Marine Tectonics – Spring 2013

Instructors: Gail Christeson (gail@ig.utexas.edu, 471-0463)
Sean Gulick (sean@ig.utexas.edu, 471-0483)
Nick Hayman (hayman@ig.utexas.edu, 471-7721)

Resource: Global Tectonics, 3rd Edition, Kearey, Klepeis and Vine. ISBN: 978-1-4051-0777-8, Wiley-Blackwell Publishers, 2008.

Meetings: GEO 3.222 at 2-3:30 on Tuesdays and Thursdays (lectures and in class exercises)

Office hours: 3:30-4:00 Tuesdays and Thursdays, 2:00-4:00 Wednesdays, EPS 4.102 (suite at the end of the hall) and by appointment

Assignments:
• In-class Exercises
• Problem Sets (6)
• Graduate students will present at least one summary of assigned paper(s)
(mandatory, graded as an in-class exercise)
• The final project will consist of both an oral presentation and a written report.
- Graduate students will prepare a report presenting original analysis of data (e.g., seismicity, potential fields, GPS, bathymetry) along a plate margin of their choice. The data are likely to derive from publications; however, analysis and synthesis of data should represent the student's work.
- Undergraduates will synthesize three or more journal articles about a plate margin of the student's choice, based on multiple techniques to understand the tectonics of the area. The written report should be 3-5 pages of text and include figures from and references to the journal articles.
- Part of the assignment is a *required* meeting with one of the instructors by **week 12** to discuss your plans for the final project assignment.

Grading:
- In-Class Exercises 15%; Problems sets 45%; final project is 40% (15% oral, 25% written)
- There are no in-class exams or final exam.
- There are no dropped grades.
- Email all instructors if you will be missing a class to make arrangements for make-up assignments.

Independent Inquiry Flag

This course carries the Independent Inquiry flag. Independent Inquiry courses are designed to engage you in the process of inquiry over the course of a semester, providing you with the opportunity for independent investigation of a question, problem, or project related to your major. You should therefore expect a substantial portion of your grade to come from the independent investigation and presentation of your own work.

Schedule

Week 1
15 January (Tu) – Course introduction, History of Plate Tectonics (Christeson)

17 January (Th) – Plate kinematics 1: plate boundaries and relative motions (Gulick)
Plate Kinematic Problem Set Assigned

Week 2
22 January (Tu) – Lithosphere-Asthenosphere, rheological definition (Hayman)
In-class Exercise- Lithosphere Strength

24 January (Th) –Earthquakes and fault-slip I (Hayman)
In-class Exercise- Earthquake Size

Week 3
29 January (Tu) – Earthquakes and fault-slip II (Hayman)
In-Class Exercise- Focal Mechanisms

31 January (Th) – Driving forces of plate tectonics and tectonics on other planets (Gulick)
Plate Kinematic Problem Set Due
Reading Assigned

Week 4
5 February (Tu) – Geophysical Techniques 1: Seismic reflection and refraction (Christeson)
Seismic Velocity Modeling Problem Set Assigned

7 February (Th) – Geophysical Techniques 2: Potential Fields and Seafloor Mapping (Christeson)
Reading Presentation

Week 5
12 February (Tu) – Geophysical Techniques 3: Geodetics, Paleoseismology, and Ocean Drilling (Gulick)
In-class Exercise- Coral and GPS Geodesy

14 February (Th) – Rifting 1: Isostasy and Crustal Extension (Hayman)
In-Class Exercise- Isostasy

Week 6
19 February (Tu) – Rifting 2: Rifting Processes (Hayman)
Seismic Velocity Modeling Problem Set Due

21 February (Th) – Seafloor Spreading 1: Structure of Ocean Crust (Christeson)
Magnetic Lineation Problem Set Assigned
Reading Assigned

Week 7
26 February (T) – Seafloor Spreading 2: Mid-Ocean Ridges and Spreading Rates (Hayman)
In-class Exercise- Heat Flow

February 28 (Th) – Seafloor Spreading 3: Ridge Upwelling and Accretion of Ocean Crust (Christeson)
Reading Presentation

Week 8
5 March (Tu) – Subduction Zones I: Structure of Convergent Margins (Gulick)
Subduction Interpretation Problem Set

7 March (Th) – Subduction Zones II: Fluids in Subduction Zones (Hayman)
Magnetic Lineation Problem Set Due

SPRING BREAK March 11-16 - No Class

Week 9
19 March (Tu) – Subduction Zones III: Earthquake and Tsunami Hazards (Gulick)
Explanation of Final Projects

21 March (Th) – Subduction IV: Ground-truthing Subduction Margins (Hayman)
In-class Exercise- Benioff Zones
Reading Assignment
Subduction Interpretation Problem Set Due

Week 10
26 March (Tu) – Transform Faults and Fracture Zones (Christeson)
Google Earth Problem Set Assigned

28 March (Th) – Strike-slip Plate Margins, Strain Partitioning and Geohazards (Christeson)
Reading Presentation

Week 11
2 April (Tu) – Microplates and Triple Junctions (Gulick)
In-class Exercise- Defining a Microplate I

4 April (Th) – Plate Boundaries in Transition (Gulick)
In-class Exercise- Defining a Microplate II

Week 12

9 April (Tu) – Climate-Tectonics Linkages (Gulick)
Google Earth Problem Set Due

11 April (Th) – Plate Tectonics over time (Hayman)
Caribbean Problem Set Assigned

Week 13
16 April (Tu) – Slab Rollback, Backarc Spreading and Basins (Christeson)
Final project advice

18 April (Th) – Hot Spots & LIPs (Christeson)
Final project advice

Week 14
23 April (Tu): Undergraduate Student Final Topic Presentations

25 April (Th): Undergraduate Student Final Topic Presentations
Caribbean Problem Set Due

Week 15
30 April (Tu): UnderGraduate Student Final Topic Presentations

2 May (Th): Graduate Student Final Topic Presentations

All Students Written Final Report Due by Midnight Electronically on the last Day of classes (May 3)