EXEMPLARY CORE COMPETENCIES IN PHYSICAL GEOLOGY LAB

The Geology 1403 instructors will administer final examinations that contain a common set of questions developed based on the following exemplary competencies:

Competency Area I: Minerals
✓ Know definition of a mineral
✓ Measure physical properties of minerals and their ranges of variability: Color, Luster, Hardness, Streak, Cleavage, Fracture, Crystal Form, HCL Reaction, Magnetism, Specific Gravity, Taste, Feel
✓ Use physical properties to group and distinguish common minerals
✓ Identify minerals with mineral charts

Competency Area II: Rocks
✓ Understand the difference between minerals and rocks
✓ Identify the minerals that are typical in igneous, sedimentary and metamorphic rocks
✓ Identify the textures that are typical of igneous, sedimentary and metamorphic rocks
✓ Identify igneous, metamorphic, and sedimentary rocks
✓ Relate grain size to cooling rates and general origin (plutonic vs volcanic)
✓ Relate igneous rock mineral assemblages to Bowen’s Reaction Series
✓ Name sedimentary rocks and classify them as clastic, chemical or biochemical
✓ Infer origin of sedimentary rocks (depositional environments) based on knowledge of modern depositional environments
✓ Be able to define and distinguish the differences between igneous, sedimentary, and metamorphic rock
✓ Identify and describe types of foliation in metamorphic rocks
✓ Distinguish foliated and nonfoliated metamorphic rocks
✓ Relate plate tectonic environments to metamorphic diagram

Competency Area III: Maps
✓ Define contour lines and understand their characteristics
  o Identify contour interval and index contours
  o Determine surface elevations, height and relief
  o Measure land slopes and directions
  o Determine stream-flow direction and gradient
✓ Contour a topographic map using elevation data
✓ Interpret cross sectional profiles of land surface and determine vertical exaggeration
✓ Use contour lines to read a topographic map and visualize the Earth’s surface features
  o Recognize geometric shape of land surface
  o Identify topographic features
  o Read map symbols and identify cultural features
✓ Plot locations, distances and compass directions using map coordinates, land subdivisions and map projections
Competency Area IV: Water As a Source

✓ Identify drainage basins (their boundaries and drainage divides)
✓ Construct stream longitudinal profiles and calculate their gradients
✓ Identify and measure river features (floodplains, natural levees, backswamps, meanders, cutbanks, point bars, oxbow lakes and stream terraces)
✓ Identify the types of drainage patterns and infer their underlying geological controls
✓ Determine the evolutionary stage of a river system (early, middle and late-stage) by identifying its associated valley characteristics and by inferring its balance between erosional and depositional processes
✓ Evaluate the relationships between the variables that control groundwater movement (porosity and permeability)
✓ Make a contour map of a water table using shoreline elevations
✓ Calculate the water table’s direction of slope and hydraulic gradient

Competency Area V: Coastal Landforms

✓ Identify (on photographs and/or maps) and explain coastal features: spit, baymouth bar, tombolo, sea stack, headland, wave-cut cliff, wave-cut platform, barrier island, tidal flats, delta, beach, and associated features such as lagoon, tidal inlet, tidal delta, tidal flat
✓ Determine the direction of longshore current from the shape of a spit or groin

Competency Area VI: Geologic Time

✓ Determine the sequence of events (relative ages) on a cross-section using stratigraphic principles; the cross-sections should include normal and reverse faults, folds, magmatic intrusions, erosional surfaces, tilting
✓ Recognize unconformity surfaces and understand what events they represent
✓ Understand the basic concepts of radiometric age determination

Competency Area VII: Structure and Geologic Maps

✓ Measure strike and dip
✓ Plot strike and dip on a map
✓ Determine the general orientation of strike and dip on surface of a block diagram
✓ Recognize structural geology symbols used on maps: strike and dip; folds; faults
✓ Define, sketch, and recognize a dome or basin, and plunging and non-plunging anticline and syncline on a block diagram
✓ Determine the direction of plunge of plunging anticlines and synclines on a block diagram
✓ Define, sketch, and recognize a normal, reverse and strike slip fault on a cross-section or block diagram
✓ Distinguish the hanging wall and footwall of a normal, reverse, and thrust fault on a cross-section and a block diagram
✓ Recognize horizontal, inclined, folded, and faulted strata; unconformities; and igneous intrusions on geologic maps
✓ Determine relative ages of formations on a geologic map by using the principle of superposition
✓ Construct a cross-section from a geologic map. The cross-section may include folds and faults.
✓ Use the rule of Vs to determine direction of dip for strata

**Competency Area VIII: Earthquakes and Plate Tectonics**
✓ Identify P, S, and surface waves on a simple seismogram
✓ Locate the epicenter of an earthquake using seismograms and travel-time curves
✓ Determine the magnitude of an earthquake using a Richter magnitude chart
✓ Determine the time of an earthquake (using the time of observance and the distance-time chart)
✓ Correlate magnetic profiles (a) along a divergent boundary and (b) with the geomagnetic polarity time scale
✓ Calculate sea floor spreading (divergence) rates from magnetic anomalies (paleomagnetic records, given their ages
✓ Recognize types of plate boundaries and their associated features on sea floor maps and/or topographic profiles