Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NGLD511	Kinematics of Rock Deformation	3	0	0	3

Course Objective

The primary objective of the course is to provide theoretical background for an in-depth understanding of deformation processes in rocks.

Learning Outcomes

Upon successful completion of this course, students will:

- Develop confidence in identifying, describing and analyzing a deformation structure in rocks.
- Have a detailed idea of strain analysis in rocks
- Understand how geometry of deformation structures are related to material point movement within a deformedbody
- Be able to apply the knowledge gained in Rock Engineering and Exploration.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Stress: Definition, units, classification, stress ellipsoid, stresses at a point, stress on a plane, Mohr circle construction and stress trajectory. Applications for basin analysis and slope stability studies	8	Understand the basics of stress
2	Strain: Definition, strain parameters, classification, strain ellipsoid and theory of deformation in two and three dimensions. Applications in basin analysis	6	Knowledge of material point movement
3	Strain Analysis: Measurement of deformation in nature, graphical representation by Flinn, Ramsay, Hossack and Mohr diagrams, progressive deformation, deformation paths and significance of geological structures.	6	Gain insights of kinematic processes related to structural geometry
4	Experimental Deformation and Rheology: Behaviour of rocks under experimental conditions. Effects of confining pressure, pore fluid pressure, anisotropy, temperature and scale on rock deformation.	4	Knowledge on fracturing of rocks and their analysis under applied stress
5	Development of Structures - I: Mechanisms of folding, and strain variations around folds. Development of secondary cleavage and lineations.	8	Understand how folds and penetrative structures develop
6	Development of Structures - II: Development of rock fractures. Conditions of fault development. Deformation mechanisms.	5	Understand how faults develop.
7	Development of Structures - III: Development of shear zones and shear zone indicators, strain within shear zones	5	Understand how shear zones develop
	Total	42	

Text Books:

1. Means, W.D. (1976) Stress and Strain. Springer-Verlag.
2. Ramsay, J.G. (1967) Folding and Fracturing of Rocks. McGraw-Hill.

Reference Books:

1. Passchier, C.W., and Trouw, R.A.J. (1996). Microtectonics, Springer.
2. Ramsay, J.G. & Huber, M.I. (1983). The Techniques of Modern Structural Geology. Vol. 1.Academic Press.
3. Ramsay, J.G. & Huber, M.I. (1987). The Techniques of Modern Structural Geology. Vol. 2.Academic Press.
4. Twiss, R.J. &Moores, E.M. (1992) Structural Geology. W.H. Freeman & Company. Page 45 of 55
5. Turcotte, D.L. & Schubert, G. (2002). Geodynamics (2nd Edition). Cambridge University Press
6. Van der Pluijm, B.A. & Marshak, S. (2004). Earth Structure: An Introduction to Structural Geologyand Tectonics (2nd Edition). WW Norton & Company.