III Year-I Semester
(20CE5317) Ground Water Development

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre- Requisites: Fundamentals of Engineering Hydrology

Course Objectives:

- Appreciate groundwater as an important natural resource.
- Understand the principles involved in design and construction of wells.
- Create awareness on improving the groundwater potential using various recharge techniques.
- Know the importance of saline water intrusion in coastal aquifers and its control measures.
- Appreciate various geophysical approaches for groundwater exploration.

UNIT–I: Introduction:
Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation.
Well Hydraulics
Steady radial flow and unsteady radial flow to a well in confined andunconfined aquifers, Theis solution, Jocob and Chow's methods, Leaky aquifers.

UNIT–II: Well Design
Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery.

UNIT-III: Well Construction and Development
Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail-down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

UNIT – IV: Artificial Recharge
Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge.
Saline Water Intrusion
Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of saline water intrusion.

UNIT–V: Geophysics
Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications.

Course Outcomes:

S.No	Course Outcomes	BTL
1	Estimate aquifer parameters and yield of wells.	L3
2	Design wells and understand the construction practices.	L4
3	Determine the process of artificial recharge for increasing ground water potential.	L4
4	Take effective measures for controlling saline water intrusion.	L3
5	Interpret geophysical exploration data for scientific source finding of aquifers.	L4

Correlation of Cos with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	3	1	1	1	2	2	3	1	1
CO2	3	3	2	3	2	3	3	1	1	1	1	3	3	2	2
CO3	3	3	2	3	3	2	3	1	3	3	2	3	3	2	2
CO4	3	3	3	3	3	3	3	1	3	3	3	2	3	3	1
CO5	3	3	3	3	3	3	3	2	2	3	3	2	3	3	3

Text Books:

1. Groundwater, Raghunath H M, New Age International Publishers, 2005.
2. Groundwater Hydrology, Todd D.K., Wiley India Pvt Ltd., 2014.
3. Groundwater Hydrology, Todd D K and L W Mays, CBS Publications, 2005.

Reference Books:

1. Groundwater Assessment and Management, Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. Groundwater Hydrology, Bouwer H, McGraw Hill Book Company, 1978.
3. Groundwater Systems Planning and Management, Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. Groundwater Resources Evaluation, Walton W C, McGraw Hill Book Company, 1978.