EAS 4200/6320
STRUCTURAL GEOLOGY AND CONTINUUM MECHANICS
Spring, 2008

INSTRUCTORS:

Dr. Andrew Newman
ES&T 2254
anewman@gatech.edu
(404) 894-3976

Dr. Kurt Frankel
ES&T 2232
kfrankel@gatech.edu
(404) 894-4008

TEACHING ASSISTANT:

Lujia Feng
ES&T 2120
lfeng@gatech.edu
(404) 385-4408

COURSE WEBSITE:
http://geophysics.eas.gatech.edu/classes/Structure

LECTURE:
Tuesday and Thursday, 9:35 to 10:55 am, ES&T L1116

LAB:
Friday, 12:05 to 1:55 pm, ES&T L1116
Laboratory exercises are due at the beginning of the lab period following the one in which they were assigned.

OFFICE HOURS:
Instructors - Tuesday 11:00 am to 12:30 pm, Friday 2:00 - 3:30 pm, and by appointment
Teaching Assistant - TBA

COURSE OBJECTIVES:

This course is designed to engage earth science and engineering students interested in applying field and theoretical methods to understand the structural make-up of the earth's crust. Students will develop the essential tools to reconstruct the dynamic state and history of earth's deformational systems. The information is useful for a wide range of natural and anthropogenic topics, including: plate tectonics; earthquake occurrence; landscape evolution; groundwater and petroleum reservoirs; and mineral resources. For students with previous coursework in mechanics, this is an opportunity to apply that knowledge to much larger bodies than the tallest buildings, longest bridges or widest dams. A greater appreciation of the forces and time involved in developing faults, folds, basins, and mountains should be a goal of all students interested in this course. We will examine the application of stress and strain on rocks, the development of faults and folds, orogenic belts and plate tectonics, the construction and interpretation of geologic maps, and basic field techniques in structural geology (yes, there will be field trips!).

REQUIRED TEXT:
Structural Geology (2nd edition - copyright 2007), by R.J. Twiss and E.M. Moores

COURSE COMMUNICATIONS:
You will occasionally receive class information via email to your prism account. Because this information may not be communicated in class, you should be sure to read messages identified as [Structure]. In emailing us for class, please add [Structure] to the subject line and identify yourself by name in the message since not all prism accounts clearly identify the email's author.

GRADING:
Your final grade will be determined based on laboratory exercises (including field exercises) and two exams (one mid-term and one final). There will be NO extra credit.

Mid-term Exam (February 21st) - 20%
Final Exam (April 28th, 8:00 am) - 30%
Laboratory/Field Exercises - 50%

FIELD TRIPS:
Field trips are an important and MANDATORY part of this course. Material covered on field trips will be included on the final exam.

Saturday, March 8th - TBD
Friday to Sunday, April 4th to 6th - western Appalachian transect

ACADEMIC HONESTY:
General: It is expected that all students are aware of their individual responsibilities under the Georgia Tech Academic Honor Code, which will be strictly adhered to in this class. The complete text of the Georgia Tech Academic Honor Code may be found at: http://www.deanofstudents.gatech.edu/integrity/policies/honor_code.html.

Laboratory Exercises: Students are encouraged to work together on developing solutions to laboratory exercises; however, the solutions/answers that are turned in must be the work of each individual. Include the name of those individuals consulted for each problem that you sought aid in answering (including instructors or teaching assistant).

Exams: All information required for exams will be supplied. Reference to texts or other documents during exams is strictly forbidden. The use of electronic devices (e.g., cellular phones, computers, iPods, etc.) other than non-programmable calculators during exams is not allowed.

COURSE SCHEDULE (subject to change):

T **1/8** - Organization/Introduction to Structural Geology (Chapter 1) [KF]

Th **1/10** - Rock Types and Locations (Chapter 1) [AN]

F **1/11** - Lab: **no lab**

F **1/11 - last day to register and/or make schedule changes**

T **1/15** - Stratigraphic Principles, Primary Structures, and Cross-Cutting Relations [KF]

Th **1/17** - Fractures and Joints (Chapter 2) [KF]

F **1/18 -** Lab: Attitudes of Lines and Planes

T **1/22** - Faults (Chapters 3 and 4) [AN]

Th **1/24** - Faults (Chapters 5 and 6) [AN]

F **1/25 -** Lab: Topographic Maps, Outcrop Patterns, and Structure Contours

T **1/29** - Stress (Chapter 7) [AN]

Th **1/31 -** Stress (Chapter 7) [AN]

F **2/1 -** Lab: Stereographic Projections

T **2/5** - Fracture Mechanics: Theory (Chapter 8) [AN]

Th **2/7 -** Fracture Mechanics: Applications (Chapter 9) [AN]

F **2/8 -** Lab: Mohr Circles

T **2/12 -** Folds (Chapter 10) [KF]

Th **2/14 -** Folds (Chapter 10) [KF]

F **2/15 -** Lab: Interpretation of Geologic Maps

T **2/19 -** Fault-Related Folds [KF]

Th **2/21** - **Midterm Exam**

F **2/22 -** Lab: Geologic Cross-Sections

T **2/26** - Foliations and Lineations (Chapter 11) [KF]

Th **2/28** - Foliations and Lineations (Chapter 11) [KF]

F **2/29** - Lab: **no lab**

F **2/29** - **last day to drop course with a grade of "W"**

S **3/1 - FIELD TRIP**

T **3/4** - Strain (Chapter 12) [AN]

Th **3/6** - Geometry of Strain (Chapter 12) [AN]

F **3/7** - Lab: Faults

T **3/11** - Kinematic Analysis of Folds (Chapter 13) [KF]

Th **3/13** - **no class**

F **3/14** - Lab: **no lab**

T **3/18** - **Spring Break (no class)**

Th **3/20** - **Spring Break (no class)**

T **3/25** - Analysis of Foliations and Lineations (Chapter 14) [AN]

Th **3/27** - Observations of Strain (Chapter 15) [AN]

F **3/28** - Lab: Folds

T **4/1** - Rheology (Chapter 16) [AN]

Th **4/3** - Geology of Georgia and the southern Appalachians (handout) [KF]

F **4/4** - **no lab: leave for field trip at noon**

F - Su **4/4 to 4/6 - <u>FIELD TRIP</u> (leave Friday afternoon and return Sunday evening)**

T **4/8** - Field trip wrap-up [AN and KF]

Th **4/10** - Rheology (Chapter 16) [AN]

F **4/11** - Lab: Balanced Cross-Sections

T **4/15** - Deformation Mechanisms (Chapter 17) [KF]

Th **4/17** - **no class**

F **4/18** - Lab**:** Geophysical Techniques in Structural Geology

T **4/22** - Deformation Mechanisms (Chapter 17) [KF]

Th **4/24** - Tectonic context of structures (Chapters 19 and 20) [KF]

F **4/25** - Lab: **no lab; last day of classes for Spring semester**

M **4/28** - **Final Exam (8:00 to 10:50 am)**