



GEOS5313: Carbonate Depositional Systems and Stratigraphy

Fall 2021, Section 101/11A (Lab)

Lecture: M W 3:00-4:20 PM | **Lab:** F 2:00-3:50 PM | **Location:** BO 105 (?)

Instructor Information

Professor: Anna M. Weiss, Ph.D.
Please call me: Anna; Dr. or Professor Weiss (Pronounced like “Rice” but with a “W”)
Pronouns: (she/her)
Email: anna.weiss@msutexas.edu (expect a response in 24-36 hours)
Office Location: Office hours will be held virtually on Zoom ID: 974 2271 9769
Office Hours: M, W, F 10 - 11 AM; Th 10 AM - 12 PM; by appointment (email me!)
Ask me about: anything related to the class, doing STEM outreach, applying to Ph.D programs

Course Description

This course covers all aspects of carbonate depositional systems and stratigraphy. The course will discuss characteristics of geologic and modern systems across a range of environments (shorelines, tidal flats, reefs, open shelf, deep basin etc.). Students will develop an understanding of sequence stratigraphy, identifying cycles, and the various features of the carbonate factory. Other topics include: diagenetic fabrics, ramp profiles, bioherm and reef formation, carbonate petrology, and petroleum reservoirs. Lecture will be supplemented by applied learning with thin sections, core, and hand samples. Concepts will be reinforced with advanced readings and discussion of carbonate-related topics.

Course Goals

1. To introduce students to carbonate field and lab methods, carbonate facies and platform models, sequence stratigraphy, carbonate cycles, Milankovitch climate forcing and porosity in carbonates.
2. To gain experience collecting and analyzing field data.
3. To understand why carbonates are major reservoirs for petroleum, metals, and potable water.
4. To comprehend how the study of modern carbonate sedimentary environments can help us better understand ancient environments and manage modern environmental change.

Student responsibilities

1. In order to pass this course, students will be expected to develop an understanding of carbonate geology and its applications.
2. Class participation: This course is not a passive lecture course. I will use a variety of classroom activities, student presentations and discussions to ensure students take an active role in learning. Students are expected to participate to the best of their ability. Additionally, students are expected to be respectful of one-another in their interactions in the classroom, lab and on-line.
3. Class preparation: The lectures, discussions, and activities for this course are designed to build on and synthesize knowledge that students glean from the assigned texts, primary literature readings, and assignments. These discussions and activities will be more meaningful when everyone shows up prepared. Students are expected to complete readings and assignments ahead of class.
4. Group projects: In lab and lecture, there will be assignments where you will work as a team. Please be a good team-mate, be respectful of one another, complete assigned tasks and help others when needed. Failure to work with your teammates will result in a failing grade for the project.
5. If you are struggling in class, please ask for help! If you cannot attend office hours, email me to make an appointment.

Course Materials

Required Text

- Tucker and Wright, 1990

This book is available as a PDF on D2L. All other required reading will also be posted as a PDF on D2L.

Lecture and Lab

Pencil/pen

Notebook (or laptop to take notes)

All assigned reading should be done in advance of class. Bring your notes, and be prepared for discussion!

Hand lens

Desire-to-Learn (D2L)

All readings, assignments, etc. will be announced in class and posted on D2L. Extensive use of the MSU D2L program is a part of this course. Each student is expected to be familiar with this program as it provides a primary source of communication regarding assignments, examination materials, and

general course information. You can log into [D2L](#) through the MSU Homepage. If you experience difficulties, please contact D2L directly.

Grading

Table 1: Points allocated to each assessment

Assignments	Percentage of grade
Class Participation and Discussions	15%
Exams	20%
Final Exam	25%
Lab Overall Grade	40%

Table 2: Total points for final grade.

Grade	Points
A	90 + %
B	80 to 89.9%
C	70 to 79.9%
D	60 to 69.9%
F	Less than 60%

Exams

Three exams will be given during the semester. The exams will be cumulative and will generally be short and long answer, with some diagram labelling, drawing or other task. Do not expect a multiple-choice test. Exams will last the length of the class period. The exam dates are as follows:

Exam 1: Friday 9/24; Exam 2: Friday 10/29; Exam 3: Friday 12/3

Exam scores will be returned with the exams the week following the exam. If you feel there was an error made in the evaluation of your exam, **you must bring this up within 10 days of the return of the mid-term exams or immediately in the case of the last exam.** If you wish to check on your current lab, quiz, and exam points at any point during the semester, check the D2L website or come to office hours. It is preferred that you email me and indicate you would like to see this summary before meeting so we can have the information ready to go.

Final Exam

The final exam will be cumulative. It will take place on Monday 12/6 from 5:45 -7:45 pm. The exam will be a combination of short and long answer, with some diagram labelling, drawing or other problem solving. Do not expect a multiple-choice test.

Exam scores will be returned with the exams the week following the exam. If you feel there was an error made in the evaluation of your final exam, **you must bring this up immediately.**

Late Work

Late work will be accepted with a **5-point penalty per day** it is late **up to one week (7 days) past the due date.** I am willing to work with students on late work, especially given extenuating circumstances **but you need to contact me before the assignment is due.** If you are having trouble keeping up or need extra time on an assignment, please contact me as early as possible. Again, this needs to be done in advance of the due date.

Make Up Work/Tests

I do not allow make-up work or exams without an official university excuse. If you need to miss work, quizzes or exams due to extenuating circumstances, **please see me as soon as possible to discuss a new deadline. This needs to be done in advance of the due date.**

Extra Credit

I do not accept individual extra credit assignments. Do not ask, the answer will be no. However, I will provide several opportunities for everyone to get extra credit throughout the semester (such as in class, on exams, as take-home assignments, for pertinent seminars) and will provide ample advanced notice of the assignments.

Instructor Class Policies

Attendance

Attendance will not be taken, however class participation will make up 15% of your final grade. Religious holy days sometimes conflict with class and examination schedules. If you must miss an examination, work assignment, or other project due to the observance of a religious holy day you will be given an opportunity to complete the work missed within a reasonable time after the absence. Please notify me at least fourteen days prior to the classes scheduled on dates you will be absent to observe a religious holiday.

Cell phones and Computers

Cell phones and computers may be used in specific contexts, such as when taking notes, but I ask you to respect myself and your fellow students and not text, use social media, email or other non-class related websites. If you are found doing this during lecture or lab, a warning will be given, then you will be asked to leave.

Services for Students With Disabilities

In accordance with Section 504 of the Federal Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, Midwestern State University endeavors to make reasonable accommodations to ensure equal opportunity for qualified persons with disabilities to participate in all educational, social, and recreational programs and activities. After notification of acceptance, students requiring accommodations should make application for such assistance through Disability Support Services, located in the Clark Student Center, Room 168, (940) 397-4140. Current documentation of a disability will be required in order to provide appropriate services, and each request will be individually reviewed. For more details, please go to [Disability Support Services](#).

Grade Appeal Process

Students who wish to appeal a grade should consult the Midwestern State University [Undergraduate Catalog](#)

Academic Misconduct Policy & Procedures

Academic Dishonesty: Cheating, collusion, and plagiarism (the act of using source material of other persons, either published or unpublished, without following the accepted techniques of crediting, or the submission for credit of work not the individuals to whom credit is given). Specifically,

“a. The term “cheating” includes, but is not limited to:

- (1) use of any unauthorized assistance in taking quizzes, tests, or examinations;*
- (2) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; or*
- (3) the acquisition without permissions, of tests or other academic material belonging to a member of the university, faculty, or staff.*

b. The term “plagiarism” includes, but is not limited to, the use by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgement. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.

c. The term “collusion” means collaboration with another person in preparing work offered for credit if that collaboration is not authorized by the faculty member in charge.” From [Student Handbook 2019-20](#)

I do not tolerate academic dishonesty of any kind. If you are caught cheating, colluding or plagiarizing, you will be given a zero on the assignment and a written warning. If you are caught twice, you will receive an F in my class.

Additional guidelines on procedures in these matters, including appeals, may be found in the Office of Student Conduct.

Refer to: https://msutexas.edu/student-life/_assets/files/handbook.pdf

Notice

Changes in the course syllabus, procedure, assignments, and schedule may be made at the discretion of the instructor. Modalities of instruction may change given developments in COVID-19. Instructor will inform students in writing of any changes to be made prior to making them.

Course Schedule*

* This schedule represents my current plans and objectives. As we go through the semester, the plans may need to change to enhance learning opportunities. Please check for announcements on D2L and your email regularly. Readings **MUST** be completed before class on the day they are due.

UNIT 1: CARBONATES - COMPONENTS AND PRODUCTION

Week	Date	Topic	Reading
1	M 8/23	Biom mineralization-- Carbonate mineralogy and chemistry	<ul style="list-style-type: none"> Syllabus
	W 8/25	Carbonate Grain Types; Limestone Classification	<ul style="list-style-type: none"> Wilson Ch. 1
	F 8/27	No Lab Week 1	<ul style="list-style-type: none">
2	M 8/30	<i>Papers discussion - carbonate grains and classification</i>	<ul style="list-style-type: none"> Dunham 1962 Folk 1959
	W 9/1	The carbonate factory: 1 Microbes and Algae, mud, peloids	<ul style="list-style-type: none"> CHAPTER 1.1 - 1.8 CHAPTER 6
	F 9/3	Lab: Grain Types	
3	M 9/6	Labor Day - No Class	<ul style="list-style-type: none">
	W 9/8	Field Trip	<ul style="list-style-type: none"> Field Guide Wermund 1975
	F 9/10	Lab: Classification of carbonate rocks pt 1.	<ul style="list-style-type: none"> Wilson Ch. 3
4	M 9/13	Field Trip Discussion and continued discussion of carbonate classification	<ul style="list-style-type: none"> Lokier and Jumaibi 2016 – The petrographic description of carbonate facies – are we all speaking the same language?
	W 9/15	The carbonate factory: 2 Single Cells and Shells	
	F 9/17	Lab: Classification of carbonate rocks pt 2	
5	M 9/20	Carbonate factory 3 - colonial inverts and echinos	
	W 9/22	Controls in carbonate production, transport and accumulation	<ul style="list-style-type: none"> CHAPTER 2.1 - 2.2

	F 9/24	Exam 1	
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UNIT 2: CARBONATE DEPOSITIONAL ENVIRONMENTS AND STRATIGRAPHY

Week	Date	Topic	Reading
6	M 9/27	Paper discussion - carbonate factory	<ul style="list-style-type: none"> • Hallock and Pomar, 2004 • Wright and Burgess, 2005 • Lougie et al. 2019
	W 9/29	Facies models: facies associations, mosaics and successions	<ul style="list-style-type: none"> • CHAPTER 2.3 • Wilson Ch. 2
	F 10/1	Lecture/Paper Discussion: Carbonate platforms: ramps, rimmed and isolated; greenhouse vs icehouse	<ul style="list-style-type: none"> • CHAPTER 2.4 - 2.11 • Burchette and Wright 1992 • Bosence et al. 2005 • Williams et al. 2011 • <i>Optional: Harris and Perkins; Wilkinson and Drummond; Ahr</i>
7	M 10/4	<i>Papers discussion - greenhouse vs icehouse</i>	<ul style="list-style-type: none"> • Read 1995 • Wright 1992
	W 10/6	High energy shorelines	<ul style="list-style-type: none"> • CHAPTER 3 • CHAPTER 4.1 - 4.2 • <i>Optional: Inden and Moore pt 1; Kendall 1992; Hampson 2000; Inden and Moore 1983</i>
	F 10/8	Lab: Guads	<ul style="list-style-type: none"> • AAPG Bulletin 49 • TBA
8	M 10/11	Peritidal Carbonates: Arid vs. Humid.	<ul style="list-style-type: none"> • CHAPTER 4.3 • Stricklin and Smith • <i>Optional: Hovorka 1987</i>
	W 10/13	The Tidal Flat Model.	<ul style="list-style-type: none"> • Shinn pts 1 & 2 • <i>Optional: Kirkham; Maloof and Grotzinger; Rankey and Morgan</i>
	F 10/15	Lab: Arid vs Humid	<ul style="list-style-type: none"> • Hallam, 1984 • Roberts 1987 • <i>Optional: Mehrabi et al 2015</i>
9	M 10/18	Shoal Complexes and reefs	<ul style="list-style-type: none"> • CHAPTER 4.5 • James 1997a
	W 10/20	Pelagic Carbonates	<ul style="list-style-type: none"> • CHAPTER 5.1-5.8 • Jenkyns 2010
	F 10/22	Lab: Building a facies model	

10	M 10/25	Resedimented Limestones, Cool and deepwater carbonates	<ul style="list-style-type: none"> • CHAPTER 5.9 - 5.13 • James 1997b • <i>Optional: Gagan; Kreisa; Hanford; Poppelreiter</i>
	W 10/27	Continental carbonates	<ul style="list-style-type: none"> • CHAPTER 4.4
	F 10/29	Exam 2	
11	M 11/1	Sequence stratigraphy and Carbonates	<ul style="list-style-type: none"> • Kerans and Tinker • <i>Optional: Schlager; Von Waggoner 1988</i>
	W 11/3	<i>Papers discussion - sequence strat and facies models</i>	<ul style="list-style-type: none"> • Fischer 1964 • Sarg 1988 • Irwin 1965 • Pomar 2001
11	F 11/5	Lab: Strat Investigation	

UNIT 3: CARBONATE DIAGENESIS

Week	Date	Topic	Reading
12	M 11/8	The chemistry of carbonate diagenesis; Syn depositional & Early Marine diagenesis	<ul style="list-style-type: none"> • CHAPTER 7.1 - 7.4
	W 11/10	Paper presentations	
	F 11/12	Lab: Paper Presentations	
13	M 11/15	Meteoric, Karst diagenesis	<ul style="list-style-type: none"> • CHAPTER 7.5 • Westphal
	W 11/17	Burial (Compaction, Stylolites, ...); Dolomitization, Late Dolomitization	<ul style="list-style-type: none"> • CHAPTER 7.6 • CHAPTER 8
	F 11/19	Lab: Diagenesis and Classifying porosity/permeability	
14	M 11/22	Porosity Types and classification	<ul style="list-style-type: none"> • CHAPTER 1.9 • Choquette and Pray (1970)
	W 11/24	THANKSGIVING	
	F 11/26	THANKSGIVING	

UNIT 4: APPLICATION OF CARBONATE GEOLOGY

Week	Date	Topic	Reading
15	M 11/29	Basin analysis	<ul style="list-style-type: none"> Sanantonio 2011, more TBA
	W 12/1	<i>Paper jigsaw - Carbonates in oil, gas, and sequestration, mineral resources, enviro</i>	TBA
	F 12/3	Exam 3	