GEOL 440/540 Sedimentary Basin Analysis: Fall 2018

SYLLABUS

Instructor: Rebecca Dorsey
Office: Cascade 305D
Office Hours: M T Th 4:00-5:00, or by appointment
Meeting Time: 12:00-1:20 T / U
Classroom: Columbia 254
Email: rdorsey@uoregon.edu
Course Web Page: https://pages.uoregon.edu/rdorsey/BasinAnalysis/basinshome.html

This course is designed to familiarize students with the major mechanisms involved in formation, subsidence, and filling of sedimentary basins. We will examine the dynamics of basin evolution in tectonically active settings, including convergent, divergent, and strike-slip plate margins and interiors. Students will develop a solid understanding of the major structural, tectonic, and geophysical processes that produce sedimentary basins, and develop some skills in basin analysis that allow us to interpret those processes from the stratigraphic record. We will emphasize a multi-disciplinary approach that integrates concepts in structure, tectonics, geodynamics, sediment transport, and process stratigraphy, to help us understand the behavior of sedimentary basins in active settings. Quantitative methods to be introduced include simple isostatic, thermal, and flexural modeling of crustal subsidence, and application of diffusion-based basin-filling models that govern the stratigraphic architecture of most basins.

There will be 5 homework assignments, one midterm exam, and a term paper, and each student will give a class presentation of their term-paper topic during final exams week. There is no final exam: this allows you to focus on the term project, paper, and final presentation. We will take a weekend field trip October 6-7, to look at Eocene sedimentary rocks and structures in the Roseburg area that are associated with accretion of the Siletz oceanic terrane to North America. Students will take notes and photos to document sedimentary lithofacies, inferred depositional processes, basinal stratigraphic architecture, and significance for tectonic evolution. Notes and maps produced on the field trip will be used to write the field trip report. Transportation will be provided by the department; logistical details will be provided during the first week of class.

The term paper will be an independent research project on a topic of your choice. Undergraduate students will write a 10-page review of a chosen topic in basin research. Graduate students will write a 15-page research paper *or* NSF-style proposal to design new research in the field of basin analysis or a related topic. Term paper topics will be proposed by students and reviewed by me as an early homework assignment. *Graduate students will be assigned additional and more difficult problems in the homework assignments and midterm exam, and will be expected to write a longer, more rigorous in-depth term paper.*

Learning Outcomes (Goals). In this course I expect students to:

- Understand the major mechanisms involved in subsidence and filling of sedimentary basins.
- Learn basic methods in numerical modeling of isostatic, flexural, and thermal subsidence.
- Derive diffusion-based basin filling models that govern stratigraphic architecture of most basins.
- Become familiar with several important examples of sedimentary basins worldwide.
- Acquire detailed insight into tectonic controls on the early Eocene Umpqua Basin, southwestern Oregon, through preparation and participation in the course field trip.
- Improve public presentation skills via classroom presentation at the end of term.

Time Commitment to This Course

Educational Activity	UG Hours	Grad Hours	Explanation / Justification
Lecture: 3 hours per week, 10 weeks	30	30	20 lectures @ 1.5 hrs
Assigned Readings: UG 3 hours (2 chapters/papers) per week; Graduate students 5 hours (4 chapters/papers) per week.	30	50	3 & 5 hours per week
Homework Assignments: 5 @ 2 hrs (UG) & 4 hrs (Grad) each	10	20	Explanation at left
Writing Assignment: term paper (including draft)	40	50	Weekly effort increases through the term
Classroom Presentation (including prep time)	10	10	
Total Hours	120	160	

Grading Criteria

Homework assignments and midterm exam will be graded based on accuracy and completeness of answers to questions on course content including solutions to quantitative problems, definition sketches, and written summaries of key concepts. Assessment of the term paper will be based on the quality and completeness of scientific content, organization, writing style, and accuracy of literature citations and references. Class presentations and participation will be evaluated on the basis of student contributions to discussions and interactions with the group. Graduate students will be assessed on their demonstrated ability to lead a group discussion of a journal article.

Grading Scheme:

	Undergrad % of Final Grade	**Graduate % of Final Grade**
Midterm Exam	25 %	25 %
Homeworks *(5 @ 6% each)*	30%	30%
Class Presentation and Participation (incl. field trip)	10%	10%
Final Term Paper	35%	35%
Lead discussion of journal article		
Total	**100%**	**100%**

Final Course Grade Policy

Final letter grades for the course will be calculated as follows:

A+ 97-100%	A 93-96.9%	A- 90-92.9%
B+ 87-89.9%	B 83-86.9%	B- 80-82.9%
C+ 77-79.9%	C 73-76.9%	C- 70-72.9%
D+ 67-69.9%	D 63-66.9%	D- 60-62.9%
	F < 59.9%	

Notes: *Numerical scores on all assignments may be curved if necessary based on class performance. If this course is taken P/NP, 80% or higher is required to pass and all assignments must be completed.*

Office Hours

My office hours are 4:00-5:00 Monday, Tuesday and Thursday, or by appointment. If these times don't work for you, be sure to ask and we can set up an alternate time to meet. In addition, I can be reached by email at rdorsey@uoregon.edu. I check email often and it is sometimes the best way to reach me quickly. Be sure to ask if you have any questions about this course.

Academic Misconduct Policy

All students in this course are subject to the regulations stipulated in the UO Student Conduct Code (http://conduct.uoregon.edu). This code contains a compilation of important regulations, policies, and procedures pertaining to student life. It is intended to inform students of their rights and responsibilities during their association with this institution, and to provide general guidance for enforcing those regulations and policies essential to the educational and research missions of the University.

Documented Disability

Appropriate accommodations will be provided for students with documented disabilities. For more information, please see the Accessible Education Center at **http://aec.uoregon.edu**

Conflict Resolution

Several options, both informal and formal, are available to resolve conflicts for students who believe they have been subjected to or have witnessed bias, unfairness, or other improper treatment.

It is important to exhaust administrative remedies available to you including discussing the conflict with the specific individual and contacting the Department Head. Outside the Department, you can contact:

- UO Bias Response Team: 346-3216 http://bias.uoregon.edu/whatbrt.htm -
- Conflict Resolution Services 346-3216 http://studentlife.uoregon.edu/support
- Affirmative Action and Equal Opportunity: 346-3123 http://aaeo.uoregon.edu/

Mandatory Reporting and Title IX

Mandatory Reporting of Child Abuse

UO employees, including faculty, staff, and GEs, are mandatory reporters of child abuse. This statement is to advise you that that your disclosure of information about child abuse to a UO employee may trigger the UO employee's duty to report that information to the designated authorities. Please refer to the following links for detailed information about mandatory reporting:
http://hr.uoregon.edu/policies-leaves/general-information/mandatory-reporting-child-abuse-and-neglect

Reporting Title IX Experiences

Any student who has experienced sexual assault, relationship violence, sex or gender-based bullying, stalking, and/or sexual harassment may seek resources and help at safe.uoregon.edu. To get help by phone, a student can also call either the UO's 24-hour hotline at 541-346-7244 [SAFE], or the non-confidential Title IX Coordinator at 541-346-8136. From the SAFE website, students may also connect to Callisto, a confidential, third-party reporting site that is not a part of the university.

Students experiencing any other form of prohibited discrimination or harassment can find information at respect.uoregon.edu or aaeo.uoregon.edu or contact the non-confidential AAEO office at 541-346-3123 or the Dean of Students Office at 541-346-3216 for help. As UO policy has different reporting requirements based on the nature of the reported harassment or discrimination, additional information about reporting requirements for discrimination or harassment unrelated to sexual assault, relationship violence, sex or gender based bullying, stalking, and/or sexual harassment is available at http://aaeo.uoregon.edu/content/discrimination-harassment. Specific details about confidentiality of information and reporting obligations of employees can be found at https://titleix.uoregon.edu.

COURSE READINGS: Sedimentary Basin Analysis (Geology 440-540)

Readings are posted at the website: https://pages.uoregon.edu/rdorsey/BasinAnalysis/basinshome.html.

Required Text: Angevine, C.L., Heller, P.L., and Paola, C., 1990, Quantitative Sedimentary Basin Modeling: AAPG Shortcourse Note Series #32, 247 pp. (I will provide this)
Also available online at: http://faculty.gg.uwyo.edu/heller/shortcourse(90).htm.

Optional Texts:

Allen, P.A. and J.R. Allen, 2013, Basin Analysis: Principles and Application to Petroleum Play Assessment. John Wile & Sons, 619 pp.

Busby, C.J., and Ingersoll, R.V. (eds.), 1995, Tectonics of Sedimentary Basins. Blackwell Science, 579 pp. *This book is out of print; I will make chapter readings available in class.*

Einsele, G., 1992, Sedimentary Basins. Springer-Verlag, New York, 628 pp.

Other Readings, which I will provide in class:

DeCelles, P.G., and Giles, K.A., 1996, Foreland basin systems. Basin Research: 8, 105-123.

Gawthorpe, R.L., Fraser, A.J., and Collier, R.E., 1994, Sequence stratigraphy in active extensional basins: implications for the interpretation of ancient basin-fills: Marine and Petroleum Geology, v. 11, p. 642-658.

Heller, P.L., and Paola, C., 1992, The large-scale dynamics of grain-size variation in alluvial basins, 2: Application to syntectonic conglomerate: Basin Research, v. 4, p. 91-102.

Ingersoll, 1988, Tectonics of sedimentary basins. GSA Bulletin, v. 100, p. 1704-1719.

Paola, C., Heller, P.L., and Angevine, C.L., 1992, The large-scale dynamics of grain-size variation in alluvial basins, 1: Theory: Basin Research, v. 4, p. 73–90.

Paola, C., 2000, Quantitative models of sedimentary basin filling: Sedimentology: 47, 121-178.

Wells, R., Bukry, D., Friedman, R., Pyle, D., Duncan, R., Haeussler, P., & Wooden, J., 2014, Geologic history of Siletzia, a large igneous province in the Oregon and Washington Coast Range: Correlation to the geomagnetic polarity time scale and implications for a long-lived Yellowstone hotspot. *Geosphere*, *10*(4), 692-719.

Whipple, K.X., and Trayler, C.R., 1996, Tectonic control of fan size: the importance of spatially variable subsidence rates. Basin Research, v. 8, p. 351-366.

Note: This is a partial list of readings; other papers will be added during the term.