2011-2012 Program Review

Bachelor of Applied Science

Sustainable Science Management

Joie Taylor, Ph.D. Program Coordinator

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Program Description

The Sustainable Science Management (SSM) program, leading to a baccalaureate degree, offers options to students seeking employment in the field of Sustainability which includes positions such as: sustainability coordinator, sustainability specialist, environmental scientist.

As an inter-disciplinary field, a program in sustainability involves topics in energy, ecology, business and management, water and wastewater, agriculture, waste-management, economics, policy, the built environment, and social science. The BAS in Sustainable Science Management program is designed to equip students with the technical and communications skills needed to bridge the disciplines and to produce sustainable operations for organizations and communities. A student graduating with a BAS in Sustainable Science Management will have career options in local, state, and federal agencies; utility companies; energy efficiency consulting; non-profit organizations; hospitality and tourism; transportation; wildlife and conservation agencies; international environmental consulting and auditing; "green" contracting and construction management; and educational work in schools, museums, and parks.

MISSION

The mission of the BAS in Sustainable Science Management program is to produce graduates who will maximize the benefits of sustainable practices across multiple disciplines by being aware of the interconnectedness of natural systems, understanding the role and function of technology development and implementation, possessing the ability to establish new partnerships, and by using resources creatively, wisely and responsibly.

Program Learning Outcomes

The program learning outcomes for the Accounting Program are the following:

PLO 1. Examines the features and functions of multiple systems are interconnected, and explain how one system can be optimized without degrading other systems or depleting natural resources.

PLO 2. Investigate, discover and summarize federal, state, local and industry codes, standards, laws, regulations, and guidelines.

PLO 3. Assess the feasibility of investing in sustainability measures using simple payback, return on investment, and life cycle costing techniques.

PLO 4. Describe the unique sustainability challenges faced by island communities.

PLO 5. Identify, outline and illustrate the fundamentals of existing and emerging technologies in energy production, distribution and management; water supply; wastewater treatment; and waste management; their applications, processes and requirements.

PLO 6. Appraise, evaluate, summarize, and explain the economic, social, cultural, political, and scientific features that make a system, process, practice, or business sustainable and consolidate that information into a sustainability profile.

PLO 7. Propose and justify creative solutions to sustainability challenges that are scientifically sound.

PLO 8. Demonstrate skills related to managing sustainability projects including defining scope, selecting achievable goals, evaluating ethical implications, working with diverse teams, making presentations, and preparing reports.

Map of Program Learning Outcomes by Course

	SSM 101	SSM 201	SSM 202	SSM 301	SSM 302	SSM 375	SSM 401	SSM 402	SSM 403
PLO 1		1	3	1	2			2	1
PLO 2					3		3		
PLO 3				3		2			
PLO 4	3		3	2				3	
PLO 5	2	3				3		3	3
PLO 6	1						3		2
PLO 7		2	3			3			3
PLO 8		3	3	2	3	3	3		

Sustainable Science Management Assessment Plan: Time Table

	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016
PLO 1									
SSM 201	E						E		
SSM 202		E							
SSM 301		E			E				
SSM 302					E				E
SSM 401			E				E		
SSM 403			E				E		
PLO 2									
SSM 302			E				E		
SSM 401				E				E	
PLO 3									
SSM 301			E				E		
SSM 375		E				E			
PLO 4									
SSM 101			E				E		
SSM 202		E				E			
SSM 301					E				E
SSM 402							E		E

PLO 5									
SSM 101			E			E			
SSM 201	E						E		
SSM 375				E				E	
SSM 402			E						E
SSM 403				E				E	
PLO 6									
SSM 101			E						
SSM 401		E						E	
SSM 403						E			E
PLO 7									
SSM 201			E						E
SSM 202				E				E	
SSM 375		E				E			
SSM 403				E				E	
PLO 8									
SSM 201					E		E		
SSM 202		E				E			
SSM 301			E						E
SSM 302					E		E		
SSM 375				E				E	
SSM 401				E		E			

ANALYSIS

Program Learning Outcome Assessment

All of the program learning outcomes were assessed in the last academic year. Summative evidence is provided for PLO 1 and PLO 5 for SSM 201. Information about how each PLO was evaluated per course is also provided in the text below though each PLO per course SLO is not evaluated by summative evidence.

Assessment tools or methods used

SSM courses used assignments, quizzes, exams and projects to assess the program learning outcomes. SSM 201 used assignments and exams course's student learning outcomes.

Summative evidence

The evidence used to assess, and the results of the assessment for the program learning outcomes, will be discussed separately for each course that was assessed during this review period. Each program assessment is based on the following scale:

Exceeds	Meets	Needs Improvement	Insufficient Progress
Grades of A-B	Grade of C	Grade of D	Grade of F

PLO 1. Examines the features and functions of multiple systems are interconnected, and explain how one system can be optimized without degrading other systems or depleting natural resources.

SSM 201 Sustainable Building Construction and Design

Of the 14 SSM majors enrolled in the classes, 55% showed exemplary understanding of course's student learning outcome. 25% met the SLO goals 8% showed a need for improvement and 16% showed no proficiency due to not completing the assignments. All of the course competencies were linked to the course student learning outcomes.

*SLO 4 and SLO 7: C*ompose and explain equation of the first and second laws of thermodynamics as they relate to heating and cooling buildings. Explain energy and heat exchanges, determine the energy required for pumping systems.

A quiz and two comprehensive thermodynamic assignments were used to assess both of the student learning outcomes. The comprehensive thermodynamic assignments, which is the calculation of heat loads and derivation of both the first and second law of thermodynamics, is important because it establishes the

foundation of understanding heat and energy exchange between systems as well as how to manage energy in one system interconnected to another without depleting natural resources of fossil fuels.

PLO 1 Rubric for SSM 201 Sustainable Building Design Construction and Operations Fall 2012				
	Exceeds	**Meets**	**Needs Improvement**	**No Proficiency**
SLO 4	6 (50%)	3	1	2 (frequent absent)
SLO 7	7 (58%)	3		2(frequent absent)
Average SLO Score for the Course	55%	25%	8%	16%

PLO 5

Identify, outline and illustrate the fundamentals of existing and emerging technologies in energy production, distribution and management; water supply; wastewater treatment; and waste management; their applications, processes and requirements.

SSM 201 Sustainable Building Construction and Design

Of the eight accounting majors enrolled in this class, 91% showed exemplary understanding of course's. All of the course competencies were linked to the course student learning outcomes.

SLO 6: Describe construction practices and methods for sustainable buildings.

Multiple assignments and embedded exam questions were used to assess SLO 6. 91% of the students exceeded expectation in this SLO.

PLO 5 Rubric for SSM 201 Sustainable Building Design Construction and Operations Fall 2012				
	Exceeds	**Meets**	**Needs Improvement**	**No Proficiency**
SLO 6	10	1		1 (frequent absent)
Average SLO Score for the Course	83%	8%		9%

Additional Information on how PLOs were assessed per class

PLO 1. Examines ways in which the features and functions of multiple systems are interconnected, and explain how one system can be optimized without degrading other systems or depleting natural resources.

a. Introduction to Sustainable Science SSM 101 – The class learns and is tested on basics of systems thinking and dynamics, and performs graded exercises stressing the interconnected nature of both human and natural systems, and the ramifications of actions.

b. Sustainable Organizations SSM 301 – A major focus of the course is the need to identify measureable indicators of degradation of resources in a variety of ways to determine which are least impactful. This is assessed in a major quiz, the final student presentation and final evaluation.

c. Systems Thinking SSM 390v – Students learn to create models which illustrate stem behaviors and impacts in complex scenarios, and learn to find 'leverage points to reduce degradation. This is assesses in class presentations and in the final evaluation.

d. SSM 302 Environmental Health- A primary focus of the course is the discussion of the interconnections among ecosystems and their biogeochemical components. The course examines the stressors on ecosystem health and how mitigating these stresses is important to the health of resources and human health in general. The interconnectedness among ecosystems and the global cycling of resources and pollutants among these integrated systems is examined throughout.

2. Investigate, discover and summarize federal, state, local and industry codes, standards, laws, regulations, and guidelines.

a. Introduction to Sustainable Science SSM 101 – Students gain a survey level understanding of some local, state and federal laws relating to sustainability. This is assessed in both mid-term and final evaluations.

b. Environmental Policy, Law and Justice SSM 401 – The course focus is on an in-depth understanding of the development and implementation of law and regulation on local, state, national and international levels. Students are assessed in quizzes, through 'mock' proceedings conducted in class and at final evaluation.

c. SSM 302 Environmental Health- Through readings and assignments, students examine federal and state laws and policies that regulate different aspects of environmental and public health. Investigation of these regulations includes recognition of the positive standards that have been achieved for environmental health and human health, while areas of needed improvement of federal, state and industry regulations and standards are also determined and discussed.

3. Assess the feasibility of investing in sustainability measures using simple payback, return on investment, and life cycle costing techniques.

a. Sustainable Organizations SSM 301 – This course proceeds through a range of sustainability measurement processes from the development of metrics, and analysis of a variety of existing models,

to cutting-edge indicator development. Along the way simple payback, return on investment and life cycle assessment are considered and used. Student are assessed on these matters by in-class assignments, quizzes, final presentation and final evaluation.

b. Energy Conversions SSM 375 – In analyzing the methods of converting raw energy resources, students delve into efficiencies and the means measuring them, including the use of simple payback, return on investment, and life cycle costing techniques. Students are evaluated on these by quiz, student presentation and final evaluation.

4. Describe the unique sustainability challenges faced by island communities.

a. Introduction to Sustainable Science SSM 101, Sustainable Organizations SSM 375, Systems Thinking SSM 301 – In each of these classes the backdrop for case studies is usually derived from island issues and circumstances. These include natural resources from land and oceans, limitations of island isolation and limits of local resources. In each class students are assessed on their understanding of island-specific issues from quizzes, presentations and final evaluations.

5. Identify, outline and illustrate the fundamentals of existing and emerging technologies in energy production, distribution and management; water supply; wastewater treatment; and waste management; their applications, processes and requirements.

a. Introduction to Sustainable Science SSM 101 – Students undertake a module focused on energy production and another addressing waste management issues. Each of these are assessed in quizzes and final evaluation.

b. Energy Conversions SSM 375 – The second half of this course deals with renewable energy development and issues, analyzing methods, efficiencies, and resource requirements. Students must demonstrate their understanding of these concepts in their final presentation and evaluation.

6. Appraise, evaluate, summarize, and explain the economic, social, cultural, political, and scientific features that make a system, process, practice, or business sustainable and consolidate that information into a sustainability profile.

a. Introduction to Sustainable Science SSM 101 – In this course students get a survey level view of the variety of system interconnections which make up sustainability issues and practice. Students are asked to describe how these interactions apply to sustainability practice in their final evaluation.

b. Sustainable Organizations SSM 375 – Beginning with the study of Triple Bottom Line as a rough structure for sustainability analysis, students use life cycle assessment, energy analysis, indicator development and other means to measure sustainability profile. Students are assessed in in-class assignments, quizzes, final evaluation and most importantly in their final Sustainable Business Case presentation.

c. Environmental Policy, Law and Justice SSM 401 – A major course module is analysis of sustainability policy initiatives at the local (Maui Island Plan currently) and international levels. This work is assessed in class presentations and final evaluation.

7. Propose and justify creative solutions to sustainability challenges that are scientifically sound.

a. Introduction to Sustainable Science SSM 101 – For their final presentation, student s are required to research and present on a topic addressing a sustainability challenge, including an assessment of the acceptability of proposed solutions from a scientific perspective as well as a broader sustainability context. This represents 25% of the course grade.

b. Sustainable Organizations SSM 375 – The final Sustainable Business Case presentation for this course is drawn from a sustainability challenge, preferably related to Maui issues, and to effectively translate scientific solutions in a business case format, making up a quarter of the course evaluation.

c. Energy Conversions SSM 375 – The final presentation in this course is based upon a scientifically feasible energy solution applied to a specific problem area. Presentations are peer-reviewed by class and assessed as a major course grade component.

8. Demonstrate skills related to managing sustainability projects including defining scope, selecting achievable goals, evaluating ethical implications, working with diverse teams, making presentations, and preparing reports.

a. Introduction to Sustainable Science SSM 101, Sustainable Organizations SSM 375, Systems Thinking SSM 301, Environmental Policy, Law and Justice SSM 401 – In each of these courses students are required to engage in group projects, self-assigning group roles and culminating in graded class presentations. In SSM 375 and 301, written reports are also required. These presentations are assessed and make is a substantial portion of the semester grade.

b. SSM 302 Environmental Health- The course includes detailed examination of the fields involved in the management, research and regulation of environmental health. Students are asked to determine how individuals from these different fields could collaborate on a project related to a specific aspect of environmental health. Students identify goals that could be addressed by certain projects and determine how these goals can be achieved through collaborative research.

Action Plan

Planned changes (pedagogy, curriculum) to improve learning

The interdisciplinary and diverse approach for reaching different learning has proven successful. SSM majors are demonstrating that they are learning the program learning outcomes for the BAS degree in Sustainable Science Management. As it is the first year of the program additional assessment will continue to provide evidence of this success in the upcoming years.

Specific Goals for 2012-2013:

- Complete course assessment for SSM 101, SSM 202, SSM 301, SSM 302, SSM 375, SSM 401, SSM 403.
- Engage in discussions to require students to have specific educational requirements to be declared an SSM major.
- Expand hybrid course offerings.

Resource Implications

For the next biennium, the following items are requested to be included in the budget:

- Marketing Materials and Outreach, $20,000.
- Software Materials $10,000