Earth Structure & Dynamics

GEOLOGY 323

Spring 2018 **MWF** **11:00-11:50 AM**

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Preamble

We inhabit a planet whose structure and tectonics are both dynamic and fascinating. Our class will explore the architecture of the Earth's interior and focus on the processes that cause earth materials to deform. Deformation occurs at many scales, ranging from lithospheric plates thousands of kilometers wide, to slip at the atomic scale in the crystal lattice of individual mineral grains. We will combine aspects of structural geology and geophysical techniques to investigate both the morphology and composition of the Earth's interior. After making those observations we will pull it together to understand global tectonic processes. To fully appreciate how the Earth works we must also delve into the geologic past, for the rock record offers us a temporal understanding of tectonic processes. We will examine both descriptive and quantitative aspects of structural geology and tectonics, all the while improving our three-dimensional thinking as the semester progresses. I hope you'll enjoy this course, let the journey begin!

Dates	***The Plan***	***Reading Assignments***
Jan 17-19	Introduction, Overview, & Expectations Games Structural Geologists Play	Fossen- Ch. 1
Jan 22-26	Thinking in Three-Dimensions Stress & Strain	Fossen- Ch. 2
Jan 29- Feb 2	Geologic Structures 1- Rock Bodies & Contacts	*Bailey & Hatcher, Ch. 2*
Feb 5-9	Geologic Structures 2- Fractures & Folds *Problem Set #1 due Friday, Feb 9*	Fossen- Ch. 7, 8, & 11
Feb 12-16	Geologic Structures 3- Foliation & Fabric	Fossen- Ch. 12, 13, 14, 15
Feb 19-23	Geochronology- Getting Dates & Determining Rates	*Bailey & Hatcher, Ch. 3*
Feb 24	***Geology Departmental Field Trip – Student-Led Trip to Research Sites in Virginia***	
Feb 26- Mar 2	The Gravity of the Situation- Geophysical Methods 1 *Midterm Exam- Friday, Mar 2*	*Bailey & Hatcher, Ch. 4*
Mar 3-11	**Spring Break**	
Mar 12-16	Magnetic Attractions- Geophysical Methods 2	*Bailey & Hatcher, Ch. 4*
Mar 19-23	Journey to the Center of the Earth *Problem Set #2 due Monday, Mar 19*	*Smith & Pun, Ch. 8.2, 11.6-11.8*
Mar 27-31	What's Shaking? Earthquakes & Seismology	*Bailey & Hatcher, Ch. 4* *Smith & Pun, Ch. 8.1, 8.3-8.5*
Apr 2-6	Paleotectonics- Perspectives on Appalachian Geology	*Bailey Field Guide*

Apr 7-8	***Class field trip to western Virginia***	
Apr 9-13	Stress & Strain Revisited *SE GSA April 12-13*	Fossen- Ch. 3, 4, & 5
Apr 16-20	Global Kinematics & Plate Tectonics *Problem Set #3 due Friday, Apr 24th*	*Smith & Pun, Ch. 10 & 12*
Apr 23-27	Plate Tectonics- The Sequel & Finale	Fossen, Ch. 16, 17, & 18

Final Exam: Monday, May 4, 9 am - noon

Grading

Mid-Term Exam	12%	Lab Exercises/Projects	33%
Final Exam	30%	Group Tectonics Project	5%
Problem Sets	15%	In-Class Participation	5%

Text Fossen, H., 2010 or 2016, *Structural Geology*

Other readings will include journal articles, chapters from useful textbooks, and some of my geological diatribes/blog posts. These other readings are shown in *italics* above. These will be posted on the class Blackboard site or will be available in the Geology computer lab (*aka: Chamber of Delights/Room 207*).

Although reading textbooks has become unfashionable, I strongly encourage you to spend some quality time reading the textbook and other materials- it will help you understand the material in a richer and more meaningful way. The Fossen textbook is well illustrated and quite readable.

Field Trips

Geology is a science that goes to the field for its primary data. Practicing geology in the field will make you a much better geologist. Field trips are an important part of the class and are ***required***. There are 2 off-campus field trips associated with the lab and a weekend trip to western Virginia (Apr. 7-8). The weekend trip will leave at 1 p.m. on Friday and will return to campus by 4 p.m. on Sunday. Invariably these trips are somewhere between fun and epic, forming an invaluable component of your geologic education.

Problem Sets

Three problem sets will be assigned during the semester. Problems are quantitative in nature and lots of fun. Part of doing science requires quantitative thinking. I hope that by the end of the semester you feel more comfortable and confident with your problem solving abilities. Start working on the problems early and drop by my office if you have questions.

In-Class Activities

I want this class to be more than just lecture so during almost every class there will be some type of in-class activity. These activities are designed to get you thinking and make you an active participant in learning. Some of the questions/exercises will be similar to those on problem sets and exams. Much of this will be done in small groups and many times the work will be collected.

Web Resources

I will post much, but not all, of the course materials on Blackboard- *http://blackboard.wm.edu/*

Office Hours

My formal office hours are Wednesdays from 1 to 4 p.m. You are welcome to drop by at other times, however I may be busy or in the lab working with my research students, but with patience you are likely to find me.

Useful Things to Have in Class EVERYDAY

Ruler Protractor Colored Pencils Laptop computer with Google Earth installed