Quaternary Geochronology GEOL551 Syllabus, Spring, 2019

Meeting time: Tuesday, 2:00-4:45, Live Oak Room 1221 (room location changes TBD)

Prof. Richard Heermance
Office LO1212, email: richard.heermance@csun.edu, phone (818) 677-4357
Office hours: Wednesday 1-3 PM or by appointment
Class webpage: CANVAS at csun.edu

COURSE OBJECTIVES
1) Understand how to interpret the timing of events and processes during the Quaternary.
2) Understand Quaternary dating methods such as oxygen isotope stages, $^{10}$Be cosmogenic nuclide dating, U-Series disequilibrium dating, and radiocarbon dating.
3) Learn how to map Quaternary geology (ie., terraces, moraines, shorelines, etc.)
4) Apply geochronologic techniques to Quaternary features, including.

TEXTS AND MATERIALS
REQUIRED TEXTS
2) Geochronology and Thermochronology, Reiners et al., 2018, Wiley Publishing, 461 p. (available online at Oviatt Library)
3) Additional course readings will be taken from a variety of sources, and pdf’s will be posted in CANVAS. I will continually update the bibliography within CANVAS as well. Please see attached bibliography.

CLASS PARTICIPATION
You will get out of this class what you put into it. Please try to keep up with the readings as much as possible. Feel free to ask questions at any time during the course.

CLASS STRUCTURE
This class is divided into 5 sections: Geomorphic Markers, Radiocarbon, Cosmogenic, Pluvial Lakes, and U-Series. Each section will be covered over ~3 weeks and will include a lecture introduction, literature review, and in some cases a problem set. Each 3-hour block will be divided between lecture and activities.

GRADING
25% Class participation, paper discussion, in class exercises, etc.
30% Problem Sets
20% Pluvial Lakes Field Trip
25% Final Exam (Take home and incorporating components of problem sets and readings.)
The following percentages will correspond to each grade, although the cutoff percentage could decrease depending on the curve.

- 93-100 % A
- 90-93 % A-
- 88-90% B+
- 82-88% B
- 80-82% B-
- 78-80% C+
- 72-78% C
- 70-72% C-
- 67-70% D+
- 63-67% D
- 60-63% D-
- <60% F

Many participation/quiz grades will be based on a scale 0-3. The following percentages will be applied to your overall participation quiz/average grade. 3 = 95%, 2 = 80%, 1 = 65%

Grades of Incomplete are extremely rare and can only be given if the student meets ALL the requirements set forth in University policy for Incompletes, including 1) has a passing grade in the work completed, 2) has completed a substantial portion of the work in the course, and 3) is able to complete the remaining work independently, with minimal assistance from the instructor. An Incomplete shall not be assigned when a student would be required to attend a major portion of the class when it is next offered.

FIELD TRIP
This class will take a REQUIRED field trip to from Friday-Sunday, April 5-7. We will be taking department vehicles. On the trip, we will visit the lake-beds and lake features from the Pluvial Lake system that covered the southwestern US ~ 15,000 years ago. You will all give presentations on different aspects of the trip. Details to follow.

CLASS RULES
A. NO TEXTING, EMAILING, WEB SURFING, OR USE ANY OTHER MULTIMEDIA OR SITE (ie. Youtube, Facebook, Reddit, ESPN, etc.). If I find anyone using multimedia not related to the course, I will confiscate the hardware and you will FAIL the class.

B. Academic dishonesty (e.g. cheating, plagiarism, fabrication; please review student conduct in the current schedule of classes and in the university catalog) will not be tolerated under any circumstances. ALL honor code violations will result in automatic NO CREDIT and will be reported to the Office of the Vice President of Students Affairs. Bottom line: pay attention, study, learn, and do your own work!

C. Discussion of course content and problem sets is encouraged, but each student must complete their own work. EXAMS must be completed independently (see B above).
**PROBLEM SETS**
During the semester, you will have 3, multi-week problem sets to complete. These will cover the following topics:
1) Radiocarbon
2) In-situ Cosmogenic Nuclide dating
3) U-Series Disequilibrium
The due dates are shown on the syllabus, and problem sets are due at the BEGINNING of class on the due date. NO LATE WORK ACCEPTED! You may discuss the problems sets amongst yourselves, but must complete all the work, calculations, maps, etc. individually and turn in your own work. These problem sets will require you to interpret real data to determine an age, and will pull together information from multiple sources (journals, textbook chapters, lecture) that we cover in class.

**PAPER PRESENTATIONS**
Throughout the class, we will review, discuss, and present studies from scientific literature. I will place you into groups of 3 to review papers, and 3 groups will present papers in a “round-table” discussion. Groups not presenting any one week will provide 3 provocative questions (1-each) for the papers. The presenters should be able to reproduce calculations presented in the text and tables. Also, make sure you pull up any supplementary data that may be archived in a data repository so the class may view it.

Paper Presentation Instructions:
- Presenting groups should provide a 1-page summary (ie. cliff notes version) of the paper. Your summary can be bulleted or prose, and should include a) Problem and Hypothesis to be tested, b) methods, c) data/results, d) implications/discussion, e) your overall thoughts on the paper (or questions).
- Groups not presenting should present to me (via email) one provocative question regarding each of the 3 papers (you might split these up among the group).
- Paper list will be updated regularly on Canvas.
<table>
<thead>
<tr>
<th>Week</th>
<th>Class Date</th>
<th>Topic</th>
<th>Readings, Exercises</th>
<th>Assignments</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>22-Jan</td>
<td>Geomorphic Markers</td>
<td>Burbank and Anderson Ch 2</td>
<td>Terrace Mapping Due, 3 PM.</td>
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<td>Terrace Mapping.</td>
<td>PAPER ROUND-TABLE</td>
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<td>2</td>
<td>29-Jan</td>
<td>14C and Applications (ie. paleoseismology)</td>
<td>INTRO RADIOCARBON LECTURE (Burbank</td>
<td>Speaker 1230-130</td>
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<td>and Anderson, Ch 3)</td>
<td>PAPER ROUND TABLE</td>
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<td>3</td>
<td>5-Feb</td>
<td>14C and Applications (ie. paleoseismology)</td>
<td>Radiocarbon Applications</td>
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<td>4</td>
<td>12-Feb</td>
<td>Cosmogenic and Applications (ie.</td>
<td>INTRO COSMOGENIC LECTURE</td>
<td>PS#1 Due (start of class)</td>
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<td>Paleoseismology</td>
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<td>5</td>
<td>19-Feb</td>
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<td>Radiocarbon Applications</td>
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<td>6</td>
<td>26-Feb</td>
<td>Cosmogenic and Applications (ie.</td>
<td>INTRO COSMOGENIC LECTURE</td>
<td>PAPER ROUND TABLE</td>
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<td>Paleoseismology</td>
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<td>7</td>
<td>5-Mar</td>
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<td>COSMOGENIC CONT. (CRONUS CALCULATOR)</td>
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<td>8</td>
<td>12-Mar</td>
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<td>19-Mar</td>
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<td>SPRING BREAK</td>
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<td>9</td>
<td>26-Mar</td>
<td>Pluvial Lakes and LGM climate in WNA</td>
<td>PLUVIAL LECTURE READINGS T.B.D.</td>
<td>Speaker 1230-130</td>
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<td>PS#2 Due (start of class)</td>
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<td>10</td>
<td>2-Apr</td>
<td>Pluvial Lakes and LGM climate in WNA</td>
<td>PLUVIAL LECTURE READINGS T.B.D.</td>
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<td>PAPER ROUND TABLE</td>
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<td>12-14 Apr</td>
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<td>Pluvial Lakes Field Trip</td>
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<td>12</td>
<td>16-Apr</td>
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<td>no class (due to field trip)</td>
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<td>13</td>
<td>23-Apr</td>
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<td>Speaker 1230-130</td>
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<td>14</td>
<td>30-Apr</td>
<td>U-Series &amp; Applications</td>
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<td>PS#3 Due (start of class)</td>
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<td>Quiz #3, PAPER DISC.</td>
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<td>15</td>
<td>7-May</td>
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<td>16</td>
<td>14-May</td>
<td>Scheduled Final Time 3:00-5:00 PM</td>
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Some pointers for reading a scientific paper (modified from Prof. S. Porter, UCSB)

- Read introduction and conclusions first. Don’t try to read the whole thing in one sitting. Read part, let it rest, and then go back to the paper to complete it.
- Make special note of who the authors are. What are their qualifications? What are potential conflicts of interest? (I’d be very wary of a paper on evolution if it came out of the Institute for Creation Research; likewise for a paper on climate change coming from an oil company.)
- Make special note of when the paper was published, and in what journal it was published. Has the paper been subject to peer-review? (You can assume all mainstream journals, such as those you find on the UCSB e-journals website, are peer-reviewed.)
- Pay close attention to the figures and tables and their captions.
- Don’t get bogged down in the details. Don’t give up if you don’t understand the Materials and Methods Section or you fall asleep during the Results Section! As with the novel Moby Dick, it’s often better to read different parts of a paper at different paces.
- Don’t shut down when you come across math. Read through the equation slowly; what’s the relationship between different variables? Often it’s easier than you think!
- If you’re new to a subject, the jargon may get to be too much. Keep a dictionary (preferably a geology dictionary) or Google on hand. Usually Wikipedia.org comes through in a pinch.
- Be an active reader, not a passive one. This means you should:
  
  **Ask yourself big-picture questions:**
  - What’s the main point of this paper?
  - How do the authors prove – or try to prove -- their point?
  - What is the hypothesis they want to test?
  - What are the results?
  - How do the authors interpret these results?
  - What are the implications of these interpretations?
  - What are the potential weaknesses of this paper? (The answer, by the way, is hardly ever ‘none’. And you don’t always have to be an expert to spot weaknesses. Often all you need is the ability to think logically.)

Take notes, even if it’s just a few lines. Try your best to write in your own words. This will help you digest the information and remember it.

When you’re done, call your mother/significant other/friend/roommate/coworker and tell him/her you just read a really interesting/stupid/brilliant/crazy paper. Then tell him/her what the paper was about. Succinctly. Don’t cheat by looking at your notes or the paper itself. If you can’t do this without cheating, you didn’t understand the paper. Go back and study it again.

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