construction for confined & unconfined flow systems. Mechanics of Well Flow: Steady & unsteady flow in confined & unconfined aquifers, Leaky aquifers, Partial penetration of wells, Multiple well systems, Boundary effects & method of images. Characteristics Well Loses. Ground water Modelling: Sand Tank, Heleshaw, Electrical analogous models, Finite Element/Difference models. Ground Water Development and Management: Design of wells, construction of wells, Well Development, Artificial recharge, Conjunctive use, Salinity of G.W., Ground water pollution.

Reference Books:

1. Groundwater Hydrology : D.K. Todd
2. Groundwater and Seepage : M.E. Harr
3. Groundwater Hydrology :A.K. Rastogi

CE 545 Watershed & Wetland Hydrology Cr. 3: (3-0-0)

Watershed Hydrology: Hydrologic Modelling of Watershed, Stochastic Models, Hydrologic rainfall models, Watershed modeling approaches, component conceptualization, Evapo-transpiration, Potential ET methods, Actual ET methods, Subsurface flow systems. Modeling Erosion Processes, upland erosion, inter-rill processes, rill erosion, channel erosion processes etc. Quality of water from agricultural land. Watershed yield: water yield & sediment yield, Hydrological consequences of watershed modifications.

Wetland Hydrology: Formation of wetlands - hydrologic conditions. Hydrologic function of wetlands: Hydrologic processes, Surface- groundwater interactions, Hydrologic linkages between uplands and wetlands, Hydrologic role of wetlands. Hydrologic Effects of Wetland Disturbance & Wetland Loss: Peat land development — effects of ditching and mining, Cumulative effects of wetland drainage in agricultural systems.

Reference Books:

1. Hydrology of Small Watersheds: C.T. Haan
2. Watershed Hydrology: Rajbir Singh
3. Watershed Hydrology: V.P. Singh

CE 546 Modelling and GIS Lab Cr. 2: (0-0-3)

Ground Water modelling systems(GMS) conceptual design and Modflow, Modpath, MT3D concepts. Watershed modelling systems (WMS). Autocad land Development Desktop. GIS softwares