Cluster Three: The Natural World

Dr. Scott Paulson, Coordinator

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. Each track is multidisciplinary and interdisciplinary, thereby demonstrating boundaries and connections among mathematics, the sciences and other aspects of culture.

Cluster Three: Track I and Track II

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

Track I

In this track, students take one course from each of three groups and are required to have at least one lab experience. Group 1 consists of mathematics courses, and Groups 2 and 3 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.

Group 1. Choose one of the following:
- GSAT 151. Topics in Applied Calculus in ISAT
- GSAT 251. Topics in Applied Statistics in ISAT
- MATH 103. The Nature of Mathematics
- MATH 205. Introductory Calculus I
- MATH 220. Elementary Statistics
- MATH 231. Calculus with Functions I
- MATH 235. Calculus I

Group 2. Choose one of the following:
- CHEM 120. Concepts of Chemistry
- CHEM 131. General Chemistry I (CHEM 131L required lab corequisite)

Group 3. Choose one of the following:
- GSAT 112. Environmental Issues in Science and Technology (includes lab)
- GSCI 101. Physics, Chemistry and the Human Experience*
- GSCI 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

Group 3. Choose one of the following:
- GANTH 196. Biological Anthropology
- ASTR 120. The Solar System
- ASTR 121. Stars, Galaxies and Cosmology
- GBIO 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
- GSCI 113. Biotechnology Issues in Science and Technology
- GPSCY 122. The Science of Vision and Audition

Lab Experience. Choose one of the following:
- Group 2 course with a lab
- Group 3 course with a lab

GSCI 104

Track II

In addition to the science and math content, Track II emphasizes the learning environment and the unifying themes that link each of the individual classes. Track II is meant to serve primarily, but not exclusively, IDLS majors. MATH 107 must be taken prior to GSCI 163; GSCI 161 and GSCI 162 are corequisites; GSCI 163 and GSCI 164 are corequisites. Corequisite pairs may be taken in any order.

- MATH 107. Fundamentals of Mathematics I
- MATH 161. Science Processes
- MATH 162. The Science of the Planets
- MATH 163. The Matter of Matter
- MATH 164. Physical Science: Learning Through Teaching
- MATH 165. The Way Life Works

Cluster Three Learning Objectives

After completing Cluster Three: The Natural World, students should be able to meet the following objectives grouped under three learning goals:

- 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 and 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.

http://www.jmu.edu/catalog/12