Foundational Component Area: Life and Physical Sciences

In the box below, describe how this course meets the Foundational Component Area description for Life and Physical Sciences. Courses in this category focus on describing, explaining, and predicting natural phenomena using the scientific method. Courses involve the understanding of interactions among natural phenomena and the implications of scientific principles on the physical world and on human experiences.

How does the proposed course specifically address the Foundational Component Area definition above?

Ecology is by definition the study of interactions between organisms and their environment. Natural selection and evolution strongly influence these interactions, they are central to the concept of ecological systems, and they have direct relevance to human society by identifying solutions to contemporary environmental challenges. Emphasis is placed on science as a systematic means of acquiring information about our physical world via the scientific method. The course addresses a diverse range of natural components from individual genes to the entire Earth System. Interactions among these various hierarchies within natural systems are also emphasized.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):

Students are routinely challenged to reevaluate origins, consequences and solutions of a broad range of environmental challenges confronting human societies. This is based in part upon recognizing that ecological principles governing all life on the planet – life cannot exist without the paramount ecological processes of energy flow, nutrients cycling and ecosystem processes of stability or resilience within ecosystems. Common and widely held ecological misconceptions are emphasized to promote critical evaluation and assessment of current ecological knowledge. Students are required to apply and strengthen their ecological knowledge outside the classroom by critically evaluating relevant readings assignments, websites, and lecture presentations as well as inside the classroom through active learning activities using clickers and think-pair-share with probing questions and cases. Students also conduct an individual ecological inquiry project and they conduct background study, develop testable hypothesis based on observations, design investigation, collect data, analyze and interpret data, develop a scientific report, conduct peer review of reports using a detailed rubric, and revise own report based on peer reviews.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

Students are provided with numerous opportunities to interpret multiple forms of scientific information, including tabular and graphical data. Information synthesis is promoted by challenging students to identify interrelations, trade-offs, and cause-effect mechanisms among disparate processes and variables within ecological systems. There are frequent in-class discussions, both among peers and the class as a whole, on ecological concepts and applications as well as interpretation of tabular and graphical data. Students also develop a written report for their individual inquiry project (including presenting their data graphically and interpreting them), conduct peer reviews of these reports using a detailed rubric, and revise their reports in
Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The course is founded on quantitative scientific evidence and methods of inquiry, and the instructors go to great lengths to emphasize and familiarize students with scientific perspective. Various mathematical equations are evaluated as they relate to population growth, species biodiversity, population genetics, and chemical transformation associated with nutrient cycling. Students are familiarized with various scientific units and expressions, including the use of Systems International Units. For the ecological inquiry project, students analyze and interpret data they collected, draw conclusions, and discuss potential mechanisms and limitations of the findings.

Teamwork (to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal):

Students are challenged to develop and exchange views and rationales to develop shared understanding for various topics through think-pair-share or peer instruction activities coupled with clicker questions. These collaborative learning and formative assessment activities facilitate peer interaction and collaboration to promote deep learning and appreciation of diverse perspectives. For the ecological inquiry project, students also conduct online group discussions and provide feedback to each other at multiple stages of the ecological inquiry process. Peer evaluations are conducted on the performance and contribution of individual group members.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.