



Course Syllabus: Invertebrate Paleobiology

McCoy College of Science, Mathematics, and Engineering

Lecture - GEOS 3534 Section 201

Spring 2023

MWF 9 – 9:50 am | Bolin Hall 125

[Course D2L Site](#)

Laboratory Sections

GEOS 3534 Section 21A: R 3 – 4:50 pm | Bolin Hall 125

Contact Information

Instructor: Dr. Steven J. Rosscoe

Office: Bolin Hall 131a

Office hours: MW 3 pm – 4 pm | T 9 am – 10 am, 11 am – 1 pm | Appointment

Office phone: (940) 397-4448

E-mail: steven.rosscoe@msutexas.edu

Course Description

An introduction to quantitative, theoretical, and descriptive invertebrate paleobiology. Topics include speciation, extinction, paleoecology, biostratigraphy, and systematics. Laboratory emphasizes hands-on analysis of fossil specimens, applied biostratigraphy, and quantitative fossil datasets. Includes a field trip with group project component to the Mineral Wells Fossil Park.

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 foundational concepts of paleontology (fossilization, evolution and speciation, growth of organisms, the principle of faunal succession, and the diversity of fossil through time).
2. Apply modern understandings of the relationships between organisms and their environments to interpret past depositional environments, energy of environment, and paleoclimate based on the fossil record.
3. Develop field and laboratory skills necessary for the proper collection and analysis of paleontological specimens.

4. Properly use anatomical terminology, observational skills, and methods of illustration that they will apply to writing professional descriptions of invertebrate fossils.

5. Students will develop presentation skills, group skills, and scientific literacy both in reading scientific literature and writing collaborative scientific-style papers.

Textbook & Required Materials

Required Textbooks:

Benton, M. J. and Harper, D. A. T., 2009. Introduction to Paleobiology and the Fossil Record. Wiley-Blackwell Publishers. ISBN: 978-1-4051-4157-4

NOTE: This is the first edition, the second edition will work as well! Get the cheapest!

Required Lab Materials:

- Laboratory Sketch Notebook – Spiral bound, 5.5” by 8.5”, 100 sheets [Amazon](#) (\$8.63)
- Mechanical Pencils, Colored Pencils, White Eraser
- Black Sharpies (Fine Point and Regular Tip)
- Rite in the Rain Field Notebook (Field Pattern Recommended) [Amazon](#)
- Rock Hammer (Rock Pick or Brick Hammer) [Amazon](#)

Grading

The formal grade for this course is determined by your performance on lecture exams, a laboratory examination, a group project, laboratory activities, and three assignments. 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.

Assignments (Quantity)	Points
Lecture Examinations (2)	200
Laboratory Examination (1)	100
Group Project (1)	180
Lab Activities (13)	130
Assignments (3)	090
Total Points	700

Table 2: Total points for final grade.

Grade	Points
A	630 and up
B	560 to 629
C	490 to 559
D	420 to 489
F	Less than 420

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 science of paleontology and its applications. Each exam will consist of 50 multiple choice questions (1 point each) and 5 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).

The examinations are open notes, open text. Do not use the internet. There are a ton of amateur paleontologists out there who love fossils and write authoritatively about them but who actually don't know what they are talking about. The use of only your notes and your textbook are allowed. No aid from any other source, including web resources, AI, or people.

The midterm will be released on March 3rd, 2023, and will be due by March 10th, 2023, at 11:59 pm. The midterm will cover chapters 1, 2, 3, and 6 from the course textbook. The final will be released on May 5th, 2023, and will be due by May 8th, 2023, at 11:59 pm. The final will cover chapters 4, 7, 8, and 20 from the course textbook. Your final exam block for this course is May 8th from 8:00 am – 10:00 am. 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 test your mastery of proper anatomical terminology, identifying the fossil group to which a specimen belongs, identifying important species (especially those from Texas), and interpreting depositional environments using information from those fossils. You will also need to demonstrate your ability to both sketch and fully describe at least one specimen. This examination will occur during our last laboratory meeting on May 4th, 2023, from 3:00 pm to 5:00 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 notebook and lab handouts. You may not use the internet, AI, or other people as you complete this examination.

Group Project (Outside of Class Time)

Employers in our industry are demanding a work force that can work collaboratively. In the field of geoscience specialization is very common but much of the work that is done requires experts from a variety of specializations. As such, geoscience is exceptionally collaborative. To help prepare you for this, you will be completing a large group research project during the semester to learn to work collaboratively, learn paleontology, and build your writing and editing skills.

The group project consists of three major components. They include a research project, coauthoring a scientific-style paper, and evaluating your participation and the participation of your group members in the project. The group project is worth 180 points.

The research phase of the project will begin with a required field trip on March 4th, 2023. This trip will leave Bolin Hall at 8 am and arrive in Mineral Wells, Texas around 10:00 am. Students will bring a picnic lunch. We will spend the day at the Mineral Wells Fossil Park. You will work in teams to make two fossil collections at the park. We will leave the Fossil Park between 4 and 5 pm. This will get us back to campus by 6 or 7 pm. Once back you will keep the same teams and work through your specimens by identifying, counting, illustrating, and describing your specimens.

You will work in your teams to coauthor a paper that compares the two collections that you made at the fossil park. In this paper you will follow a proscribed format, write independently, edit each other's work and blend your writings together so that it reads as if written by one individual. A complete rough draft of the paper is due on April 17th, 2023, by 11:59 pm in D2L. The paper will be edited, graded, and returned in approximately one week's time. You will then have until May 5th, 2023, to revise, update, and improve your paper. The final paper will be due at 11:59 pm in D2L. The grade you earn on the final paper will also replace the grade you earned on the rough draft. Also due on May 5th is your evaluation of your group and yourself throughout the duration of the project. The point breakdown for the project and components is found below:

Field Work = 50 points
Rough Draft = 50 points
Final Draft = 50 points
Group Evaluation = 30 points

Lab Activities (In Lab)

There will be thirteen laboratory activities throughout the duration of the course. One per week with the exception of the holiday week in April and the final week of lab meeting for the laboratory final. Labs are each worth 10 points. The first lab will require the submission of a paper worksheet. Each subsequent laboratory assignment requires the submission of your lab notebook (sketchbook) where you will sketch, label anatomical components, and describe between 10 and 15

fossil specimens, each week. Details of the lab sketchbook needed are found in the required materials portion of this syllabus. You will be supplied with a format guide for making entries in your sketchbook at the start of lab 2.

Labs meet each week on Thursday at 3:00 pm. You must complete your lab specimen work by 3:00 pm on the following Wednesday and submit your sketchbook to me. I will grade the sketchbooks and turn them back at the start of the next lab. The artistic nature of sketches is not graded, but they do need to show detailed anatomy and ornamentation as demonstrated by the specimen. Lab notebook grades are determined using the following point distribution.

Specimen Information = 2 points
Sketch(es) = 2 points
Anatomy Labels = 2 points
Description = 2 points
Other (Interpretations/Identifications) = 2 points

Assignments (Online Submission)

Early in the semester we will complete three assignments focusing on three important aspects of paleobiology and its applications. Each assignment is worth 30 points. Each assignment will be made available for more than one week and will need to be submitted as a Microsoft Word document in D2L for grading at the assignment deadline. These assignments are individual assignments, they are not group work. They should be completed independently using only notes and textbook materials. The following table (Table 3) shows the release date and due date for each assignment.

Table 3: Assignment Topic, Release, and Due Dates

Assignment Topic	Release Date	Due Date & Time
Description Assignment	R Jan. 19	M Jan. 30 11:59 pm
Biocorrelation Assignment	F Feb. 03	M Feb. 13 11:59 pm
Biostatistics Assignment	F Feb. 20	M Feb. 27 11:59 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.

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 and Inclusion

The best environment for learning is an environment where everyone is respected and valued for who they are. In my classroom, we are striving for full inclusion. Anyone using derogatory language toward an individual or group is in violation of this policy and will be asked to leave. We are all here together, learning together, this is not a place for hate of any kind. Be civil, treat each other with respect, and do your best listen to each other in any conversation.

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 a non-educational way 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: January 20, 2023

Deadline to file for May graduation: February 20, 2023

Last Day to drop with a grade of "W:" March 27, 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	Wednesday	Friday
<u>Week 1</u> 1/16 to 1/20	No Class <i>MLK Jr. Holiday</i>	Introduction <i>No Reading</i>	Paleontology <i>Chapter 1</i>
	Lab 1: Sketching and Description <i>No Reading</i>		
<u>Week 2</u> 1/23 to 1/27	Fossils & Taphonomy <i>Chapter 3</i>	Preservation <i>Chapter 3</i>	Bias & Sampling <i>Chapter 3</i>
	Lab 2: The Protists <i>Chapter 9</i> * Dr. Rosscoe's Research Presentation 4:30 pm (required)		
<u>Week 3</u> 1/30 to 2/03	Review of Biostrat. <i>Chapter 2</i>	Biozones <i>Chapter 2</i>	Biocorrelation <i>Chapter 2</i>
	Lab 3: The Basal Metazoans <i>Chapter 11</i>		
<u>Week 4</u> 2/06 to 2/10	Growth Styles <i>Chapter 6</i>	Growth Rates <i>Chapter 6</i>	Population Growth <i>Chapter 6</i>
	Lab 4: The Cnidarians <i>Chapter 11</i>		
<u>Week 5</u> 2/13 to 2/17	Morphology <i>Chapter 6</i>	Biostatistics <i>Chapter 6</i>	Biostatistics <i>Chapter 6</i>
	Lab 5: The Bryozoans <i>Chapter 12</i>		
<u>Week 6</u> 2/20 to 2/24	Bivariate Analysis <i>Chapter 6</i>	Multivariate Analysis <i>Chapter 6</i>	Interpreting Stats <i>Chapter 6</i>
	Lab 6: The Brachiopods <i>Chapter 12</i>		
<u>Week 7</u> 2/27 to 3/03	Paleoecology <i>Chapter 4</i>	Habitat/Niche <i>Chapter 4</i>	Trophic Structure <i>Chapter 4</i>
	Lab 7: The Gastropods <i>Chapter 13</i>		
<u>Week 8</u> 3/06 to 3/10	Limiting Factors <i>Chapter 4</i>	Paleocommunities <i>Chapter 4</i>	Paleoclimate <i>Chapter 4</i>
	Lab 8: The Cephalopods <i>Chapter 13</i>		
Spring Break	Spring Break Holiday 3/11 to 3/19		

Course Schedule Continued

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

Week	Monday	Wednesday	Friday
Week 9 3/20 to 3/24	What is Life? <i>Chapter 8</i>	Origin of Life <i>Chapter 8</i>	Origin of Life <i>Chapter 8</i>
	<u>Lab 9: The Bivalves</u> <i>Chapter 13</i>		
Week 10 3/27 to 3/31	Prokaryotes <i>Chapter 9, 10</i>	Eukaryotes <i>Chapter 9, 10</i>	Multicellularity <i>Chapter 9, 10</i>
	<u>Lab 10: The Arthropods</u> <i>Chapter 14</i>		
Week 11 4/03 to 4/07	Diversification <i>Chapter 20</i>	Diversification <i>Chapter 20</i>	No Class Holiday Break
	No Lab Holiday Break		
Week 12 4/10 to 4/14	Diversification <i>Chapter 20</i>	Adaptive Radiation <i>Chapter 20</i>	Biotic Replacement <i>Chapter 20</i>
	<u>Lab 11: The Echinoderms</u> <i>Chapter 15</i>		
Week 13 4/17 to 4/21	10 Major Steps <i>Chapter 20</i>	Biodiversity Loss <i>Chapter 7</i>	Rates of Extinction <i>Chapter 7</i>
	<u>Lab 12: Graptolites and Conodonts</u> <i>Chapter 15, 16</i>		
Week 14 4/24 to 4/28	Selective Extinction <i>Chapter 7</i>	End Ordovician Ext. <i>Chapter 7</i>	Late Devonian Ext. <i>Chapter 7</i>
	<u>Lab 13: Trace Fossils</u> <i>Chapter 19</i>		
Week 15 5/01 to 05/05	End Permian Ext. <i>Chapter 7</i>	End Triassic Ext. <i>Chapter 7</i>	End Cretaceous Ext. <i>Chapter 7</i>
	Laboratory Examination All Materials from Labs 1-13		
Finals 05/08	Final Exam Block: Mon. May 8, 2023, 8:00 am – 10:00 am		

Course Due Dates in Chronological Order

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

Due Date	Assignment
W 01/25	Lab 1: Sketching and Description
R 01/26	Dr. Rosscoe's Research Presentation
M 01/30	Description Assignment
W 02/01	Lab 2: The Protists
W 02/08	Lab 3: The Basal Metazoans
M 02/13	Biocorrelation Assignment
W 02/15	Lab 4: The Cnidarians
W 02/22	Lab 5: The Bryozoans
M 02/27	Biostatistics Assignment
W 03/01	Lab 6: The Brachiopods
Sat 03/04	Field Trip: Mineral Wells
W 03/08	Lab 7: The Gastropods
F 03/10	Midterm Examination (Chapters 1, 2, 3, 6) (11:59 pm)
W 03/22	Lab 8: The Cephalopods
W 03/29	Lab 9: The Bivalves
W 04/12	Lab 10: The Arthropods
M 04/17	Rough Draft of Paper Due (11:59 pm)
W 04/19	Lab 11: The Echinoderms
W 04/26	Lab 12: Graptolites and Conodonts
W 05/03	Lab 13: Trace Fossils
R 05/04	Laboratory Examination (5:00 pm)
F 05/05	Final Paper Due (11:59 pm)
F 05/05	Group Evaluations Due (11:59 pm)
M 05/08	Final Examination (Chapters 4, 7, 8, 20) (11:59 pm)