

**GEOLOGY 4315/5315/6315: Tectonic Geomorphology**  
The University of Texas at El Paso      Department of Geological Sciences  
Fall Semester 2019

**Instructor:**

Dr. José M. Hurtado, Jr.  
[hurtado@geo.utep.edu](mailto:hurtado@geo.utep.edu)  
Geology room 301A  
(915) 747-5669

**Class Website:**

<http://www.geo.utep.edu/pub/hurtado/tectgeo>

Check the web resources often for important class news and material!

**Class Meetings:**

Lectures/Lab: MW 10:30 am - 12:30 pm, Geology 320

Office Hours: MW 1-2 pm in Geology 301 (or by appointment)

**Text:**

Required (not in bookstore; available on Amazon if you want a hardcopy, but **will be made available via PDF from the instructor – no need to purchase**):

Douglas W. Burbank and Robert S. Anderson, 2012, *Tectonic Geomorphology* (2<sup>nd</sup> edition), Wiley-Blackwell: UK, 454 pp. (ISBN 9781444338874)

The following are not required, but are optional/recommended. Selected readings from these will be distributed:

William B. Bull, 2008, *Tectonic Geomorphology of Mountains: A New Approach to Paleoseismology*, Wiley-Blackwell: Malden, MA, 328 pp. (ISBN 1405154799)

William B. Bull, 2009, *Tectonically Active Landscapes*, Wiley-Blackwell: Malden, MA, 320 pp. (ISBN 1405190124)

Edward A. Keller and Nicholas Pinter, 2002, *Active Tectonics: Earthquakes, Uplift, and Landscape* (2<sup>nd</sup> edition), Prentice Hall: Upper Saddle River, NJ, 362 pp. (ISBN 0130882305)

James P. McCalpin (editor), 2009, *Paleoseismology* (2<sup>nd</sup> edition), Elsevier/Academic Press: Burlington, MA, 629 pp. (ISBN 0123735769)

Handouts and supplemental materials from a variety of other sources (e.g. recent and classic papers on selected topics) will also be provided throughout the semester. You will also present and discuss journal articles in class.

**Grading:**

- **Assignments (60%)**: There will be **six lab/field trip/homework assignments** (see schedule). Each is worth 10%. Note that there will 2 Saturday field trips during the semester (**tentatively scheduled for TBD and TBD**). These **trips**

**are mandatory** since they are an important component of 2 of your assignments.

- **Paper Discussion (20%)**: This is the participation component of the course. During the semester, **each student will have to present** a summary of a journal article and lead a discussion about it (10%). Two students will do so every week (**details TBA**). Every student must read the paper, so, in addition, each week **every student must submit one question** pertaining to the week's readings (10%).
- **Final Exam (20%)**: **Further details TBA.**
- **You will be organized into teams** to work on some of the assignments. Each team must have at least one graduate student as the team leader. No team may have more than one undergraduate.
- **Graduate students will be held to a higher standard than undergraduates. Ph.D. students will be held to a higher standard than M.S. students.**

### **Policies:**

Please contact the instructor about any concerns, schedule conflicts, missed work, etc. in advance or otherwise as soon as possible! Valid excuses include illness, absence with the instructor's prior approval, official University business, etc., but all require documentation. Otherwise, there are no make-ups for missed work, and late work will lose 50% of its value for each day it is late!

Attendance and participation are mandatory. Excessive absences may result in being dropped from the course! Do each reading assignment before attending class and come to class prepared with questions. I expect everyone to contribute to class discussions.

*If you are in the military with the potential of being called to military service and/or training during the course of the semester, you are encouraged to contact the instructor as soon as possible.*

*If you think you may have a disability or if you are experiencing learning difficulties, please contact the Disabled Student Services Office (DSSO) at (915) 747-5148. They're located in Union East room 106 or you can reach them by e-mail at [dss@utep.edu](mailto:dss@utep.edu). The student is responsible for presenting to the instructor any DSS accommodation letters and instructions.*

Reasonable collaboration is allowed on assignments (not exams). However, I expect everyone to turn in work that is his or her own! The University guidelines for academic dishonesty are very specific and will be strictly followed. Please read the guidelines (see <http://studentaffairs.utep.edu/dos>), and contact the Dean of Students or the instructors if you have any concerns.

Because they are vital venues for all course business, computer and internet use outside of class are required. You need to have your free UTEP email account activated for this course and you need to check it regularly. If you do not have one, go to <https://newaccount.utep.edu/> to activate yours. You will also be expected to stay continually up to date with all information posted on the course

website, which will include course notes, readings, supplemental material, and assignments. We may be experimenting with internet activities this semester so the syllabus may change as the class evolves.

**Course Description:**

The goal of this course is for the student to attain an understanding of modern, quantitative geomorphology and its application to tectonics. Topics will include: process geomorphology; tectonic landforms; Quaternary geochronology; stress, strain, faults, and folds; geodesy; paleoseismology; geomorphic indices; erosion and uplift in orogenic settings; landscape response to tectonics and landscape evolution; active tectonics and rivers. Assignments will involve readings from the literature, fieldwork, and quantitative exercises, some of which will involve basic MATLAB® programming.

**Course Outline:**

Note that the details of our schedule are subject to change as the semester progresses. Please be flexible, and let Professor Hurtado know if you have any concerns or suggestions. The detailed, preliminary schedule is subject to change.

| Week    | Dates (MW)                             | Lecture Topic  | Readings and Assignments  |
|---------|--|--|---|
| Week 1  | Aug. 26, 28                            | Introduction; Basic Concepts                             | B&A Ch. 1<br>Molnar and England (1990); England and Molnar (1990); Hoffman and Grotzinger (1993); Whipple et al. (1999); Zeitler et al. (2001); Bishop (2007); Brocklehurst (2010)  |
| Week 2  | Sept. 4 ( <i>UTEP closed Sept. 2</i> ) | Geomorphic Markers and Landforms                         | B&A Ch. 2<br><i>Lab 1: Photointerpretation and Process Geomorphology</i><br><i>Lab 2 : Geodesy, Remote Sensing, and Image Processing</i>  |
| Week 3  | Sept. 9, 11                            | <i>JMH out of town – no class meetings</i>               |   |
| Week 4  | Sept. 16, 18                           | <i>JMH out of town – no class meetings</i>               |   |
| Week 5  | Sept. 23, 25                           | Geomorphic Markers and Landforms                         | B&A Ch. 2   |
| Week 6  | Sept. 30, Oct. 2                       | Quaternary Geochronology                                 | B&A Ch. 3<br>Gallagher et al. (1998); House et al. (1998); Farley (2002); Ehlers et al. (2003); Donelick et al. (2005); Reiners and Brandon (2006); Rahl et al. (2007); Reiners and Shuster (2009)<br>Handouts  |
| Week 7  | Oct. 7, 9                              | <i>JMH out of town – no class meetings</i>               |   |
| Week 8  | Oct. 14, 16                            | Deformation  | B&A Ch. 4<br>Bucknam and Anderson (1979)<br>Nash (1979); Meyer (1984); Andrews and Bucknam (1987); Dahlen (1990); Matson and Bruhn (2001); Nash (2005); Pelletier and Cline (2007)<br>Handouts<br><i>Lab 3: The Diffusion Equation Applied Two Ways</i> |
| Week 9  | Oct. 21, 23                            | Geodesy and Short-Term Deformation                       | B&A Ch. 5   |
| Week 10 | Oct. 28, 30                            | Paleoseismology  | B&A Ch. 6<br>Handouts   |
| Week 11 | Nov. 4, 6, 9                           | Erosion and Uplift                                       | B&A Ch. 7<br>See week 1 readings<br><i>Field Trip (Lab 4): Paleoseismology and Field Neotectonics Methods (Nov. 9)</i>  |
| Week 12 | Nov. 11, 13                            | Landscape Response to Holocene Tectonics                 | B&A Ch. 8<br>Kirby and Whipple (2001); Whipple (2004); Wobus et al. (2006); Pritchard et al. (2009); Roberts and White (2010)   |
| Week 13 | Nov. 18, 20                            | Quaternary and Neogene Geomorphic Responses to Tectonics | BB&A Ch. 9, 10<br>Lave and Avouac (2000); Lave and Avouac (2001)<br>Keller et al. (1998); Pearce et al. (2004)<br><i>Lab 5: Slope-Area Analysis and River Terraces</i>  |
| Week 14 | Nov. 25 ( <i>no class Nov. 27</i> )    | TBD  |   |
| Week 15 | Dec. 2, 4                              | Numerical Modeling                                       | B&A Ch. 11<br>See week 3 readings<br><i>Lab 6: Thermochronology</i>   |

Final examination scheduled for Fri, Dec. 13, 10 am - 12:45 pm in Geology 320.

*Your continued enrollment in this course implies your acceptance of the policies set by Dr. Hurtado!*