Name of Programme: M. Sc. Applied Geology
Course Code: GEO-502
Title of the Course: Structural Geology and Geotectonics
No of Credits: 03
Effective from AY: 2022-23

Prerequisites for the course:	Degree of Bachelor of Science in Geology from any UGC recognized University or an equivalent examination.	
Objective:	To provide a conceptual understanding of deformation processes and mechanisms at different levels in the Earth's lithosphere and their effects at different scales from regional to microscopic. Students will also be introduced to plate tectonics and tectonic processes in the context of major tectonic features present in different tectonic environments.	
Content:	**Module 1: Introduction to Deformation and Rock Mechanics** Components of deformation, Strain in 1D, 2D and 3D, strain ellipsoid, Pure shear and simple shear, progressive deformation, strain analysis. Introduction to stress, deviatoric and mean stress, Mohr Circle diagram. Rheology: elastic, viscous and plastic deformation, rheologic stratification of the lithosphere. Deformation microstructures and mechanisms, recovery and recrystallization. Fractures: brittle deformation mechanisms, failure and fracture criteria, types of fractures and joints. **Module 2: Fault and Fold Mechanics** Faults: Characteristics of faults and fault planes, movement mechanisms, role of fluids, brittle versus ductile faults, mylonites, shear sense indicators, shear zone kinematics. Folds: Mechanisms of folding, kinematic models of folding, Ramsay's classification of folds, superposed folding, occurrence and recognition. Cleavage and foliations. Linear structures and their interpretation. An overview of structures in contractional and extensional regimes with field examples. **Module 3: Geotectonics** Fundamental concepts of Geotectonics, Isostasy and geoid. Continental drift, Sea floor spreading, paleomagnetism and Plate tectonics. Supercontinent cycles. Volcanic and seismic belts of the Earth. Major tectonic features in intraplate settings and at convergent, divergent and transform plate margins.	15 hours 15 hours 15 hours
Pedagogy	Lectures/ tutorials/ assignments/ self-study	

References/ Readings	1. Condie, K. C. (2013). *Plate tectonics and crustal evolution*. Elsevier. 2. Davis, G.H. and Reynolds, S.J. (1996). *Structural Geology of rocks and regions*, John Wiley and Sons. 3. Fossen, H. (2010). *Structural Geology*, Cambridge University Press. 4. Ghosh, S.K. (1993). *Structural Geology: Fundamentals, and modern developments*, Pergamon Press. 5. Means, W. D., and Williams, P. F. (1976). *An outline of structural geology*. John Wiley. 6. Passhier, C. and Trouw, R.A.J. (2005). *Microtectonics*. Springer, Berlin. 7. Pollard, D.D. and Fletcher, R.C. (2005). *Fundamentals of structural geology*, Cambridge University Press. 8. Ramsay, J.G and Huber, M.I. (1983). *Techniques of Modern Structural Geology: Vol. I and II*, Academic Press. 9. Ramsay, J.G. (1967). *Folding and Fracturing of Rocks*, McGraw-Hill Book Company, New York. 10. Turcotte, D.L., and Schubert, G. (2002). *Geodynamics*. Cambridge University Press. 11. Twiss, R.J. and Moores, E.M. (2007). *Structural Geology*. Freeman. 12. Van der Pluijm, B.A. and Marshak, S. (2004). *Earth structure: an introduction to structural geology and tectonics*, W.W. Norton and Company Ltd. 13. Windley, B.F. (1996). *The evolving continents*. Oceanographic Literature Review, 8(43), 785.
Course outcomes	1. Students will acquire a comprehensive understanding of how rocks deform at different scales 2. Students will be able to relate stress to strain in rocks and quantitatively measure strain. 3. Students will acquire in depth understanding of brittle and ductile deformation 4. Students will be able to relate deformation with the tectonic processes responsible for the formation of the different tectonic features present within the Earth's lithosphere.