STRUCTURAL GEOLOGY (ES411A)

UG Course; 2018-19-1st Semester

[Please see tentative Lecture Schedule in the next page]

Course Content:

Concepts of deformation and structures in Earth and planetary systems; Measurement and presentation of 1-, 2- and 3D structural elements; Concepts of Continuum, Tensor, Solid, Fluid, Force, Stress and Strain; Basics of rheology and deformation mechanisms; Structures associated with extensional, compressional, sliding tectonics and erosion; Fold morphology, kinematics and mechanism; Normal, reverse, oblique and strike-slip faults; Fold and thrust belts; Planar and linear fabrics; Ductile shear zones; Poly-phase (superposed) deformation and overprinting relationships; Deformation and Metamorphism; Applications of Structural Geology.

Lab-work: Measurement and presentation of structural elements; Stereographic projection and interpretation; Construction and interpretation of structural map, profile and balanced cross section; measurement of finite strain; studying geological structures under optical/electron microscope.

Selected Readings:

Ramsay, J.G., & Huber, M.I., 1983. The Techniques of Modern Structural Geology: V.1: Strain analysis. NY, Academic Press, 307 p.

Ramsay, J. G., and Huber, M. I., 1987. The Techniques of Modern Structural Geology, V. 2: Folds and Fractures, NY, Academic Press, 392 p.

Ramsay, J. G., and Lisle, R. J., 2000. The Techniques of Modern Structural Geology, V. 3, Applications of Continuum Mechanics in Structural Geology. Academic Press, 361 p.

Recommended readings:

Twiss, R.J. & Moores, E.M. 2005 Structural Geology, 2nd Edition. W. H. Freeman; 532p.

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Tentative Course Outline, 2018-19-I Semester

LEC: T Th 08:00 – 09:00; **LAB:** F 14:00 – 17:00

Day	Lecture Topics
July 31	Syllabus Discussion & Introduction to Structural Geology
Aug 02	Concept of dip, strike and contour; Outcrop patterns of different structures
Aug 07	Effects of topography on structural features. Topographic and structural maps
Aug 09	Planar and linear structures. Brief description of structural features for e.g. fold, fault, joints, trend and plunge etc. Measuring of trend and plunge
Aug 14	Theory of Stress and Strain.
Aug 16	Derivation of stress at a point and on oriented plane
Aug 21	Strain ellipses of different types and their geological significance
Aug 23	Failure Criteria
Aug 28	Stress tensor
Aug 30	Mohr diagram for three dimensional stress
Sep 04	Introduction to mechanics of fracturing and faulting - I
Sep 06	Introduction to mechanics of fracturing and faulting -II
Sep 11	Geometric and genetic classification of faults - I
Sep 13	Genetic classification of faults - I
	Sept 17-23 Mid-Sem Exam
Sep 25	Geometric and genetic classification of folds
Sep 27	Mechanics of folding: Buckling, Bending
Oct 02	**Holiday/Mahatma Gandhi Birthday**
Oct 04	Mechanics of folding: Flexural slip and flow folding
Oct 09	Description and origin of foliations and axial plane cleavage
Oct 11	Description and origin of lineation and relationship with the major structures
	Oct 13-21 Mid-Semester Recess

Oct 23	Superposed deformation
Oct 25	Introduction to micro-tectonics and porphyroblasts
Oct 30	Shear Zones
Nov 01	Brief description of fold and thrust belt
Nov 06	Introduction to basic Rheology
Nov 08	Introduction to Plate-tectonic
Nov 13	Introduction to Plate-tectonic
Nov 15	**Last day of class: Discussion**
	Nov 19-28 End-Sem Exam

Day	Labs
Aug 03	No lab. Enjoy the free time!
Aug 10	Measuring dip, strike,
Aug 17	Basic idea of topographic contour and V-rules
Aug 24	Structural contouring and 3-point problems
Aug 31	Problem related to stress
Sep 07	Strain analysis
Sep 14	Introduction to Geological maps: Lithological and Structural maps
	Sept 17-23 Mid-Sem Exam
Sep 28	Drawing profile sections
Oct 05	Drawing profile sections and interpretation of geological maps
Oct 12	Drawing profile sections and interpretation of geological maps
	Oct 13-21 Mid-Semester Recess
Nov 02	Stereographic projections of structural data
Nov 09	Stereographic projections of structural data
Nov 16	Discussion
	Nov 19-28 End-Sem Exam