227b Advanced Seismology I – Structure

UCSD Calendar:

SQ begins	3/23	
Cesar Chavez	3/25	
Instructions begin	3/28	
Memorial Day	5/30	
Instruction ends	6/3	
Final exams	6/4-10	SIO227B will have no final exam
SQ ends	6/10	

Lecture calendar:

Peter Shearer
Week 1: 3/28 - 4/1
Week 2: 4/4 - 4/8
Week 3: 4/11 - 4/25
Week 4: 4/18 - 4/22
Gabi Laske
Week 5: 4/25 - 4/29
Week 6: 5/2 - 5/6
Week 7: 5/9 - 5/13
Week 8: 5/16 - 5/20
Student Presentations
Week 9: 5/23 - 5/28
Week 10: 5/30 - 6/3 (Memorial Day)

Topics covered by Peter:

- Body-wave seismology overview
- Synthetic seismograms: geometrical ray theory, WKBJ, reflectivity method
- Beam forming and stacking methods
- Upper-mantle discontinuity phases (e.g., receiver functions)
- Seismic anisotropy and S-wave splitting

Topics covered by Gabi:

- global models – 1D: reference Earth models; basic mineral physics context
- global models – 3D: main features; Vp, Vs, density; comparison, interpretation
- seismic tomography – body waves; basics of finite frequency theory
- seismic tomography – normal modes; synoptics; basics of perturbation theory
- seismic tomography – surface waves; dispersion; relationship to ambient noise
- seismic tomography – amplitudes and attenuation
- surface wave anisotropy – Love/Rayleigh; azimuthal anisotropy

Learning goals:
The lectures will give a broad overview on various aspects in structural seismology and establish the context for Earth's evolution and plate tectonics. Students will learn about imaging capabilities of different seismic phases, different methods to compute synthetic seismograms, and imaging strategies to compile seismic models.

Homework assignments will touch on some of the tools used by researchers in seismology.

For a final project assignment, students will work in pairs to explore the research into a 'major topic of controversy', write a one-page summary, give a short presentation and lead the following discussion.

Evaluation:
Students will be evaluated by attendance of the lectures, homeworks, and the final 'controversy' project.

Prerequisites:
Students are expected to have taken an introductory class on seismology, e.g. SIO227A. Homeworks will involve numerical exercises where students may write short pieces of code for computational and/or plotting purposes. Some proficiency in a preferred language such as Python, Matlab, Fortran, C as well as GMT (generic mapping tool) and UNIX scripting is expected.