

GEOSC 479: Advanced Stratigraphy

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office hours: 2-3 pm Wednesday and Thursday or by appointment

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Tuesday-Thursday, 5:45-6:45 pm, Deike 341

3.0 Credits

Course description and goals:

The stratigraphic record is a rich archive of past landscape, climate, and tectonic conditions and hosts valuable petroleum and water resources. This course is designed to help you develop advanced skills for stratigraphic data collection and analysis.

The overarching goal of this course is for you to be able to *pose a stratigraphic question, determine the appropriate methods of data collection, analyze and communicate the results, and evaluate uncertainty.*

At the end of this course you should be able to:

- 1) Analyze stratigraphy using a simple mass-balance framework
- 2) Interpret basin/depositional histories using sequence stratigraphy
- 3) Evaluate important autogenic (self-formed) scales in sedimentary basins
- 4) Interpret qualitative and quantitative stratigraphic paleoenvironmental signals

We will practice these techniques throughout the semester and will use them on a required weeklong field trip to central Utah at the end of the semester. You will be evaluated through a series of projects and homework assignments.

There is no textbook for this class, and much of the course content will be based on recent peer-reviewed journal articles. You are expected to keep up with reading and actively participate in group discussions throughout the semester, both in class and on class discussion boards. I encourage you to ask questions and express your opinions and ideas, and share your interests and findings with the class.

Evaluation:

Rates and scales reference sheet	10%
Homework assignments	10%
Participation	5%
Mass balance/sequence stratigraphy project	20%
Individual project	30%
Field trip projects	25%

Course outline (subject to change):

- Week 1 (1/11): What is stratigraphy?
- Week 2-3 (1/18): Mass balance and sediment extraction
- Week 4-5 (2/1): Sequence Stratigraphy
- Week 6 (2/15): Mass balance/sequence strat project
- Week 7 (2/22): Mass balance/sequence strat project
- Week 8-9 (3/1): Quantitative paleomorphodynamics
- Week 10 (3/15): Spring break – no class
- Week 11-12 (3/22): Autogenic depositional processes
- Week 13 (4/5): Interpreting paleoenvironmental signals
- Week 14 (4/12): Individual projects
- Week 15 (4/19): Individual projects
- Week 16 (4/26): Field trip background and prep
- Finals week: Field trip!

Assignments and projects:

Detailed instructions and evaluation guidelines will be distributed in advance of each project or assignment, but here is an overview of each assignment.

Rates and scales reference sheet – over the course of the semester you will produce a crib sheet with examples of characteristic and extreme rates and scales useful for stratigraphic interpretation.

Homework – small homework assignments and mini-projects will help you practice the concepts presented in class. Homework assignments will typically be due one week after they are assigned.

Mass balance/sequence stratigraphy project – this major project will entail conducting a combined mass balance and sequence stratigraphic analysis of a stratigraphic succession. This will involve a report that will be due in early March.

Individual projects – The largest assignment you will have is to conduct a stratigraphic analysis of a data set of your choosing using the techniques presented in class. You will write a *Geology*-length paper to convey your results. Ideally this will be analysis that is related to your research topic and the writing will be incorporated into your thesis.

Field component: c. 8-9 day trip to Utah/Colorado during Finals Week. You need to arrange to take finals or complete TA responsibilities ahead of time. We will be finalizing the schedule in the first few weeks of class, but anticipate being gone from about April 29-May 7

This field trip is sponsored by Shell, so most of the costs will be covered. You will be asked to pay a field trip fee of \$250 and pay for your meals.

Further information regarding the field trip will be provided later in the semester.

Example Itinerary (subject to change)

Day 1 Travel from State College to Salt Lake City

Day 2 Price – Introduction to Book Cliffs stratigraphy and investigation of parasequence sedimentology and architecture

Day 3 Price – Sequence stratigraphy of the Book Cliffs

Day 4 Price – Autogenic stratigraphy of the Book Cliffs

Day 5 Project – Reconcile sequence stratigraphic interpretations with autogenic processes

Day 6 San Rafael Swell – Quantitative paleoenvironment reconstruction (Buckhorn Conglomerate, Morrison Formation, Curtis Formation)

Day 7 Green River – Nonmarine sequence stratigraphy, alluvial architecture, and paleohydraulic reconstruction in fluvial systems

Day 8 Project – Predict fluvial sandstone distribution and connectivity from regional stratigraphy and paleohydraulic data

Day 9 Return to State College