

GEOL 360/560: STRUCTURAL GEOLOGY

Fall 2004

(Call # 03355/03368)

TIME: Lectures: 2.10 - 4.00 TF Clippinger 311.
Lab: 2.10 - 4.00 Th Clippinger 311.
Lab extra: 7.00 - 9.00 W Clippinger 311.

INSTRUCTOR: R. Damian Nance.

TEXTBOOK: R.G. Park, "Foundations of Structural Geology", 3rd Edition, Chapman and Hall, N.Y.
Course Manual (includes lecture notes and lab. assignments).

SCHEDULE

Sept. 7 INTRODUCTION: Course outline and policies. Basic concepts (1.1-1.8).

Description and Classification of Structures

Sept. 7 *FOLDS 1: Geometry, nomenclature, orientation, classification (3.1-3.4). Geometry of fold profile (3.5).*

Sept. 8 *FOLDS 2: Fold systems, folds in 3D, fold mechanisms, relationship to faults and shear zones (3.6-3.9).*

Sept. 9 **LAB. 1:** Geologic maps (x-xii).

Sept. 10 **Class cancelled.**

Sept. 13 *STEREOGRAPHIC PROJECTIONS 1: Theory (193-195). Use in plotting planar, linear data.*

Sept. 14 *STEREOGRAPHIC PROJECTIONS 2: Determination of angular relationships, use in rotational problems.*

Sept. 14 **LAB. 3:** Stereographic projection exercises (7-9 pm).

Sept 16 **Class cancelled (Lab 1 due).**

Sept 17 **Class cancelled.**

Sept 21 **Class cancelled.**

Sept. 23 **LAB. 2:** Fold geometry.

Sept 24 **Class cancelled.**

Sept. 27 *FAULTS & FRACTURES 1: Geometry, nomenclature, fault rock-types (2.1-2.3). Fault-plane features, fault associations (2.4-2.5). Inversion, joints, (2.9-2.10).*

Sept. 28 *FAULTS & FRACTURES 2: Thrust systems, extensional fault systems, strike-slip fault systems (2.6-2.8).*

Sept. 30 **LAB. 4:** Exercise in faulting

Oct. 1 *FOLIATION, LINEATION AND FABRIC 1: Types of foliation. Foliation and folding (4.1).*

Oct. 2 *FOLIATION, LINEATION AND FABRIC 2: Types of lineation. Boudinage, fabric (4.2-4.4).*

Mechanics of Deformation

Oct. 4 *STRESS: Relation to force, normal and shear stresses, stress on a plane, hydrostatic and deviatoric stresses, stress fields (5.1-5.7).*

Oct. 5 *STRAIN: Types, measurement, strain ellipse, pure and simple shear (6.1-6.5). Volume changes, graphical representation, progressive deformation and relation to stress (6.6-6.9).*

Oct. 7 **LAB. 5:** Exercise in rock fabrics.

Oct.	8	Class cancelled.
Oct.	12	Mid-term Exam (25%)
		[Lecture material through “Stain” (1.1-6.9) plus simple map and stereonet problems]
Oct.	14	MECHANICAL PROPERTIES 1: Elastic and viscous strain, rock behavior, rock strength (7.1-7.4). Effects of time, confining pressure and temperature on rock strength (7.5-7.6).
Oct.	15	MECHANICAL PROPERTIES 2: Effects of pore pressure and strain rate on rock strength, mechanisms of rock deformation (7.7-7.10).
		Field Trip (\$15-20)
Oct.	16	Valley and Ridge folding at Hancock, Md.
Oct.	17	Blue Ridge folding at South Mountain, Md.
Oct.	19	STRAIN DETERMINATION 1: Stain axes, use of spherical objects (8.1-8.2). Use of deformed conglomerates (8.3).
Oct.	21	STRAIN DETERMINATION 2: Use of fossils, folds and balanced sections (8.4-8.7).
Oct.	22	LAB. 6: Determination of finite strain.
Oct.	26	MECHANICS OF FAULTING: Shear stress and brittle failure (9.1). Fault orientation and stress, faulting and earthquakes (9.2-9.3).
Oct.	28	LAB. 7: Use of the Mohr diagram.
Oct.	29	MECHANICS OF FOLDING 1: Fold mechanisms and geometry (10.1). Buckling (10.2).
Nov.	2	Class cancelled.
Nov.	4	LAB. 7: Mock Lab. Exam Exercise (take home).
Nov.	5	Class cancelled.
Nov.	9	MECHANICS OF FOLDING 2: Shear folding, fold interference (10.3). Kink bands, controls on fold mechanism (10.4-10.5). Shear zones (10.6).
Nov.	11	INTERPRETATION OF MINOR STRUCTURES 1: Structures associated with bedding plane slip and the interpretation of flexural slip folds. Axial planar cleavage and its relation to shear folds.
Nov.	12	INTERPRETATION OF MINOR STRUCTURES 2: Determining the sense of fault movement from structures associated with faulting. Derivation of tectonic vectors from structures associated with thrusting. Derivation of shear sense from kinematic indicators in ductile shear zones.
Nov.	16	Review of Mock Lab Exam.
Nov.	17	Lab. Exam (40%): 1.00-5.00
Nov.	20	Final Exam (25%): 12.20-2.20
		(Lab. grade 10%)

COURSE POLICIES

- A. Grades are based on a 2-hour mid-term exam worth 25% of the overall grade, a 3-hour lab. exam worth 40%, and a non-comprehensive 2-hour theory exam worth 25%. The remaining 10% is based on lab. work. To receive full credit, all lab. exercises must be completed and submitted for grading within one week of their assignment. Late labs will receive only partial (50%) credit, and lab. exercises a week or more overdue will be corrected but not graded. Failure to complete all lab. exercises will result in an I grade for the course.
- B. Attendance is expected at all classes. Unexcused class absences may be penalized through lowered academic grades.
- C. Academic dishonesty will be penalized by an F grade for the course.