

MATLAB[®] in “Principles of Geochemistry”

The course is a general introduction to high- and low-temperature geochemistry, from mantle depths to environmental problems.

This course is designed for 1st semester, 1st year students after their equivalent of grades 12 and 13 at general education junior colleges. The course is taken by Geology majors and majors in Earth system science and in selected programs of the McGill School of Environment.

2 hours of lecture and 3 hours of lab per week for 13 weeks.

MATLAB[®] is introduced and used as a tool to solve geochemical problems.

Principles of Geochemistry: Learning Goals

Long Term Goals

Understanding of the role of geochemistry in affecting geological processes

Understanding that quantification of many geologic processes is possible and that there are tools that they can use:

MATLAB[®]

Understanding equilibrium versus kinetic processes

MATLAB[®] in “Principles of Geochemistry”

MATLAB[®] is used as a tool to solve quantitative geochemical problems

Specific Learning goals:

1. Introduction to MATLAB[®] and one toolbox in a geological context
2. Conditional statements and loops for iterative calculations
3. Construction and use of simple functions within scripts
4. Simple 2-dimensional plotting

Departmental constraints:

Students are expected by other professors to be introduced to MATLAB[®] in my course, upper-level courses will build upon my introduction

Students and “Principles of Geochemistry”

The students have had college-level chemistry, some linear algebra, differential and integral calculus, but often never took a geology course before

Some have had programming courses. My estimate is about 20 to 35 % of the students.

But, student numbers are low – from 6 (this year) to a high of about 30 students so the previous statistic is based upon few data

Teaching MATLAB[®] in “Principles of Geochemistry” – Part 1

0. The syllabus is circulated to the students at least 1 week before class begins and students are encouraged to download MATLAB[®] and use the “OnRamp” before the first laboratory of the class where they should bring their computers and when MATLAB[®] will be used.
1. A “formal” ~ 1 hour introduction to MATLAB[®] is given at the beginning of a 3-hour laboratory period (see my contributions on the website)
2. Students are split into working groups of 3 to 5 people (they remain in the same group all year long). Each group is given a problem to solve in MATLAB[®] (see my contributions on the website)
3. At the end of the laboratory period each group reports on their problem's solution

Teaching MATLAB[®] in “Principles of Geochemistry” – Part 2

4. No other lectures dedicated to MATLAB[®] are given, but in each subsequent laboratory session the student groups are given problems to solve using MATLAB[®] and report their solutions to the group
5. Example programs are provided to the students on the class website
6. Teaching MATLAB[®] involves significant amounts of interaction between the instructor, the teaching assistants, and the students (possible because of small class sizes), but . . .
7. Most of the teaching is done by the students' peers – the students who are more interested in MATLAB[®] and/or have computer programming experience (Groups are sometimes modified to ensure there is at least one student “expert” in each group)

Teaching MATLAB[®] in “Principles of Geochemistry” – Assessment of Effectiveness

1. Primarily by presentations at end of the laboratory sessions
2. Also by interaction during the laboratory sessions
3. Student's use of MATLAB[®] on exams and assignments

Teaching MATLAB[®] in “Principles of Geochemistry” – Finally . . .

**I always see need for improvement and keep tweaking my
teaching of MATLAB[®]**

(as well as the rest of the course)