The exam will be a close book exam. This exam has four parts. **I. Multiple Choice Section (20 points)**. 10 questions, worth 2 points each = 20/100. **II. True or false Section (30 points).** 15 questions, worth 2 points each = 30/100. III. **Matching Section (30 points).** 15 answers, worth 2 points each = 30/100. IV. **Short Answer Section (20 points).** 4 questions, worth 5 points each = 20/100. **You will have 75 minutes. We will begin promptly at 9:30am Feb. 25, 2014. Bring pencils and erasers.**

LECTURE 6: Climate Varibility
1. Definition of direct radiative effect (slide #2).
2. Definition of a closed system (slide #3).
3. Definition of positive feedback and negative feedback (slide #5).
4. Understand water vapor feedback (slide #6-7).
5. Understand Ice albedo/melting positive feedback (slide #9) .
6. Definition of ENSO (slide #17-18).
7. El Nino is caused by natural variability of atmospheric-ocean connections (slide #12-14).
8. Describe/list 5 features associated with El Nino conditions with the figure given on slide #17 (**will be a short answer question**).
9. Characteristics of La Nina conditions (slide #19).
10. Why ENSO can affect global climate? (slide #27-28)**.**

LECTURE 7: Extreme Climate Anomalies
1. In which ocean basin tropical cyclones are called typhoons (slide #1).
2. What are the environmental conditions required for hurricane development? (slide #4).
3. Where do energy and moisture come from to foster a large amount of convection in a hurricane? (slide #12)
4. Why there are less hurricane activities in the North Atlantic Ocean in El nino years? (slide #15, **will be a short answer question**).
5. Definition and characteristics of PDO (slide #20).

LECTURE 8: Climate Modeling
6. List the 3 main challenges of numerical simulations of climate (slides #15, **will be a short answer question**).
7. Clouds have both cooling and warming effect on climate. Which net effect of clouds in the current climate? (slide 37-38)
8. Definition of simple climate models and complex climate models (slide #2-3).
9. What are the 2 main natural impact factors on climate change? (slide #10).
10. What are the 2 main human impact factors on climate change? (slide #11).
11. Climate models need to take into account both human and natural impacts (slide #12).
12. What is the dominant effect of high clouds and low clouds, respectively? (slide #39).
13. What are the direct aerosol effect and primary indirect aerosol effect? (slide #43).

LECTURE 9: Climate change projections
14. Definition of climate sensitivity (slide #3).
15. Definition of scenario; what are the main driven forces to design emission scenarios (slide #8).
16. Definition of the three A1 scenarios: A1FI, A1B, and A1T (slide #12)
17. How will the deep ocean circulation respond to a warmer climate? (slide #27)
18. What are the direct outcomes of polar ice melting? (slide #28)
19. What types of marine lives are directly threatened by increased marine acidity? (slide #29)
20. What are the direct contributors for sea level rising? (slide #30)
21. Why ocean acidity increase in response to global warming? (slide #29)
22. How to stabilizing atmospheric CO_2 level? (slide #25). Be able to explain the two figures in slide 25 (**will be a short answer question**).