Geo 582: ST: Topics in Structure and Geophysics
Seismology and Geodesy

Instructor information
Instructor: Dr. Hilary Martens | Office: CHCB 329/330
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Lecture hours: TR 10:00-11:20 am | Office hours: TBD

Course description:
We will explore modern topics in geophysics, with a focus on seismology and geodesy. Advanced topics may vary with each offering, but will generally include selections from continuum mechanics, inverse theory, seismic wave propagation, earthquake location, tidal analysis and prediction, GNSS theory and analysis, spheroidal Earth deformation, and surface mass loading. Students will have the opportunity to engage directly with real seismic and geodetic datasets, as well as to investigate problems of personal interest through individual research projects. Prerequisites: PHSX207 or PHSX217 or equivalent, M263 or M172 or equivalent, and GEO439 or equivalent, or consent of instructor. 3 credits. Offered Spring.

Learning Outcomes:
By the end of the course, students should be able to:
1. Describe the causes and consequences of plate tectonics
2. Visualize and explain how the solid Earth responds to loading and gravitational forcing
3. Solve basic geophysical inverse problems
4. Quantify stress and strain relationships in solids
5. Assess the advantages and disadvantages of various geophysical methods used to probe Earth structure and dynamics
6. Acquire, process, visualize, and interpret seismic and geodetic data using computational tools
7. Apply geophysical theory and methods to problems in their own research areas
8. Appreciate the importance and relevance of geophysics to society
9. Navigate file systems from a Linux terminal and write simple shell scripts
10. Write simple computer programs in Python to solve geophysical problems

Course Calendar*:
* Subject to change: We will try to stick to the schedule as best as possible, but may need to adjust from time to time.

<table>
<thead>
<tr>
<th>Dates</th>
<th>Topic</th>
<th>Assignment</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Welcome</td>
<td></td>
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<tr>
<td>23 January</td>
<td>Welcome</td>
<td>Pre-Quiz</td>
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<tr>
<td>25 January</td>
<td>Linux Lab</td>
<td>Linux and Python Tutorials</td>
<td>Thursday 1 February at 10 am</td>
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<tr>
<td>Week 2</td>
<td>Earth Structure and Dynamics I</td>
<td></td>
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<tr>
<td>30 January</td>
<td>Planetary Formation and Evolution</td>
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<tr>
<td>1 February</td>
<td>Earth Structure</td>
<td>Problem Set 1</td>
<td>Thursday 8 February at 10 am</td>
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<tr>
<td>Week 3</td>
<td>Earth Structure and Dynamics II</td>
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<tr>
<td>6 February</td>
<td>Global Tectonics</td>
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<td>8 February</td>
<td>Heat Flow</td>
<td>Problem Set 2</td>
<td>Thursday 15 February at 10 am</td>
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<td>Week 4</td>
<td>Rock Mechanics</td>
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<tr>
<td>13 February</td>
<td>Rock Mechanics I</td>
<td></td>
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<tr>
<td>15 February</td>
<td>Rock Mechanics II</td>
<td>Problem Set 3</td>
<td>Thursday 22 February at 10 am</td>
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<td>Week 5</td>
<td>Earthquake Seismology I</td>
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<tr>
<td>20 February</td>
<td>Seismology I</td>
<td></td>
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<td>22 February</td>
<td>Seismology II</td>
<td>Problem Set 4</td>
<td>Thursday 1 March at 10 am</td>
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<tr>
<td>Week 6</td>
<td>Earthquake Seismology II</td>
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<td>27 February</td>
<td>Seismology III</td>
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<td>1 March</td>
<td>GMT Lab</td>
<td>GMT Tutorials</td>
<td>Thursday 8 March at 10 am</td>
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<td>Week 7</td>
<td>Earthquake Seismology III</td>
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Required assignments:
1. Problem Set 1: Moments of Inertia
2. Problem Set 2: Planetary Density Structure
3. Problem Set 3: Stress and Strain in Solids
4. Problem Set 4: Earthquake Hypocenters and Focal Mechanisms
5. Problem Set 5: Graphical Visualizations
6. Problem Set 6: Inverse Theory
7. Problem Set 7: Earthquake Location
8. Problem Set 8: Earth and Ocean Tides
9. Independent Research Project: Geophysical Methods and Applications
10. Computer Tutorials: Linux, Shell scripting, Vi text editor, Python, GMT, SAC, ObsPy, GIPSY

Required textbooks:
No textbooks are specifically required for the course. Applicable reading materials may be provided throughout the semester.

Suggestions for further reading include:
Course guidelines and policies:

**Student Conduct Code**

All students are expected to abide by The University of Montana’s Student Conduct Code: https://www.umt.edu/vpsa/policies/student_conduct.php

**Attendance**

Regular attendance is encouraged and expected. If you need to miss a class, please inform the instructor in advance.

**Course withdrawal**

Please refer to Institute policy on adding, dropping, and withdrawing from courses: https://www.umt.edu/registrar/students/dropadd.php

**Disability modifications**

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.

**Assignment expectations**

Assignments are expected to be completed thoughtfully and on-time. More information on UM’s academic policies and procedures: http://archive.umt.edu/catalog/14_15/academics/academic-policy-procedure.php

**Honor code** (from Caltech): “No member of the community shall take unfair advantage of any other member of the community.”

**Plagiarism**: Reproducing the work of someone else, and representing the work as your own, without appropriate citation and attribution is forbidden. Plagiarism extends beyond tangible material to also include ideas. When in doubt, cite.

**Collaboration**: Collaboration on problem sets, projects, and tutorials is encouraged. You may consult external references (e.g., internet, books, journal papers, etc.) with appropriate citations and attributions. You may also work with others provided that all solutions that you submit represent your own work (written up individually and reflecting your own understanding of the material). As a general guideline, you should be able to reproduce solutions from your submitted problem sets without help from anyone else.

**Grading policy**

Problem sets: 50%  ||  Independent Research Project: 30%  ||  Tutorials/Labs: 20%

It is recommended to start assignments early to avoid last-minute complications. I understand that sometimes situations arise that are out of our control. For that reason, you will be allowed one late-assignment grace period during the term. When electing to use your grace period, you must submit the late assignment within 48 hours of the original due date. Please plan accordingly, and let me know in advance if you may not be able to complete an assignment on time.

**Additional Information and resources:**

**Student Academic Resources**

Disability Services for Students (DSS): http://www.umt.edu/dss/
Office for Student Success: http://www.umt.edu/oss/
Career Services: http://www.umt.edu/career/
Mansfield Library: http://www.lib.umt.edu
UM Writing and Public Speaking Center: http://www.umt.edu/writingcenter/

**Student Health and Wellbeing**

Curry Health Center (mental health, physical health, pharmacy, health promotion): http://www.umt.edu/curry-health-center/
Campus Recreation: http://www.umt.edu/crec/
DiverseU: http://www.umt.edu/diverseu/
Student Activity Groups: http://TDwww.umt.edu/asum/student_groups/