

## **GROUND WATER DEVELOPMENT AND MANAGEMENT**

Lectures / Tutorials : 4 Periods/ week

Sessional Marks : 40

Semester End Exam. : 3 Hours

Semester End Exam. Marks : 60

Credits : 4

### **Course Objectives:**

1. To provide knowledge on groundwater availability and distribution in different types of rocks
2. To demonstrate the groundwater movement and groundwater reservoir parameters
3. To develop the skills needed for ground water investigation
4. To teach the concept of artificial recharge of ground water
5. To give an idea of groundwater management and conjunctive uses of ground water

### **Course out comes:**

The student will be able to understand

1. The location of availability of ground water and the relationship with the rock type.
2. Assess the ground water movement and reservoir parameters
3. Use of the different techniques of ground water investigation
4. The GIS and its use in the artificial recharge of groundwater.
5. The effective management of groundwater and conjunctive use

## **UNIT – I**

### **Introduction**

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

### **Ground Water Movement**

Permeability, Darcy's law, storage coefficient, Transmissivity, differential equation governing ground water flow in three dimensions derivation, Ground water flow contours their applications.

## **UNIT – II**

### **Analysis of Pumping Test Data**

Steady flow towards a well in confined and unconfined aquifers – Dupit's and Theim's equations, Assumptions, Formation constants, yield of an open well interface and well tests. Unsteady flow towards a well – Non equilibrium equations – Theis solution – Jacob and Chow's simplifications, Leaky aquifers.

## **UNIT – III**

### **Surface and Subsurface Investigation**

Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

### **Artificial Recharge of Ground Water**

Concept of artificial recharge – recharge methods, relative merits. Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

## **UNIT – IV**

### **Saline Water Intrusion in aquifer**

Occurrence of saline water intrusions, Ghyben-Herzberg relation, Shape of interface, control of seawater intrusion.

### **Groundwater Basin Management**

Concepts of conjunction use, Case studies.

**NOTE**

*Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.*

**TEXT BOOKS**

1. Groundwater by H.M. Raghunath, New Age International, 2008.
2. Ground water Hydrology by David Keith Todd, John Wiley & Sons, 1980

**REFERENCES:**

1. Fundamentals of Ground Water by [Franklin W. Schwartz](#) and [Hubao Zhang](#), Wiley India Pvt.Ltd.,2012.
2. Groundwater System Planning & Management by R. Willis & W.W.G. Yeh, Printice Hall,1987.

**WEB REFERENCE:**

- 1.[http://www.fs.fed.us/biology/resources/pubs/watershed/groundwater/ground\\_water\\_technical\\_guide\\_fs-881\\_march2007.pdf](http://www.fs.fed.us/biology/resources/pubs/watershed/groundwater/ground_water_technical_guide_fs-881_march2007.pdf)
- 2.[http://www.fs.fed.us/biology/resources/pubs/watershed/groundwater/ground\\_water\\_technical\\_guide\\_fs-881\\_march2007.pdf](http://www.fs.fed.us/biology/resources/pubs/watershed/groundwater/ground_water_technical_guide_fs-881_march2007.pdf)