

GEOL 499 Continental Tectonics

Units: 4

Fall 2024

Day, time and location:

Lectures: Tues, Thurs, 12.30 -1.50 pm, ZHS 118

Discussions Wed 2-3.50 pm, ZHS 118

Field trips to be arranged

Instructor: Professor John Platt

Office: ZHS 313

Office Hours: Tues 10-12.

Contact Info: jplatt@usc.edu.

Course Description

The course is designed for senior undergraduate and beginning graduate students in the Earth Sciences, and covers tectonic processes within the continental lithosphere, including extensional tectonics and the formation of rifted margins, ocean-continent convergent margins, collisional orogens and plateaux, and strike-slip tectonics. The course aims at a mechanical understanding of tectonic processes, and interpretation of the structural geometry in terms of the mechanics. Examples are drawn from the North American Cordillera, the Alps, and the Himalayan/Tibetan system, in order to provide geological frameworks within which these processes can be analyzed.

Prerequisites include The course will include lectures, seminars, some paper labs, and two weekend field trips.

Learning Objectives

Students will become familiar with the geometry and mechanics of plate boundaries in and around continental areas; the structural geometry of thrust belts, accretionary wedges, rift zones, passive continental margins, transform zones, collisional orogens and collisional plateaux; and the geological and tectonic evolution of the North American Cordillera, the Alps, and the Himalayas.

Prerequisite(s): One or more of GEOL 465 Field Geology, GEOL 321 Structural Geology, GEOL 316 Petrological Processes, or their equivalents.

Recommended Preparation: GEOL316 Petrologic Systems; GEOL 321 Structural Geology; GEOL 320 Surficial Processes and Stratigraphic Systems.

Course Notes

Lecture slides, course notes, and other class information will be posted on Brightspace. Required reading will be made available in the same way.

Description and Assessment of Assignments

1. Short presentations based on reading in Discussion sessions. The student will hand in a summary of the presentation after the session, and a grade will be assigned based on the extent to which the student has understood the material and the clarity of the presentation.
2. Mid term exam to be held around Week 10, to test overall comprehension of basic material, and to give students some insight as to how well they are doing on the course.
2. Term paper covering some aspect of the course to be chosen by the student, to be delivered at the end of the examination period (Wed Dec 12). This will be graded based on understanding of the chosen topic, originality of the analysis, and the quality of the written work and illustrative material.

Grading Breakdown

Assignment	% of Grade
Presentation 1	10
Presentation 2	10
Presentation 3	10
Presentation 4	10
Presentation 5	10
Mid-term	20
Term paper	30
TOTAL	100

Assignment Submission Policy

By email to the instructor

Grading Timeline

One week.

Course Schedule: A Weekly Breakdown

There will be two lectures and a Discussion Session each week. The Discussion sessions will center around readings from the primary literature, and each student will be expected to give a short presentation of a paper every third week, and to participate in discussion of the papers. Time spent on reading and preparation of presentations will average 8 hours per week. The Discussion sessions will be broadly related to the lecture topics, and will proceed hand-in-hand with them.

Week 1 Tectonic evolution of the North American Cordillera

Week 2 Plate interactions in the North American Cordillera

Week 3 Passive continental margins ancient and modern: the Atlantic passive margin of North America and its conjugates, and the Cordilleran miogeocline as an ancient passive margin.

- Week 4** The Mesozoic convergent plate margin of western North America, and the structural and metamorphic evolution of the Franciscan Complex.
- Week 5** The Mesozoic magmatic arc in western North America
- Week 6** The Cordilleran thrust belt: Sevier and Laramide orogens
- Week 7** The mechanics of thrust belts and accretionary wedges
- Week 8** Continental collision and the evolution of the European Alpine arc
- Week 9** India-Asia collision: the Himalayan thrust belt and foreland basin
- Week 10** India-Asia collision: the Tibetan plateau
- Week 11** The Basin and Range province of the North American Cordillera: an extended collisional plateau?
- Week 12** Metamorphic core complexes: windows into the deep crust of orogens
- Week 14** Transform tectonics: the San Andreas system
- Week 15** Review and Discussion

The term paper is due at end of exam week: Wednesday Dec 12.