A New Computational Methods Course for Geology Majors

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The Department of Geological Sciences at UT Austin has one of the largest undergraduate geosciences programs in the country, with over 300 majors. About 70% are in a BS General Geology Curriculum, with the remainder divided between Geophysics and Hydrogeology degree plans. In preparation for a modest revision of degree requirements in Fall 2014 we conducted an on-line survey of recent graduates (years 2000-2014) to understand, from their post-graduate perspective, which courses and topics (in-Department and outside) should receive more or less emphasis in a revised curriculum.   Out of 490 graduates, 121 responded, or 25%. The responses strongly indicated a need for increased emphasis on computer programming, numerical simulation, data analysis, and geophysics. All of these elements are well-represented in the Geophysics degree plan, but absent (not required) in the other two (General Geology, Hydrogeology). Consequently we revised these two degree plans to include a new required computation course during the second semester of the sophomore year. We thought it important to make this a _geoscience_ course (and not a computer science or out of department course) to better engage our majors and to make it clear that computation is a core discipline within the geosciences.

I am in the process of developing the new course for its first offering Spring 2016 and will teach it at least a second time to be sure it is reasonably well developed before the first students are required to take in Spring 2018. The course will cover programming, data analysis and numerical simulation in a geoscience context. The early part of the course must be devoted to concepts important in MATLAB (matrices, functions, scripts, variable types…), so these topics might lack the geoscience context. Most of the course will be built around geoscience problems, with an emphasis on geophysics because that subject is still not required in the revised Geology and Hydrogeology degree plans. MATLAB is the obvious language choice given that UT Austin has recently purchased a campus-wide license to cover all UT computers and every student's personal computer. Its many other advantages as an introductory language are well known.

There are two main goals. One is to teach basics of several geophysical topics (seismology, gravity, heat flow, climate time series analysis, and others). Second is to develop computational skills to prepare students for later course work and research. At present such skills are rarely needed in our upper division courses, but I fully expect that to change as new faculty replace old, and course content evolves.

Because the course is still in development and will not be taught until next semester, there are not yet detailed notes or assignments. The exemplar on teaching seismology with MATLAB outlines preliminary ideas based on a format with two lecture hours and two lab hours each week.