Lecture:	Monday, Wednesday, 4:30 - 5:45	114 Bretske Hall
Instructor:	J. W. Mies, Ph.D. Office phone: 755-4606 E-mail: jmies@cecasun.utc.edu	102 Bretske Hall www: http://www.utc.edu/~jmies
Text:	Moores, E. M. & Twiss, R. J. 1995. *Tectonics*. W. H. Freeman & Co., New York, 415 p.	
Prerequisites:	Geology 111 or approval of the instructor	
Hours:	3 credit hours	3 contact hours
Description:	In GEOL 407, students should gain an appreciation for large-scale motion and deformation of Earth's crust and upper mantle, i.e. plate tectonics. By way of informal lectures, in-class exercises, problem sets, research of recent geophysical events, and student-led discussions, students will be presented with basic techniques of geophysical study, evidence for Earth's dynamic character, and models of tectonic processes.	

TENTATIVE LECTURE SCHEDULE

Date	M	W	Topic	Chapter(s)
Jan	7		Intro and overview, the plate tectonic revolution	Ch. 1, Interlude
		9	Earthquakes, seismic waves, seismic studies	2.2, p.317, notes
	14		Seismic studies (cont'd), gravity	2.2, p.317, 2.3, notes
		16	Gravity corrections and anomalies, isostasy	2.3, notes
	21		**Martin Luther King Holiday, no class**	
		23	Isostacy (cont'd), magnetics	2.3, 2.4, notes
	28		Magnetic anomalies, pole reversals, paleomag	2.4, notes
		30	Heat, heat sources, heat flow	2.4, notes
Feb	4		Tectonic features of oceanic and continental crust	Ch. 3
		6	Motions of plates on a sphere	4.1-4.5
	11		Driving forces of plate tectonics	4.6-4.7
		13	**MID-TERM EXAM**	
	18		Divergent margins and rifting	Ch. 5
		20	Rifting (cont'd), transform faults	Ch. 5, 6
	25		Transform plate boundaries	Ch. 6
		27	Convergent margins	Ch. 7
Mar	4		Convergent margins (cont'd), collisions	Ch. 7, 9
		6	Collisions (cont'd)	Ch. 9
	11		**Spring Break, no class**	
		13	**Spring Break, no class**	
	18		Appalachian-Caledonide orogenic belt, tectonics	12.6
		20	Appalachian-Caledonide orogenic belt (cont'd)	12.6
	25		Selected orogenic belt, TBA	12.x
		27	Selected orogenic belt, TBA	12.x
Apr	1		Selected orogenic belt, TBA	12.x
		3	**Student-led discussion (_____, _____, _____)**	
	8		**Student-led discussion (_____, _____, _____)**	
		10	**Student-led discussion (_____, _____, _____)**	
	15		**Student-led discussion (_____, _____, _____)**	
		17	**Student-led discussion (_____, _____, _____)**	
	22		Synthesis/review, journal and map due	
		24	**FINAL EXAM** ***Wednesday, April 24, 5:30 - 7:30 p.m.***	Ch. 1-7, 9, 12.6, 12.x, discussions

GRADES

The final numerical grade for this class will be computed as follows.

20 %	Midterm exam (February 13)	_____	x 0.20 =	_____.
25 %	Final exam (April 24, 5:30 - 7:30 p.m.)	_____	x 0.25 =	_____.
20 %	Average of 3 or 4 problem sets	_____	x 0.20 =	_____.
12 %	Geophysical-events journal and map (due April 22)	_____	x 0.12 =	_____.
13 %	Student-led discussion and article summary (date TBA)	_____	x 0.13 =	_____.
10 %	Attendance, participation, and attitude	_____	x 0.10 =	_____.
		TOTAL (Final numerical grade)	=	_____.

The *final letter-grade* for this class will conform to the following scale, based upon the computed *final numerical grade*.

F≤59.9, D=60-69.9, C=70-79.9, B=80-89.9, A=90-100

EXAMS

Exams will include questions of multiple-choice, matching, and fill-in-the-blank formats, and may require simple computation. There will also be at least one question on each exam requiring a short written answer (several well-composed sentences, plus pertinent diagrams).

The final exam will be comprehensive, meaning that it will cover material from the entire semester, including student-led discussions.

Make-up exams will be provided in only the most adverse circumstances (e.g. serious illness). Documentation of the circumstance (e.g. doctor's note) may be required.

Arrangements for a make-up exam must be made with the instructor prior to the scheduled time of the regular exam.

In the event that a student is provided with a make-up exam, he or she should anticipate that it is likely to be different from the regular exam.

OTHER POLICIES

Students are expected to attend class regularly. Attendance and participation will be considered in the final grade. (See *Grades* .)

Students are expected to be punctual, prepared for class, attentive, and respectful of others.

Students that arrive late for an exam may not be permitted to take the exam.

Assignments are expected to be turned in on time. Late assignments will be accepted in only the most adverse circumstances (e.g. serious illness or accident). Documentation of the circumstance (e.g. doctor's note or police report) may be required.

All students are expected to follow the UTC honor code.

ATTENTION: If you are a student with a disability and think that you might need special assistance or special accommodation(s) in this class or any other class, call the Office for Students with Disabilities / College Access Program at 755-4006 or come by the office, 110 Frist Hall.

This syllabus is tentative; students are expected to keep informed of changes.

Information and materials related to this class can also be found on the web; direct your browser to

http: / / www.utc.edu / ~jmies / g407 / g407.html .

PROBLEM SETS

Requirements for this course include three or four problem sets related to earthquakes, seismic reflection and refraction, gravity, isostacy, heat flow, etc. These problem sets involve simple calculations and/or interpretation of data.

GEOPHYSICAL EVENTS JOURNAL AND MAP

Recent seismicity, volcanic eruptions, etc.

Students are expected to keep abreast of seismic (M≥5), volcanic, and other pertinent events (meteorite falls, tsunami, etc.) on Earth during the semester (January 1 through April 20). Each student will record these events in a journal and will mark their locations on a world map of appropriate scale (Mercator-projection is preferred); locations of significant events should be indexed to journal entries. (Color-coded, adhesive dots with index numbers work well.) The geophysical-events journal and map are due on the last day of classes, Monday, April 22. Students may also be called upon in class to report on recent geophysical events and should always be prepared to do so.

Information on recent geophysical events is most easily acquired from internet resources. It is important that students become familiar with use of the internet for research needs.

Contact information for some of the useful internet resources is listed below. Many of the pertinent web sites can also be accessed from the Geology 407 web page (**http://www.utc.edu/~jmies/g407/g407.html**).

Web Sites

EARTHQUAKES

The Center for Earthquake Research and Information (CERI)

http://www.ceri.memphis.edu/

International Data Center (IDC) of the Comprehensive Test Ban Treaty (CTBT)

http://www.pidc.org

National Earthquake Information Center (NEIC)

http://wwwneic.cr.usgs.gov/

VOLCANOES

VolcanoWorld

http://volcano.und.nodak.edu

Global Volcanism Program (Global Volcanism Network Bulletin)

http://www.nmnh.si.edu/gvp/

Keweenaw Volcano Observatory (a premier volcano page by Michigan Technological University)

http://www.geo.mtu.edu/volcanoes

Volcano livecams (certainly not a comprehensive list)

http://web.poseidon.nti.it/Sorvis/	Mt. Etna, etc.	Italy
http://www.stv.ne.jp/test1/usu.html#	Mt. Usu	Japan
http://www.cenapred.unam.mx/mvolcan.html	Popo	Mexico
http://www.ucol.mx/volcan/envivo_naranjal.html	Colima	Mexico

E-mail Services

Automatic Data Request Managers (requests of an AutoDRM for earthquake data via e-mail)

The e-mail request, which is actually a short computer program, should be as follows:

BEGIN	
DATE1 yyyymmddhhmm	*Information following DATE1 and DATE2 indicate the*
DATE2 yyyymmddhhmm	*beginning and end of the period of interest; yyyy = year,*
DETEC	*mm = month, dd = day, hh = hour, mm = minute, all numeric,*
EMAIL *your@e-mail.address*	*using universal time (GMT).*
STOP	

Send this message, with no subject line, to

autodrm@gldfs.cr.usgs.gov

Results of your request (detections of the U.S. National Seismograph Network) will be returned to you via e-mail, usually within a few minutes.

Complete guides (manuals) that explain additional request codes are available from the AutoDRM's.

Bigquake

The subscription form for the list *Bigquake* (e-mail alerts of large earthquakes) is available at

http://neic.usgs.gov/neis/data_services/data_services.html

Volcano

To subscribe to the list *Volcano* (e-mail postings from volcanophiles), send an e-mail message to

listserv@asu.edu

The e-mail message should have no subject and should consist of one line,

subscribe volcano *YourFullName*

STUDENT-LED DISCUSSIONS

Student-led discussions of articles from *Scientific American* and *Science* (see list) are tentatively scheduled for five class meetings at the end of the semester. By the time of the mid-term exam (February 13), each student should have selected (and had approved) the article that he/she will lead discussion of. These 20-minute discussions will be scheduled (TBA) in a logical order.

To help ensure worthwhile discussions, the discussion leader is expected to provide other students of the class with a **one-page summary** of their article (discussion leader's wording), plus pertinent illustrations, at least two class periods prior to the scheduled time of the discussion.

To help ensure that students are prepared for each discussion, each student member of the audience is expected to prepare and turn in a **question** related to each article. This question should demonstrate that important points of the article have been considered. Questions are due at the **beginning** of class on the day that the article is scheduled to be presented.

Participation in these discussions will weigh heavily on the "attendance, participation, and attitude" aspect of the final grade.

Articles for student-led discussions

Asphaug, E. 2000. The small planets. *Sci. Am.* **282** (5), 46-55.
Bonatti, E. 1994. The Earth's mantle below the oceans. *Sci. Am.* **270** (3), 44-51.
Bullock, M. A. & Grinspoon, D. H. 1999. Global climate change on Venus. *Sci. Am.* **280** (3), 50-57.
Coffin, M. F. & Olav, E. 1993. Large igneous provinces. *Sci. Am.* **269** (4), 42-49.
Dalziel, I. W. 1995. Earth before Pangea. *Sci. Am.* **272** (1), 58-63.
Fryer, P. 1992. Mud volcanoes of the Marianas. *Sci. Am.* **266** (2), 46-52.
Golombek, M. P. 1998. The Mars Pathfinder mission. *Sci. Am.* **279** (1), 40-49.
Gonzalez, F. I. 1999. Tsunami. *Sci. Am.* **280** (5), 56-65.
Green, H. W. II. 1994. Solving the paradox of deep earthquakes. *Sci. Am.* **271** (3), 64-71.
Gurnis, Michael. 2001. Sculpting the Earth from inside out. *Sci. Am.* **284** (3), 40-47.
Hoffman, P. F. and Schrag, D. P. 2000. Sowball Earth. . *Sci. Am.* **282** (1), 68-75.
Jeanloz, R. & Thorne, L. 1993. The core-mantle boundary. *Sci. Am.* **268** (2), 40-49.
Johnson, T. V. 2000. The Galileo Mission to Jupiter and … . *Sci. Am.* **282** (2), 40-49.
Milne, G. A. and many others, 2001. Space-geodetic constraints on glacial iso ... *Science* **291** , 2381-2385.
Pinter, N. & Brandon, M. T. 1997. How erosion builds mountains. *Sci. Am.* **276** (4), 74-79.
Smith, D. E. *and many others,* 1999. The global topography of Mars ... *Science* **284** , 1495-1502.
Taylor, S. R. & McLennan, S. M. 1996. The evolution of continental crust. *Sci. Am.* **274** (1), 76-81.

TECTONICALLY SIGNIFICANT FEATURES

By the conclusion of the class, students should be familiar with these features, particularly with regard to their location and tectonic significance.

Geographic features (and political places)

Afar
Africa
Alaska Peninsula
Aleutian Islands
Alpine-Himalayan Mountain system
Andes Mountains
Antarctica
Appalachian-Caledonide Mountain system
Ascension Island
Asia
Austral Islands
Australia
Azores (islands)
Baja California
Banda (Banda Arc, Banda Sea)
Basin-and-Range province (USA)
Benue trough
Canarie Islands
Cape Mendocino, California
Cape Verde Islands
Caribbean Sea
Cascade Mountains
Central America
Colorado Plateau
East-African rift valley
Easter Island
Emperor Sea Mounts
Galapagos Islands
Gilbert Islands
Gulf of Aden
Gulf of California
Hawaiian Islands
Iceland
India
Indonesia
Iran
Japan (Japanese Islands)
Kamchatka Peninsula
Kermadek Islands
Kuril Islands
Lake Baikal
Lesser Antiles
Macquarie Island
Mariana Islands
Marshal Islands
Mediterranean Sea
New Guinea
New Zealand
North America
Pitcairn Island
Red Sea
Reunion Island
Ryuku Islands
Saudi Arabia
Sea of Japan
Solomon Islands
South America
South Sandwich Islands
Tiawan
Tonga
Tuamotu Islands
Vanuatu
Zagros Mountains

Lithospheric Plates and Related Features

African plate
Antarctic plate
Arabian plate
Australian-Indian plate
Caribbean plate
Cocos plate
East Pacific rise
Eurasian plate
Farralon plate
Galapagos triple junction
Juan de Fuca plate
Kula plate
Mendocino triple junction
Mid-Atlantic ridge
Nazca plate
North American plate
Pacific plate
Phillipine plate
Rivera triple junction
San Andreas Fault
South American plate
South Sandwich plate

Volcanoes

Most of these volcanoes are active (or recently active); some have had historically important eruptions.

Arenal
Augustine
Bezymianny
Cameroon
Cerro Negro
Colima
Etna
Fujiyama
Galeras
Hekla
Karymsky
Kilauea
Krakatau
Lascar
Long Valley caldera
Maderas
Mauna Loa
Mayon
Merapi
Pacaya
Pelée
Pinatubo
Poas
Popocatepetl
Rabaul
Ruapehu
Rincon de la Vieja
Saint Helens
San Cristobal
Soufriere Hills (Montserrat)
Stromboli
Surtsey
Tambora
Unzen
Usu
Vesuvius
White Island