**SIO 100 Geological Field Methods Fall 2023**

Overview: This class will introduce you to geologic methods. These include strategies for

research design, data reduction, geological inference and use of basic instruments. The class will feature specific exercises in mapping, measuring sections, working with imagery and topographic maps, and cross-sections. In addition to field exercises most Fridays and parts of three weekends, the course features a series of exercises where you have to collect data and interpret it to make measured sections, cross-sections, field maps and structural interpretations. In addition to the practical aspects of the class, we will learn about the general geology and tectonics of the American Southwest, where many of the exercises are based. We will also touch on field safety as well as the identification of sources of published and informal geological data, the integration

of field data with other data sources (such as making overlay maps) and LIDAR data. The class is designed so that you will come away confident in your ability to lead your own field projects.

Instructors:

Richard D. Norris: rnorris@ucsd.edu

Office: 300C Ritter Hall,

Ph. 858-395-9702 (cell); 858-822-1868

Jeffrey S. Gee: jsgee@ucsd.edu

Office: 300D Ritter Hall,

Ph. 760-846-5751 (cell); 858-534-4707 (Office)

Teaching Assistants:

Anna Golub: angolub@ucsd.edu

Class Meeting Times and Requirements:

Wednesdays (1-2 p.m. in Eckart 225) - short in-class exercises or lectures

Fridays (12-3 p.m. in Eckart 225) - weekly project/exercise (sometimes in the field)

This class will meet Wednesday (1-2) and Friday Afternoon (12-3 pm) in Eckart 225. In general, Wednesdays will be devoted to a ~1 hr lecture on relevant material.

Fridays 12-3 pm will be devoted to “lab” exercises.

We will not have exams. Grades will, instead, be based entirely on: (1) weekly exercises (each worth 10-15% of the grade), (2) short in-class exercises (whose score is incorporated in the weekly assignment grade), and (3) Participation in weekend field trips. You will typically have a week between the assignment of a project/exercise and when it is due. Late work will not be graded without prior agreement of the instructors.

**A Note about Field Trips:**

Field trips are part of the class, participation is mandatory, and only documented excuses (university-approved absences or medical issues) will be accepted. Field trips are EACH worth 10% of your grade as participation points in addition to whatever the assignment is worth; if you skip one, the best you can do in the class is a 90% which will typically be a low A or high B. Skipping multiple trips quickly will become a problem.

We plan to have three field trips. Two are overnight trips to Rainbow Basin October 14-15 and October 28-28. The third trip is a Saturday day-trip: Nov 18—Salton Sea (Mud Hills). To maximize our time in the field the plan is to depart early on Saturday (7 am, Osler Parking Structure), and return in the early evening on Sunday (plan on 8 pm, also to Osler).

*Please mark these trips on your calendar as we will not have makeup times*.

Office Hours:

Wednesdays (2-3 p.m. in Eckart 225 or via Zoom)

Thursday (2-3 p.m. Ritter 300 or via Zoom)

Fridays (9-10 a.m. Ritter 300 via Zoom)

Assignments:

Your grade will depend upon: (1) graphical work—cross-sections, maps, stereonet plots; these will be graded on accuracy, appropriate use of geological terminology and symbols, quality of presentation including neatness and artistic merits, (2) Field book notes where you will be graded on the accuracy of your geological interpretation/presentation, quality of your data reporting and outcrop drawings and (3) the Wednesday in-class exercises. We have rubrics for each assignment so if you do everything on the rubric you should score well.

Course Learning Objectives:

* Learn how to read and understand information in geologic maps
* Learn basic geologic history and context of Western North America and SW US
* Use of different Data types: Digital elevation models (like LiDAR and drone-image
* based DEMs)
* Overlay various map types on Google Earth
* Learn basic field mapping skills: Compasses, Abney Levels, Jacob’s Staff and
* Electronic mapping programs (“Clino” and “Field Move”, “Google Earth”, “Rockd”) and
* graphics packages: Illustrator, Affinity Designer, or Inkscape.
* How to measure a stratigraphic section and describe rock sequences
* Mapping geologic features
* Use of graphics programs to make professional maps
* Making cross sections from a geologic map

**Course Syllabus**

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|  | **Date** | **Topic** | **Reading/lab** |
| Week 1 | F Sept 29 | SIO Entry Strike & Dip Exercise |  |
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| Week 2 | W Oct 4 | Stereonets |  |
| F Oct 6 | Google Earth & GE Fold Axis Challenge  Due (Fri): Strike & Dip Exercise |  |
| Week 3 | W Oct 11 | Field Rock Description-SIO Cliffs |  |
| F Oct 13 | Drawing Measured Sections; Intro Rainbow Basin; Rainbow GE Exercise  Due (Fri): Rock Descriptions | Oct 14-15: Weekend Field Trip-Rainbow Basin |
| Week 4 | W Oct 18 | Drawing Rainbow Basin Measured Section & Outcrop Drawing |  |
| F Oct 20 | Tourmaline Beach Outcrop Drawing  Due (Fri): Rainbow Measured Section |  |
| Week 5 | W Oct 25 | Drawing a map |  |
|  | F Oct 27 | Preliminary Rainbow Basin Map  Due (Fri): Tourmaline Beach Drawing | Oct 28-29: Field Trip Rainbow Basin |
| Week 6 | W Nov 1 | Rainbow Basin Mapping |  |
| F Nov 3 | Rainbow Basin Final Map  Due (Sat): Rainbow Basin Preliminary Map |  |
| Week 7 | W Nov 2 | Drawing a cross section |  |
| F Nov 4 | Rainbow Basin Cross Section  Due(Sat): Rainbow Basin Final Map |  |
| Week 8 | W Nov 8 | Intro to Mud Hills |  |
| F Nov 10 | Holiday-Veteran’s Day  Due (Sun): Rainbow Basin Cross Section |  |
| Week 9 | W Nov 15 | Drawing a Mud Hills Map |  |
| F Nov 17 | Mud Hills Mapping  Due (Sat): Mud Hills Map | Nov 18: Field Trip Mud Hills structure |
| Week 10 | W Nov 29 | Mud Hills Cross Section |  |
| F Dec 1 | LIDAR Exercise  Due (Sat): Mud Hills Cross Section |  |

**Required Materials:**

* A computer with internet,
* Google Earth--a free download: <http://www.google.com/earth/download/ge/>
* Field move (for tablets) or Field Move Clino (for phones)--an e-mapping program; <https://www.petex.com/products/move-suite/digital-field-mapping/>
* Adobe Illustrator, Affinity Designer, or Inkscape,

Other useful materials:

* Protractor,
* ruler,
* colored pencils,
* pencils
* Field book such as Write-in-the-Rain books: <https://www.ascscientific.com/geology-field-equipment/field-books/geology-field-book/>($18.50, with scale and ruler in a pocket in the back); A cheaper field book without the back pocket is: <https://www.amazon.com/Elan-Publishing-Company-E64-4x4-Surveying/dp/B071GNK2XB> ($10.95, also comes in yellow covers)
* A “Brunton” Compass: [this is a Chinese knockoff, but surprisingly good quality. I bought one; I also reviewed this compass on the Amazon website] <https://www.amazon.com/Geological-Compass-Harbin-DQL-8/dp/B00I4W95CK/ref=sr_1_1?dchild=1&keywords=Harbin+compass&qid=1609548999&sr=8-1> ($70.00)

**Optional Reference Books**:

* Baldridge, Geology of the American Southwest. Can be rented online for $12.77 for three months; used copies available for ~$20
* Blakey, R.C., and Ranney, W.D., 2018. Ancient landscapes of Western North America, Springer. 228 pp. ($20.99)
* Compton, R., 2017. Geology in the Field. CreateSpace Independent Publishing Platform **SBN-10:** 1547118776; **ISBN-13:** 978-1547118779 ($16.95)
* Lisle, R.J., Brabham, P. & Barnes, J., Basic Geological Mapping, 5th Edition, The Geological Field Guide Series, 2011. ($34)
* Stow, D. A.V., 2005. Sedimentary rocks in the field. CRC Press 320 pp. ($34 used from Amazon)