

16AG309 GROUND WATER, WELLS AND PUMPS

Hours Per Week :

L	T	P	C
2	1	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSR	CS	SA	S	BS
30	15	-	5	40	5	8	5	-

Course Description and Objectives:

This course covers the fundamentals of surface and subsurface flow, emphasizing the role of groundwater in the hydrologic cycle, the relation of groundwater flow to geologic structure, and the management of contaminated groundwater. The objective of the course to enable the students to have knowledge on occurrence and movement of ground water, analyzing the data of pumping test and artificial recharge of ground water methods.

Course Outcomes:

The student will be able to:

- get basic knowledge on different types of wells and pumps.
- acquire knowledge in modelling and uses of different methods used for estimation of ground water potential.
- identify the different components of pumps.
- understand hydraulic conductivity measurement techniques.

SKILLS:

- ✓ *Differentiating various types of pumps based on their working mechanisms.*
- ✓ *Identifying various components of pumps.*
- ✓ *Identifying the location of groundwater resources.*

UNIT - 1**L-06, T-03**

GROUND WATER AND WELLS: Definitions, Origin of groundwater, Water budget, Groundwater Scenario- Global and Indian Perspectives; Types of rocks, Groundwater hydrologic cycle, Occurrence and movement of ground water, Vertical distribution of groundwater, Darcy's law, Aquifer and its types; Aquifer characteristics- Permeability, Transmissivity, Specific yield, Specific retention, Porosity, Leakage factor, Hydraulic resistance, Classification of wells, Steady and transient flow into partially, Fully and non penetrating tube wells and open wells.

UNIT - 2**L- 06, T-03**

DESIGN OF WELLS: Design of open well, Groundwater exploration techniques, Methods of drilling of wells, Percussion, Rotary, Reverse rotary, Design of assembly and gravel pack, Installation of well screen, Completion and development of well, Groundwater hydraulics, Determination of aquifer parameters by different methods such as Theis, Jacob and Chow' s etc., Recovery method, Well interference, Multiple well systems.

UNIT - 3**L-06, T-03**

GROUND WATER MODELLING: Surface and subsurface exploitation and estimation of ground water potential, Quality of ground water, Artificial groundwater recharge techniques, Salt water intrusion, Groundwater basin management.

UNIT - 4**L-06, T-03**

PUMPS AND CLASSIFICATION: Water lifting devices, Different types of pumping machinery, Classification of pumps, Component parts of centrifugal pumps, Pump selection, Installation and Troubleshooting.

UNIT - 5**L-06, T-03**

WORKING OF PUMPS: Design of centrifugal pumps, Performance curves, Effect of speed on head capacity, Power capacity and efficiency curves, Effect of change of impeller dimensions on performance characteristics, Hydraulic ram, Propeller pumps, Mixed flow pumps and their performance characteristics, Priming-self priming devices, Rotodynamic pumps for special purposes such as deep well turbine pump and submersible pump.

TEXT BOOKS:

1. D. K. Todd, "Groundwater Hydrology", 2nd Edition, John Wiley and Son, New York, 2006.
2. H. M. Raghunath, "Groundwater", 3rd Edition, New Age International, 2007.

REFERENCE BOOKS:

1. V. V. N. Murty and M. K. Jha, "Land and Water Management Engineering", 6th edition, Kalyani Publishers, 2013.
2. A. M. Michael. "Irrigation Theory and Practice", 2nd edition, Vikas Publishing House, 2008.
3. V. T. Chow, "Hand Book of Applied Hydrology", McGraw Hill, New York, 2012.

WEB LINKS :

1. <http://nptel.ac.in/courses/105105042/>
2. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=124667>

ACTIVITIES:

- *Demonstration of different pump working models.*
- *Assembling and dismantling of various pumps.*
- *Measurement of hydraulic conductivity using inverse auger hole.*
- *Construction of artificial recharge pits.*
- *Analyzing groundwater quality by collecting various water samples.*
- *Determining groundwater budget model by collecting various data on rainfall, runoff, infiltration and other economical losses.*