SOUTH DAKOTA BOARD OF REGENTS
ACADEMIC AFFAIRS FORMS
Revisions to General Education Requirements

USD	Meghann Jarchow	*Michael Kruger*	9/27/18
Institution	Form Initiator	Dean's Approval Signature	Date
USD	Arts & Sciences	*Elizabeth M. Freeburg*	10/25/2018
Institution	Division/Department	Institutional Approval Signature	Date

Indicate (X) the component of the General Education Curriculum that the proposal impacts.

X System General Education Requirements

Indicate (X) the revision(s) that is being proposed (more than one may be checked).

_____ Revision to an approved course

X Addition of a course to the set of approved courses

_____ Deletion of an approved course from the set of approved courses

Section 1. Provide a Concise Description of the Proposed Change

To include SUST 113: Sustainable Environment and SUST 113L: Sustainable Environment Lab as an option in meeting System General Education Requirement (SGR) #6 (Natural Sciences).

Section 2. Provide the Effective Date for the Proposed Change

Fall 2019

Section 3. Provide a Detailed Reason for the Proposed Change

USD began an undergraduate major and minor in sustainability in August 2012. As the major was originally designed, there were two core courses for the major: Sustainability and Society (SUST 201) and Sustainability and Science (SUST 203). When we began the sustainability major, we designed SUST 201, which addresses the social science of sustainability, to fulfill SGR #3. We did not initially design SUST 203 to have an associated laboratory, which meant that it did not fulfill the learning outcomes for SGR #6. Now that we have been offering the course for the past 6 years, it is clear that the course would be improved if it had a laboratory. Additionally, we recently revised the undergraduate major curriculum, so this is a good time for us to re-evaluate the structure of the core courses for the major. During the 2017-2018 academic year, we made a major modification to SUST 203:

- we renumbered the course from SUST 203 to SUST 113,
- we renamed the course from Sustainability and Science to Sustainable Environment,
- we added a required co-requisite laboratory to the course SUST 113L, and
- we increased the number of credits of the course from 3 credits to 4 credits. (4 credit lecture + 0 credit lab)

With these changes (hereafter SUST 113/113L), the course meets all of the learning outcomes for SGR #6. The course is founded in sciences currently offered at USD, earth science and biology, but in a new context, sustainability. We believe that this course will be a useful and desirable course for many students. Framing science within the context of societal issues, as is done in

SUST 113/113L, has been found to be more effective in engaging students in science, especially students who are underrepresented in STEM fields.[1] By making SUST 113/113L a course that fulfills SGR #6, we will be promoting science to a broad audience.

Section 4. Provide Clear Evidence that the Proposed Modification will Address the Specified Goals and Student Learning Outcomes

With the revisions to SUST 113/113L, it will meet all of the student learning outcomes (SLO) for SGR #6.

SLO 1. Explain the nature of science including how scientific explanations are formulated, tested, and modified or validated.

Sustainability draws heavily upon the natural sciences, and a sustainability education requires that students have a solid foundation of the natural sciences, especially biology, and earth science. SUST 113/113L will provide students will the natural-science foundations that underlie sustainability through both the lecture and laboratory portions of the course. Students will apply the scientific method within the course, especially in the laboratory portions of the course. In the laboratory sessions students will make observations, use data to test predictions, and use modeling tools to evaluate alternative scenarios. For example, in a sequence of labs students will work with observations of climate and climate change, make measurements of changes observable in satellite imagery using Google Earth, use computer modeling applications to assess natural and anthropogenic drivers of climate change, and the evaluate what ecosystem changes can be predicted for the future on the basis of such changes. Students will demonstrate understanding of the processes of the scientific method in laboratory exercises.

SLO 2. Distinguish between scientific and non-scientific evidence and explanations, and use scientific evidence to construct arguments related to contemporary issues

Earth science and biology concepts addressed in the course will be framed within the context of contemporary issues because we are using sustainability as a framework through which to understand these concepts. Every subject in the course syllabus applies scientific concepts and theories to contemporary issues (e.g., climate change, water pollution, energy production, etc.). The distinction between scientific and non-scientific arguments will be developed as students apply the scientific method to these problems. Student understanding of the contemporary relevance of scientific concepts covered in the course will be assessed through classroom assignments, exams, and the laboratory exercises.

SLO 3. Apply basic observational, quantitative, or technological methods to gather and analyze data and generate evidence-based conclusions in a laboratory setting.

Laboratory exercises will involve gathering and analyzing data, from imagery, model output, and, at the end of the course, field studies. For example, students will make measurements of the magnitude of advance/retreat of glaciers around the world (using historical imagery in Google Earth), calculate rates of change, develop conclusions regarding the global patterns in changes in

[1] InTeGrate (2017) Why should undergraduate education include a focus on sustainability and earth-centered societal issues? Available online at http://serc.carleton.edu/integrate/why_integrate.html.

glacial systems, and interpret the causes of these patterns. Students will be assessed on their ability to evaluate data using the scientific method in the laboratory exercises.

SLO 4. Understand and apply foundational knowledge and discipline-specific concepts to address issues, solve problems, or predict natural phenomena.
SUST 113/113L will focus on earth science and biology and draw on terminology, concepts, and theories from these sciences. Earth system science provides a valuable lens for these studies. The course works through a series of subject areas each of which has foundation of terminology (e.g., albedo), underlying concepts (e.g., ice-albedo feedback), and theories (e.g., natural and anthropogenic causes of climate change). Student learning of the concepts, terminology, and theories will be assessed through classroom assignments, exams, and the laboratory reports.

LEARNING OUTCOMES:

SGR #6 Student Learning Outcome	*Course-Specific Learning Outcomes*
1. Explain the nature of science including how scientific explanation are formulated, tested, and modified or validated.	Utilize the scientific method to address sustainability-related scientific problems.
2. Distinguish between scientific and non-scientific evidence and explanations, and use scientific evidence to construct arguments related to contemporary issues.	Use models and data to develop and support scientific arguments of regarding phenomena such as climate change, pollution, and resource depletion.
3. Apply basic observational, quantitative, or technological methods to gather and analyze data and generate evidence-based conclusions in a laboratory setting.	Measure changes in Earth system (geosphere, hydrosphere, atmosphere, and biosphere) using satellite images and maps, perform calculations with these measurements, and draw conclusions from the results.
4. Understand and apply foundational knowledge and discipline-specific concepts to address issues, solve problems, or predict natural phenomena.	Demonstrate knowledge of basic scientific terminology and core concepts relevant to the spheres of the Earth system, and how the systems influence one another, including feedback cycles, in a sustainability context.

Section 5. Provide a Copy of all Course Syllabi and Other Supporting Documentation

See following pages.

SUST 113 Sustainable Environment
University of South Dakota - Spring 2019

LECTURE MEETINGS: MWF 11:00-11:50 in Akeley-Lawrence Science Center 125
LAB MEETINGS: M 1:00-2:50 in Akeley-Lawrence Science Center 209
PROFESSOR: Dr. Brennan Jordan
TEACHING ASSISTANT: TBD
E-MAIL: brennan.jordan@usd.edu
OFFICE: Akeley-Lawrence Science Center 310, phone# 677-6143

CATALOG DESCRIPTION:
SUST 113: This course will examine how science seeks to answer questions and how it can be used to address sustainability-related issues including climate change as well as energy production and use. Co-requisite: SUST 113L. Credits: 4

COURSE OVERVIEW: The concept of sustainability is often generalized as: individuals, institutions, and society following practices that meet present needs without compromising the ability of future generations to meet their own needs. There are scientific, economic, and social dimensions to sustainability. This course focuses on scientific issues in sustainability with an emphasis on earth science and biology. The course will provide students with a background in scientific concepts relevant to sustainability, an appreciation for the significance of science in society, and an understanding of the application of the scientific method to real-world problems.

REQUIRED TEXT: Sustainability Principles and Practice by Margaret Robertson, 2nd ed.

OTHER REQUIRED MATERIALS: TurningPoint Clicker with active subscription/license (cell phones not acceptable alternative)

OFFICE HOURS: TBD

ATTENDANCE: Daily attendance is essential. Communicate with me if you are sick or have another reason for an excused absence. Unexcused absences directly impact your grade because of clicker points lost.

GRADING: There will be two midterm exams and a final exam. There will also be in-class and homework assignments. Clicker grades reflect attendance and correct responses given in class. The accompanying lab represents ¼ of the credits and is a proportional amount of the overall course grade. Grading will be based on a conventional scale: A=90-100%; B=80-89.9%; C=70-79.9%; D=60-69.9%; F=<60%. A curve may be applied to some exams at the instructor's discretion, but don't count on it. The weighting of coursework will be as follows:

Clicker questions	15%
Assignments	10%
Midterm Exams	30%
Final Exam	20%
Lab Exercises	25%

ACADEMIC DISHONESTY: The college policy on cheating is as follows: "The College of Arts and Sciences considers plagiarism, cheating, and other forms of academic dishonesty inimical to the objectives of higher education. The College supports the imposition of penalties on students who engage in academic dishonesty, as defined in the "Conduct" section of the University of South Dakota Student Handbook. No credit can be given for a dishonest assignment. A student found to have engaged in any form of academic dishonesty may, at the discretion of the instructor, be: (a) given a zero for that assignment; (b) allowed to rewrite and resubmit the assignment for credit; (c) assigned a reduced grade for the course; (d) dropped from the course; or (e) failed in the course."

COURSE EVALUATION: You will have an opportunity to evaluate the course and the instructor using the IDEA Diagnostic Form at the end of the semester

FREEDOM IN LEARNING: Under Board of Regents and University policy student academic performance may be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards. Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled. Students who believe that an academic evaluation reflects prejudiced or capricious consideration of student opinions or conduct unrelated to academic standards should contact Associate Dean John Dudley to initiate a review of the evaluation.

DISABILITIES: Any student who feels s/he may need academic accommodations or access accommodations based on the impact of a documented disability should contact and register with Disability Services during the first week of class or as soon as possible after the diagnosis of a disability. Disability Services is the official office to assist students through the process of disability verification and coordination of appropriate and reasonable accommodations. Students currently registered with Disability Services must obtain a new accommodation memo each semester. Disability Services, Service Center North, R119B, (605) 677-6389, www.usd.edu/ds, e-mail: disabilityservices@usd.edu

DIVERSITY AND INCLUSIVE EXCELLENCE: The University of South Dakota strives to foster a globally inclusive learning environment where opportunities are provided for diversity to be recognized and respected.

UNIVERSITY OF SOUTH DAKOTA TITLE IX STATEMENT: In compliance with Title IX, University of South Dakota must provide a safe and equitable learning environment for all students. You have the right to protection from: dating violence, domestic violence, gender harassment, discrimination based on pregnancy and parental status, sexual assault/rape, sexual harassment, and stalking. Read more about your rights here. If you experience or witness any of this type of behavior, please report it to the Title IX Coordinator, Khara Iverson, 605-677-5671, Khara.Iverson@usd.edu. If you have any other concerns regarding a student such as: alcohol abuse, drug abuse, depression or suicide, please report these to the Dean of Students, Kimberly Grieve, Vice President of Student Services; MUC #218; 605-677-5331. Anonymous complaints can also be made using the Silent Witness Form.

You can also get help through the Student Counseling Center at 605-677-5777. You can also get help from the Domestic Violence Safe Option Services located here in Vermillion. This is a confidential center that aids victims of sexual assault, domestic violence, and/or stalking. They have a 24 hour hotline at 605-624-5311. If you are not located in Vermillion, you can find your local services through the South Dakota Coalition Ending Domestic & Sexual Violence at this website.

LEARNING OUTCOMES:

SGR #6 Student Learning Outcome	*Course-Specific Learning Outcomes*
1. Explain the nature of science including how scientific explanation are formulated, tested, and modified or validated.	Utilize the scientific method to address sustainability-related scientific problems.
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3. Apply basic observational, quantitative, or technological methods to gather and analyze data and generate evidence-based conclusions in a laboratory setting.	Measure changes in Earth system (geosphere, hydrosphere, atmosphere, and biosphere) on satellite images and maps, perform calculations with these measurements, and draw conclusions from the results.
4. Understand and apply foundational knowledge and discipline-specific concepts to address issues, solve problems, or predict natural phenomena.	Demonstrate knowledge of basic scientific terminology and core concepts relevant to the spheres of the Earth system, and how the systems influence one another, including feedback cycles, in a sustainability context.

ASSESSMENT OF SDBOR SGR #6 LEARNING OUTCOMES:

SGR #6, Natural Sciences: Students will understand the fundamental principles of the natural sciences and apply scientific methods of inquiry to investigate the natural world.

As a result of taking courses meeting this goal, students will:

Student Learning Outcome	*Assessment(s)*
1. Explain the nature of science including how scientific explanation are formulated, tested, and modified or validated,	Laboratory exercise questions
2. Distinguish between scientific and non-scientific evidence and explanations, and use scientific evidence to construct arguments related to contemporary issues,	Exam questions and laboratory exercise questions
3. Apply basic observational, quantitative, or technological methods to gather and analyze data and generate evidence-based conclusions in a laboratory setting, and	Laboratory exercise questions
4. Understand and apply foundational knowledge and discipline-specific concepts to address issues, solve problems, or predict natural phenomena.	Knowledge and concepts assessed with exam questions; application assessed with laboratory exercise questions

Tentative Schedule

Week	Topic	Read
1/7	Intro and history of sustainability	Ch. 1 & 2
1/14	Intro to Earth system; Climate	Ch. 3 & 5
1/21	**No class M**; Climate	Ch. 5
1/28	Ecosystems & habitat	Ch. 7
2/4	Water	Ch. 6
2/11	Water and air pollution; **EXAM (F)**	Ch. 8
2/18	**No class M**; Energy: fossil fuels	Ch. 9
2/25	Energy: renewable	Ch. 9
3/4	**Spring Break**	
3/11	Green building	Ch. 10
3/18	Food; **EXAM (F)**	Ch. 12
3/25	Natural resources	Reserve
4/1	Natural resources	Reserve
4/8	Sustainability of industrial production and products	Ch. 13
4/15	Waste management & recycling; **No class F**	Ch. 14
4/22	Sustainable science and policy	Reserve
Final	**FINAL EXAM [TBD]**	

SUST 113L Sustainable Environment Lab
University of South Dakota - Spring 2019

LAB MEETINGS: M 1:00-2:50 in Akeley-Lawrence Science Center 209
INSTRUCTOR: TBD
E-MAIL: TBD
OFFICE: TBD

CATALOG DESCRIPTION:
SUST 113: Laboratory to accompany SUST 113. Credits: 0

COURSE OVERVIEW: This laboratory course provides hands-on exercises to increase depth of understanding knowledge and concepts introduced in lectures SUST 113 Sustainable Environment.

OTHER REQUIRED MATERIALS: Bring a calculator to all laboratory meetings

OFFICE HOURS: TBD

ATTENDANCE: Laboratory attendance is required. Graded work is done in every meeting. Communicate with the instructor if you are sick or have another reason for an excused absence. Make-up opportunities will be offered only for excused absences.

GRADING: This zero-credit laboratory represents ¼ of the 4 credits of SUST 113. Your final score for the lab will be transmitted to the SUST 113 lecture instructor, and will constitute 25% of your SUST 113 grade. Your lab score will be calculated as follows:

Pre-lab questions	10%
Laboratory Exercises	80%
Exercise 11 Presentations	10%

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Tentative Schedule

Week	Lab
1/7	-
1/14	1. Climate measurements
1/21	**Holiday no lab**
1/28	2. Modeling climate change
2/4	3. Impacts of climate change: Google Earth
2/11	4. Modeling ecosystem effects of climate change
2/18	**Holiday no lab**
2/25	5. Water on Earth: Google Earth
3/4	**Spring Break**
3/11	6. Water quality & pollution
3/18	7. Renewable & non-renewable energy resources
3/25	8. Energy efficiency and conservation
4/1	9. Sustainable management of common resources (Catch: fisheries simulation)
4/8	11a. Biodiversity: Field Observations
4/15	11b. Biodiversity: Laboratory Follow-up
4/22	11c. Biodiversity: Presentations