EARTH SYSTEM SCIENCE
ENVST-UA.340.1
PROF. RAMPINO
Spring 2020

Class meets Tuesday/Thursday, 3:30 to 4:45 PM in Room B07, 45 W. 4th St.

Lectures: Prof. Michael R. Rampino (Departments of Biology and Environmental Studies). Office: 1157 Brown Bldg.; Office phone: 212-998-3743; Cell: 718-578-1442; e-mail: mrr1@nyu.edu Office Hours: 1 to 3 PM Tuesdays and Thursdays or contact me for an appointment.

Earth System Science examines our current view of planet Earth as a complex system involving interactions among the atmosphere, oceans, solid earth, and life. Emphasis is placed on the dynamics and evolution of these systems over time, and predictions for the future. The subject matter includes observations from space; planetary habitability, the Goldilocks Problem; the Gaia Hypothesis; geophysics and plate tectonics; the rock cycle; the circulation of the oceans and atmosphere; cycles of elements essential for life; the co-evolution of climate and life on Earth. The course will include lectures, discussion and videos.

REQUIRED READING:
1) Skinner, B.J and Murck, B. W. The Blue Planet, 3rd edition. (Wiley, 2011). This book is expensive, and not in the bookstore. There are used copies available on Amazon. If you want to purchase the e-version, that is also OK.

COURSE REQUIREMENTS: The grading in the course will be based on performance in three exams (2 quizzes and final quiz) and homework assignments (There will be homework assignments every week). A great deal of factual information and a number of new concepts will be introduced in this course; it is essential to keep up in the readings and to attend the lectures/discussions.

POLICY ON ATTENDANCE: Students are expected to attend the class, and you are forewarned that some class material will not be covered completely in the readings. This is a small class, and your absence will be noted. Absences for quizzes must be accompanied by a doctor's note.

SYLLABUS

Week 1
28 January: The Earth as a System: What is Science? Introduction to Earth System Science; Solid Earth, Atmosphere, Hydrosphere & Biosphere; Examples of the Earth as a Complex System.
Reading: BP Chapter 1

Reading: BP Chapter 4

Week 2
February 4: Early History of Earth & its Moon. What we Learned from the Apollo Program & Later Explorations.
Reading: BP Chapter 4

February 6: Why is Earth Habitable? The Goldilocks Problem: Why is Earth Comfortable, Mars Too Cold, & Venus Too Hot? Are There Other Habitable Planets?
Reading: BP Chapter 4

Week 3
Reading: BP Chapter 7
**February 13:** The Rock Cycle: Igneous, Sedimentary & Metamorphic Rocks.
Reading: BP Chapter 7

**Week 4**
**February 18:** What is the Earth Made of? The Composition of our Planet.
Reading: BP Chapter 3

**February 20:** The Mobile Earth: Wegener’s Theory. Continental Drift & Sea-Floor Spreading. Plate tectonics.
Reading: BP Chapter 5

**Week 5**
**February 25:** NO CLASS. Trip to AMNH Hall of Meteorites. Meteorites, Asteroids & Comets. The Ingredients of the Earth & Planets.

**February 27:** Video -- Amazing Earth

**Week 6**
**March 3:** History of Plate Tectonics: The Mobile Earth Through Time; The Formation & Break-up of Pangea. The Wilson Cycle.
Reading: BP Chapter 5

**March 5:** QUIZ 1

**Week 7**
**March 10:** Earthquakes & the Earth’s Interior: The internal Structure of the Earth, Seismology, & the Global Distribution of Earthquakes.
Reading: BP Chapter 6.

Reading: BP Chapter 6

**Week 8**
**March 16-22nd Spring Break**

**Week 9**
**March 24:** The Atmosphere: Structure & Composition of the Earth’s Atmosphere.
Reading: BP Chapter 11
Reading: BP Chapter 12

Week 10
Reading: BP Chapter 10

Reading: BP Chapter 10

Week 11
Reading: BP Chapter 14, GP Chapter 1 & 2

April 9: QUIZ 2

Week 12
Reading: BP Chapter 14, GP Chapter 3

Reading: BP Chapter 14

Week 13
Reading: BP Chapter 13, GP Chapters 4-6

April 23: Short-Term Climatic Variability: Solar Variations, Sunspots, Volcanic Eruptions, $CO_2$, etc.
Reading: BP Chapter 13, GP Chapters 7-9

Week 14
Reading: BP Chapter 15
Reading: BP Chapter 19, GP Chapter 10

Week 15
May 5: The Earth as a Planet: What was this Course About?

May 7: Last Class--Final Quiz

Remember the Quiz dates: March 5, April 9, May 7