Paleoecological Analysis
EAR 400/600, section M007

Spring 2019 sections:
Mondays and Wednesdays 2:15-3:35pm
Heroy Geology Laboratory (HGL) Room 219

Instructor:
Dr. Melissa Chipman
Assistant Professor, Department of Earth Sciences
Office: HGL 317
Email: mlchipma@syr.edu

Office hours: Mondays 9:30-11:00 AM or email for appointment

Course Description
What is paleoecology? How are paleoecological data used to answer questions about ecosystem response to humans and climate change? This course will explore various themes and methods in paleoecological research, including an introduction to age-depth modelling, plotting stratigraphic data, and using multivariate techniques. In addition, we will critically examine different methods for reconstructing past climate, vegetation, and ecosystem change. Example datasets may include diatom, pollen, charcoal, and insect records from lake sediments.

Course Objectives:
1. Critically examine age modelling methods, with a focus on assumptions and sources of error
2. Evaluate paleoecological datasets using stratigraphic and multivariate data techniques in R
3. Explore quantitative methods for reconstructing climate and environmental change with biological data

Course Content and Format
This course will explore topics throughout the semester using a Discussion + Practical approach. In general, weekly topics will be divided into one class period of lecture and discussion of weekly readings, and a second class period that will be dedicated to hands-on data analyses. Most data analyses will be done in R, but we may also use Excel and online programs throughout the semester.

Course materials will be housed on **Google Drive** and updated regularly. Materials include:

1. Course schedule - readings and links to online data will be updated on this syllabus each week. Check here for all assignments. *Content on the hard copy of the course schedule handed out on the first day is likely to change. All updates will be online.*
2. Readings/Assignments – a folder with all handouts and reading assignments, except for any that are only accessible online (links provided in the online course schedule)
3. PowerPoints – After each lecture, PowerPoint presentations will be uploaded for students to use as supplements to notes taken in class
4. Optional Material - any optional material for students will be housed here. These materials are not required for the course.

Course Evaluation:
Final grades will be assigned based on the following rubric:

Attendance & Participation (20% of total): Active participation in the group discussions is valuable to everyone's learning experience. Thus, students are expected to read all assigned articles, attend class, and participate in weekly discussions. In addition, everyone likely has different levels of experience with using the software. Thus, students are strongly encouraged to help each other during weekly coding sessions. Assessment of participation may include short written quizzes to assure weekly readings have been completed. All students will receive a weekly grade for participation.

In-Class Practicals (40% of total): Students will turn in a word or pdf document each week that may include annotated scripts used in R (to show work and help diagnose any issues), generated figures and plots, and/or data interpretation (specifics of this will be included as part of each assignment).

Midterm Exam (20% of total): Short-answer and multiple-choice exam

Final Class Project (20% of total): Includes a short written report with figures and an oral presentation on an assigned topic. This will be considered the final exam.

Final Grade	Minimum Percentage
A	93% and above
A-	90%
B+	87%
B	83%
B-	80%
C+	77%
C	73%
C-	70%
D	60%
F	59% and below

Expectations and Classroom Policies:
Students must bring laptops to class, and must download any course material necessary to complete in-class and homework assignments.

Students are expected to attend all classes, do weekly reading and homework assignments, and participate in all classroom discussions.

For classroom discussions, all opinions and experiences, no matter how different or controversial they may be perceived, must be respected in the tolerant spirit of academic discourse. You are encouraged to respectfully comment on ideas, but not the people who present those ideas. This statement is intended to help cultivate a respectful environment, and it should not be used in a way that limits expression or restricts academic freedom at Syracuse University and at ESF.

University Polices that will be enforced in this class:

Attendance Policy: Attendance in classes is expected in all courses at Syracuse University. It is a federal requirement that faculty promptly notify the university of students who do not attend or cease to attend any class. Faculty will use Early-Semester Progress Reports and Mid-Semester Progress Reports in Orange SUccess to alert the Registrar and Financial Aid Office on non-attendance. For more information visit: http://registrar.syr.edu/students/non-attendance/. Students may contact the Office of Student Assistance in cases where they are absent from class for an extended period of time (48 hours or more) due to illness or other medical condition. The Office of Student Assistance will utilize Orange SUccess to send absence notifications to faculty. For illnesses lasting less than 48 hours, the student should discuss academic arrangements with their faculty. Additional information may be found at: http://studentassistance.syr.edu/our-services/absence-notifications.html

Syracuse University Academic Integrity: Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered as described in the Violation and Sanction Classification Rubric. Syracuse University students are required to read an online summary of the University's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check- in on MySlice.

SUNY-ESF Academic Integrity Policy: Academic dishonesty is a breach of trust between a student, one's fellow students, and/or the instructor(s). By registering for courses at ESF you acknowledge your awareness of the ESF Code of Student Conduct (http://www.esf.edu/students/handbook) , in particular academic dishonesty includes but is not limited to plagiarism and cheating, and other forms of academic misconduct. The Academic Integrity Handbook contains further information and guidance (http://www.esf.edu/students/integrity/). Infractions of the academic integrity code may lead to academic penalties as per the ESF Grading Policy (https://www.esf.edu/provost/documents/GradingPolicy.11.12.2013.pdf)

Disability-Related Accommodations: Students at both Syracuse University and SUNY-ESF who need academic adjustments (accommodations) for a disability can contact the Office of Disability Services (ODS) at Syracuse University, who is responsible for coordinating disability related accommodations. Students can contact ODS at 804 University Avenue- Room 309, or call (315) 443-4498 or TDD: (315) 443-1371 to schedule an appointment and discuss their needs and the process for requesting accommodations. ESF students may also contact the ESF Office of Student Affairs, 110 Bray Hall, 315-470-6660 for assistance with the process. To learn more about ODS, visit http://disabilityservices.syr.edu. Authorized accommodation forms must be in the instructor's possession one week prior to any anticipated accommodation. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

Other Policies: Students should review Syracuse University's policies regarding: Diversity and Disability https://www.syracuse.edu/life/accessibilitydiversity/; the Religious Observances Notification and Policyhttp://supolicies.syr.edu/studs/religious_observance.htm; and Orange SUccess - http://orangesuccess.syr.edu/getting-started-2/

Course schedule (subject to revision) - updated weekly on Google Drive

Date	Day	Class Type	Description	Assigned Homework and Readings
14-Jan	Mon	Discussion	**Welcome to course!** **Introduction to paleoecology**	Download for Weds: R (latest version) Download for Weds: R Studio Do before Weds: Short R Tutorial
16-Jan	Weds	Practical	Introduction to R Studio	Read for Wed: Blaauw and Heegaard 2012 (TEC_v5 Chapter 12)
21-Jan	Mon	NO CLASS	MLK Day	
23-Jan	Weds	Discussion	**Overview of dating methods**	Read for Mon: Telford 2004
28-Jan	Mon	Practical	Calibrating radiocarbon ages *Turn in: Age data table*	Read for Weds: Traschel and Telford 2017
30-Jan	Weds	Discussion	**Chronologies: The good, the bad, and the ugly**	Download for Mon: CLAM and BACON
4-Feb	Mon	Practical	Constructing age-depth models in R *Turn in: Age model plot and justification*	Read for Weds: Birks 2012 (TEC_v5 Chapter 11)
6-Feb	Weds	Discussion	**Stratigraphic Data Part 1: First steps in dealing with multivariate data**	
11-Feb	Mon	Practical	Plotting stratigraphic diagrams, clustering and zonation, scatterplots of data, var/covar tables *Turn in: Plots and tables*	
13-Feb	Weds	NO CLASS		Read for Monday - Simpson et al. 2018
18-Feb	Mon	Discussion	**Stratigraphic Data Part 2: loess smooths, splines, and GAMS**	
20-Feb	Weds	Practical	Plotting and smoothing data in R *Turn in: plots and justification*	
25-Feb	Mon	Discussion	**Detecting change/patterns in paleorecords**	
27-Feb	Weds	Practical	Change point analysis and Superposed Epoch Analysis in R *Turn in: Plots and interpretation*	
4-Mar	Mon	Discussion	**Chronologies revisited:** Incorporating age model error into data interpretation	
6-Mar	Weds	EXAM	Midterm - written exam	
11-Mar	Mon	NO CLASS	SPRING BREAK - Have fun!	
13-Mar	Weds	NO CLASS	SPRING BREAK - Have fun!	
18-Mar	Mon	Discussion	**Data Exploration Part 1: Multivariate techniques**	

20-Mar	Weds	Practical	DCA, PCA, and CA in R *Turn in: Plots and interpretation*	
25-Mar	Mon	Discussion	**Data Exploration Part 2: Direct gradient analyses**	
27-Mar	Weds	Practical	CCA and RDA in R *Turn in: Plots and interpretation*	
1-Apr	Mon	Discussion	**Modern Analogue Techniques**	
3-Apr	Weds	Practical	MAT in R *Turn in: plots and interpretation*	
8-Apr	Mon	Discussion	**Transfer Functions Part 1 - a critical evaluation**	
10-Apr	Weds	Practical	Creating and Assessing Transfer Functions in R *Turn in: Plots and interpretation*	
15-Apr	Mon	Discussion	**Transfer Functions Part 2: Using training sets to explore fossil data**	
17-Apr	Weds	Practical	Reconstructing paleoenvironmental and paleoclimate change in R *Turn in: Turn in: Plots and interpretation*	
22-Apr	Mon	Discussion	**Exploring paleodata archives** **Best practices for presenting paleodata**	
24-Apr	Weds	Practical	In class work on final projects	
29-Apr	Mon	Discussion	**Tying it all together**	
TBD	TBD	EXAM	FINAL EXAMS - turn in final projects	