

Code	Title	L	T	P	C
CE807	GROUNDWATER HYDROLOGY	3	0	0	3
<b>Objectives:</b>					
<ul style="list-style-type: none"> <li>To understand the basic aquifer parameters and the relationship between groundwater and surface water flow</li> <li>To solve simple real-world problems for different hydro-geological boundary conditions</li> </ul>					

### **Unit I: GROUNDWATER BASICS AND AQUIFERS**

Global distribution of water; introduction to groundwater – origin and age of ground water; groundwater in hydrologic cycle; occurrence of groundwater; groundwater utilisation and historical background; ground water budget; zone of aeration and saturation; types of aquifers; aquifer parameters; ground water level fluctuations and environmental influence

### **Unit II: GROUNDWATER HYDRAULICS**

Rock properties affecting groundwater; Darcy's law and its limitations; stream lines and flow net analysis; potential flow theory; discharge and draw down for various conditions of groundwater flow; hydraulic conductivity; aquifer transmissivity and storativity; permeability; principles of groundwater flow and its equation – Dupuit–Forchheimer assumptions; general flow equations through porous media; steady and unsteady state flow – initial and boundary conditions, solution of flow equations

### **Unit III: WELL HYDRAULICS**

Steady and unsteady flow to a well in a confined and unconfined aquifer; partially penetrating wells; wells in a leaky confined aquifer; multiple well systems; wells near aquifer boundaries; hydraulics of recharge wells

### **Unit IV: GROUNDWATER MANAGEMENT**

Dynamic equilibrium in natural aquifers; groundwater budgets; groundwater basin management and conjunctive use; groundwater assessment and balancing safe yield; management potential of aquifers; land subsidence; seepage from surface water; stream-aquifer interaction; artificial recharge – concept and methods of artificial groundwater recharge, recharge mounds and induced recharge, wastewater recharge for reuse, water spreading

### **Unit V: GROUNDWATER FLOW IN HARD ROCK SYSTEMS AND MODELLING GROUNDWATER**

Groundwater flow in hard rock system – conceptual models; structure and hydrodynamic properties of hard rock aquifers; groundwater modelling through various models.

### **TEXT BOOKS/ REFERENCES:**

1. Todd, D.K. and Mays, L.W., *Groundwater Hydrology*, John Wiley & Sons, Inc., 2005
2. Fitts, C.R., *Groundwater Science*, Academic Press, 2013.
3. Sterrett, R.J., *Groundwater and Wells*, Johnson Screens, 2007.
4. Ojha, C.S.P., Berndtsson, R., Bhunya, P., *Engineering Hydrology*, Oxford University Press, 2008.
5. Konig, L.F., Weiss, J.L., *Groundwater: Modelling, Management and Contamination*, Nova Science Publishers, 2008.