

**Department of Earth & Environmental Sciences
LEHIGH UNIVERSITY**

EES 427 Orogenic Belts 3 credits Fall 2020

COVID-19

We will all have to have some agility as I expect course plans and this syllabus might change with evolving circumstances. Please exercise best safety practices and remind one another that we all have to adhere to safety guidelines. We will follow and when possible, exceed all Lehigh University protocols; these will include all state and CDC guidance to help keep everyone safe. If there is a positive test, expect adjustments on a case-by-case basis.

Professor Dave Anastasio, Office: 226 STEPS Building

Office Hours: Monday 10:45-12:00PM via zoom, or you can Email for an appointment dja2@lehigh.edu.

Class meets two days weekly, Wednesday, 9:15-10:30AM and Friday 9:15-10:30AM synchronously over zoom.

Coursesite: Papers and course announcements will be posted on the Lehigh's course site system (<http://coursesite.lehigh.edu>). Check the site often.

Expectations:

You are expected to attend all class meetings. You will be responsible for all material covered in class as well as assigned readings. Course assignments when noted are expected to be your own work otherwise collaborative learning is encouraged.

Course Objectives:

Structural Analysis of deformed Earth materials. Deformation can be broken into three main issues that must be considered in sequence: Geometry, Kinematics, and Dynamics. These are questions about what, how, and why deformation occurs. We will do a little of each to know the scope of the problems we are dealing with and as a jumping off point for further research. The course will be topically biased to my own interests and expertise. Topics will generally be treated as vignettes or short courses. You will be expected to participate in the classes' operation throughout the semester.

Course outline:

Week 1

August 26 Preliminary meeting

August 28 No Class

Unit I Stress, Strain, Deformation Mechanisms, Strain History

Week 2 Course Introduction, Structural Analysis

Sept. 2 Deformation Mechanisms-Diffusion Mass Transfer

Sept. 4	Cleavage, Volume strain
<i>Week 3</i>	
Sept. 9	Deformation Mechanisms-Dislocation Creep [HW I: Deformation maps, Object Strain, Bulk Strain]
Sept. 11	Deformation Mechanisms-Cataclastic Flow
<i>Week 4</i>	
Sept. 16	Ductile Kinematic Methods, Sense of Shear, Petrofabrics-GSF, LPO
Sept 18	Phorphyroblast /clast Rotation.
<i>Week 5</i>	
Sept. 23	Brittle Kinematic Methods– Brittle Deformation Zones
Sept 25	Lithotectonics-Structural Lithic Units [HW I due, HW II Faultkin and slip linears]
<i>Week 6</i>	<i>Unit II</i>
Sept 30	Thrust Systems
Oct 2	Climate, Erosion, Mountain Building
<i>Week 7</i>	
Oct. 7	Sedimentation and Deposition in Foreland and Wedge-top basins
Oct. 9	Growth Strata [HWII due, HWIII Fault bend Folding, Balanced Cross Sections]
<i>Week 8</i>	
Oct. 14	Fault-Related Folding
Oct. 16	Salt Tectonics HW IV: Syndepositional halotectonics]
<i>Week 9</i>	
Oct 21	No Class. GSA meeting
Oct. 23	<i>Unit 3 Subduction Zones e.x. Costa Rica Margin</i> Structure
<i>Week 10</i>	
Oct 28	Accretionary Prisms
Oct 30	Tectonic Melange [HW III: due]
<i>Week 11</i>	
Nov. 4	Earthquake types and location <i>Unit 4 Discussion Topics--</i>
Nov. 6	Student Discussion [HW IV: due]
<i>Week 12</i>	
Nov. 11	Student Discussion

Nov. 13 Student Discussion

Week 13

Nov. 18 Student Discussion

Nov. 20 Student Discussion

Week 14 No Class Thanksgiving Week

Week 15

Dec. 2 Student Discussion

Dec. 4 Student Discussion

Discussion Classes and Papers

Advance preparation for discussion classes is important. It is expected that all students will prepare for class and participate in the discussions. Final papers will be on the same topic as the discussion class. Papers are due by December 14, 2020, 5:00PM. Class reading should be assigned one week prior to your seminar. Papers should be ~5-6-page paper plus figures and references. Orogenic process selection for class discussion and final papers is due by October 2, 2020 class.

Pick topics by October 2, 2020

Student Seminar Topics

- Thermal Consequences of Deformation
- Heterogeneous Strain, AMS, and otherwise
- Rheology–Geodynamical Modeling of Orogenesis
- Plate Motion Partitioning–GPS Geodesy
- Rates of Deformation
- Fault Propagation–Fracture Mechanics
- Fluids and Deformation
- Structural Inheritance
- Gneiss Domes and Crystalline thrust sheets
- Other Topics??

Final Paper Due by December 14, 2020, 5:00PM

Course Evaluation:

4 HW Sets	25%
Discussion Class	25%
Final Paper	25%
Class Participation	25%

Academic Honesty: It is the duty and obligation of students to meet and uphold the highest principles and values of personal, moral and ethical conduct. As partners in our educational community, both students and faculty share the responsibility for promoting and helping to ensure an environment of academic integrity. As such, each student is

expected to complete all academic course work in accordance to the standards set forth by the faculty and in compliance with the University's Code of Conduct.

Accommodations for Students with Disabilities: The Office of Academic Support Services in the Dean of Students office addresses requests for accommodations for learning and/or physical disabilities for undergraduate and graduate students. For more information, I encourage you to visit the web site at:

<https://studentaffairs.lehigh.edu/disabilities> . If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, University Center C212 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

Diversity and Inclusion: Lehigh University is committed to diversity, inclusion and engagement [<http://www.lehigh.edu/diversity>]. That commitment is captured in The Principles of Our Equitable Community. The Principles have been endorsed across Lehigh and by the Board of Trustees. We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.