GOL 445.001 – Geochronology – Fall 2019
College of Sciences & Mathematics – Stephen F. Austin State University

Instructor: Dr. Liane Stevens
Department: Geology
Email: stevenslm@sfasu.edu
Office: Miller Science, Room 311
Phone: 936-468-2024
Mailbox: Miller Science, Room 301 (business hours)
Office Hours: M 9:30-11:00 a.m.; TR 10:45 a.m. – noon; W 1-2:00 p.m.; drop in; or by appointment.

Lecture Meetings: Monday, 1:00-3:30 p.m., Miller Science, Room 333

Course Description: Geochronology (GOL 445) – Three semester hours (three lecture hours per week). The principles and practical applications of using radiogenic isotope systems to determine the timing of geologic events and the rates of geologic processes. Prerequisites: GOL 132. Required field trip. Required field trip fee.

Course Materials:
- No single textbook is suitable for the range of topics we will cover this semester. I will make available to you many excellent online resources and journal articles. Please see D2L for PDFs, links, and a list of suggested references.
- You will need a pencil, eraser, calculator, and access to a computer laboratory for this course.
- You are expected to bring a notebook and/or binder to all class meetings to keep and organize notes and handouts for reference.

Program Learning Outcomes:
PLO 1. Demonstrate knowledge of fundamental geoscience concepts. (Concepts)
PLO 2. Execute geoscience procedures and methods accurately, appropriately, and safely. (Geoscience Skills)
PLO 3. Demonstrate proficiency in interpretation and communication of geoscience information. (Scientific Communication)
PLO 4. Apply concepts, skills, and scientific communication to identify, analyze, and interpret geoscience phenomena. (Research)

Student Learning Outcomes: After successful completion of this course, students will be able to:
SLO 1. Describe past and modern approaches to the understanding of geologic time. (PLO 1)
SLO 2. Explain the fundamental principles of radiogenic isotope geochemistry and geochronology. (PLO 1)
SLO 3. Apply the appropriate isotope systems, chronometers, and analytical methods to the resolution of geologic problems. (PLO 1)
SLO 4. Analyze and interpret simple geochronologic and geochemical data using Excel. (PLO 3, 4)
SLO 5. Evaluate the current scientific literature in the context of course concepts and themes. (PLO 1, 3)
**Course Format:** Course material is addressed through traditional lectures paired with learning activities and discussions of relevant scientific literature. Coursework also includes problem sets and paper summaries. A **required** field trip to a nearby geochronology laboratory will provide context to our discussions. Your progress during the semester will be assessed through problem sets, paper summaries, discussion participation, and two exams (midterm and final). This course differs from the graduate version (GOL 545) as follows: the scope of the problem sets and paper summaries is lesser; exams do not require the detailed application of course concepts in essays; and you will not be expected to lead paper discussions.

**Workload:** You are expected to spend time on this course outside of lecture and lab periods. This time should be spent 1) completing assignments (readings, problem sets, paper summaries); 2) reviewing/studying your lecture notes, lecture slides, readings, and assignments on a regular basis; and 3) studying for exams.

**Lectures:** It is your responsibility to take good notes during lectures so that you have a record of concepts, chalkboard sketches, activities, and discussions not included in my image-heavy PowerPoint slides. Each PowerPoint file ends with two review slides. The first slide contains vocabulary introduced or emphasized during class; the second contains review questions designed to help you summarize, reinforce, and apply your new knowledge. I strongly recommend that you review these slides after each lecture, and again as you prepare for each exam.

**Problem Sets:** Problem sets are assigned to reinforce lecture concepts and to explore methods of data analysis in geochronology (see course schedule). Additional problem sets may be assigned as warranted. Students are expected to work independently toward completion of problem sets, unless otherwise instructed.

**Paper Summaries & Discussions:** Reading, summarizing, and discussing papers from the geoscientific literature will develop and apply your understanding of course content. For each scientific paper assigned, you will answer questions and write a brief summary that will be due at the beginning of class on the day of the discussion. You are expected to participate in the discussion. Discussions require your presence in class and cannot be made up in case of absence. Effective methods for reading, summarizing, and discussing papers will be discussed in detail during course meetings.

**Required Field Trip:** This course has a required field trip on October 24-26. We will travel by SFA vans to a nearby academic geochronology laboratory and also collect some geochronology samples. This will be a camping field trip – you will receive more detailed information regarding requirements, the itinerary, and a packing list well before the trip.

**Exams:** The midterm and final exams will test lecture concepts. The exam will include a variety of question formats (multiple choice, fill in the blank, short answer, etc.) The final exam is not cumulative. You will need a pencil, eraser, straight edge, and calculator (if indicated) for exams – the use of any other materials or devices during exams is not permitted.
Course Schedule: A course calendar provided at the end of the syllabus outlines the schedule of lecture topics, paper discussions, exams, the field trip and other course activities, as well as the due dates for all assignments. Note that all assignments are due at the beginning of class on the date for which they are listed. I reserve the right to modify the schedule as needed, and I will notify you accordingly.

Attendance: You are expected to attend all course meetings. I will take attendance for university accounting purposes. Excused absences include illness, serious emergency, and events during which you are representing the University. Poor planning and vacations are not excused absences.

If You Have Been Absent: 1) Contact a classmate for a copy of lecture notes. 2) Check D2L for lecture slides and course assignments. 3) Attend office hours or make an appointment for clarification of missed concepts or assignments. All information regarding what you missed is provided in the syllabus and on D2L. You do not need to contact me regarding an absence unless you require new deadlines. Exams will not be rescheduled for unexcused absences.

Late Work: If you have an upcoming excused absence or are having trouble completing an assignment on time, please contact me well before the due date about alternative arrangements. Otherwise, a 10% per school day penalty (to a maximum loss of 50%) will apply to all assignments. No assignment will be accepted for credit after the assignment has been graded and returned – keep on top of your work!

Final Grades: Your final grade will be determined by summing the weighted averages of your grades in each of the categories below. Letter grades will be assigned as follows: A (90.0–100), B (80.0–89.9), C (70.0–79.9), D (60.0–69.9), F (< 60.0). There will be no extra credit assignments – focus your attention on the tasks at hand.

- Problem Sets 30 %
- Paper Summaries 25 %
- Discussions/Debates 15 %
- Midterm & Final Exams 30 %

Success! Your academic achievement naturally depends on your level of involvement in this course. You improve your chances of success if you: complete readings and assignments, attend all lectures and labs, take advantage of office hours, participate in activities and discussions, study regularly, form study groups, make use of available resources, and ask questions. Do not hesitate to ask for help!

Classroom Courtesy: Please be considerate of your classmates and of me. Refrain from distracting behaviors, and keep electronic devices silent. Listening to music, studying for other courses, or using electronic devices for purposes other than participating in class (e.g., note-taking) is distracting and unprofessional, and therefore not acceptable in the classroom. You may not photograph or record lectures without my permission – you will find all resources on Brightspace/D2L.

Brightspace/D2L: Course content (lecture slides, handouts, assignments, rubrics, etc.) and useful resources (e.g., websites, FAQ topics) will be posted using the Brightspace learning environment, which you can access through mySFA. Grades will be posted on Brightspace, but note that calculated grades shown on Brightspace may differ slightly from my Excel grade determinations,
which are final. Brightspace will also be used for important notifications. It is your responsibility to check the site regularly for access to course materials and information. Please do not email through D2L; instead, contact me directly at stevenslm@sfasu.edu.

**Office Hours**: Office hours are the times when I guarantee my availability. My office hours for this semester are listed at the top of this syllabus. Office hours are open to all students. Office hours are a good time to discuss course topics, ask questions, discuss your course progress, talk about ways to improve your understanding, chat, or have a cup of tea.

**Communication**: Seek me out when you have questions or concerns. I guarantee my availability during office hours, but you are welcome to stop by any time – if my door is open, I’m available. Email (stevenslm@sfasu.edu) is preferable to telephone communication – I won’t check voicemail when I’m off campus. I will contact you through SFA email and/or post announcements on D2L – it is your responsibility to make sure you check your messages regularly.

**Students with Disabilities**: To obtain disability related accommodations, alternate formats, and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Room 325, Human Services Building, 936-468-3004/1004 (TDD) as early as possible in the semester. Once verified, ODS will notify me and outline the accommodations and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices. Please be in touch with me at the beginning of the semester to discuss arrangements for accommodations.

**Academic Integrity**: Academic integrity is the responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism. Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit. Read the complete policy at http://www.sfasu.edu/policies/academic_integrity.asp (Policy A-9.1). You are encouraged to ask questions about completing your coursework with academic integrity.

**Withheld Grades**: At the discretion of the instructor of record and with the approval of the academic unit head, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F, except as allowed through policy [i.e., Active Military Service (6.14)]. If students register for the same course in future semesters, the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.
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<th>Week</th>
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| 1    | Aug. 26    | Course Introduction; Relative and Numerical Approaches to Deep Time  
Read: Syllabus, Handouts                                                                                                                      |
| 2    | Sept. 2    | Radiogenic Isotope Geochemistry; The Fundamentals of Geochronology  
**Due:** Introduction Meeting; Anthropocene Essay  
Read: Gill (2019); Anthropocene Working Group website; White (2009 – 1; 3) |
| 3    | Sept. 9    | The U-Th-Pb System; The Zircon Geochronometer  
Read: Schoene (2014, p. 341-351); White (2009 – 6)                                                                                           |
| 4    | Sept. 16   | Zircon: Sample Preparation & Analytical Approaches  
**Due:** Problem Set #1  
Read: Schoene (2024, p. 351-370); BSU How It’s Done slides                                            |
| 5    | Sept. 23   | The Age of the Earth: Meteors, Rocks, Minerals  
**Due:** Paper Summary #1; D2L Discussion  
Read: Bowring (1989); Valley et al. (2014); Bowring (2014)                                         |
| 6    | Sept. 30   | Isochron Methods: Nd-Sm, Rb-Sr, and Lu-Hf Systems  
**Due:** Problem Set #2  
Read: White (2009 – 5; 8, p. 75-79)                                                                   |
| 7    | Oct. 7     | The Evolution of the Continental Crust  
**Due:** Paper Summary #2  
Read: Hawkesworth & Kemp (2006); White (2011 – Ch. 7)                                                  |
| 8    | Oct. 14    | Midterm Exam                                                                                                                                          |
| 9    | Oct. 21    | Detrital Zircon Geochronology  
**Due:** Paper Summary #3  
Read: Blum & Pecha (2014)                                                                              |
|      |            | **Field Trip: October 24-26**                                                                                                                       |
| 10   | Oct. 28    | Thermochronology: K-Ar System and Low-T Thermochronometry  
**Due:** Problem Set #3  
Read: White (2009 – 4); Peyton & Carrapa (2013)                                                          |
| 11   | Nov. 4     | Landscape Evolution & Climate  
**Due:** Paper Summary #4  
Read: Wobus et al. (2003)                                                                              |
| 12   | Nov. 11    | Cosmogenic Isotopes  
**Due:** Problem Set #4  
Read: White (2009 – 9)                                                                                |
| 13   | Nov. 18    | **Debate:** A Grand Old Canyon?  
**Due:** Preparation for class debate; Paper Summary #5  
Read: Flowers & Farley (2012); Karlstrom et al. (2014); replies & responses                           |
| 14   | Nov. 25    | **Thanksgiving Break – No Class**                                                                                                                    |
| 15   | Dec. 2     | Applications for Stable Isotopes  
Read: White (2011 – Ch. 10)                                                                                  |
| 16   | Dec. 9     | **Final Exam – Monday, 1:30-4:00 p.m.**                                                                                                               |