22IADE201 GROUND WATER, WELLS AND PUMPS

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Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of Hydrology.

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.

MODULE-1

UNIT-1 **9L+0T+6P=15 Hours**

AQUIFER:

Occurrence and movement of ground water, aquifer and its types, classification of wells, fully penetrating tube wells and open wells, familiarization of various types of bore wells, design of open wells, groundwater exploration techniques, methods of drilling of wells, percussion, rotary, reverse rotary.

UNIT-2 **8L+0T+08P=16 Hours**

DESIGN OF TUBE WELLS AND ASSESSMENT OF GROUND WATER QUALITY:

Design of tube well and gravel pack, installation of well screen, completion and development of well, groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow's, Theis recovery method, well interference, multiple well systems, estimation of ground water potential, quality of ground water, artificial groundwater recharge techniques, pumping systems.

PRACTICES:

- Verification of Darcy's Law; study of different drilling equipments.
- Sieve analysis for gravel and well screens design.
- Estimation of specific yield and specific retention.
- Testing of well screen.
- Estimation of aquifer parameters by Theis method, Coopers-Jacob method, Chow method.
- Theis Recovery method.

MODULE-2

UNIT-1 **9L+0T+6P=15 Hours**

WATERLIFTING DEVICES:

Water lifting devices; different types of pumps, classification of pumps, component parts of centrifugal pumps, priming, pump selection, installation and trouble shooting, performance curves, effect of speed on capacity, head and power, effect of change of impeller dimensions on performance characteristics.

UNIT-2 **08L+0T+08P=16 Hours**

PERFORMANCE OF PUMPS:

Hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; deep well turbine pump and submersible pump.

SKILLS:

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

PRACTICES:

- Well design under confined and unconfined conditions.
- Well losses and well efficiency; estimating ground water balance.
- Study of artificial ground water recharge structures.
- Study of radial flow and mixed flow centrifugal pumps, multistage centrifugal pumps, turbine, propeller and other pumps.
- Installation of centrifugal pump.
- Testing of centrifugal pump and study of cavitations, study of hydraulic ram.
- Study and testing of submersible pump.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the knowledge of aquifer parameters and yield of wells	Apply	1	1, 2, 7
2	Analyze radial flow towards wells in confined and unconfined aquifers	Analyze	1	1, 2, 4, 7
3	Evaluate pump performance and troubleshooting characteristics	Analyze	2	1, 2, 4, 5, 7
4	Creative design of wells and understand the construction practices	Create	1	1, 2, 3, 4, 5, 6

TEXT BOOK:

1. Michael AM, Khepar SD. and SK Sondhi. 2008. “Water Well and Pumps” 2nd Edition, Tata Mc-Graw Hill, 2018.

REFERENCE BOOKS:

1. Todd David Keith and Larry W. Mays. 2004. “Groundwater Hydrology”, 3rd Edition, John Wiley & Sons, New York (International Book Distributing Company Lucknow).
2. Michael AM. and Ojha TP. 2014. “Principles of Agricultural Engineering” Vol-II, 5th Edition. Jain Brothers Publication, New Delhi.