EASTERN MICHIGAN UNIVERSITY
DIVISION OF ACADEMIC AFFAIRS

REQUEST FOR INCLUSION OF A COURSE IN THE GENERAL EDUCATION PROGRAM: EDUCATION FOR PARTICIPATION IN THE GLOBAL COMMUNITY

DEPARTMENT/SCHOOL: BIOLOGY, GEOGRAPHY AND GEOLOGY **COLLEGE:** ARTS & SCIENCES

DEPARTMENT CONTACT: ULRICH REINHARDT, SANDRA RUTHERFORD **CONTACT PHONE:** 487-4398 (UR) 487-858 (SR),

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1. Subject Code, Number, and Title: BIOL107/ ESSC107 Introduction to Environmental Science
2. Credit Hours 3
3. Course Description:

An introduction to the basic biological, physical and chemical processes that control today's environmental conditions. The global ecosystem is presented as a structure that includes human society. The understanding of local and global environmental problems and discussion of potential solutions are emphasized.

This class is co-taught between the Biology and Geography/Geology Departments.

4. This course is (check one):

■ an existing course with no revisions (need not go through the input system)

an existing course with revisions (attach this form to Request for Course Revision form)

a new course (attach this form to Request for New Course form)

5. Check the General Education requirement this course is intended to meet. If the course is to be proposed for more than one requirement, submit a separate form for each one.

Effective Communication

Quantitative Reasoning (*QR designation*)

Writing Intensive (*WI designation*)

■ **Perspectives on a Diverse World**

■ Global Awareness

U.S. Diversity

Knowledge of the Disciplines

Arts	Humanities
Science	Social Science

Learning Beyond the Classroom (*LBC designation*)

Self and Well Being

Community Service, Citizenship, and Leadership

Cultural and Academic Activities and Events

Career and Professional Development

International and Multicultural Experience

Undergraduate Research

6. Rationale. Provide a concise, clear, jargon-free explanation of why this is a General Education course and how it fits into this specific area of the program. (The rationale should explain to students why the are taking the course. It should address both why it is part of the General Education program and why it fits into the particular category.) This rationale should appear on the general course syllabus provided here and should be included in specific course syllabi given to students.

This course gives students an understanding of important challenges to the integrity of the global ecosystem and begins to explain many of the scientific and social issues that surround them. Globally, human health and economic well-being can only be sustained under amenable environmental conditions, which depend on climate, atmosphere, water, forests, agricultural soils, human population density, and biodiversity. Every bit of the surface of Earth is influenced by human activities; the global connectedness of our economic activities means that many of our everyday decisions impact far-flung corners of the planet. The goal of this class is for students to gain a better understanding of the workings of the global ecosystem and how the expanding human population interacts with it and depends on it. Learning the basics of environmental science will allow students to make informed decisions about individual and collective actions that impact the present and future state of the environment, both locally and globally. As such, BIOL/EESC 107 meets the requirements of the Perspectives on a Diverse World, Global Awareness section of the General Education program.

7. Clearly and concisely explain how this course meets each of the General Education outcomes for the requirement checked in number five (all outcomes should be addressed). To do this, (a) list the General Education outcomes for the requirement and explain how the course meets each outcome; and (b) explain, in general terms, the method(s) of evaluation to be used in the course and how these methods assess the degree to which students have met the General Education outcomes for this requirement

Outcomes for the Perspectives on a Diverse World: Global Awareness Course, students will…

- Explore specific global issues influencing diverse nations and/or cultures, along with their interrelations within the global community

a) Most of the class topics make the connection between actions in our cultural and economic sphere and those of other spheres. An example that will be used in class deals with human population growth and resource use: most industrialized nations have gone through a demographic transition and now have a shrinking population base while poorer, non-industrialized countries maintain a population growth that will increase the pressure on Earth's resources. On the other hand, wealthy industrialized nations consume a disproportionately large share of the Earth's resources. This leads to tension between rich and poor nations when it comes to arguing on the international stage for population control versus resource use control. The arguments over the Kyoto protocol on climate change are used as an example of these global tensions.

b) The students' understanding of the effects of demography, lifestyle and the just distribution of resources is assessed in lecture exams and in specific assignments. For example, exam questions could require the students to discuss in an essay question nutritional imbalances in rich countries (60% overweight) versus poor countries (undernourishment e.g. in sub-Saharan countries). There will be an assignment that explores the demography of various nations using computer simulation: students manipulate the values for women's total fertility and crude death rates in select countries from current rates and project the population growth and resulting population age structure 50 years into the future. They then try to predict what socio-economic consequences the different population trajectories will entail. In another assignment, students will explore the effect of curtailing or not curtailing global greenhouse gas emissions on climate and sea level in select nations, e.g. the predicted loss of entire Pacific island nations through a sea level rises by 1.5 meters in the next hundred years if greenhouse gas emissions continue to rise at the current rate.

- Explore their own culture and cultural practices and how these relate to the cultures and cultural practices of others in the global community

a) Resource use in the U.S. is an important aspect of our consumption-oriented culture. The U.S. has about 5% of the Earth's population, yet uses about 30% of its resources. A good portion of the course is dedicated to analyzing the U.S.'s use of mineral resources and primary energy in juxtaposition to patterns in other industrialized (e.g. European countries) and less-industrialized, countries (e.g. China and African countries). Students will learn e.g. that the per capita energy consumption

in the U.S. is twice that of European countries and multiple times that of developing nations. By exploring the underlying reasons (industrial processes, size of dwellings, transportation and urban sprawl issues) in lecture and assignments, students will examine whether this discrepancy is sustainable in a world of equal economic opportunities.

b) The exploration of the USA's versus others' consumption patterns will be assessed in lecture exams and assignments, e.g. in short-answer exam questions where students are required to analyze a graphical representation of per-capita energy use in relation to per-capita GDP in various countries. Using the graph and knowledge from the lecture, the students will try to explain why the U.S. has twice the per capita energy consumption of similarly wealthy European countries, but less than similarly wealthy Saudi Arabia. In one homework assignment, students will use a computer simulation model to assess the ecological footprint (a model that translates land consumption patterns into land area needed to sustain the lifestyle). They will alter their input data on commuting distance, gas mileage, diet, size of house etc. to explore the effects of their own lifestyle choices on the individual ecological footprint and will compare the typical U.S. footprint with that of other select countries, including China, which still has a low per person footprint, but is rapidly increasing resource consumption. Students will find through this exercise that the U.S. lifestyle is not a suitable model for sustaining every Earth citizen.

- Explore the social and historical dynamics that create and influence nations, governments, global alliances and global conflicts

a) Several topics in this class deal with social and historical reasons for current challenges to the environment. A prime example for these dynamics and the resulting regional and international conflicts is the demise of the Aral Sea in the former Soviet Union. Due to historical Soviet-era designs to turn the desert into prime cotton-growing land, the feeder rivers are being drained for irrigation water and the Aral Sea, once the fourth-largest body of freshwater by surface area has shrunk 75% in area and 90% in volume. The ecological and economic and public-health consequences of the upstream water withdrawal are catastrophic; the social coherence within the afflicted region is under strain due to ill health and poverty created by the drought and pollution and regional conflicts among the now independent nations (Tajikistan, Kyrgyzstan, Turkmenistan, Uzbekistan and Kazakhstan) that use the water are intensifying. A second example of social and historical dynamics influencing nations that will be dealt with in class is the civilian use of nuclear energy in the U.S. and Russia. Since peaceful nuclear technology was initially a spin-off from weapons technology, much of its use throughout most of the 20th century and the resulting radioactive contamination of the environment have been kept secret. Only since the disintegration of the Soviet Union have we begun to learn about large-scale dumping of nuclear waste (incl. whole reactors) in the Arctic Ocean and the Sea of Japan off Russia and dumping of nuclear waste by the U.S. army in coastal waters off the U.S. The Russian waste dumping has recently lead to increased tensions between Japan and Russia, and widespread nuclear contamination of whole landscapes in Russia. The Soviet-American dynamic has changed dramatically, such that Russia is now even allowing the importing of highly radioactive U.S. waste to dump in unsecured above-ground storage as a source of

cash, but with potentially grave consequences for the Russian people and their ecosystems These and other examples will be used to illuminate the historical and social roots of global cooperation or conflict in environmental issues.

b) The students' insights into the historical roots of current tensions surrounding environmental issues will be assessed in lecture exams and assignments: in one exam, students will be given a scenario related to nuclear waste disposal and will have to write an essay arguing for or against a specific course of action, e.g. argue for storage in the U.S. versus export to Russia. The students' understanding of the Aral Sea water issue will be assessed in a homework assignment: students will use internet, video documentaries, books and scientific articles to assess the reasons for the continuing diversion of river water for irrigation, i.e. the strong financial dependence of the nations (Tajikistan, Kyrgyzstan, Turkmenistan, Uzbekistan and Kazakhstan) on Aral feeder water for cotton growing. They will also examine the effects of water withdrawal on the people living downstream of the irrigated region. Students will investigate the large-scale climatic shifts resulting from the lake shrinkage to understand how the decision to divert water in one region affects neighboring countries over a substantial distance e.g. regional desertification results from a reduced moderating lake effect on and shrinking of glaciers and associated summer droughts are caused by windswept lake floor dust settling in the mountains 100s of miles away from the dry lake bed. This assignment will thus help the students understand how inter-regional environmental issues have historical roots (i.e. Soviet-style planning), are impacted by social dynamics (i.e. the regional power imbalance) and cause regional conflicts (i.e. over access to water).

- Explore the causes and consequences of social, cultural and racial intolerance in the world

a) One branch of environmental science, environmental justice, deals specifically with the issue of racial and social intolerance and its effect on the environmental quality of populations who lack political and economic power to protect their communities. One example is the gross environmental negligence of some U.S. companies who manufacture goods cheaply just south of the U.S.-Mexican border. The resulting water and soil contamination has grave impacts on the poor population living in shantytowns near the manufacturing plants. Thus the poor living conditions in the shanty towns are partly caused by a power imbalance between the ruling (white) business elite and the poor (Hispanic) workers. The class further explores these issues as they learn how the causes and consequences of social, cultural and racial intolerance are interrelated in the issue of solid waste export from wealthy to poor countries, e.g. the export of toxic consumer electronics waste to African countries because their disposal in the U.S. is subject to much stricter dumping rules. In this example, the social imbalance starts in the U.S. where education about the environmental hazards of toxic wastes has lead to strict regulation and therefore costly disposal procedure. Lacking education about environmental hazards, socially disadvantaged nations have not implemented such regulation, which leads to an opening for cheap disposal of dangerous waste. We seem to be lacking the will to extend our environmental protection to the "weaker" nations, which usually differ in their cultural and racial make-up from us, and therefore don't ban export of our dangerous wastes. Thus the issue of toxic waste dumping in other nations can serve as an example of the causes and consequences of social, racial and cultural intolerance in the world.

b) The students' understanding of environmental justice and its mission to stamp out social, cultural and racial intolerance in environmental issues will be assessed in lecture exams: for example the students will be given a list of toxic materials used in computer components and the methods and cost of various ways of disposal or recycling of computer trash. The students will then argue in an essay which is their preferred disposal method based on the best balance between environmental safety, environmental justice and the cost of the product to the U.S. consumer. Another question on a lecture exam will ask students to write an argumentative essay in form of a letter to an elected official in which the student petitions to introduce legislation to ban a certain practice. The students will have to describe one of the issues related environmental justice they learned about in class and phrase their arguments so that they are based on alleviating social, cultural or racial intolerance.

- Analyze and synthesize information from diverse sources to make informed decisions regarding global issues

a) Since environmental science is a value-driven and interdisciplinary undertaking, it incorporates aspects of many of the social and natural sciences. For example, the issue of global warming and greenhouse gas emissions touches on such diverse areas as atmospheric science, biology, international law, ethics and economics. Consequently, many issues are not only complex, but also require assembly and evaluation of information from a wide variety of sources. The media used in this class by instructors and students include, but are not limited to, PowerPoint lectures, newspaper articles, film documentaries, internet websites, books and scientific articles, computer simulation models, and numerical databases. As is typical for areas where science and society interact, almost all environmental issues lack a clear-cut solution. The various stakeholders' suggestions for best course of action often stem from a biased interpretation of the underlying science and varying mixtures of economical, ethical and emotional arguments. The current greenhouse gas dispute is a perfect example of this. By using a variety of sources, to draw up information on climatic trends and evaluate future warming scenarios, students in this class begin to grasp the complexity of environmental issues and will start to question the effects their own background and biases have on their views and decisions.

b) Students are trained in using diverse sources mostly in the homework assignments. For example, in the weather and climate assignment, students will explore the website of the Intergovernmental Panel for Climate Research and extract one of a number of evidences for global warming. They then go to a different database, where they check how strong the reported trends are for select regions, e.g. they use the AccuData weather website to extract and plot sea surface temperatures for the last two decades for sampling points in the Caribbean and they extract data on hurricane frequency and severity in the same timeframe in the Caribbean. They then analyze the data (e.g. in temperature-hurricane frequency correlations) and report their findings in a data report. Another example is the home energy audit assignment. In teams of two, students will collect from two single-family home details on the building (insulation material, efficiency of appliances, home area, lifestyle choices such as preferred interior

temperature, etc.) and actual energy use (from utility bills). They will then compare their findings with Michigan home averages, using the federal government's Home Energy Saver website. In a comprehensive report, they will then suggest the top ten energy efficiency improvements to the two homes, ranked by estimated greenhouse gas emission reduction and estimated pay-back time of the investment.

8. Attach a syllabus (1-inch margins and 10-12 pt. font). The syllabus must include the rationale from #6 above and clearly reflect the outcomes and methods detailed in #7 above.

BIOL107/ESSC107 Introduction to Environmental Science

General Syllabus

INSTRUCTOR:
CONTACT INFORMATION:
Office:
Office Hours:
Phone:
Email:

Course Description

An introduction to the basic biological, physical and chemical processes that control today's environmental conditions. The global ecosystem is presented as a structure that includes human society. The understanding of local and global environmental problems and discussion of potential solutions are emphasized.

General Education Rationale: BIOL107/ESSC 107

This course gives students an understanding of important challenges to the integrity of the global ecosystem and begins to explain many of the scientific and social issues that surround them. Globally, human health and economic well-being can only be sustained under amenable environmental conditions, which depend on climate, atmosphere, water, forests, agricultural soils, human population density, and biodiversity. Every bit of the surface of Earth is influenced by human activities; the global connectedness of our economic activities means that many of our everyday decisions impact far-flung corners of the planet. The goal of this class is for students to gain a better understanding of the workings of the global ecosystem and how the expanding human population interacts with it and depends on it. Learning the basics of environmental science will allow students to make informed decisions about individual and collective actions that impact the present and future state of the environment, both locally and globally. As such, BIOL 107/EESC 107 meets the requirements of the Perspectives on a Diverse World, Global Awareness, section of the General Education program.

Course Objectives

The course will be divided into six broad, interlocking topics. Two general objectives are:

- To understand the workings of the global ecosystem.
- To describe responses of an ecosystem to human activities.

Topic and Objectives	Homework Assignment
LIFE ▪ To understand how humanity interacts with and depends on the global ecosystem. ▪ To understand human demography and how population size responds to human development ▪ To explain the effects of agriculture and urban development on ecosystems. ▪ To foster informed decision making about individual and	Human Demography and Ecological Footprint Assignment

collective actions that impact the environment.	
EARTH ▪ To explain what geologic resources are and why they need to be conserved. ▪ To evaluate alternatives for resource use and by-product disposal with respect to the environment and environmental justice. ▪ To describe how matter cycles through ecosystems, e.g. the carbon cycle.	Mining and Waste Disposal Assignment
WATER ▪ To describe how human activities affect the distribution and quality of water in the hydrosphere.	Aral Sea and Ocean Pollution Assignment
CLIMATE ▪ To explain how interactions of the atmosphere, hydrosphere, and geosphere create climates ▪ To understand how climate is affected by human activities.	Weather and Global Warming Assignment
AIR ▪ To explain the impact of human activities on the atmosphere and explain ways that individuals and society can reduce air pollution.	Air Quality Assignment
ENERGY ▪ To explain usage patterns of non-renewable fossil fuels ▪ To explain the advantages and drawbacks of using various renewable energy sources.	Home Energy Efficiency Assignment

Textbook

Cunningham, Cunningham and Saigo 2003, "Environmental Science- a Global Concern", 7th edition. McGraw & Hill.

Assessment and Grading

A. **Exams**: There will be two lecture exams and a cumulative final exam, together comprising 50% of the final grade. Exams will consist of a mixture of short-answer questions, multiple-choice, matching and simple calculations; there will also be essay questions. Students are responsible for all materials covered in the lecture, activities and assigned readings. Requests for make-up exams can only be accommodated under **documented** circumstances of necessary absence due to unforeseen outside forces (e.g. sickness, death in the family).

B. **Assignments**: There will be one homework assignment for each of the six broad topics, comprising 50% of the final grade. Each assignment will be a based on collecting and analyzing data and answering questions based on data sources found on the internet and at Halle Library. The assignments will also use relevant readings found at websites such as CQ Researcher, Atlantic Monthly or the New York Times; questions about those readings will be part of the homework assignments.

Minimum Percent Required for Each Grade

A 83%	B+ 77%	C+ 67%	D+ 57%	
A- 80%	B 73%	C 63%	D 53%	
	B- 70%	C- 60%	D- 50%	E below 50%

Attendance

Attendance is required. Attendance may or may not be taken on any given day. It is expected you will be in class everyday and stay for the entire class. You are responsible for all material covered in class, including all announcements about the class.

Where to get General Help (free of charge)?

- With tutoring and academic skill building: Holman Learning Center, basement of Halle Library
- With research for assignments and term papers: Halle Library Information Desk
- With writing assignments: The Writing Center. 613P Pray-Harrold Building, 487-0694 www.emich.edu/public/english/writing-center/
- With health and wellness concerns: **Counseling Services** 487-1118, Snow Health Center; **Health Services** (fee) 487-1122 Snow Health Center; **Wellness Programs** 487-2226 Snow Health Center

Important Notes

Class schedules and policies are subject to change. Students are responsible for all changes that have been announced in class. If you need any special accommodations in this class (e.g. due to a documented learning disability), you need to **notify the instructor in writing**.

Classroom Conduct

Students are expected to abide by the **Student Conduct Code** and assist in creating an environment that is conducive to learning and protects the rights of all members of the University community. Incivility and disruptive behavior will not be tolerated and may result in a request to leave class and referral to the *Office of Student Judicial Services (SJS)* for discipline. Examples of inappropriate classroom conduct include repeatedly arriving late to class, using a cellular telephone, or talking while others are speaking. You may access **the Code** online at www.emich.edu/sjs.

Academic Integrity (*language should be adjusted to reflect department policy*)

Academic dishonesty, including all forms of cheating and/or plagiarism, will not be tolerated in this class. Penalties for an act of academic dishonesty may range from receiving a failing grade for a particular assignment to receiving a failing grade for the entire course. In addition, you may be referred to the *Office of Student Judicial Services* for discipline that can result in either a suspension or permanent dismissal. The **Student Conduct Code** contains detailed definitions of what constitutes academic dishonesty, but if you are not sure about whether something you're doing would be considered academic dishonesty, consult with the instructor.

Students with Disabilities

If you wish to be accommodated for your disability EMU Board of Regents policy #8.3 requires that you first register with the *Access Services Office (ASO)* in room 203 King Hall. You may contact *ASO* by telephone at (734) 487-2470. Students with disabilities are encouraged to register with *ASO* promptly as you will only be accommodated from the date you register with them forward. **No retroactive accommodations are possible.**

F and J Visa International Students

The Student Exchange Visitor Information System (SEVIS) requires F and J students to report the following to the *Office of International Students*, 229 King Hall within ten (10) days of the event:

- Changes in your name, local address, major field of study, or source of funding.
- Changes in your degree-completion date
- Changes in your degree-level (ex. Bachelors to Masters)
- Intent to transfer to another school

Prior permission from *OIS* is needed for the following:

- Dropping ALL courses as well as carrying or dropping BELOW minimum credit hours
- Employment on or off-campus
- Registering for more than one ONLINE course per term (F-visa only)
- Endorsing I-20 or DS-2019 for re-entry into the USA

Failure to report may result in the termination of your SEVIS record and even arrest and deportation. If you have questions or concerns, contact the *OIS* at 487-3116, not your instructor.

Please submit all materials in electronic form.

Action of the Department/College

1. Department

Vote of department faculty: For 20 Against 0 Abstentions 0

Department Head — 1/27/06 Date

Vote of department faculty: For 11 Against 0 Abstentions 0

Department Head — 1-31-06 Date

2. College

College Dean — Date

Action of General Education Advisory Committee

Vote of General Education Committee: For _____ Against _____ Abstentions _____

Approval

Associate Vice-President for Undergraduate Studies and Curriculum — Date