

# **EAR 203: Earth Systems Science**

**EAR 203**  
**Earth Systems Science**  
**(4 credits)**  
**Class Size: 10-20**

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## **Course Catalog Description**

An integrated view of interactions among Earth's systems (lithosphere, biosphere, hydrosphere, atmosphere) and the timescales over which they operate. Topics covered in this course include: plate tectonics, atmospheric circulation, oceanic circulation, the greenhouse effect, the carbon cycle, the origin of the earth and life, and climate.

## **Course Overview**

An integrated view of interactions among Earth's systems (lithosphere, biosphere, hydrosphere, atmosphere) and the timescales over which they operate. Topics covered in this course include: plate tectonics, atmospheric circulation, oceanic circulation, the greenhouse effect, the carbon cycle, the origin of the earth and life, and climate.

Topics Covered:

Global change over different timescales

Introduction to systems

Global energy balance and the Earth's greenhouse

Atmospheric circulation

Ocean circulation

Circulation of the solid earth

Continental landforms Nutrient cycling

The origin of the Earth and life

Long-term climate regulation

Global change over the last 2.5 Ma-present

EAR 203 is recommended for students who wish to pursue a major or minor program in environmental studies, whether from the physical, biological or engineering perspective as well as geology. It is also appropriate for students with a strong science background who plan a major in a non-science discipline who are seeking a course that will fulfill general education requirements.

## **Pre- / Co-requisites**

N/A

## **Course Objectives**

At the end of Earth System Science, a student should have a fundamental understanding of how the earth operates from the core to the edge of the atmosphere in space and time. In addition, students will understand how the basic elements of the earth function and interact through various linkages and feedbacks that operate at a global scale over timescales of minutes to millions of years. Specifically, students will:

1. Gain an understanding of:

- a. Systems approach to understanding the Earth
  - b. Global change over different time scales
  - c. Global energy balance and Earth's greenhouse
  - d. Atmosphere circulation
  - e. Oceanic circulation
  - f. Plate tectonics
  - g. River systems
  - h. Nutrient cycling
  - i. The origin of Earth and life
  - j. Long-term climate regulation
2. Gain a deep understanding of the scientific method
    - a. Develop pertinent questions
    - b. Gather relevant data (or find it from reliable sources)
    - c. Construct interpretations
    - d. Formulate strategies for the development and testing of hypotheses
3. Apply mathematical and scientific knowledge and skills to solve:
    - a. qualitative,
    - b. quantitative,
    - c. spatial, and
    - d. analytic problems;

4. Apply basic arithmetic, algebra, and geometry to earth science concepts;
5. Use basic statistical concepts to draw both inferences and conclusions from data;
6. Identify implications and consequences of drawn conclusions;
7. Measure, compare, order, scale, locate, and code (meaning encode, describe, or communicate) data accurately;
8. Do scientific research and report and display the results of this research;
9. Understand these issues in terms of the modern political and social context; and
10. Learn to think critically in order to solve problems.

## **Laboratory**

N/A

## **Required Materials**

Kump, L.R., Kastings, J.F., and Crane, R.G., 2009 The Earth System, 3rd Edition: Pearson. ISBN: 978-0321597793

Sherman, D. and Montgomery, D., 2020 Environmental Science and Sustainability, 1 st edition: W.W. Norton & Company.

ISBN: 978-0393422108

## **Instructor Recommendations**

N/A