# Spring, 2016

**Earth 202 – Modeling the Earth System**

Locations & Times: Lecture: 240 Deike TR 9:45 – 11:00

***Instructor:*** David Bice, 309 Deike, Ph.: 865-4477, email: dmb53@psu.edu, Office hours: by appt.

***Text***: no textbook — readings are either online or on ANGEL

***Grading***: Quizzes — 20%; Lab exercises — 60%; Final Project — 20%

***Exams***: no exams

***Quizzes:*** There are 10 quizzes throughout the course, these will be administered on ANGEL and must be completed before the Tuesday class to receive credit. They are short-answer questions and you can refer to the reading material, so if you take your time, you should get 100% on every quiz — they are simply intended to get you to read over the materials before class so that you are prepared to jump in and start the exercise during the class period.

***Lab exercises***: There will be ~10-11 lab exercises throughout the semester. These exercises include instructions for making and experimenting with models and include a series of questions that you need to answer. We’ll begin these exercises on Tuesday of each week and complete them on Thursday; then you have until the following Monday to turn in your answers. You are encouraged to discuss questions included with these exercises with classmates, but each person must turn in their own, original work.

***Class Attendance***: More than most other classes you might take, this one really demands your presence — the class periods are working sessions where we are actively engaged in creating, debugging, and experimenting with computer models. This work is very difficult to do without the guidance of your instructor. There are effectively no lectures in this course.

***Academic Integrity***: As in all EMS courses, we expect you to follow the letter and the spirit of the College’s statement on academic integrity, which can be seen in its entirety here: /www.ems.psu.edu/current\_undergrad\_students/academics/integrity\_policy

Academic integrity is very important and we expect that you will refresh your understanding of the concept, the expectations, and the consequences of violating the policy by visiting the web site above.

***Course Goals***: The overall goal of this course is to understand how various parts of the whole Earth system evolve and interact with each other through the use of modeling. Modeling is an incredibly widespread tool throughout the sciences, so some experience with modeling will serve you well regardless of what you do after this class. The modeling process involves both qualitative study of processes and relationships as well as quantitative study, wherein we try to attach numbers and equations to model components in order to more carefully explore the consequences of our model design. We think you will find that modeling these Earth systems leads to fascinating insights and also promotes a way of thinking that is characterized by lots of questions about connections and changes over time that ultimately leads to a much richer understanding of the Earth. We hope you will come to see the utility of models, and how we evaluate the significance of model results, including the limitations of models.

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| Week 1 | Jan. 12 | Intro to Class and STELLA |   |
|  | Jan. 14 | More Intro to STELLA |   |
| Week 2 | Jan. 19 | [Unit 1: Introduction to Modeling Dynamic Systems](http://serc.carleton.edu/s/integrate/earth_modeling/index.html) | Pre-class Quiz on Reading (ANGEL) |
|  | Jan. 21 |   | Exercise 1 due before next class |
| Week 3 | Jan. 26 | [Unit 2: Modeling Population](http://serc.carleton.edu/s/integrate/earth_modeling/index.html) | Pre-class Quiz on Reading (ANGEL) |
|  | Jan. 28  |   | Exercise 2 due before next class |
| Week 4 | Feb. 2 | [Unit 3: Simple Climate Models](http://serc.carleton.edu/s/integrate/earth_modeling/index.html) | Pre-class Quiz on Reading (ANGEL) |
|  | Feb. 4  |   | Exercise 3 due before next class |
| Week 5 | Feb. 9 | [Unit 4: Daisyworld](http://serc.carleton.edu/s/integrate/earth_modeling/index.html) | Pre-class Quiz on Reading (ANGEL) |
|  | Feb. 11 |   | Exercise 4 due before next class |
| Week 6 | Feb. 16 | [Unit 5: Glacial Models](http://serc.carleton.edu/s/integrate/earth_modeling/index.html) | Pre-class Quiz on Reading (ANGEL) |
|  | Feb. 18 |   | Exercise 5 due before next class |
| Week 7 | Feb. 23  | [Unit 6: Modeling Water in Lake Chain & Climate Change](http://serc.carleton.edu/s/integrate/earth_modeling/index.html) | Pre-class Quiz on Reading (ANGEL) |
|  | Feb. 25  |   | Exercise 6 due before next class |
| Week 8 | Mar. 1  | [Unit 7: Heat Flow & Permafrost](http://serc.carleton.edu/s/integrate/earth_modeling/index.html) | Pre-class Quiz on Reading (ANGEL) |
|  | Mar. 3 |   | Exercise 7 due before next class |
|  | **Mar. 7-11**  | Spring Break |   |
| Week 9 | Mar. 15 | [Unit 8: Thermohaline Circulation](http://serc.carleton.edu/s/integrate/earth_modeling/index.html) | Pre-class Quiz on Reading (ANGEL) |
|  | Mar. 17 |   | Exercise 8 due before next class |
| Week 10 | Mar. 22 | [Unit 9: Carbon Cycle](http://serc.carleton.edu/s/integrate/earth_modeling/index.html) | Pre-class Quiz on Reading (ANGEL) |
|  | Mar. 24 |   |   |
| Week 11 | Mar. 29  | Carbon Cycle continued | Reading TBA |
|  | Mar. 31  |   | Exercise 9 due before next class |
| Week 12 | Apr. 5  | [Unit 10: Coupled Economic & Environmental Models](http://serc.carleton.edu/s/integrate/earth_modeling/index.html) | Pre-class Quiz on Reading (ANGEL) |
|  | Apr. 7  |   | Exercise 10 due before next class |
| Week 13 | Apr. 12 | Unit 11: The DICE Model | Reading TBA |
|  | Apr. 14 |   | Exercise 11 due before next class |
| Week 14 | Apr. 19 | Work on Final Projects |  |
|  | Apr. 21 |   |   |
| Week 15 | Apr. 26  | Present Final Projects |  |
|  | Apr. 28  | Present Final Projects |   |