

# Cluster Three: The Natural World

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Scientific investigations into the natural world use analytical methods to evaluate evidence, build and test models based on that evidence, and develop theories. Mathematical studies of form and pattern can create a language that assists in these investigations. Courses in this cluster provide students with the opportunity to develop problem-solving skills in science and mathematics at the college level. Students will be introduced to a substantial body of scientific facts, concepts, models and theories, and they will also gain experience in using basic mathematics to obtain knowledge about the natural world. The cluster is cross disciplinary, thereby demonstrating boundaries and connections among mathematics, the sciences and other aspects of culture.

Typically students begin Cluster Three during their first year and should complete it by the end of their sophomore year. Individual courses satisfy requirements in a number of major and professional programs. Students are encouraged to select appropriate courses in Cluster Three on the basis of their backgrounds, interests and educational objectives.

## Cluster Three Structure

Cluster Three consists of 10 credits distributed across four areas representing four different aspects of scientific knowledge. Students must take one class that fulfills each of the four areas. Quantitative Reasoning consists of mathematics courses, and Physical Principles and Natural Systems consist of science courses. The groups may be taken in any order, except for courses denoted by an asterisk (\*), which have a mathematics and/or science prerequisite or corequisite. In addition, students are required to have at least one lab experience. Certain courses are designed for future teachers, and enrollment in these courses may be limited to IDLS majors; these courses are indicated with a double asterisk (\*\*).

### Quantitative Reasoning

Students build mathematical models of systems and learn to understand, interpret and analyze data that is numerical in nature.

#### Choose one of the following:

ISAT 151. Topics in Applied Calculus in ISAT  
 ISAT 251. Topics in Applied Statistics in ISAT  
 MATH 103. The Nature of Mathematics  
 MATH 105. Quantitative Literacy and Reasoning  
 MATH 107. Fundamentals of Mathematics I \*\*  
 MATH 205. Introductory Calculus I  
 MATH 220. Elementary Statistics  
 MATH 231. Calculus with Functions I  
 MATH 235. Calculus I

### Physical Principles

In this area, students study underlying principles of nature. These principles are applied to build models, often quantitative in nature, that explore and explain a variety of natural phenomena.

#### Choose one of the following:

CHEM 120. Concepts of Chemistry  
 CHEM 131. General Chemistry I (CHEM 131L required lab corequisite)  
 ISAT 100. Environmental and Energy Sustainability  
 ISAT 112. Environmental Issues in Science and Technology (includes lab)  
 ISCI 101. Physics, Chemistry and the Human Experience\*  
 ISCI 172. Physical Science for Teachers \*\*  
 PHYS 121. The Physical Nature of Light and Sound (includes lab)  
 PHYS 140. College Physics I (PHYS 140L required lab corequisite)  
 PHYS 215. Energy and the Environment\*  
 PHYS 240. University Physics I\*

### Natural Systems

Students study the behavior of earth and life systems. Students will investigate interactions within these systems, between the systems and their environment, and with society.

#### Choose one of the following:

ANTH 196. Biological Anthropology  
 ASTR 120. The Solar System  
 ASTR 121. Stars, Galaxies and Cosmology  
 BIO 103. Contemporary Biology  
 BIO 114. Organisms (includes lab)  
 BIO 222. Interdisciplinary Biology for Engineering and Physical Sciences  
 BIO 270. Human Physiology (includes lab)\*  
 GEOL 102. Environment: Earth  
 GEOL 115. Earth Systems and Climate Change  
 GEOL 110. Physical Geology (includes lab)  
 GEOL 200. Evolutionary Systems (includes lab)  
 GEOL 210. Applied Physical Geography\*  
 GEOL 211. Introduction to Oceanography  
 ISAT 113. Biotechnology Issues in Science and Technology  
 ISCI 171. Earth and Planetary Science for Teachers \*\*  
 PSYC 122. The Science of Vision and Audition

### Lab Experience

This area emphasizes the observational and experimental nature of science. Through hands-on experiential learning, students will make observations and use them to test predictions and hypotheses.

#### Choose one of the following:

Physical Principles course with a lab  
 Natural Systems course with a lab  
 ISCI 104. Scientific Perspectives  
 ISCI 173. Life and Environmental Science for Teachers \*\*

## Cluster Three Learning Objectives

After completing Cluster Three: The Natural World, students should be able to meet the following objectives:

- Describe the methods of inquiry that lead to mathematical truth and scientific knowledge and be able to distinguish science from pseudoscience.
- Use theories and models as unifying principles that help us understand natural phenomena and make predictions.
- Recognize the interdependence of applied research, basic research and technology, and how they affect society.
- Illustrate the interdependence between developments in science, social and ethical issues.
- Use graphical, symbolic and numerical methods to analyze, organize and interpret natural phenomena.
- Discriminate between association and causation, and identify the types of evidence used to establish causation.
- Formulate hypotheses, identify relevant variables and design experiments to test hypotheses.
- Evaluate the credibility, use and misuse of scientific and mathematical information in scientific developments and public-policy issues.