



SENATE COMMITTEE ON CURRICULAR AFFAIRS
COURSE SUBMISSION AND CONSULTATION FORM

Principal Faculty Member(s) Proposing Course

Name	User ID	College	Department
TAMRYA D'ARTENAY	tdd12	University College (UC)	Not Available

Academic Home: University College (UC)

Type of Proposal: Add Change Drop

Course Designation

(SUST 150N) The Science of Sustainable Development

Course Information

Cross-Listed Courses:

Prerequisites:

Corequisites:

Concurrents:

Recommended Preparations:

Abbreviated Title: Sci & Sust Devel
Discipline: General Education
Course Listing: Inter-Domain

Special categories for Undergraduate (001-499) courses

Foundations

- Writing/Speaking (GWS)
- Quantification (GQ)

Knowledge Domains

- Health & Wellness (GHW)
- Natural Sciences (GN)
- Arts (GA)
- Humanities (GH)
- Social and Behavioral Sciences (GS)

Additional Designations

- Bachelor of Arts
- International Cultures (IL)
- United States Cultures (US)
- Honors Course
- Common course number - x94, x95, x96, x97, x99
- Writing Across the Curriculum

First-Year Engagement Program

- First-Year Seminar

Miscellaneous

Common Course

GE Learning Objectives

GenEd Learning Objective: Effective Communication

GenEd Learning Objective: Creative Thinking

GenEd Learning Objective: Crit & Analytical Think

GenEd Learning Objective: Global Learning

GenEd Learning Objective: Integrative Thinking

GenEd Learning Objective: Key Literacies

GenEd Learning Objective: Soc Resp & Ethic Reason

Bulletin Listing

Minimum Credits:	3
Maximum Credits:	3
Repeatable:	NO
Department with Curricular Responsibility:	UC Science (UC_UCSCI)
Effective Semester:	FA 2018
Travel Component:	NO

Course Outline

A brief outline or overview of the course content:

This course will focus on how human society depends on the environment for its continued existence. It will examine the goals involved of sustainable development and how science must be used to attain these goals.

A listing of the major topics to be covered with an approximate length of time allotted for their discussion:

Each number refers to one week in a 15 week semester course. (Note: These goals are based on the seventeen current U.N. Goals for Sustainable Development)

1. Overview of the Goals of Sustainable Development. GN: Introduction to Environmental Science, Nature of Science and the Scientific method. GS: Environmental Ethics
2. How do we end poverty? GN: Population ecology. GS: Causes of poverty, Human Overpopulation
3. How do we end hunger? GN: Science of agricultural and food production. GS: History of agriculture and food systems
4. How can we ensure all people have access to good health and well-being? GN: Environmental health and toxicology, Atmospheric science and pollution. GS: Risk assessment and management, Causes and effects of poor air quality in developing countries
5. How can we ensure all people have access to quality education and gender equality? GN: Human population growth, Reproductive health. GS: Effect of forced population controls, Demographic transitions, Effect of decreasing populations in wealthy countries, Educating poverty stricken countries, Creating opportunities for women, family planning services, empowering women
6. How can we ensure all people have access to clean water and sanitation? GN: Ecosystems, Biogeochemical cycles, Freshwater systems, Distribution of accessible freshwater resources. GS: Consequences of running out of freshwater, Consequences of draining aquifers, Human and environmental consequences of water pollution
7. How can we attain affordable and clean energy? GN: Energy fundamentals, Nonrenewable energy technologies, Renewable energy technologies. GS: Human consequences of current energy uses, Weighing the pros and cons of fossil fuel energy use, Impacts of nuclear power plant disasters world-wide, Motivations behind the lag in transitioning to renewable energies
8. How can we ensure decent work condition, economic growth, and growth in industry, innovation, & infrastructure for all people? GN: Deforestation, forest recovery. GS: Basics of economics
9. How do we reduce Inequalities and provide sustainable cities and communities? GN: Urban ecology. GS: Causes and effects of urbanization
10. How do we teach individuals and businesses about responsible consumption and production? GN: Waste management processes. GS: Causes of current consumption patterns, Implementing reduce, reuse, recycle mentality
11. How and why should we act on climate change? GN: Scientific basis of climate change. GS: Climate change impacts on humans and the environment
12. How do we ensure life below water persists? GN: Oceans, coastal systems, Fisheries science, Depletion speed of modern fishing techniques. GS: Job and food insecurity caused by unsustainable fishing practices
13. How do we ensure life on land persists? GN: Biodiversity, Conservation biology, Forests. GS: Deforestation solutions, Parks and protected areas, Benefits of biodiversity to humans,

14. How do we attain peace, justice, and strong institutions? GN: Tragedy of the commons. GS: Environmental policy, U.S. environmental law and policy.

15. Who can we count on as partners for these goals? GS: Human partnerships to promote sustainable development, Student led sustainability efforts on campuses, Strategies toward sustainable solutions.

Course Description:

This course will focus on how human society depends on the environment for its continued existence. It will examine several major topics relating to environmental and social sustainability including ecosystem conservation, sustainability of food systems with special reference to the water-food-energy nexus, and current and future trends in urbanization. Within each of these topics, students will learn fundamental scientific principles and use this information to gain a better understanding of what human behaviors have led to our current resource production and consumption crisis. This class will explore ways people can modify behavior to relieve poverty in developing nations and meeting basic human needs while still affording economic growth, environmental protection, and social equality to all peoples around the world.

The name(s) of the faculty member(s) responsible for the development of the course:

Name: TAMRYA D'ARTENAY (tdd12)

Title:

Phone:

Address:

Campus: SH

City:

Fax:

Course Justification

Instructional, Educational, and Course Objectives:

This section should define what the student is expected to learn and what skills the student will develop.

1. (GN1) Explain the methods of inquiry in environmental science and describe how the contributions of this field complement inquiry in other areas
2. (GN3) Demonstrate informed understandings of scientific claims and their applications
3. (GS3) Describe the ways in which many different factors in human history have interacted to influence behaviors of modern consumption
4. (GS4) Explain how scientists use concepts, theoretical models and data to better understand and address world problems relating to sustainability
5. (GN4) Evaluate the quality of the data, methods, and inferences used to generate scientific knowledge in the field of environmental science
6. (GN5) Identify implications of 'green' discoveries in the natural sciences, as well as their potential to address a more sustainable human society in the future
7. (GS5) Recognize social, political and ethical implications of work being done in the field of sustainability

Evaluation Methods:

Include a statement that explains how the achievement of the educational objective identified above will be assessed. The procedures for determining students' grades should be specifically identified.

Quizzes and Exams (Objectives 1, 2, 3, 4, 5, 6): Students will be tested over the course material to see if they can integrate the content and knowledge gain into real world applications.

Discussions/In-class participation (Objectives 2, 3, 7): Students will read contrasting viewpoints over different sustainability issues, and discuss this with their fellow classmates.

Problem-based learning assignments (Objectives 2, 3, 4, 5, 7): Students will complete either in-class or at home assignments in which they will be presented with a problem surrounding the material covered and then will be asked to provide a relevant solution.

Project-based learning assignment (Objectives 2, 6, 7): Students will complete an end-of-the-semester project that will ask them to integrate the knowledge gain during the class in order to solve a major problem in sustainable development.

Reflective journals (Objectives 2, 3, 6, 7): Students will complete a reflection of what they found most interesting about the topics covered during the week. The journaling encourages a connection between different concepts, enhance the communication skills, allow reflection on ethical implications of the various topics, and a chance to express opinions and feelings about the course material through informal writing.

Relationship/Linkage of Course to Other Courses:

This statement should relate the course to existing or proposed new courses. It should provide a rationale for the level of instruction, for any prerequisites that may be specified, or for the course's role as a prerequisite for other courses.

Currently, BISC 3: Environmental Science and SOILS 071 discusses many of the topics covered in the class, but from a scientific standpoint. My course will choose a few scientific topics from the environmental science perspective and discuss more of the social impact, asking student to integrate the scientific knowledge gained with how it will impact human civilization as a whole and what can be learned from this.

Relationship of Course to Major, Option, Minor, or General Education:

This statement should explain how the course will contribute to the major, option, or minor and indicate how it may function as a service course for other departments.

This will be an Interdisciplinary Course in the General Education curriculum.

A description of any special facilities:

None.

Frequency of Offering and Enrollment:

Fall term of every year.

Alignment with General Education Objectives

EFFECTIVE COMMUNICATION – the ability to exchange information and ideas in oral, written, and visual form in ways that allow for informed and persuasive discourse that builds trust and respect among those engaged in that exchange, and helps create environments where creative ideas and problem-solving flourish.

KEY LITERACIES – the ability to identify, interpret, create, communicate and compute using materials in a variety of media and contexts. Literacy acquired in multiple areas, such as textual, quantitative, information/technology, health, intercultural, historical, aesthetic, linguistic (world languages), and scientific, enables individuals to achieve their goals, to develop their knowledge and potential, to lead healthy and productive lives, and to participate fully in their community and wider society.

CRITICAL AND ANALYTICAL THINKING – the habit of mind characterized by comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating a conclusion. It is the intellectually disciplined process of conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.

INTEGRATIVE THINKING – the ability to synthesize knowledge across multiple domains, modes of inquiry, historical periods, and perspectives, as well as the ability to identify linkages between existing knowledge and new information. Individuals who engage in integrative thinking are able to transfer knowledge within and beyond their current contexts.

CREATIVE THINKING – the capacity to synthesize existing ideas, images, or expertise in original ways and the experience of performing, making, thinking, or acting in an imaginative way that may be characterized by innovation, divergent thinking, and intellectual risk taking.

GLOBAL LEARNING – the intellectually disciplined abilities to analyze similarities and differences among cultures; evaluate natural, physical, social, cultural, historical, and economic legacies and hierarchies; and engage as community members and leaders who will continue to deal with the intricacies of an ever-changing world. Individuals should acquire the ability to analyze power; identify and critique interdependent global, regional, and local cultures and systems; and evaluate the implications for people's lives.

SOCIAL RESPONSIBILITY AND ETHICAL REASONING – the ability to assess one's own values within the social context of problems, recognize ethical issues in a variety of settings, describe how different perspectives might be applied to ethical dilemmas, and consider the ramifications of alternative actions. Individuals should acquire the self-knowledge and leadership skills needed to play a role in creating and maintaining healthy, civil, safe, and thriving communities.

What component(s) of the course will help students achieve the General Education Learning Objectives covered in the course? Provide evidence that students in the course have adequate opportunities to achieve the identified learning objectives.

This course will be addressing the science of how we as a planet can achieve sustainable development and the consequences on human civilization when these goals are not achieved.

CRITICAL AND ANALYTICAL THINKING

This course will cover a wide range of topics in environmental science and sustainability. Students will be asked to critically evaluate scientific data from field such as such as population ecology, climate science, and agriculture. Student will learn the scientific foundation of demography, which has its roots in the study of population ecology, how populations in nature change in size. This data has been applied to the study of human population, allowing scientists to predict future trends in human population growth. Students will also learn about the applications of the scientific method to gathering of climate data from the past and present in order to formulate an understand of how this data is used to predict future climate patterns.

INTEGRATIVE THINKING

Throughout the course, students will be learning about the basic principles of environmental science. In many of their assignments, they will be asked to integrate the scientific principles they have just learn in order to understand the factors influencing current and future behavior of peoples and nations around the world. For example, after learning about the production of plastics from petroleum products, the factors influencing wages in developing nations, the ease of transportation of goods around the world, students will be asked to explain how the interaction of these factors have cause the over-consume goods in developed nations, leading to a throw-away society. They will also be asked to explain the social and environmental effects of these actions. Students will also learn about the many 'green' discoveries currently being made in the natural sciences. They will be asked to address how these discoveries can make us a more sustainable human society.

SOCIAL RESPONSIBILITY AND ETHICAL REASONING

Social responsibility and ethical reasoning are woven in throughout the content of the course. This is a major component of the U.N.'s Sustainable Development goals, and therefore is of utmost importance to achieving sustainable development. By completing this course, students must gain an understanding that we as a society have a responsibility to living organisms on this planet to ensure that we can continue our existence without putting future peoples and environments at risk. By learning the different factor influencing political decisions, students will learn where societal problems may start, and how they can be mitigated. For example,

students will learn about how China's solution to its growing overpopulation problem has caused selective abortions and killing of female infants, along with an age imbalance which will lead to a shrinking labor force and many elderly peoples relying on government support. After having examined many case study like this, students will be asked to make political decisions that must be both ethical and social responsible, predicting and providing a responsible solution all of the possible outcomes.

How will students be assessed to determine their attainment of the Learning Objective(s) of General Education covered in this course? This assessment must be included as a portion of the student's overall performance in this course.

Evaluation Methods

1. Quizzes: Approximately 5-10% of final grade
2. Discussions/in-class participation: Approximately 15-25% of final grade.
4. Problem-based learning assignments (on homeworks and exams): Approximately 50-60% of final grade
5. Project-based learning assignment: Approximately 5-15% of final grade.
6. Reflective journals: Approximately 5-15% of final grade.

CRITICAL AND ANALYTICAL THINKING

Assessment based on performance on reflective journals and/or discussion participation demonstrating integration of newly acquired knowledge of environmental and social sciences with regards to the Sustainable Development goals with that of their existing knowledge of how the world works.

Example:

Discussion 2

Read pages 195-206 in your Taking Sides textbook. The Topic is: "Do we have a population Problem?" Once complete, compose a 250 word response. In your response you should:

1. State which side you agree with (yes or no).
2. Give details as to why you support this side of the argument.
3. Offer any further evidence that you may have researched on your own that supports your argument. If you choose to do this, make sure to cite your source!
4. Remember that your post must be made AT LEAST 24 hours before the due date. If it is not completed in a timely fashion, you will lose half of the points for the discussion automatically.

Make sure to follow the discussion instructions. Response to AT LEAST two other students' posts (minimum of 100 words). If anyone has responded to your post, reply to AT LEAST one. Failure to do either of these will result in point deductions.

INTEGRATIVE THINKING

Assessment based on performance on problem-based learning assignments regarding implementation of Sustainable Development Goals (SDG) in the real world.

Example:

Homework 2

Review the UN Sustainable Development Goals website on the Sustainable Development Goals (SDG) 1, 2, and 3 then answer each of these questions making reference to the SDGs and the reading. Your answers to each question should be at least 250 words EACH (not total).

Do you think that all of today's developing nations will complete the demographic transition and come to enjoy a permanent state of low birth and death rates? Why or why not? What steps might we as a global society take to help ensure that they do? Now think about developed nations such as the United States and Canada. Do you think these nations will continue to lower and stabilize their birth and death rates in a state of prosperity? What factors might affect whether they do so?

SOCIAL RESPONSIBILITY AND ETHICAL REASONING

Assessment based on performance on sustainable solutions project where social responsibility and ethical reasoning must be demonstrated in order to solve a problem plaguing Sustainable Development.

Example:

Choose a problem that will be encountered while trying to attain one of the sustainable development goals. You then write a 1,000 word essay in which you attempt to provide solutions to this problem. You should address how this solution is social responsible and involves ethical reasoning. You are encouraged to look up local issues that are currently effecting your community. It must contain the following sections:

- An introduction that discusses the problem and what sustainable development goal it is associated with
 - A body that lays out details regarding the solutions to this problem.
 - A conclusion restating the problem and summarizing your solution.
 - Reference section citing where your information has come from (references are NOT included in the 1,000 words, neither is a title, your name, heading, etc not pertinent to the text of your paper)
-

General Education Domain Criteria

GN Criteria

- Explain the methods of inquiry in the natural science fields and describe how the contributions of these fields complement inquiry in other areas
- Construct evidence-based explanations of natural phenomena
- Demonstrate informed understandings of scientific claims and their applications
- Evaluate the quality of the data, methods, and inferences used to generate scientific knowledge
- Identify societal or philosophical implications of discoveries in the natural sciences, as well as their potential to address contemporary problems

What components of the course will help students achieve the domain criteria selected above?

EXPLAIN THE METHODS OF INQUIRY IN THE NATURAL SCIENCE FIELDS AND DESCRIBE HOW THE CONTRIBUTIONS OF THESE FIELDS COMPLEMENT INQUIRY IN OTHER AREAS

At the beginning of the semester, students will learn about what constitutes natural science and how this differs from social science. They will learn about the scientific method and how it is used by scientists to answer questions about natural phenomena. They will then be asked to apply the scientific methods to many of the questions that arise in the study of environmental science. For example, students will complete readings from the textbook about climate change. They will need to formulate an understanding how the scientific method has been applied to gather data on how the climate works and what is driving climate change. This understanding will allow students to apply this method in decision making in other disciplines. They should then be able to understand the distinction between facts and opinions on controversial topics in the social sciences. This will lead students to understand that addressing issues associated with climate change will help alleviate societal and economic suffering in the near future. Students will be tested over this objective on problem-based assignments in homeworks and exams to see if they can utilize the scientific method in a way that demonstrates their knowledge gain and transfer this into real world applications. They will also complete a sustainable solutions project where they must apply the scientific method in an attempt to solve a problem that is holding back sustainable development.

CONSTRUCT EVIDENCE-BASED EXPLANATIONS OF NATURAL PHENOMENA

During the course of this class, students will be presented with scientific evidence in the form of tables and graphs from many different categories of environmental science. They should be able to observe data collected from a scientific study and be able to correctly interpret and communicate their findings. They will practice this during their readings, where they will be given a case studies with scientific evidence included usually in a graphical form. During homeworks and exams, students will be asked to explain whether the data presented supports or rejects a specific explanation.

DEMONSTRATE INFORMED UNDERSTANDINGS OF SCIENTIFIC CLAIMS AND THEIR APPLICATIONS

Students must be able to demonstrate that they understand scientific claims and their applications in order to perform well in this class. One topic students will learn about is the collapse of fisheries around the world and its implication on the future of fishing as a source of food and jobs. Scientists have collected information on fish catch numbers for decades, and stated repeatedly that most fish populations are not being harvested sustainably. In one assignment, students are asked to be the mayor of a coastal town where some residents are employed as commercial fishers and others serve ecotourists that snorkel and scuba dive at the nearby coral reef. They have noticed in recent years, several fish stocks have crashed, and ecotourism is dropping off as fish disappear from the increasingly degraded reef. Scientists want to establish a marine reserve around portions of the reef, but most commercial fishers are opposed to this idea. Students must demonstrate their knowledge of how marine ecosystems operate in order to convince the skeptics that a marine reserve will be beneficial in the long term.

IDENTIFY SOCIETAL OR PHILOSOPHICAL IMPLICATIONS OF DISCOVERIES IN THE NATURAL SCIENCES, AS WELL AS THEIR POTENTIAL TO ADDRESS CONTEMPORARY PROBLEMS

During this class, students will identify many societal and philosophical implications from scientific discoveries and their potential to address contemporary problems, including how to end hunger. They will learn that hunger can be addressed by increasing food availability in many impoverished countries. This can be accomplished through the science of agriculture by improving soil quality using fertilizers and decreasing soil erosion, decreasing water consumption by installing drip irrigation systems, or introducing new varieties and genetically modified crops that are drought, flood, and pesticide resistant. These are all important discoveries made by agricultural science during the 20th century. Along with completing readings, students will demonstrate completion of this objective through their sustainable solutions project. They will chose a specific problem in implementation in a specific area of sustainable development. In order to solve this problem, students will need to integrate the knowledge gain in the natural sciences and apply it to their specific social problem.

GS Criteria

- Explain the various methods of inquiry used in the social and behavioral sciences and describe how the contributions of these fields complement inquiry in other areas
- Identify and explain major foundational theories and bodies of work in a particular area of social and behavioral sciences
- Describe the ways in which many different factors may interact to influence behaviors and/or institutions in historical or contemporary settings
- Explain how social and behavioral science researchers use concepts, theoretical models and data to better understand and address world problems
- Recognize social, cultural, political and/or ethical implications of work in the social and behavioral sciences

What components of the course will help students achieve the domain criteria selected above?

Describe the ways in which many different factors may interact to influence behaviors and/or institutions in historical or contemporary settings:

Student will need to understand the different factors influencing decision making for several topics in this course. We will examine policy for many topics such as land conservation, regulation of air pollutants and hazardous chemical, and climate change. In one assignment, students will be asked to describe the difference in the policies of the United States and the European Union toward the study and management of the risks of synthetic chemicals and decide which they believe is more appropriate. Students will need to understand the different factors affecting the decision making process of these two entities in order to describe why they exist in their current form. Once they understand this, they will then be able to apply that information to choosing the entity which is more appropriate and be able to defend that choice should others question it.

Explain how social and behavioral science researchers use concepts, theoretical models and data to better understand and address world problems:

Once component of the course addressed heavily is demography, a social science that applies the principles of population ecology to the study of statistical change in human population. Students will come away with an understanding of the causes of human population growth and what has led to the current exponential growth of human in the last 150 years. They will then be asked to explain how we can slow population growth down. They should be able explain that providing better health care, education, and family planning services to people in poverty is the best, and most effective way to combat human population growth.

Recognize social, cultural, political and/or ethical implications of work in the social and behavioral sciences:

One controversial topic that will be discussed heavily is hydraulic fracturing (fracking). There are many social science ramifications of this topic that students will need to be able to understand in order to make an informed choice about the safety of this procedure. Students will learn the argument for fracking, such as increases in jobs and independence from foreign energy type, as well as the arguments against it which concern the possibility of contamination of surface and ground water with fracking fluids along with increases in global carbon emissions. The students will need to demonstrate that they recognize the implications whether we continue fracking in the future and be able to put together a coherent argument in support or opposition of this topic.

Integrative Studies

Explain how the intellectual frameworks And methodologies of the two Knowledge Domains will be explicitly addressed in the course and practiced by the students.

In Natural Science courses, students learn to make informed judgements about scientific information and arguments, while in the Social and Behavioral Sciences students focus on analyzing forces that influence behaviors, values, habits, attitudes and institutions. In an area of study like sustainable development, it is nearly impossible to do one without the other. This course will cover many different topics where a basic understanding of the science behind it is of paramount importance. One topic is climate action, goal 13 the U.N. Sustainable Development Goals. Students must understand the scientific causes of climate change and what is driving it in order to better understand the behavior motivating individuals and nations to preventive action. A person who is misinformed or does not understand the scientific basis of the causes of climate change is much less likely to accept it is actually happening. These individuals, especially if they are involved in government, are more likely to prevent any policy or laws from being enacted that might alleviate some of the driving factors behind climate change. By students learning the basic scientific principles behind many of our current problems, this will help to alleviate ignorance of these topics.

Student will be assigned readings that informs them of basic scientific principles behind the topic being covered. These reading should also use case studies to help students integrate the scientific principles with social aspects of the topic. For example, one case study deals might deal with China's one-child policy and the ramification of its implementation. Students read this case study, then follow it up with a chapter about demography, a social science that applies the principles of population ecology to the study of statistical change in human populations. In order to understand human population changes not just in China but around the world, students must understand the causes of these changes along with what kinds of factors limit growth, establishes carrying capacity for a given population, and what kinds of growth can occur. With these concepts understood, they can understand what is driving the explosive population growth around the world, and see how the Sustainable Development Goals can help to stop our current growth trends.

Demonstrate that each Of the two domains will receive approximately equal attention, providing evidence from course topics, assignments, or other course components, and that students will integrate material from both domains.

When learning about each of the U.N. Sustainable Development Goals, the students will have readings that address both the Natural and Social Science aspect of each. One example comes from Sustainable Development Goal 2: Zero Hunger. During this module, student should read material pertaining to agriculture and the future of food. It should give an explanation of food inequity around the world, a social science topic, then proceeds through the causes of the green revolution where world-wide crop yields increase, explaining improvements in breeding, fertilizer, and pesticides, very natural science intensive topics. It also explains how genetically modified organisms are made, their impacts, and the public debate surrounding them, a topic that integrates both a natural and social science approach. Students may also complete a reading contrasting the differing opinions about the use and desirability of genetically modified organism. Student should either complete a discussion or paper that states which side of the argument they agree with and why. This kind of exploration of both sides of a debate, coupled with an full understanding of the scientific principles leading up to it will allow students to effectively explore the interrelationships of the many factors which shape human behavior on these topics.

Briefly explain the staffing plan. Given that each Inter-Domain course is approved for two Knowledge Domains, it will be taught by an instructor (or instructional team) with appropriate expertise in both domains.

This course can be taught by a single instructor with expertise in environmental science and sustainability, or two instructors, one with expertise in environmental science and one with expertise in social or economic sustainability.

Describe the assessments that will be used to determine students' ability to apply integrative thinking.

1. Quizzes and Exams: Questions should cover the materials from lecture or readings to see if students can integrate the knowledge gain in natural science into real world applications. For example, student should know the biological importance of tropical rainforests such as being a carbon sink that can prevent climate change and a reservoir of biological diversity that might hold new medicines. They can then demonstrate their understanding of the social behaviors driving tropical forest destruction. They must be able to argue the importance of an intact rainforest versus cleared agricultural land. The clearing might bring a short-term income to a family, but in the long-term, because of the poor quality of rainforest soils, the family will be forced to move to another location of cleared forest or immigrate to a city where social and working conditions are poor.

2. Discussions/in-class participation: By students completing reading covering both sides of controversial topic relevant to the Sustainable Development Goal addressed that week, students will need an understanding of the scientific principles involved in order to decide of which side of the argument to support. For example, Sustainable Development Goal 7 is affordable and clean

energy. The discussion topic in this module could be "Is the Fracking Industry Adequately Regulated for Public Safety?" Student must first know what hydraulic fracturing is and how it is accomplished. They can then begin to understand why and how decisions regarding public safety are either being implemented or ignored in order to agree or disagree with the original question. Students must be able to integrate their natural science information into this social science problem that they can then communicate and defend their position against differing opinions in the class.

3. Problem-based learning assignments: The problem-based learning assignments are designed to engage students in solving a problem relating to the material. For example, one such assignment may require students to watch a PBS report about surface mining for coal in the Appalachian Mountains. Students are then presented with the problem, should surface mining continue? Students must choose a side and use scientific evidence to support their claim, such as scientific studies that have found heavy metals in waters near surface mining operations. They must also think about what might happen to the people of these areas if surface mining were to stop, including changes to their income or health. By the end of this assignment, students should be able to understand how the social and natural scientific principles involved and apply this knowledge in making an informed decision about the original question.

4. Project-based learning assignment: The project based learning assignment will give students a chance to choose a topic that they are interested in and integrate the knowledge they have gain in the natural and social sciences in order to effect a social change.

5. Reflective journals: The journaling encourages student to form a connection between different concepts learned during that week and integrate it into the big picture. The free-writing component allows a freedom they might not have in structured assignments to make these leaps between scientific cause and social effect. For example, students will learn about the tragedy of the commons, a social principle with great effects on the biological aspects of a given area. This concept states that a publicly accessible resources open to unregulated use will tend to become damaged or depleted with overuse; this is currently happening with fisheries around the world, where people are taking too many fish and not leaving enough to reproduce, causing fish numbers to crash. A student might connect this with something they have experienced in their own lives, perhaps in a buffet setting with a highly desirable item like a tray of chocolate cookies. The student might take more chocolate cookies than they needs just because there are plenty at the time and they want to make sure they get enough cookies before everyone else takes them. This behavior tends to deplete the trays so that when someone comes along later, there are no cookies left because everyone took more than they needed. A solution one may pose could be to place a paper by the tray asking guest to only take one cookie, so that there may be plenty left for other customers later. This can then be connected back to the fisheries, where enacting laws and restrictions about fishing limits have help people to understand that taking too many fish just because someone else is doing the same is not a sustainable method. These rules have helped to improve numbers and rescued many fish species from extinction.

Campuses That Have Offered () Over The Past 4 Years

semester	AB	AL	BK	BR	BW	CR	DS	ER	FE	GA	GV	HB	HN	HY	LV	MA	NK	PC	SH	SL	UP	WB	WC	WS	XC	XP	XS	YK
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UPLOADED DOCUMENTS FOLLOW:

Course Abbreviation and Number: SUST 150N: The Science of Sustainable Development

Credits: 3

Prerequisites/Co-requisites/Concurrent Requirements/Recommended Preparation: None

Course Attributes/Designations: GN, GS

General Education Learning Objectives Addressed:

Critical and analytical thinking: The habit of mind characterized by comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating a conclusion. It is the intellectually disciplined process of conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. Assessment based on performance on reflective journals and/or discussion participation demonstrating integration of newly acquired knowledge of environmental and social sciences with regards to the Sustainable Development goals with that of their existing knowledge of how the world works.

Integrative thinking: The ability to synthesize knowledge across multiple domains, modes of inquiry, historical periods, and perspectives, as well as the ability to identify linkages between existing knowledge and new information. Individuals who engage in integrative thinking are able to transfer knowledge within and beyond their current contexts. Assessment based on performance on problem-based learning assignments regarding implementation of Sustainable Development Goals (SDG) in the real world.

Social responsibility and ethical reasoning: The ability to assess one's own values within the social context of problems, recognize ethical issues in a variety of settings, describe how different perspectives might be applied to ethical dilemmas, and consider the ramifications of alternative actions. Individuals should acquire the self- knowledge and leadership skills needed to play a role in creating and maintaining healthy, civil, safe, and thriving communities. Assessment based on performance on sustainable solutions project where social responsibility and ethical reasoning must be demonstrated in order to solve a problem plaguing Sustainable Development.

General Education Domain Criteria Addressed

Natural Science Criteria

- Explain the methods of inquiry in the natural science fields and describe how the contributions of these fields complement inquiry in other areas. Assessment based on performance on problem-based questions on assignments and exams about achievement of Sustainable Development Goals on assignments and exams.
- Construct evidence-based explanations of natural phenomena. Assessment based on performance on reflective journals and discussions about achievement of Sustainable Development Goals.
- Demonstrate informed understandings of scientific claims and their applications. Assessment based on performance on problem-based questions on assignments and exams about achievement of Sustainable Development Goals on assignments and exams.
- Identify societal or philosophical implications of discoveries in the natural sciences, as well as their potential to address contemporary problems. Assessment based on performance on Sustainable Solutions paper where students attempt to solve a problem relating to the achievement of one of the Sustainable Development Goals.

Social and Behavioral Science Criteria

- Describe the ways in which many different factors may interact to influence behaviors and/or institutions in historical or contemporary settings. Assessment based on performance on problem-based questions on assignments and exams about achievement of Sustainable Development Goals on assignments and exams.
- Explain how social and behavioral science researchers use concepts, theoretical models and data to better understand and address world problems. Assessment based on performance on reflective journals and discussions about achievement of Sustainable Development Goals.
- Recognize social, cultural, political and/or ethical implications of work in the social and behavioral sciences. Assessment based on performance on Sustainable Solutions paper where students attempt to solve a problem relating to the achievement of one of the Sustainable Development Goals.

Course Description: This course will focus on how human society depends on the environment for its continued existence. It will examine several major topics relating to environmental and social sustainability including ecosystem conservation, sustainability of food systems with special reference to the water-food-energy nexus, and current and future trends in urbanization. Within each of these topics, students will learn fundamental scientific principles and use this

information to gain a better understanding of what human behaviors have led to our current resource production and consumption crisis. This class will explore ways people can modify behavior to relieve poverty in developing nations and meeting basic human needs while still affording economic growth, environmental protection, and social equality to all peoples around the world.

Course Learning Objectives:

By the completion of this course students will be able to:

- Explain the methods of inquiry in environmental science and describe how the contributions of this field complement inquiry in other areas.
- Demonstrate informed understandings of scientific claims and their applications.
- Describe the ways in which many different factors in human history have interacted to influence behaviors of modern consumption.
- Explain how scientists use concepts, theoretical models and data to better understand and address world problems relating to sustainability.
- Evaluate the quality of the data, methods, and inferences used to generate scientific knowledge in the field of environmental science.
- Identify implications of 'green' discoveries in the natural sciences, as well as their potential to address a more sustainable human society in the future.
- Recognize social, political and ethical implications of work being done in the field of sustainability.

General Course Outline: Each number refers to one week in a 15 week semester course. (Note: These goals are based on the seventeen current U.N. Goals for Sustainable Development)

1. Overview of the Goals of Sustainable Development, Introduction to Environmental Science, Nature of Science and the Scientific method, and Environmental Ethics
2. How do we end poverty?: Population ecology, Causes of poverty, Human Overpopulation
3. How do we end hunger?: Science of agricultural and food production, History of agriculture and food systems
4. How can we ensure all people have access to good health and well-being? Environmental health and toxicology, Atmospheric science and pollution, Risk assessment and management, Causes and effects of poor air quality in developing countries
5. How can we ensure all people have access to quality education and gender equality?: Human population growth, Reproductive health, Effect of forced population controls, Demographic transitions, Effect of decreasing populations in wealthy countries, Educating poverty stricken countries, Creating opportunities for women, family planning services, empowering women
6. How can we ensure all people have access to clean water and sanitation?: Ecosystems, Biogeochemical cycles, Freshwater systems, Distribution of accessible freshwater resources, Consequences of running out of freshwater, Consequences of draining aquifers, Human and environmental consequences of water pollution
7. How can we attain affordable and clean energy?: Energy fundamentals, Nonrenewable energy technologies, Renewable energy technologies, Human consequences of current energy uses, Weighing the pros and cons of fossil fuel energy use, Impacts of nuclear power plant disasters world-wide, Motivations behind the lag in transitioning to renewable energies
8. How can we ensure decent work condition, economic growth, and growth in industry, innovation, & infrastructure for all people?: Deforestation, forest recovery, Basics of economics
9. How do we reduce Inequalities and provide sustainable cities and communities?: Urban ecology, Causes and effects of urbanization
10. How do we teach individuals and businesses about responsible consumption and production?: Waste management processes, Causes of current consumption patterns, Implementing reduce, reuse, recycle mentality
11. How and why should we act on climate change?: Scientific basis of climate change, Climate change impacts on humans and the environment

12. How do we ensure life below water persists?: Oceans, coastal systems, Fisheries science, Depletion speed of modern fishing, Job and food insecurity caused by unsustainable fishing practices

13. How do we ensure life on land persists?: Biodiversity, Benefits of biodiversity to humans, Conservation biology, Forests, Deforestation solutions, Parks and protected areas

14. How do we attain peace, justice, and strong institutions?: Environmental policy, Tragedy of the commons, U.S. environmental law and policy,

15. Who can we count on as partners for these goals?: Human partnerships to promote sustainable development, Student led sustainability efforts on campuses, Strategies toward sustainable solutions, Political engagement, Consumer power, Population stability, Green technologies, Research and education