

DISCIPLINE SPECIFIC CORE COURSE -10 (DSC-10) – : Geomorphology

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)	No. of hours of Lectures	No. of hours of Tutorial	No. of hours of Practical	Total Hours of Teaching
		Lecture	Tutorial	Practical/ Practice						
Geomorphology (DSC-10)	4	3	0	1	Class XII with Science	Studied Earth System Science and Equivalent at the UG level				

Course Objectives

The main aim of this course is to learn about the fundamentals of Geomorphology.

Learning outcomes

In this course a student will learn about 1) the advantages to study geomorphology, 2) fundamentals of working of earth surface processes, and 3) various geomorphic techniques, 4) geomorphology of India, and 5) extra-terrestrial landforms.

SYLLABUS OF DSC-7**UNIT – I (9 hours)**

Detailed content

Introduction to Geomorphology: Geosphere-Hydrosphere-Biosphere; Unifying concepts

UNIT – II (9 hours)

Detailed contents

Geoid, Topography, Hypsometry, Global Hypsometry, Major Morphological features
Large Scale Topography - Ocean basins, Plate tectonics overview, Large scale mountain ranges (with emphasis on Himalaya)

UNIT – III (9 hours)

Detailed contents

Surficial Processes and geomorphology; Weathering and associated landforms, Hill slopes
Glacial, Periglacial processes and landforms, Fluvial processes and landforms, Aeolian Processes and landforms, Coastal Processes and landforms, Landforms associated with igneous activities

UNIT – IV (9 hours))

Detailed contents

Dating Methods, measuring rates; Rates of uplift and denudation, Tectonics and drainage development, Sea-level change, Long-term landscape development

UNIT – V (9 hours)

Detailed contents

Overview of Indian Geomorphology; Introduction to Extra-terrestrial landforms

Practical Component- (30 Hours)

Reading topographic maps, Concept of scale, Preparation of a topographic profile, Preparation of longitudinal profile of a river, Preparing Hack Profile and Calculating Stream length gradient index, Morphometry of a drainage basin - Calculating different morphometric parameters, Preparation of geomorphic maps.

Essential/recommended readings

M.A. Summerfield (1991) Global Geomorphology. Wiley & Sons.

Robert S. Anderson and Suzzane P. Anderson (2010): Geomorphology - The Mechanics and Chemistry of Landscapes. Cambridge University Press.

Suggestive readings

Robert S. Anderson and Suzzane P. Anderson (2010): Geomorphology - The Mechanics and Chemistry of Landscapes. Cambridge University Press.

Paul R. Bierman and D.R. Montgomery (2014): Key Concepts in Geomorphology. W.H. Freeman and Company Publishers.

M.A. Summerfield (1991) Global Geomorphology. Wiley & Sons.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

DISCIPLINE SPECIFIC CORE COURSE – 11 (DSC-11): Hydrogeology

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)	No. of hours of Lectures	No. of hours of Tutorial	No. of hours of Practical	Total Hours of Teaching
		Lecture	Tutorial	Practical/ Practice						
Hydrogeology (DSC-11)	4	3	0	1	Class XII with Science	Studied Stratigraphy, Earth System Science or Equivalent at the UG level				

Learning Objectives

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

Learning outcomes

The course will introduce students to the fundamental concepts of hydrogeology. They will learn about occurrence and movement of groundwater, aquifers and their parameters, groundwater exploration methods, aspects of groundwater chemistry and groundwater management.

SYLLABUS OF DSC- 11

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.

Suggestive readings (if any)

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>

DISCIPLINE SPECIFIC CORE COURSE– 12 (DSC-12): Geology of India

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)	No. of hours of Lectures	No. of hours of Tutorial	No. of hours of Practical	Total Hours of Teaching
		Lecture	Tutorial	Practical/ Practice						
Geology of India (DSC-12)	4	3	0	1	Class XII with Science	Studied Earth System Science, Structural Geology, and Mineralogy or Equivalent at the UG level				

Learning Objectives

- To make students acquainted with the overall geology of the Indian subcontinent
- To make the students aware the dynamic geological history of the Indian subcontinent spanning from Archean to Quaternary
- To make students understand roles of tectonics, climate and sea level in framing the geological history through time

Learning Outcomes:

- The students will get a holistic understanding on the geological set up of India
- The students will come to know the state-of-the-art understanding and will be prepared to take future challenges to carry out research in order to resolve key issues in Indian stratigraphy

SYLLABUS OF DSC-12

UNIT – I (9 hours)

- Detailed contents
- Physical and tectonic subdivisions of Indian subcontinent

UNIT – II (9 hours)

- Detailed contents
- Distribution of stratigraphic units in the Peninsula and in the Himalayas

UNIT – III (9 hours)

- Detailed contents
- Stratigraphy, geographic distribution, lithological characteristics, fossil contents and economic importance of Precambrian and Phanerozoic

successions of India: Precambrian basement rocks of Dharwar, Aravalli-Bundelkhand, Bastar, Singhbhum, central provinces of northeastern India; Proterozoic mobile belts in northwestern, central, eastern and southern Indian peninsular regions and in the extra-peninsula; Proterozoic basins including: Vindhyan, Cuddapah, Kurnool, Bhima, and Kaladgi.
Marine Paleozoic formations of India: Tethyan regions, Lesser Himalayan region.
Marine Mesozoic formations of India: Himalayan and Peninsular region.
Gondwana sequences of India.
Cenozoic formations in western, eastern, southern and Himalayan regions
Deccan Traps, Rajmahal Traps.

UNIT – IV (9 hours)

Detailed contents

Stratigraphic boundary problems in Indian Geology: Precambrian-Cambrian boundary; Permian-Triassic boundary; Cretaceous-Tertiary boundary.

UNIT – V (9 hours)

Glacial events in the Earth's history, stratigraphic implication of the sea-level changes in the Quaternary period and their significance in Indian subcontinent.

Practical Component- (30 Hours)

Study of rocks in hand specimens from the known stratigraphic horizons, Drawing various paleogeographic maps and tectonic maps of sedimentary basins. Study of different Proterozoic supercontinent reconstructions, Interpretation of various stratigraphic logs and their correlation.

Essential/recommended readings

Wadia, D.N. 1957. Geology of India, 3rd Ed., McMillan, London.
Ravindra Kumar, 1985. Fundamentals of historical geology and stratigraphy of India. Wiley Eastern Ltd., Delhi.
Ramakrishnan, M. & Vaidyanathan, R. (2008) Geology of India. Volume 1 & 2, Geological Society of India, Bangalore.

Suggestive readings

Wadia, D.N. 1957. Geology of India, 3rd Ed., McMillan, London.
Naqvi, S.M. and Rogers, J.J. 1986. Precambrian Geology of India. Clarendon Press.
Ravindra Kumar, 1985. Fundamentals of historical geology and stratigraphy of India. Wiley Eastern Ltd., Delhi.