Indian Institute of Technology
Course Details Report

Course No: CE5460

Course Name: Ground Water Engineering

Course Type:

Theory

Description:

1) Characterize the properties of groundwater aquifers in terms of its ability store and transmit water
2) Predict the transient fluxes, and the hydraulic heads of groundwater in 1D, and 2D groundwater aquifer systems, including the effects of heterogeneity and anisotrpy
3) Estimate the drawdown due to well (multiple) pumping is different groundwater aquifer systems
4) Apply the techniques of groundwater management (pumping, recharge, monitoring, measurements) to regional groundwater systems including coastal aquifers

Course Content:

1) Introduction: Role of groundwater in the hydrologic cycle, ground water origin, distribution, porosity, classification of sediments, hydrogeology of aquifers, soil moisture contents.
2) Properties of aquifers: Energy distribution in porous media, Darcy's law, hydraulic conductivity, hydraulic gradients, aquifer types (confined, unconfined, leaky and karst), homogeneity, isotropy, conductivity tensor (for 2D and 3D flow), specific yield, specific storage, storativity.
3) Principles of groundwater flow: Components of hydraulic head, specific discharge, flow equations in confined, unconfined, and leaky confined aquifers, Dupuit assumptions, unsteady flow, groundwater flux and velocity, flow net
4) Well Hydraulics: steady and unsteady radial flows in aquifers (confined, unconfined and leaky), drawdown computation, slug test, pump test, multiple well systems, partially penetrating wells, characteristic well losses, specific capacity.
5) Soil moisture and recharge: Unsaturated soil moisture, soil water characteristic curve, Richard’s equation, infiltration and recharge.
6) Surface and Subsurface investigations of Groundwater: Geologic methods, remote sensing, geophysical exploration, electrical resistivity and seismic refraction, gravity, and magnetic methods; test drilling, various logging techniques including geophysical and resistivity methods.
7) Water wells: methods of construction, completion and development, yield tests, protection, and rehabilitation of wells
8) Quality of groundwater: measures of quality, groundwater samples, physical, chemical, and biological analyses, water quality criteria, and salinity.
9) Pollution of groundwater: sources and causes, distribution, attenuation, evaluation and monitoring, remediation.
10) Management of Groundwater: concepts of basin management, groundwater basin investigations, conjunctive use, mathematical modelling, examples.
11) Artificial recharge of groundwater: concepts, recharge methods, recharge mounds, induced recharge.
12) Saline water intrusion in aquifers: occurrence, shape and structure of the interface, up-coning, control of saline water intrusion.

Text Books:

1) Applied hydrogeology, C. W.Fetter (January 2014), Fourth edition, Pearson Education India, ISBN-10: 9789332535114; ISBN-13:978-9332535114

Reference Books:

1) Ground water hydrology, David K. Todd, and Larry W. Mays (February 2011), Third edition, Wiley India Pvt. Ltd, ISBN-10:9788126530038, ISBN-13:978-8126530038
2) Hydraulics of groundwater, Jacob Bear (December 2013), McGraw Hill Education, ISBN-10:9332901910, ISBN-13:978-9332901919