

DISCIPLINE SPECIFIC CORE COURSE : DSC-11- Hydrogeology (L3, P1)

Credit distribution, Eligibility and Prerequisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
(DSC-11) Hydrogeology (L3, P1)	4	3	0	1	12 th Pass with Science	Studied Stratigraphy, Earth System Science or Equivalent

Learning Objectives

Main objective of the course is to make students comprehend about the nature, occurrence and movement of groundwater in geological context. To develop basic understanding about ground water exploration and management.

Learning Outcomes:

After completing the course, the students will get a basic understanding of aquifers and groundwater systems. The students will be able to comprehend the groundwater flow dynamics and well hydraulics, enhancing their numerical skills for development of groundwater resources. Learners will gain expertise in fundamentals of groundwater exploration helping them to identify groundwater sources in field. The students will be able to analyse and compare the groundwater quality. This would help them to categorise the use of groundwater for various purposes. Learners will be skilled with fundamentals of water balance, groundwater resource estimation and groundwater resource management practices.

SYLLABUS OF DSC- 11

Theory (45 Hours)

UNIT – I (9 hours)

Detailed contents

Introduction and basic concepts: Scope of hydrogeology and its societal relevance. Hydrologic cycle: precipitation, run-off, infiltration and subsurface movement of water. Hydrogeological formations: Aquifer; Aquitard; Aquiclude; Aquifuge. Vertical distribution of subsurface water. Types of aquifers, aquifer properties, anisotropy and heterogeneity of aquifers. Introduction to geologic formation as aquifers.

UNIT – II (9 hours)

Detailed contents

Groundwater flow: Darcy's law and its validity (discussions on laminar and turbulent groundwater flow), intrinsic permeability and hydraulic conductivity, Groundwater flow rates and flow direction.

UNIT – III (9 hours)

Detailed contents

Well hydraulics and Groundwater exploration: Basic Concepts of well hydraulics (drawdown; specific capacity etc). Elementary concepts related to: equilibrium conditions for water flow to a well in confined and unconfined aquifers, estimation of permeability in field and laboratory. Introduction to non-equilibrium groundwater flow condition. Surface-based groundwater exploration methods.

UNIT – IV (9 hours)

Detailed contents

Groundwater chemistry: Physical and chemical properties of water and water quality. Introduction to methods of interpreting groundwater quality data using standard graphical plots. Sea water intrusion in coastal aquifers.

UNIT – V (9 hours)

Detailed contents

Groundwater management: Basic concepts of water balance studies, issues related to groundwater resources development and management. Groundwater level fluctuations. Rainwater harvesting and artificial recharge to groundwater.

Practical Component- (30 Hours)

Preparation and interpretation of water level contour maps and depth to water level maps. Preparation and analysis of hydrographs for differing groundwater conditions. Graphical representation of chemical quality data and water classification (C-S and Trilinear diagrams). Simple numerical problems related to: estimation of permeability in field and laboratory, Groundwater flow, Well hydraulics etc.

Essential/recommended readings

Todd, D. K. 2006. Groundwater hydrology, 2nd Ed., John Wiley & Sons, N.Y.

Karanth K.R., 1987, Groundwater: Assessment, Development and management, Tata McGraw- Hill Pub. Co. Ltd.

Suggested readings

Davis, S. N. and De Weist, R.J.M. 1966. Hydrogeology, John Wiley & Sons Inc., N.Y.

Raghunath, H.M. 2007. Groundwater, Third Edition, New Age International Publishers.

Shekhar Shashank . 2017a. Aquifer Properties. E-PG Pathshala, UGC, MHRD, Govt. of India.

Available on: <https://epgp.inflibnet.ac.in/ahl.php?csrno=448>

Shekhar Shashank. 2017b. Darcy's law. E-PG Pathshala, UGC, MHRD, Govt. of India.

Available on: <https://epgp.inflibnet.ac.in/ahl.php?csrno=448>

Shekhar Shashank. 2017c. Assessment of groundwater quality. E-PG Pathshala, UGC, MHRD, Govt. of India. Available on: <https://epgp.inflibnet.ac.in/ahl.php?csrno=448>

Syed Tajdarul Hassan. 2017a. Introduction to Hydrology. E-PG Pathshala, UGC, MHRD, Govt. of India. Available on: <https://epgp.inflibnet.ac.in/ahl.php?csrno=448>

Syed Tajdarul Hassan. 2017b. Hydraulic Head, Fluid Potential, Reynolds number and Pumping Tests-I. E-PG Pathshala, UGC, MHRD, Govt. of India. Available on: <https://epgp.inflibnet.ac.in/ahl.php?csrno=448>

Syed Tajdarul Hassan. 2017c. Hydraulic Head, Fluid Potential, Reynolds number and Pumping Tests-II. E-PG Pathshala, UGC, MHRD, Govt. of India. Available on: <https://epgp.inflibnet.ac.in/ahl.php?csrno=448>