Geography 1000 Final Exam Study Guide

Spring 2014

EXAM WILL BE ON APRIL 30TH FROM 9-11 IN PE250 (OUR LECTURE HALL)

Please find below a list of topics that should be understood by students for the final exam. I have concentrated on the key 'take home messages' of the course: those topics that are important to understand and remember beyond Geog1000. Topics are taken directly from lectures. Additional information can be gathered from the textbook.

Please also review the study guide for the midterm as approximately 1/3 of exam questions will be from before the midterm.

The exam will be multiple choice, so even though I have asked questions below, these will help you to better understand topics and make decisions with regards to multiple choice questions.

Lecture 19 – Chapter 11: Fluvial Geomorphology and River Systems.

- What are *fluvial processes,* and how is this related to *fluvial geomorphology?*
- Describe the main hydrological input(s), outputs and storage mechanisms of the water cycle. Why are they considered inputs, outputs or storage?
- Define *control volume*. Why is it necessary that we are able to quantify the control volume? What are other names for control volume in the context of hydrology?
- How are the edges of a watershed defined?
- What are some of the largest watersheds in the world?
- Describe the flow of water through various components of the watershed (e.g. from the drainage divide through to rivers).
- What types of watershed characteristics are found in areas with high vs. low drainage density of streams and rivers?
- Be able to describe various drainage patterns and why they might be formed.
- How is stream discharge calculated? And in what part of the stream is the velocity of water movement greatest?

Lecture 21 – Chapter 11.

- Why is discharge spatially and temporally variable (in other words, what causes discharge to vary in space and time?)
- What does the *stream hydrograph* tell us? Why is it important?
- How does the stream hydrograph respond to rainfall?
- When describing stream erosion, what is hydraulic action? How does this differ from abrasion?
- Understand terms: Dissolved load, suspended sediment load, bed load, competence, and capacity of streams when moving materials.

- Understand sediment transport terms: aggradation, alluvium
- What are the processes (velocity and deposition) associated with stream meandering over time and space?
- Describe the process of deposition from weathering. What types of deposition land forms may be created during these processes?

Lecture 22 – Chapter 12 – Oceans, coastal systems and wind processes.

- What is ocean salinity and what are the units? What are the top 4 saline components found in the ocean? What is the average salinity of the ocean? And what would we consider *brackish water*?
- Why do we see spatial and/or temporal variations in salinity?
- Approximately how much CO2 do oceans absorb per year? How does this affect ocean pH levels, and what happens to some organisms living in the oceans?
- Describe the vertical structure of the ocean *mixing zone, thermohaline transition zone, and deep cold zone.*
- What is the Littoral zone, and how is it defined?
- What are spring tides and neap tides? When do these occur?
- How does wave energy vary as waves roll onto shore?

Lecture 23 – Chapter 12 - Water and wind erosion and deposition

- Understand the work done by water and wind: Erosion, transportation, and deposition landforms.
- Know the difference between coastal deposition landforms: wave built terrace, etc.
- What is Aeolian or Eolian erosion? What increases wind erosion?
- Know the difference between deflation hypothesis and sediment accumulation hypothesis (in text). How are these different from abrasion?
- Describe Eolian transport: Suspension, saltation, and surface creep. What other process is similar?
- Describe the windward, leeward, and slipface of a dune, according to wind direction.
- What likely exacerbated the dustbowl of the 1930's? How do trees reduce soil transport?

Lecture 24 – Chapter 15 - Ecosystem dynamics:

- Know the difference between biotic and abiotic subsystems of ecosystems.
- Know the spatial scales of interest from biomes (the largest area) to habitats (the smallest area) and examples for each. Also know the difference between communities, habitats, and niches within an ecosystem.
- Describe the *competitive exclusion principal.*
- Describe energy inputs into plants, and movement of gasses, water and mineral though a plant to the atmosphere. Also understand the functioning of stomata.

- Understand the processes involved in photosynthesis, compensation point and growth (net primary production), including uptake of CO2, water and light, and conversion into glucose and oxygen. Also understand and describe respiration.
- Describe sources and sinks for carbon dioxide and nitrogen.

Lecture 25 – Chapter 15 – Ecosystem Energy Pathways:

- What happens to plants in winter, and why do healthy green plants turn red, yellow and orange in the fall? Why do we continue to see respiration (CO2 release into the atmosphere) throughout the winter?
- Describe the difference between autotrophs, heterotrophs, and decomposers (or detritivores).
- Understand the efficiency of a food web as energy (and energy loss) is passed through trophic levels from producers to primary, secondary, and tertiary consumers. Why is energy lost at each level? How is conversion efficiency calculated?
- Describe the factors that influence ecosystem growth and decline (as a part of ecosystem evolution).
- Define biodiversity. Why does greater biodiversity result in greater long-term stability and productivity. What are the 5 greatest threats to biodiversity as mentioned on slide 24 (according to the IPCC)?
- Understand the phases of aquatic and terrestrial ecological succession.

Lecture 26 – Chapter 13 – Glaciers and glacial geomorphology

- What is the cryosphere? What parts of the planet comprise the cryosphere and why are they important?
- An interesting fact: Greenland and Antarctic ice sheets contain more than 99% of the freshwater ice on Earth.
- What is the difference between an alpine and valley glacier? How are they formed?
- What is isostatic depression when referring to continental glaciers (or ice sheets)?
- Be able to locate the firn line, accumulation zone, lateral and medial moraines, a tributary glacier, and the approximate equilibrium line of a glacier and describe what each is. What do glacier mass balance and ablation refer to?
- What are the main influences of glacier movement downslope? Why is the velocity of movement greatest at the top and least near the ground surface?
- Describe the dominant landforms created after a glacier has formed and retreated.

Lecture 27 – Chapter 1 – Mapping and GIS

- Understand the difference between latitude and longitude (parallels and meridians), prime meridian (also see Lecture 29 for more detail). How is the geographic coordinate system determined?
- What is a map scale? How is it used to determine a distance on a map, vs. the distance on the ground?

Lecture 28 – Guest lecture – Justin Hill

- What spatial data layers are used to make urban planning decisions in Southern Alberta?
- What layers are required to optimize ambulance routes?

Lecture 29 – Chapter 1 – Mapping and GIS continued.

- What is a geographic information system? What are the two types of linked datasets that are used in a GIS? What attribute do GIS data have that many other datasets (in spreadsheets, etc) often don't have.
- Describe the difference between raster and vector. Why might increased *pixel* resolutions (cell/box sizes) help us to better define edges of different land cover types?
- How is Boolean analysis used with *map overlays* (or map layers) to make decisions? Understand intersection, union, and or (A and B but not intersection; A but not B) queries, bearing in mind that A and B are understood to be different map layers.
- What is a coordinate system?
- Describe the difference between a *geographic* coordinate system and a *projected* coordinate system. Why might projected coordinate systems be problematic in some locations?
- Describe the shape of the geoid and why it differs from that of a spheroid. When is the geoid height positive? Negative?
- What is the difference between *geographic scale* and *map scale?* Understand the differences between a small scale map (showing a larger area) and a large scale map (showing a smaller area)
- Describe the 3 components of a GPS system. What will improve the accuracy of your GPS-defined location on Earth?

Lecture 30 – Chapter 1 – Remote Sensing

- What is remote sensing? What is the difference between passive and active remote sensing (Lecture 31)?
- Describe 3 types of radiation interactions with the surface of a target (or object) on Earth. Why does energy interaction with the surface vary depending on the type of material and the wavelength?
- Describe absorption and reflection characteristics of healthy vegetation in the blue to near infrared wavelengths. How does the spectral reflectance change as plants begin to die?
- What are bands? Why are they used in remote sensing?
- What do absorption vs. reflection characteristics tell us about vegetation? What important spectral remote sensing ratio is used to quantify this?

Lecture 31 – Remote sensing continued

- What is spatial resolution? If you could resolve a car within pixels from space, would you consider this satellite to have high or low spatial resolution compared to a satellite that is able to resolve a field?

- What is a pixel? How is it defined?
- Describe the differences between spectral resolution, radiometric resolution, temporal resolution and spatial resolution.

Lecture 32 – Remote sensing technology

- What does stereoscopy allow us to do?
- What do thermal images measure? Is thermal infrared considered shorter or longer wave energy than the visible spectrum?
- What is the main difference between hyperspectral remote sensing and multi-spectral remote sensing?
- Is LiDAR a passive or active sensor? Why?
- What kind of energy does RADAR use? What is meant by *polarization*?

Lecture 33 – LiDAR technology guest lecture by Dr. Chris Hopkinson

- What is 't' and why is this relevant to LiDAR as an active sensor?
- Describe the difference between a first return and a last return.
- What is occlusion and why might it be problematic? How can occlusion be overcome using mobile mapping or ground-based LiDAR systems?

Lecture 34 – Chapter 13 – Periglacial environments and paleoclimatology

- Define the periglacial environment. What are the main factors that affect the location of periglacial environments?
- How much land surface area do periglacial/permafrost environments cover?
- Describe the formation of ice wedges, mass movement due to solifluction and frost creep.
- Understand the general processes associated with pingo development.
- What is a proxy? How are proxies used to understand past climates? Describe an example of a long term and short term proxy (or be able to identify what a long term proxy might be as well as a short term proxy… should be pretty obvious…).
- Describe astronomical causes of climate variation, including tilt, eccentricity, precession.
- How did the Great Salinity Anomaly affect climate? Why?

Lecture 35 – Chapter 7 – Climate change

- What is the difference between climate change and climate variability?
- Describe the components of the greenhouse effect. Why is the greenhouse effect important for life on Earth? How is atmospheric warming affected by increased greenhouse gases?
- What is the impact of of natural vs. anthropogenic influences on air temperature (in degrees C).
- What are the main greenhouse gases that contribute to the greenhouse effect?
- What is happening to the major components of the cryosphere as a result of climate change? Why is the cryosphere considered the "canary in the coal mine"?
- What is happening to the heat content of oceans and sea levels?

- What does 2 degrees C refer to? Why is it such a grave concern? At what rate is carbon emissions increasing per year and in how many years will we get through our global 563 Gigaton allowance?
- What does carbonic acid do to aquatic ecosystems?

Lecture 36 – Chapter 7 – Global Change implications to civilisations

- Understand the ozone hole, what is good ozone and bad ozone?
- What depletes the ozone hole?
- What is causing climate change? What are the human influences? How does IPCC reporting work?
- What is “water for life”? And what are the objectives of this program?
- What might happen to the water resources in Southern Alberta as the climate warms?