Texas A&M University  
Core Curriculum  
Initial Request for a Course Addition to the Fall 2014 Core Curriculum  

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.  

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?  

The course focuses upon describing, explaining, and predicting the interactions of microorganisms with their physical environment and the resulting impacts of these microorganisms on natural phenomena including: the sustainability and productivity of various ecosystems; nutrient cycling; degradation of pesticides and other xenobiotics; generation of trace gases; and soil and water quality. The laboratory portion of the course will reinforce these concepts and provide hands-on experience with using the scientific method and current analytical techniques to describe, explain, understand, and predict the impacts of soil and water microorganisms on the physical world and human experiences, with an emphasis on the natural phenomena listed above.  

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.  

The proposed course is required to contain each element of the Core Objective.  

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

How addressed:  
The critical thinking objective is largely accomplished through the laboratory portion of the course and discussion of case studies in the lecture. This includes the students conducting inquiry-based laboratory experiments followed by collection, evaluation, and synthesis of the results. In addition, case studies are included in the lecture portion of the course to encourage students to synthesize covered topics and critically evaluate the approaches and results from the case studies and to develop innovative approaches to answer scientific questions.  

Strategies:  
Students will evaluate and interpret case studies and their laboratory experiments and use this information to predict how these results would translate to other scenarios. For example, students will conduct a laboratory experiment in which they monitor carbon dioxide evolution from soils in response to amendment with plant materials having different carbon/nitrogen ratios. Following the experiment, students will be asked to use their results to predict the impact of different cropping systems on the levels of carbon dioxide released from soils under various scenarios.  

How evaluated:  
Questions will be included on quizzes, exams, and laboratory data sheets to verify the student’s ability to answer questions requiring critical thinking.
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Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

How addressed:
Effective written communication is demonstrated using exams, lab datasheets, etc. In addition, written, oral, and visual communication is demonstrated by PowerPoint presentations.

Strategies:
Students will answer discussion questions on exams and lab datasheets which will evaluate their ability to interpret a scenario and express their conclusions in a logical manner. In addition, the students will give PowerPoint presentations for selected laboratory experiments. These presentations will allow the students to demonstrate their ability to effectively develop a presentation, interpret their laboratory results, and express their conclusions. The presentations will include photos and graphical and tabular expressions of their results.

How evaluated:
Discussion questions on exams and lab datasheets along with PowerPoint presentations on their laboratory experiments will be used to verify that the students can develop, interpret, and express their ideas through written (exams & presentations), oral (presentations), and visual (presentations) communication. A rubric will be used to assess the PowerPoint presentations.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

How addressed:
Students will conduct laboratory experiments and then collect, analyze, and interpret their results.

Strategies:
Students will collect, manipulate, and analyze numerical data and other observable results from their laboratory experiments. For example, students will conduct a microbial respiration experiment in which they will quantify the amount of carbon dioxide released from soil following amendment with different plant materials. Using a titration-based method, students will calculate how much carbon dioxide was produced at each measurement time-point and then graph these results for comparison among treatments and across lab groups. Following the experiment, students will be asked to use their results to predict the impact of different cropping systems on the levels of carbon dioxide released from soils under various scenarios.

How evaluated:
The student’s empirical and quantitative skills will be evaluated via questions and calculations on laboratory datasheets, quizzes, presentations, and a lab practical.

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

How addressed:
Students will work as groups of 2-3 people in the laboratory portion of the course.

Strategies:
Lab exercises are done as groups of 2-3 people. This requires the students to coordinate activities to conduct the experiments, interpret the results, and present them to the class. Additional group activities (e.g., discussion of case studies) occur in both the lecture and lab portions of the course.
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How evaluated:
The student’s ability to effectively work as part of a team will be evaluated based upon his/her performance conducting the laboratory exercises and group lab presentations. The instructor will consider peer-evaluation feedback from the student’s other group members in making the evaluation.

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