**General Education Course Inclusion Proposal**

**SCIENTIFIC INQUIRY**

*This proposal form is intended for departments proposing a course for inclusion in the Northern Michigan University General Education Program. Courses in a component satisfy both the Critical Thinking and the component learning outcomes. Departments should complete this form and submit it electronically through the General Education SHARE site.*

**Course Name and Number:** Physical Geography, GC 100

**Home Department:** Earth, Environmental, and Geographical Sciences

**Department Chair Name and Contact Information**: Susy Ziegler, [suziegle@nmu.edu](mailto:suziegle@nmu.edu), 227-1104

**Expected frequency of Offering of the course**: Every Fall and Winter semester, and most Summers

**Official Course Status**: Has this course been approved by CUP and Senate? **YES**

*Courses that have not yet been approved by CUP must be submitted to CUP prior to review by GEC. Note that GEC is able to review courses that are in the process of approval; however, inclusion in the General Education Program is dependent upon Senate and Academic Affairs approval of the course into the overall curriculum.*

**Overview of course** (please attach a current syllabus as well): *Please limit the overview to two pages (not including the syllabus)*

**A. Overview of the course content:** Physical geography is the study of Earth’s major systems, and the physical, chemical, biological, and geological processes that shape it over time and space. This course is an introduction to the many interrelated components of the physical environment including: atmosphere, biosphere, hydrosphere, and lithosphere. This course also introduces a wide variety of scientific techniques and tools used to understand earth systems. The main focus is on the physical systems, processes, and interactions, while also highlighting the context and implications of various human-environment interactions.

**B. Explain why this course satisfies the Component specified and significantly addresses both learning outcomes**

***Critical Thinking Learning Outcomes*:** To satisfy the *Evidence* learning outcome, GC100 teaches students how to assess the quality of information during lecture and requires students to apply their knowledge and skills by completing hands-on, quantitative, and inquiry-based exercises. To satisfy the *Integrate* learning outcome, GC100 students synthesize ideas from various science, technology, engineering, and mathematical (STEM) disciplines presented in readings and during lectures to explain earth system processes while completing numerous interactive exercises. To satisfy the *Evaluate* learning outcome, GC100 students apply concepts introduced via readings and lectures to examine and analyze data, graphs, maps, photographs, and/or physical samples (e.g., rocks or soil). Students are required to apply *Critical Thinking* skills during the all in-class exercises (15-20), and most quiz and exam questions require students to assess information, integrate insight and reasoning, or evaluate ideas to draw conclusions about earth system science concepts and processes.

***Scientific Inquiry Learning Outcomes*:** To satisfy the *Research Question* outcome, GC100 students will be introduced to scientific research methods, including development of research questions and testable hypotheses in lectures, and will generate their own research questions and testable hypothesis during inquiry-based exercises. To satisfy the *Methodology / Data Collection* outcome, students will be introduced to data collection methodologies during lecture, and will have the opportunity to apply their newly discovered data collection skills during 3-5 interactive exercises. To satisfy the *Analysis, Results, and Presentation* outcome, students will produce simple graphs or maps, analyze existing graphs or maps, or perform simple calculations to determine what data (collected by the students or provided by the instructor) show about different aspects of the physical environment during the majority of exercises. To satisfy the *Discussion/Conclusions* learning outcome, GC100 requires students to reflect, in writing and class discussion, on readings, video clips, and current events. The majority of exercises (15-20) will incorporate *Scientific Inquiry* learning outcomes, and all quizzes and exams will include questions containing one or more of these dimensions.

**C. Describe the target audience (level, student groups, etc.)** As a current Division III Foundations of Natural Sciences/Mathematics Liberal Studies course, GC100 is offered at a freshman level to introduce students to the natural processes of Earth. No prerequisites are required. Students in the class often include prospective majors and minors of the EEGS Department, as well as students in Education, Biology, Criminal Justice, and other majors who need GC100 for a prerequisite or are using it for general education.

**D. Give information on other roles this course may serve (e.g. University Requirement, required for a major(s), etc.)** GC100 Physical Geography is a required course for majors in: Earth Science, Environmental Studies & Sustainability, Geomatics, Secondary Education Geography, and Secondary Education Social Studies. It is a prerequisite to required courses for majors in: Environmental Sciences, all four Integrated Science Majors, and Secondary Education Earth Sciences. It also serves as an elective and course substitute for a number of other majors including: Elementary Education Social Studies, Fisheries & Wildlife Management, and Secondary Education Biology.

GC100 Physical Geography is currently a service course to the general university as a Division III Foundations of Natural Sciences/Mathematics Liberal Studies non-lab course.

**E. Provide any other information that may be relevant to the review of the course by GEC**

This course may be taught by several members of the EEGS faculty. Whenever possible we offer two sections of 80 students per semester, and the sections routinely fill. We also offer it as an online course as often as we can during Summer Session I. We feel strongly that this course should be included within NMU’s General Education Program course because it extensively integrates *Critical Thinking* and *Scientific Inquiry* learning outcomes. As an introductory non-laboratory course with 80 students in a lecture hall, it is more difficult to integrate the *Research Question* and *Data Collection* dimensions when compared to introductory courses with a designated laboratory component, such as BI 111 or CH 111. However, we have spent a considerable amount of time constructing lecture-based laboratory style exercises into this non-laboratory course. Collectively these exercises engage GC100 students by requiring them to apply all of the *Critical Thinking* and *Scientific Inquiry* learning outcomes, including the *Research Question* and *Data Collection* dimensions, demonstrated by the instructor during lecture. The instructor may use all of the lecture-based exercises for formative or summative assessments of student understanding, and ultimately foster a deeper student understanding of *Scientific Inquiry* based learning outcomes as they prepare for summative, quiz and exam based, assessments.

We are submitting the proposal for GC 100 for the second time. We learned a great deal from comments provided by the initial GEC review and are excited about inclusion of Physical Geography into NMU’s General Education Program.

**PLAN FOR LEARNING OUTCOMES  
CRITICAL THINKING**

*Attainment of the CRITICAL THINKING Learning Outcome is required for courses in this component. There are several dimensions to this learning outcome. Please complete the following Plan for Assessment with information regarding course assignments (type, frequency, importance) that will be used by the department to assess the attainment of students in each of the dimensions of the learning outcome. Type refers to the types of assignments used for assessment such as written work, presentations, etc. Frequency refers to the number of assignments included such as a single paper or multiple papers. Importance refers to the relative emphasis or weight of the assignment to the entire course. For each dimension, please specify the expected success rate for students completing the course that meet the proficiency level and explain your reasoning. Please refer to the Critical Thinking Rubric for more information on student performance/proficiency in this area. Note that courses are expected to meaningfully address all dimensions of the learning outcome.*

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| **DIMENSION** | **WHAT IS BEING ASSESSED** | **PLAN FOR ASSESSMENT** |
| **Evidence** | Assesses quality of information that may be integrated into an argument | ***Task type*:** In-class exercises, quizzes and exams.  ***Frequency*:** 2-4 in-class exercises, 1 quiz and 1 exam.  ***Importance*:** Exercises that incorporate this dimension will constitute 5-10% of the course grade, while quizzes/exams that incorporate this dimension will constitute 5-10% of course grade.  ***Expected success rate*:** 75% of students meet the proficiency level  ***Rationale*:** This course attracts students with a wide range of background; thus we expect as many as ¼ of enrollees will fail to achieve a “proficient” rating. This is consistent with past grades in this course.  ***Implementation of dimension:*** In this introductory class with wide range of student interests, our primary learning outcomes are focused on: understanding the earth system processes, interpreting physical science results, and drawing conclusions from scientific data. We will introduce the evidence dimension alongside the research question dimension. Student’s will apply what they know about this dimension while working through 2-4 inquiry based exercises where they will be required to assess the quality of information before developing a research based argument. Furthermore, summative assessment questions that incorporate this dimension will be included within one quiz and one exam. |
| **Integrate** | Integrates insight and or reasoning with existing understanding to reach informed conclusions and/or understanding | ***Task type*:** In-class exercises, quizzes, and exams.  ***Frequency*:** 15-20 in-class exercises, 5-10 quizzes and 3-4 exams (dependent on instructor).  ***Importance*:** Exercises that incorporate this dimension will constitute 20-50% of course grade, while quizzes/exams that incorporate this dimension will constitute 50-80% of course grade.  ***Expected success rate*:** 75% of students meet proficiency level  ***Rationale*:** This course attracts students with a wide range of background; thus we expect as many as ¼ of enrollees will fail to achieve a “proficient” rating. This is consistent with past grades in this course.  ***Implementation of dimension:*** This introductory course will extensively incorporate the insight and reasoning skills required to understand course content and to reach informed conclusions. Every exercise will contain components of this dimension, and the majority of quizzes and examples will require students to reach informed conclusions or understanding based on reasoning and/or insight. |
| **Evaluate** | Evaluates information, ideas, and activities according to established principles and guidelines | ***Task type*:** In-class exercises, quizzes and exams.  ***Frequency*:** 15-20 in-class exercises, 5-10 quizzes and 3-4 exams (dependent on instructor).  ***Importance*:** Exercises that incorporate this dimension will constitute 20-50% of course grade, while quizzes/exams that incorporate this dimension will constitute 50-80% of course grade.  ***Expected success rate*:** 75% of students meet proficiency level  ***Rationale*:** This course attracts students with a wide range of background; thus we expect as many as ¼ of enrollees will fail to achieve a “proficient” rating. This is consistent with past grades in this course.  ***Implementation of dimension:*** This introductory course will extensively incorporate evaluation of information, ideas, and activities that are based upon established principles and guidelines associated with earth systems science. Every exercise will contain components of this dimension, and the majority of quizzes and examples will require students to evaluate content according to principles and guidelines discussed during lecture. |

**PLAN FOR LEARNING OUTCOMES  
SCIENTIFIC INQUIRY**

*Attainment of the SCIENTIFIC INQUIRY Learning Outcome is required for courses in this component. There are several dimensions to this learning outcome. Please complete the following Plan for Assessment with information regarding course assignments (type, frequency, importance) that will be used by the department to assess the attainment of students in each of the dimensions of the learning outcome. Type refers to the types of assignments used for assessment such as written work, presentations, etc. Frequency refers to the number of assignments included such as a single paper or multiple papers. Importance refers to the relative emphasis or weight of the assignment to the entire course. For each dimension, please specify the expected success rate for students completing the course that meet the proficiency level and explain your reasoning. Please refer to the Rubric for more information on student performance/proficiency in this learning outcome. Note that courses are expected to meaningfully address all dimensions of the learning outcome.*

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| **DIMENSION** | **WHAT IS BEING ASSESSED** | **PLAN FOR ASSESSMENT** |
| **Research Question** | Develop a manageable and appropriate research question that is tied to testable hypotheses. | ***Task type*:** In-class exercises, or quizzes and exams.  ***Frequency*:** 2-4 exercises per semester, 1 quiz and 1 exam  ***Importance*:** Exercises that incorporate this dimension will constitute 5-10% of the course grade, while quizzes/exams that incorporate this dimension will constitute 5-10% of course grade.  ***Expected success rate*:** 75% of students meet proficiency level  ***Rationale*:** This course attracts students with a wide range of background; thus we expect as many as ¼ of enrollees will fail to achieve a “proficient” rating. This is consistent with past grades in this course.  ***Implementation of dimension:*** In this introductory class with a wide range of student interests, our primary learning outcomes are focused on understanding earth system processes, interpreting physical science results, and drawing conclusions from scientific data. We introduce scientific research methods, including development of research questions and testable hypotheses in lectures. Student’s apply what they know about this dimension while working through 2-4 inquiry based exercises where they are required to formulate a research question, develop a testable hypothesis, collect data, interpret data, evaluate their hypothesis, and draw conclusions about earth system processes. Furthermore, summative assessment questions that incorporate this dimension will be included within one quiz and one exam. |
| **Methodology/Data Collection** | Select and/or develop appropriate scientific methodologies | ***Task type*:** In-class exercises.  ***Frequency*:** 3-5 exercises.  ***Importance*:** Exercises that incorporate this dimension will constitute 5-15% of the course grade.  ***Expected success rate*:** 75% of students meet proficiency level  ***Rationale*:** This course attracts students with a wide range of background; thus we expect as many as one-quarter of enrollees will fail to achieve a “proficient” rating. This is outcome consistent with past grades in this course.  ***Implementation of dimension:*** This course is currently offered, in the liberal studies program, as a non-laboratory Natural Science/Mathematics course. Students will be introduced to data collection methodologies during lecture, and will have the opportunity to apply their newly discovered data collection skills during 3-5 in-class exercises. Students will use hand-held and computer-based measurement methodologies to collect data during exercises. |
| **Analysis, Results and Presentation** | Collected data is appropriately analyzed and presented | ***Task type*:** In-class exercises and quizzes/exams.  ***Frequency*:** 10-20 in-class exercise, 5-10 quizzes, and 3-4 exams (dependent on instructor).  ***Importance*:** Exercises that incorporate this dimension will constitute 10-40% of the course grade, while quizzes/exams that incorporate this dimension will constitute 50-80% of course grade.  ***Expected success rate*:** 75% of students meet proficiency level  ***Rationale*:** This course attracts students with a wide range of background; thus we expect as many as ¼ of enrollees will fail to achieve a “proficient” rating. This is consistent with past grades in this course.  ***Comment on Task Type and Importance:*** This introductory course will extensively incorporate data analysis, result interpretation, and data presentation content. Every exercise will contain at least one of the major components within this dimension, and the majority of quizzes and examples will require students to interpret results, analyses and/or figures. |
| **Discussion/Conclusions** | Conclusions are linked to evidence and are in the context of scientific limitations and implications. | ***Task type*:** In-class exercises and quizzes/exams  ***Frequency*:** ≈10 in-class exercises, 5-10 quizzes, and 3-4 exams will include questions addressing this dimension. (dependent on instructor)  ***Importance*:** exercises that incorporate this dimension will constitute 10-25% of the course grade, while quizzes/exams that incorporate this dimension will constitute 50-80% of course grade.  ***Expected success rate*:** 75% of students meet proficiency level  ***Rationale*:** This course attracts students with a wide range of background; thus we expect as many as ¼ of enrollees will fail to achieve a “proficient” rating. This is consistent with past grades in this course.  ***Comment on Task Type and Importance:*** *this introductory course will extensively incorporate the discussion and conclusion dimension. Approximately ten exercises will require students to discuss and draw conclusions based on evidence they collected or that was previously summarized. The majority of quizzes and examples will require students to draw conclusions or interpret pre-formulated conclusions associated with earth systems processes.* |