DISCIPLINE SPECIFIC CORE COURSE (DSC-4) – Structural Geology (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-4) Structural Geology (L3, P1)	4	3	0	1	12th pass with science	Studied Earth System Science, Mineral science, stratigraphy and Equivalent

Learning Objectives

The main objective of this course is to teach the basic principles and concepts of structural geology that helps in understanding rock deformation. The course aims to provide a preliminary introduction to the concepts of stress, strain and rock behaviour. This course also aims to develop fundamental skills in geological mapping, structural data plotting and their interpretation.

Learning outcomes

By the end of this course, students will learn the principles, theories, mechanisms and concepts involved in the deformation of rocks. Students will be able to visualise and interpret three-dimensional geological structures from geological mapping and stereographic projections. They will be able to identify different geological structures, such as folds, faults, and fractures. Students will be able to identify and explain the geometry, dynamics and kinematics involved during the deformation of rocks.

SYLLABUS OF DSC-4
Theory (45 Hours)

UNIT – I (9 hours)

Detailed contents

Introduction to Structure and Topography: Understanding a topographic map; Effects of topography on structural features: Rule of V; Planar and linear structures; Concept of dip and strike, trend and plunge.

UNIT – II (9 hours)

Detailed contents

Stress and strain in rocks: Concept of rock deformation: Definition of Stress and Strain, Strain ellipses of different types and their geological significance. Mohr circle for stress and its application.

UNIT – III (9 hours)

Detailed contents

Folds: Fold morphology; Geometric and genetic classification of folds; Introduction to the mechanics of folding: Buckling, Bending, Flexural slip and flow folding.

UNIT – IV (9 hours)

Detailed contents

Foliation and lineation: Description and origin of foliations: axial plane cleavage and its tectonic significance; different types of foliations: crenulation cleavage, disjunctive cleavage, salty cleavage, schistosity, gneissosity etc. Description and origin of lineation and relationship with major structures; stretching lineation and its relationship with strain.

UNIT – V (9 hours)

Detailed contents

Fractures and faults: Geometric and genetic classification of fractures and faults; Effects of faulting on the outcrops; Geologic/geomorphic criteria for recognition of faults and Mechanism of faulting: Anderson theory of faulting. Joints – different types of joints and their geological significance – columnar joint, pinnate joint, plumose structure. Shear Zones: Introduction, Geometry, strain profile, shear zones rocks and shear sense indicators.

Practical component (30 hours)

Basic idea of topographic contours, Topographic sheets of various scales.
Structural contouring and 3-point problems of dip and strike
Introduction to Geological maps: Drawing profile sections and interpretation of geological maps of different complexities.
Exercises of stereographic projections

Essential/recommended readings

Fossen, H. (2010) Structural Geology. Cambridge University Press
Park, R. G. (2004) Foundations of Structural Geology. Chapman & Hall.

Suggestive readings

Fossen, H. (2010) Structural Geology. Cambridge University Press.
Davis, G. R. (1984) Structural Geology of Rocks and Region. John Wiley
Billings, M. P. (1987). Structural Geology, 4th edition, Prentice-Hall.
Park, R. G. (2004) Foundations of Structural Geology. Chapman & Hall.
Pollard, D. D. (2005) Fundamental of Structural Geology. Cambridge University Press.

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