GEOL 0220 Physical Processes in Geology COURSE GOALS

This course is intended primarily for science concentrators or students with a strong interest or background in the sciences; others may wish to consider Geo 10, 50, or 70. The geological sciences are integrative by nature, and during the semester we will use some physics, chemistry and biology to understand the Earth. We will emphasize a rigorous analysis of geologic problems and processes, although not necessarily a mathematical one; some calculus and vector analysis will be used. Our main emphasis will be on concepts and processes rather than on terminology and facts per se. We expect you to think critically and actively about the course material, and on exams to clearly and completely verbalize your reasoning as well as demonstrate your knowledge of key facts.

There are a number of different educational objectives in this course, with varying degrees of complexity. These include the following:

1. Knowledge and information - to learn 'facts' about physical geology, such as the age of the Earth, the rates at which the tectonic plates move across the Earth's surface, and the sizes of rock particles carried by rivers flowing with different velocities.

2. Comprehension - to understand the meaning and significance of these facts, such as the ways in which plate motions can produce mountain ranges and earthquakes, and the situations under which running water or wind will tend to erode or to deposit particles.

3. Applications - to be able to apply this information to new situations, such as using concepts of river dynamics to interpret features preserved in the Tapeats sandstone in the Grand Canyon and thus determine the nature of the Earth's surface 500 million years ago when the rock was formed.

4. Analysis - to be able to break a given geological topic into its constituent parts and to understand the relationships among them, for example to analyze the various 'constructive' and 'destructive' factors which determine the height of a given mountain range.

5. Synthesis - to combine the new material you have learned with your previous experience to form a more complete understanding of various topics, such as using physical chemistry combined with new information about the composition of the Earth's crust and mantle to understand why some volcanoes are explosive and others are quiet; also to understand the complex causality involved in Earth systems, such as understanding the positive and negative feedbacks contributing to global climate change.

6. Evaluation - to be able to make judgements about the value of different aspects or components of given topics, for example using your understanding of river dynamics to evaluate the consequences of building a dam in a given area.

How will you achieve these goals? Different people have different modes of learning; we will try to provide different ways of describing and explaining the material. The geological sciences require 4D thinking, including the ability to visualize phenomena in three spatial dimensions *and* to imagine how they change through geologic time. Lectures will include a lot of boardwork, including diagrams; it is important to take good notes. Examples of geologic phenomena will be illustrated using Powerpoint images, maps, globes, rock samples, movies, and 3D models. Labs will provide an opportunity for hands-on experience with geologic materials and tools, as well as a chance for small-group collaborative work and individualized help from the TAs. Field trips will provide opportunities to actually apply what you have learned to the 'real world'. We *strongly* encourage you to form small study groups and to make use of the daily 'drop-in' sessions; you may not know whether you understand something until you try to explain it to someone else.

Last but not least, our goal is for you to enjoy learning this material!