PTYS 512 Planetary Global Tectonics
Co-convened with GEOS 419/519: Physics of the Earth
Fall 2016 SYLLABUS

Lectures: T-Th 11:00-12:15 pm Gould-Simpson 203

Instructors: Randy Richardson, GS 525, 621-4950, rmr@email.arizona.edu
Office Hours: Monday 1-2pm and Wednesday 11-noon, and by appointment
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Office hours: by appointment

Required Text: Turcotte & Schubert, 2014, *Geodynamics*, 3rd Edition, Cambridge University Press (everyone should own this text; older editions OK, but are pre-Matlab; the 2002 version ebook is available through the UA library at http://ebooks.cambridge.org/ebook.jsf?bid=CBO9780511807442)

Supplementary Reading:
Handouts (covering aspects of Tensors, Heat Flow, Rheology, Seismology, Plate Kinematics/Dynamics, Spherical Harmonics, and Planetary Global Tectonics), all of which will be posted to the class D2L site.

Prerequisites: Calculus and Math 254: Ordinary Differential Equations. A previous course in geophysics is strongly encouraged but not required. Please Note: If you have no geology background, we will work to set up a one hour a week session that you need to attend for the first month or so to come up to speed in the geosciences.

Class D2L site: the D2L course website will be used to post content, including homework, etc., and for handing in most homework. The class will also use Matlab, available to all UA students at no cost (http://softwarelicense.arizona.edu/mathworks-matlab) for homework. Mastering Matlab is a learning outcome for this course. There is material posted on D2L to help those who are not familiar with Matlab get started, and a tutorial.

Course Content and Structure: Geos 419/519: *Physics of the Earth* and PTYS 512: *Planetary Global Tectonics* are co-convened courses, which means they will meet together. Dr. Alfred McEwen will be involved with this co-convened course, a great benefit for students in both courses. Dr. McEwen will attend class regularly and will provide some lectures on planetary global tectonics of interest/value for all students. We will use one D2L course website (identified as Geos 419/519) for students in both Geos 419/519 and PTYS 512. All students will have and complete the same assignments, exams, etc. The grad student term project for students in PTYS 512 will be guided/graded by Dr. McEwen and for students in Geos 519 it will be guided/graded by Dr. Richardson (unless a Geos 519 student wishes to do a planetary science term project and Dr. McEwen agrees to guide it). The objective of this co-convened class is to apply quantitative methods to large-scale tectonic processes on the Earth and other planets. The major topics will

include plate tectonics and kinematics, stress/strain and rheology of planetary materials, flexure, heat transfer, global gravitational fields, and some basics of seismic waves. Much of the necessary mathematics and physics to understand these topics will be developed in this course. We may read current literature and discuss it in class to supplement readings from the text, Turcotte & Schubert.

Grades are assigned on the A, B, C, D, E system.

Grading Basis: Undergrads

40% Homework
25% Midterm exam* (date approximately 27 September)
35% Final exam** (hopefully Friday, 9 Dec, time TBA)

Grading Basis: Graduate Students

30% Homework
20% Midterm exam* (date approximately 27 September)
20% final exam** (hopefully Friday, 9 Dec, time TBA)
30% term paper

Make-up exams by prior arrangement only.

* The class may choose to have a second midterm. If it does, the UG grading will change to 30% HW, 20% each midterm, and 30% for the final; the Grad Student grading will change to 30% HW, 15% each midterm, 20 % final, and 20% term paper.

** Final exam: Hopefully Friday, 9 Dec, TBA (Note, this is not the official final exam slot for this class (Monday, 12 December 10:30-12:30), which occurs the following week during the Fall AGU meeting. If we can't come to an agreement on an alternative time for the final, it will have to be during the regularly scheduled slot, and proctored by someone else).

Cheating: Don't Do It! Cheating is any attempt to represent someone else's work (on exams, or any other course work) as your own. Submission of any written work that partially or fully duplicates material from the web, your fellow students, or any other source constitutes plagiarism. Students are encouraged to work together on the homework sets, but unique written responses must be handed in by each student. Do not post/share Matlab code, although I encourage more experienced Matlab users to help less experienced students understand coding principles and techniques. This class operates on the honor system but I will monitor submitted material and scripts in detail. Instances of plagiarism will lead to a zero on that assignment, with harsher penalties for repeat offenses or extreme cases. Plagiarism on a midterm or final exam will lead to a failing grade for the course. All students in this course are expected to abide by the Code of Academic Integrity, which can be found at https://deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity. The Code of Academic Integrity will be strictly enforced in this course.

Special Needs? Students requiring accommodation in testing or note taking should work with the Disability Resource Center on campus. It is very helpful if you let me know about any accommodations that might be needed as early in the semester as possible.

Tentative Schedule of Topics*:

	Topic	~# Lectures	(T&S Chapter.Sections)
1.	Introduction	…1	
2.	Plate kinematics and dynamics	2	1.1-1.21, handout
3.	Cartesian tensors	2	Handout
4.	Stress and strain	3	2.1-2.7; 3.1-3.8
5.	Plate flexure	…2	3.9, 3.13-3.18
	Midterm hour exam (approximately Tuesday, 27 September) Grad Student Term Project topics approved by midterm date		
6.	Seismic waves	3	Handout
7.	Rheology	3	7.1-7.5, handout
8.	Heat flow & Mantle Convection	4	4.1-4.8, 13, 15, 16, 20-22, handout
9.	Spherical harmonics	3	Handout
10.	Gravity, geoid, and mantle	3	5.1-5.9, 5.12-5.14
11.	Planetary global tectonics	3	Handouts

* This schedule is necessarily tentative because Dr. McEwen and I are still sorting out when he will give the planetary global tectonics lectures, and what the specific topics will be. These will be special topics such as tidal heating, icy worlds, and processes at low g.

(N.B. This schedule is subject to change.)

Additional Course Policies:

Homework: You are encouraged to work together on the homeworks, but you must each turn in a unique homework written by you alone.

Feedback: Please let us know how you think the course is going. Suggestions for improvements and ideas for things to try (e.g., topics or activities you'd like to see) are both welcome.

Late work: If an assignment is due, you are responsible for turning it in, even if you are absent.

All assignments are due at the beginning of class on the due date. Any assignments turned in after that time will be considered late. Special circumstances will be considered. For example, several Planetary Science majors will be away from Sept 7-13 for the OSIRIS-Rex launch.

Academic Integrity: It is strongly recommended that all students read the University of Arizona's Code of Academic Integrity. All students in this course are expected to abide by this code, which will be strictly enforced. Cheating will not be tolerated in any form. Submission of any written work that partially or fully duplicates material from the web, your fellow students, or any other source constitutes plagiarism. Students are encouraged to work together on the homework sets, but unique written responses must be handed in by each student. Instances of plagiarism will lead to a zero on that assignment, with harsher penalties for repeat offenses or extreme cases. Plagiarism on the midterm or final exam will lead to a failing grade for the course.

Significant Dates:

Wed Sept 7 to Tues Sept 13: OSIRIS-Rex launch and field trip for PTYS majors.

Sunday Sept 25 to Wednesday Sept 28: GSA annual meeting.

Monday Oct 17 to Friday Oct 21: DPS annual meeting.

Thursday November 24– Thanksgiving, no class

Monday Dec 12 to Friday Dec 16: AGU annual meeting

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