Overview of Part 1 of course (The Atmosphere, Weather, and Climate)

Lecture-by-lecture reading in text – I have highlighted in red material that we have not yet covered in detail and that you WILL NOT be responsible for on this test.
Questions from Midterm 1 are listed in Blue

1-12 Lecture 1, January 18 – Climate Change: Past, Present and Future
1-1, 3, 7 Earth as a system (atmosphere, hydrosphere, solid earth)
External forcing (e.g. solar energy) p 14-15
1-2, 4, 5 Evidence of Change – p 3-5
1-11, 2-f Recent changes in surface temperature – p 6-7
Evidence of ozone depletion – p 8
Deforestation and Loss of Biodiversity – p 9-10
Global Change on long time scales – p 11-13
Changes in solar forcing – p 14-15

Lecture 2, January 20 – Feedbacks in the Earth System
The Systems Approach – p 18-19
3-I Feedback loops – p 19-20
Equilibrium states – p 20-22
1-8, 3-I Albedo as an example (“Daisyworld”) – p 23-25
Equilibrium states in “Daisyworld” – p 25-27
The response to external forcing – p 27-28
Response of equilibrium states to forcing – p 29
1-6, 3-I Climate history and Lessons to be learned – p 30-31

Lecture 3, January 23 – Properties of Light
2c Electromagnetic radiation – p 34-36
2a Photons and energy – p 36
2c The electromagnetic spectrum – p 36-37
2b Flux – p 37-38
2b The inverse square law – p 38
Temperature scales – p 38-39

Lecture 4, January 25 – Energy Balance
2a Blackbody radiation – p 39-40
2a Wein’s Law – p 40
2h The Stefan-Boltzmann Law – p 40-41
1-9, 4-3 Planetary energy balance – p 41-42
1-5, 2e Greenhouse gases – p 43
2g Atmospheric composition – p 44
Atmospheric structure – p 45
Lecture 5, January 27 – Energy Balance
2b Demos on “one over R squared law” and light and angle of incidence
1-10, 3-IV Forms of heat transport – p 45-46
2e Molecular motion and infrared radiation – p 47-48

Lecture 6, January 30 – A Simple Model of Earth’s Energy Balance
Review of Lectures 4 and 5
1-9 Planetary energy balance revisited in more detail – p 41-42

Lecture 7, February 1 – Clouds, Radiation, and Feedbacks
3-V Clouds and radiation – p 48-49
3-II Earth’s Global Energy Budget – p 49-51
3-I Introduction to Climate Modeling – p 50-51
3-I Climate feedbacks – p 51-53

Lecture 8, February 3 – Earth’s General Circulation
4-1,6,7 Atmospheric circulation – p 55-58
2d,4-2,4 Solar energy distributions – p 58-59
3-III, 4-5 General circulation, The Hadley Cell– p 59-61
3-III, 4-9 The Coriolis Effect – p 61-62
Fronts – p 62
4-10 Simple model of surface winds – p 63

Lecture 9, February 6 – Surface Winds
4-10 Trade winds and midlatitudes – p 63-65
4-9,11,12 Geostrophy and upper level winds – p 65-66
4-8 Seasonal variability – p 67-68

Lecture 10, February 8 – Global Distributions of Temperature and Precipitation
4-13,14,15 Land/sea effects (“Sea breeze”) – p 69-71
4-16 Continentality – p 71
Monsoons – p 72
1-10, 3-IV Properties of water – p 76-78
The hydrologic cycle – p 74-77
4-16 Continental influences on precipitation – p 78-80