

**Course Syllabus:**  
**Carbonate Depositional Systems & Stratigraphy**

McCoy College of Science, Mathematics, and Engineering

Lecture - GEOS 5313 Section 101

Spring 2023

MW 3 – 4:20 pm | Bolin Hall 125

[Course D2L Site](#)

**Laboratory Section**

GEOS 5313 Section 11A: F 1 – 2:50 pm | Bolin Hall 125

**Contact Information**

Instructor: Dr. Steven J. Rosscoe

Office: Bolin Hall 131a / Pierce Hall 204 (after Nov. 1)

Office hours: MWF 10 am – Noon | By Appointment

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**Course Description**

This course covers all aspects of marine 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 reading and discussion of carbonate related topics.

**Course Learning Objectives**

The successful completion of this course will be evaluated around the following course learning objectives. Each of these course learning objectives include aspects of both content knowledge and skills development. Students will:

1. Investigate the fundamental concepts of the formation and alteration of carbonate rocks in varying depositional environments and through diagenetic processes.

2. Apply modern understandings of the relationship between the lithological and biological components of carbonate rocks with their environment and exposure to diagenetic processes to interpret past depositional environments, energy of environment, and paleoclimate.
3. Develop analytical techniques and observational skills to analyze carbonate rocks and sediments using reflected light microscopy, petrographic microscopy, core logging, and well log data.
4. Apply analytical techniques and observational skills to analyze carbonate rocks in the field through stratigraphic investigations.
5. Students will develop writing skills and illustration techniques by evaluating and interpreting depositional environments of carbonate rocks in core samples.

### **Textbook**

Required Textbook:

James, N. P. and Jones, B. 2016. Origin of Carbonate Sedimentary Rocks. Wiley. 446 p. ISBN 978-1-118-65273-2

*NOTE: This book is an excellent reference, you should strongly consider a physical copy if you plan to work in the fields of sedimentary geology or paleontology and keep it for life.*

### **Grading**

The formal grade for this course is determined by your performance on lecture exams, a laboratory examination, a course project, and laboratory activities. Table 1 shows the point distribution for each of the major activity groupings. Table 2 (next page) shows the point allocation for the determination of the final letter grade in the course.

Table 1: Points allocated to each assignment type. For more details see assignment descriptions below.

<b>Assignments (Quantity)</b>	<b>Points</b>
Lecture Examinations (2)	200
Laboratory Examination (1)	100
Course Project (1)	100
Lab Activities (10)	200
<b>Total Points</b>	<b>600</b>

Table 2: Total points for final grade.

<b>Grade</b>	<b>Points</b>
A	540 and up
B	480 to 539
C	420 to 479
D	360 to 419
F	Less than 360

#### Lecture Examinations (Online)

There will be a midterm exam and a final exam in this course. Each examination is worth 100 points. The midterm and final will focus on lecture content related to the study of carbonate rocks. Each exam will consist of 10 essay questions (10 points each). Exams are given online through D2L. You will have three hours to complete each examination and will have one attempt (note: you must complete the exam once you start it). A ten-point essay question requires complete, grammatically correct, graduate-level writing. Each answer will need to be a minimum of ten sentences in length if you expect to earn full credit. You must answer the question asked. Unrelated or off topic answers will not earn credit.

The examinations are open notes and open textbook. Do not use the internet. The use of **only** your notes and your textbook are allowed. No aid from any other source, including web resources, AI, or people is all allowed. Copying directly or paraphrasing the works of others as answers to these questions will be considered academic dishonesty and will result in the penalties ranging from getting a zero on the question to failing the course.

The midterm will be released on Friday October 6<sup>th</sup>, 2023, by 11:59 pm and will be due by Friday October 13<sup>th</sup>, 2023, at 11:59 pm. The midterm will cover all lecture discussions from weeks 1 through 6. The final will be released on December 8<sup>th</sup>, 2023, by 11:59 pm and will be due by December 11<sup>th</sup>, 2023, at 11:59 pm. The final will cover all lecture discussions from weeks 7 through 15 and may require knowledge from weeks 1 through 6 to completely answer questions.

Your final exam block for this course is December 11<sup>th</sup> from 3:30 pm – 5:30 pm. You are not required to be present during the exam block but I will be available, in my office, for you at this time if you have any last-minute questions or study help needs.

#### Laboratory Examination (In Class)

There will be one laboratory examination at the end of the course. This examination is worth 100 points. This examination will evaluate your ability to use the proper terminology to formally describe, identify, and interpret the depositional environment of carbonate rocks. The examination will be specimen based and must be taken in the lab at the time and date scheduled on this

syllabus. This examination will occur during our last laboratory meeting on December 8<sup>th</sup>, 2023, from 1:00 pm to 2:50 pm. It must be completed during this time as it is a specimen-based examination. This examination is open notes. You may use only your lab notes, course textbook, supplemental lab readings, and lab handouts. You may not use the internet, AI, or other people as you complete this examination.

#### Project (Outside of Class Time)

The course project is a detailed investigation of two stratigraphic sections where you will identify units, describe the lithological and biological characteristics of the units, and interpret the environment and the depositional and diagenetic history of the rocks with each unit. Each study is worth 50 points. The two sections studied are unrelated.

One section will be a measured section of the West Spring Creek Lime from the Arbuckle Mountains of Oklahoma. You will work in pair to measure and describe this section on the required course field trip on October 21, 2023 (see D2L for more field trip details).

The second section will be one derived from the core you begin to investigate in Lab 9 for the course. Lab 9 will involve a small portion of the core. For the project you will need to complete the full core in pairs for the second portion of the course project.

You will construct a detailed annotated measured section for each study using Adobe Illustrator and the standardized lithology symbols required for scientific publications. You will then write a paper for each study that describes, identifies, and interprets the depositional and diagenetic history of the rocks and fossils present. Specific formatting and structuring of the papers will be found in D2L after mid semester. Both papers will require a digital annotated measured section and digital photos of specimens from the study that show important features you discuss in your papers.

#### Lab Activities (In Lab)

There are 10 formal labs that will be completed for this course. Each lab focuses on an aspect of carbonate mineral, sedimentology, petrography, outcrop-scale study, or core study. These labs are designed to build your comfort and skill in the terminology, analysis, and interpretation of carbonate rocks.

Each of the ten labs will be designed to build your experience with the skills and interpretations related to the week's lab materials. Each lab period will start with a brief introduction to the content and will be followed with time to work on the lab activity. The bulk of the lab activity is to practice and build skills and is not graded, a portion of the lab activity will be turned in for grading. At the start of the next laboratory period students will submit the graded activity to the instructor for grading.

Note: For lab meetings on 9/8, 10/20, and \_\_\_\_\_, you will need to read the pre-lab reading, print the activity from D2L, and I will provide a video introduction in advance. The lab room will be open, but I will be attending a first-year seminar class and arrive for the lab activity by 2 pm.

#### Late Work

Most assignments in this course have at least a week of lead time before their due dates. It is your responsibility to complete the assignment before the due date. If you have something that will prevent you from completing the assignment on the day it is due, get it done earlier. **No late work will be accepted.** Missed labs and examinations may be made up with a legal, paper-documented, excuse. See below for make-up work policy.

#### Make-Up Work/Tests

For legal, paper-documented, excuses make-ups for labs and examinations can be completed. Discussions cannot be made up; discussions require interaction with your peers in real time. Make-up work should be arranged for in advance wherever possible. The instructor will give you a new deadline that is reasonable for the course timeline. **No make-up work (lecture or lab) will be allowed beyond 10 days past the original deadline.**

#### Instructor Class Policies

The following policies are the policies that are integral for our successful completion of the course and should be read thoroughly. If you have any questions, please see the instructor.

#### Academic Honesty

Academic dishonesty is considered cheating, collusion, and plagiarism. Any unauthorized assistance during the completion of assignments, using on aids beyond those authorized for an assignment, or the use of other people or services to complete assignments is considered cheating. Working with others in a way that is not authorized by the instructor to complete assignments is considered to be collusion. Plagiarism is the use of another person's materials (by paraphrase or direct quotation) without giving them full and clear acknowledgement. The use of material prepared by another person or agency selling term papers and academic materials is also considered plagiarism.

The use of any artificial intelligence (AI) in completing course assignments is NOT allowed. AI in this sense is any technology that summarizes, writes, or answers questions on its own. Recent court rulings have allowed lawsuits to go forward against Chat GPT and other AI operators because it directly plagiarizes the use of others. College is about you learning to write, you developing your voice, and you learning how to process, summarize, and properly cite information. Any use of AI is considered a violation of this academic honesty policy.

If a student is caught cheating, colluding, or plagiarizing on any assignment the assignment grade will automatically be a zero. Two or more violations will result in failure of the course.

### Classroom Civility (IMPORTANT)

Learning, especially in science, can be a very challenging process. Learning often requires putting yourself out there and being vulnerable. Science also happens to be at the forefront of information which may conflict with personal beliefs. Your beliefs are yours and nothing will change that, though those beliefs may not get you credit on the exam. We are focused on science and what understandings have been developed in the field. Additionally, no scientist thinks the same way as every other scientist. To develop the best understandings of our universe, we must seek input from all people in the field.

In my classroom, we strive to create an environment where everyone is respected and valued for who they are. We are all here together, learning together, and working toward the same goal. This is not a place for hate of any kind. The use of derogatory language, hate speech, or violence is absolutely unacceptable in this classroom and in any setting related to the course. Learn to work with and value all people. Be civil and treat each other with respect. Do your best to listen to each other, in any conversation. Use of derogatory language, hate speech, or violence will result in removal to the classroom or the course.

Dr. Rosscoe (me) is available to help if you have any concerns or questions about building a positive classroom environment. The campus also has numerous resources related to a safe and welcoming experience at MSU. Also, don't forget the MSU Safety App.

- [MOSAIC Cross Cultural Center](#): Works to create a campus community where all students feel included, affirmed, and successful.
- [Title IX Misconduct](#): Dating violence, sexual assault, sexual harassment, stalking, and other forms of sexual misconduct.
- [Bias Incident Reporting](#): Bias and hate incidents related to race, gender, or sexual identity.
- [Disability Grievance Procedures](#): Discrimination on the basis of disability.

### COVID-19 and Illnesses

Since COVID-19, classroom health has been a necessary and probably long overdue focus. While there are no longer COVID-19 policies in place by the university the following procedures are scientific best practices. These same principles can be applied to any viral infection (flu, cold, etc.).

- If you become ill and have symptoms, get tested.
- If you are positive for COVID-19, stay home. It's good for your recovery and good for protecting your peers.

- Illness happens and if you absolutely must be in public, wear a mask. Even a cloth mask reduces the chance you will spread the illness to others.
- If you stay home or miss assignments, be sure to get a Doctor's note and excuse. It let's me help you make things up.

In the case of long-term illnesses or medical situations that will prevent you from attending classes regularly, contact the professor (me) as soon as possible. We will work together to make sure that you can succeed, just make sure it's Doctor-documented. I can't do much to help, if I don't know until the day before the semester ends.

#### Electronic Devices

Use of electronic devices for taking notes is allowed in my classroom. Recording (audio or video) is not allowed unless approved by the instructor for educational purposes. The use of social media or streaming anything is not an appropriate use of technology during class. If your use of technology in non-educational or is being disruptive to your peers, you will be asked to leave.

#### Course Grade and Grade Bumps

In my courses, a grade is earned by accumulating points throughout the semester. The grade you earn in the course is determined by the number of points you earn through the timely completion of assignments. As such, at the end of the semester, there are no grade bumps given out. Do not ask how or if you can be bumped up to the next letter grade, if you haven't earned the points you will not be able to get that grade.

If you believe there to be an error in the calculation of your grade, whether it is on a specific assignment or the whole course feel free to ask me to re-evaluate and double check. I will do so happily. For specific assignments, be prepared to give me specific reasons you feel the grade is wrong (which wrong answer do you think was right, etc.).

#### Desire-to-Learn (D2L)

Extensive use of the MSU D2L learning management system is required in 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 the technicians listed for the program or contact your instructor.

#### Computer Requirements

Taking this course involves the completion of all lecture exams, reading quizzes, and discussions in the course learning management system (D2L). This class requires you to have access to a computer (with Internet access) to complete and upload your assignments. It is your responsibility to have (or have access

to) a working computer in this class. **Assignments and tests are due by the due date, and personal computer technical difficulties will not be considered a reason for the instructor to allow students extra time to submit assignments, tests, or discussion postings.** Computers are available on campus in various areas of the buildings as well as the Academic Success Center. **Your computer being down is not an excuse for missing a deadline!!** There are many places to access your class! Our online classes can be accessed from any computer in the world which is connected to the internet. Contact your instructor immediately upon having computer trouble. If you have technical difficulties in the course, there is also a student helpdesk available to you. The college cannot work directly on student computers due to both liability and resource limitations however they are able to help you get connected to our online services. For help, log into D2L.

### **University Policies and Information**

The following information and policies apply to this course. Please read each of these policies and ask your instructor if you have any questions.

#### Important Dates

Last day for term schedule changes: August 31, 2023

Deadline to file for December graduation: September 25, 2023

Deadline to file for May graduation: October 2, 2023

Last Day to drop with a grade of "W:" October 30, 2023

#### Attendance

Students are expected to attend all meetings of the classes in which they are enrolled. Although in general students are graded on intellectual effort and performance rather than attendance, absences may lower the student's grade where class attendance and class participation are deemed essential by the faculty member. In those classes where attendance is considered as part of the grade, the instructor should so inform students of the specifics in writing at the beginning of the semester in a syllabus or separate attendance policy statement. An instructor who has an attendance policy must keep records on a daily basis. The instructor must give the student a verbal or written warning prior to being dropped from the class. Instructor's records will stand as evidence of absences. A student with excessive absences may be dropped from a course by the instructor. Any individual faculty member or college has the authority to establish an attendance policy, providing the policy is in accordance with the General University Policies.

#### Change of Schedule

A student dropping a course (but not withdrawing from the University) within the first 12 class days of a regular semester or the first four class days of a summer semester is eligible for a 100% refund of applicable tuition and fees. Dates are published in the Schedule of Classes each semester.



### Refund and Repayment Policy

A student who withdraws or is administratively withdrawn from Midwestern State University (MSU) may be eligible to receive a refund for all or a portion of the tuition, fees and room/board charges that were paid to MSU for the semester. HOWEVER, if the student received financial aid (federal/state/institutional grants, loans and/or scholarships), all or a portion of the refund may be returned to the financial aid programs. As described below, two formulas (federal and state) exists in determining the amount of the refund. (Examples of each refund calculation will be made available upon request).

### 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](#).

### Campus Carry Rules/Policies

Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. The new Constitutional Carry law does not change this process. Concealed carry still requires a License to Carry permit, and openly carrying handguns is not allowed on college campuses. For more information, visit [Campus Carry Rules and Policies](#)

### Active Shooter

The safety and security of our campus is the responsibility of everyone in our community. Each of us has an obligation to be prepared to appropriately respond to threats to our campus, such as an active aggressor. Please review the information provided by MSU Police Department regarding the options and strategies we can all use to stay safe during difficult situations. For more information, visit [Safety / Emergency Procedures](#).

### Smoking/Tobacco Policy

College policy strictly prohibits the use of tobacco products in any building owned or operated by MSU. Adult students may smoke only in the outside designated-smoking areas at each location.

### Alcohol and Drug Policy

To comply with the Drug Free Schools and Communities Act of 1989 and subsequent amendments, students and employees of Midwestern State are informed that strictly enforced policies are in place which prohibits the unlawful possession, use or distribution of any illicit drugs, including alcohol, on university property or as part of any university-sponsored activity. Students and employees are also subject to all applicable legal sanctions under local, state and federal law for any offenses involving illicit drugs on University property or at University-sponsored activities.

### Grade Appeal Process

Following the appropriate procedure for grade appeals requires you to speak to your instructor first, so talk to your instructor. Students who wish to appeal a grade should consult the Midwestern State University [Undergraduate Catalog](#).

## Course Schedule

Notice: Changes in the course syllabus, procedure, assignments, and schedule may be made at the discretion of the instructor.

Week	Monday (Lecture)	Wednesday (Lecture)
	Friday (Labs)	
<b>Week 1</b> <b>8/28</b> to <b>9/1</b>	Introduction/Carbonates Review <i>James &amp; Jones Ch. 1</i>	Carbonate Chemistry <i>James &amp; Jones Ch. 2</i>
	<b>No Laboratory Meeting</b> <b>First Week of Classes</b>	
<b>Week 2</b> <b>9/4</b> to <b>9/8</b>	<b>No Classes</b> <b>Labor Day Holiday</b>	The Carbonate Factory <i>James &amp; Jones Ch. 3</i>
	Lab 1: Carbonate Mineralogy <i>James &amp; Jones Ch. 2, Lerman &amp; Mackenzie (2016) [PDF]</i>	
<b>Week 3</b> <b>9/11</b> to <b>9/15</b>	Marine Carbonate Factories <i>James &amp; Jones Ch. 4</i>	Microbes and Algae <i>James &amp; Jones Ch. 5</i>
	Lab 2: Carbonate Sediments <i>Imbry &amp; Purdy (1962) [PDF]</i>	
<b>Week 4</b> <b>9/18</b> to <b>9/22</b>	Single Cells and Shells <i>James &amp; Jones Ch. 6</i>	Echinoderms & Colonial Inverts <i>James &amp; Jones Ch. 7</i>
	Lab 3: Folk Classification of Carbonates <i>Folk (1962) [PDF]</i>	
<b>Week 5</b> <b>9/25</b> to <b>9/29</b>	Lacustrine Carbonates <i>James &amp; Jones Ch. 8</i>	Carbonate Springs <i>James &amp; Jones Ch. 9</i>
	Lab 4: Dunham Classification of Carbonates <i>Dunham (1962) [PDF]</i>	
<b>Week 6</b> <b>10/2</b> to <b>10/6</b>	Warm-Water Neritic Carbonates <i>James &amp; Jones Ch. 10</i>	Cool-Water Neritic Carbonates <i>James &amp; Jones Ch. 11</i>
	Lab 5: Carbonate Facies Description <i>Lokier &amp; Al Junaibi (2016) [PDF]</i>	
<b>Week 7</b> <b>10/9</b> to <b>10/13</b>	Muddy Peritidal Carbonates <i>James &amp; Jones Ch. 12</i>	Carbonate Tidal Sands <i>James &amp; Jones Ch. 13</i>
	Lab 6: Carbonate Cements <i>Scholle (1978) [PDF]</i>	
<b>Week 8*</b> <b>10/16</b> to <b>10/20</b>	Modern Reefs* <i>James &amp; Jones Ch. 14</i>	Ancient Reefs* <i>James &amp; Jones Ch. 15</i>
	Lab 7: Carbonate Diagenesis <i>Scholle &amp; Scholle Ch. 22-26 (2003) [PDF]</i>	
	<i>10/21/2023 - Arbuckles Field Trip (8 am – 6 pm)</i>	

\*Note: Dr. Rosscoe will be attending and presenting at GSA Connects in Pittsburgh, PA during week 8. Lectures will be provided as video lecture in D2L. Currently, we will plan on operating lab in person depending on travel needs.

## Course Schedule Continued

Notice: Changes in the course syllabus, procedure, assignments, and schedule may be made at the discretion of the instructor.

Week	Monday (Lecture)	Wednesday (Lecture)
	Friday (Labs)	
<b>Week 9</b> <b>10/23</b> to <b>10/27</b>	Carbonate Slopes <i>James &amp; Jones Ch. 16</i>	Deep-Water Carbonates <i>James &amp; Jones Ch. 17</i>
	Lab 8: Carbonate Porosity <i>James &amp; Jones Ch. 32</i>	
<b>Week 10</b> <b>10/30</b> to <b>11/3</b>	Precambrian Carbonates <i>James &amp; Jones Ch. 18</i>	Carbonate Sequence Strat. I <i>James &amp; Jones Ch. 19</i>
	Lab 9: Carbonates in Core	
<b>Week 11</b> <b>11/6</b> to <b>11/10</b>	Carbonate Sequence Strat. II <i>James &amp; Jones Ch. 19</i>	Carbonates & Earth I <i>James &amp; Jones Ch. 20</i>
	Lab 10: Carbonates in Well Logs	
<b>Week 12</b> <b>11/13</b> to <b>11/17</b>	Carbonates & Earth II <i>James &amp; Jones Ch. 20</i>	Introduction to Diagenesis <i>James &amp; Jones Ch. 21</i>
	Project Work Period	
<b>Week 13</b> <b>11/20</b> to <b>11/24</b>	Synsedimentary Diagenesis <i>James &amp; Jones Ch. 24</i>	<b>No Classes</b> <b>Thanksgiving</b>
	<b>No Laboratory Meeting</b> <b>Thanksgiving Holiday</b>	
<b>Week 14</b> <b>11/27</b> to <b>12/1</b>	Meteoric & Karst Diagenesis <i>James &amp; Jones Ch. 25, 26</i>	Burial Diagenesis <i>James &amp; Jones Ch. 27</i>
	Project Work Period	
<b>Week 15</b> <b>12/4</b> to <b>12/8</b>	Dolomite & Dolomitization <i>James &amp; Jones Ch. 28</i>	Dolomitization Processes <i>James &amp; Jones Ch. 29, 30</i>
	<b>Laboratory Examination</b> <b>All Materials from Labs</b>	
<b>Final</b> <b>12/11</b>	Final Exam Block: Mon. Dec. 11, 2023, 3:30 pm – 5:30 pm	

## Course Dates in Chronological Order

The following table lists the due dates of each assignment in the course.

<b>Date</b>	<b>Assignments/Events</b>
Fri. 09/15	Laboratory 1 – Graded Activity Due
Fri. 09/22	Laboratory 2 – Graded Activity Due
Fri. 09/29	Laboratory 3 – Graded Activity Due
Fri. 10/06	Laboratory 4 – Graded Activity Due Lecture Midterm Examination Released
Fri. 10/13	Laboratory 5 – Graded Activity Due Lecture Midterm Examination Due (11:59 pm)
Fri. 10/20	Laboratory 6 – Graded Activity Due
Sat. 10/21	Field Trip – Arbuckles, Oklahoma
Fri. 10/27	Laboratory 7 – Graded Activity Due
Fri. 11/3	Laboratory 8 – Graded Activity Due
Fri. 11/10	Laboratory 9 – Graded Activity Due
Fri. 11/17	Laboratory 10 – Graded Activity Due
Mon. 11/20	West Spring Creek Section Due (Optional) (11:59 pm)
Fri. 12/08	Full Project (Both Sections) Due (11:59 pm) Laboratory Final Examination (3:00 pm)
Mon. 12/11	Lecture Final Examination Due (11:59 pm)