

DISCIPLINE SPECIFIC CORE COURSE - DSC-20 (4)
Research and Analytical Methods in Geoscience (L3, P1)

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)
		Lecture	Tutorial	Practical/ Practice		
DSC-20 (4) Research and Analytical Methods in Geoscience (L3, P1)	4	3	0	1	12 th pass with science	Studied Earth System Science and Equivalent

Learning Objectives

This course intends to familiarize students to the methods of designing and carrying out research. Also, aim is to introduce students to various laboratory and field techniques used in the field of geosciences.

Learning outcomes

After completion of this course, students will understand the significance of research philosophy. They will also learn the modern field and laboratory techniques used widely in geosciences.

SYLLABUS OF DSC-20 Research and Analytical Methods in Geoscience (L3, P1)
Theory (45 hours)

UNIT – I (10 hours)

Meaning and objective of research, significance, types of research (descriptive, analytical, qualitative, quantitative, empirical, conceptual, fundamental), hypothesis forming and testing, ethical guide for academic research.

UNIT – II (10 hours)

Field methods: Introduction to basic instruments and techniques used to collect sedimentary, structural, geomorphic and other data in field. Sample and type of samples, sampling theory.

UNIT – III (12 hours)

Laboratory techniques - X-ray diffraction, X-ray fluorescence and induced couple plasma (ICP) analysis- principles and instrumentation (TA), Reciprocal lattice, Ewald's Sphere, Crystal field theory. Raman and Mossbauer spectroscopy, Microbeam techniques- SEM, EPMA, Atomic Force Microscope, electron beam-matter interaction, secondary and back-scattered electrons, auger electrons, energy transitions and characteristic x-rays, EDS & WDS, data generation, detection limits, matrix correction and data reduction, Total organic carbon analyzer, TL/OSL dating techniques, Fluid inclusion and analog and digital modeling.

UNIT – IV (13 hours)

Quantitative methods: Basic Statistics- measures of central tendency, dispersion and asymmetry, simple and multiple correlation and regression; Plotting in Excel; Data collection and analysis; Interpolation techniques; Time series analysis; Standard error and error analyses.

Computing in Geosciences: Introduction to R, Python and Matlab. Information regarding software's used in different disciplines of geology. Testing hypothesis; Interpretation and Report writing.

Practical (30 Hours)

Computational techniques associated with different analytical techniques

Essential/recommended readings

Research Methodology: Methods and Techniques by C.R. Kothari, New Age International Publishers

Suggestive readings

1. Matlab recipes for Earth Sciences by Marin H Trauth, Springer International Publishing. Data Analysis in the Earth Sciences Using MATLAB by Gerard Middleton, This book is available for free on Mathworks website.
2. Python: Introduction to Scientific Programming with Python by Joakim Sundnes. This book is available for free from Springer

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