***STUDENT LEARNING ASSESSMENT PROGRAM***

***SUMMARY FORM AY 2016-2017***

Please complete a separate worksheet for each academic program (major, minor) at each level (undergraduate, graduate) in your department. Worksheets are due to CASA this year by **June 15, 2017**. Worksheets should be sent electronically to [kjsanders@eiu.edu](mailto:kjsanders@eiu.edu) and should also be submitted to your college dean. For information about assessment or help with your assessment plans, visit the Assessment webpage at <http://www.eiu.edu/~assess/> or contact Karla Sanders in CASA at 581-6056.

Master of Science in Sustainable Energy (Interdisciplinary)

**Degree and**

**Program Name:**

# Submitted By:

Dr. Peter Ping Liu, Director, CENCERE

**PART ONE**

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| **What are the learning objectives?** | **How, where, and when are they assessed?** | **What are the expectations?** | **What are the results?** | **Committee/ person responsible? How are results shared?** |
| 1. Students will demonstrate understanding of scientific principles related to the field of sustainable energy (CGS goal: depth of content knowledge) | Students will be assessed in the following courses:  BIO 5333  CHM 5007  PHY 5233  TEC 5533  At the end of every semester, assessment data will be submitted by faculty teaching the courses that are regular rotation. | Students possess knowledge or understanding of principles in biological sciences, chemistry, physics and technology, related to sustainable energy discipline. | Out of 13 students enrolled in the class (TEC 5533 Biomass Gasification) in Spring 2017 semester,  1 students (or 7%) met expectations,  13 students (or 93%) exceeded expectations, and 0 students (or 0%) did not meet the expectations.  Note: This course is offered for Sustainable Energy program and open for Technology graduate program. Thus, most students enrolled in the course are in the major.  During the exit interview, students expressed a high level of satisfaction on CHM 5007 Energy Chemistry, especially the way Dr. Periyanna interacts with students. | The science subcommittee includes Drs. Canam, He, Periyanna, Daniels, and Cloward.  The assessment results are shared and discussed among committee members, to look for ways to continuously improve the curriculum design and offerings. The results are also shared and discussed during the regular Sustainable Energy board meeting every semester.  Based upon the assessment feedback, faculty members adjusted their way of instruction so that scientific content can be readily understood by students with non-science background.  Students are encouraged and they are highly satisfied with the breadth offered by the interdisciplinary program. |
| 2. Students will have a grasp of leadership and managerial practices in sustainable energy operations (CGS goal: depth of content knowledge) | Students will be assessed in the following courses:  TEC 5103/MBA 5680 TEC 5133/MBA 5660 MBA 5001  ECN 4751  At the end of every semester, assessment data will be submitted by faculty teaching the courses that are regular rotation. | Students possess knowledge of leadership, and managerial principles and practices related to sustainable energy operations. | Out of 42 students enrolled in the class (TEC 5103 Leadership) in Spring 2017 semester,  20 students (or 48%) met expectations,  20 students (or 48%) exceeded expectations, and 2 students (or 4%) did not meet the expectations.  Out of 29 students enrolled in the class (TEC 5133 Total Quality) in Spring 2017 semester,  15 students (or 52%) met expectations,  10 students (or 34%) exceeded expectations, and 4 students (or 14%) did not meet the expectations.  Note: The above courses are offered for both MS in Technology and MS in Sustainable Energy programs. Thus, students enrolled in these courses may be from either of the two (2) programs.  Out of 7 students enrolled in the class ECN 4751 in Spring 2017 semester, 4 students (or 57%) met expectations, 2 students (or 29%) exceeded expectations, and 1 student (or 14%) did not meet the expectations.  Note: The above course was open for other majors. The instructor only reported the performance of students from Sustainable Energy program. | The management subcommittee includes Drs. Cloward, Liu, Boonsuk and Chao.  The assessment results are shared and discussed among committee members, to look for ways to continuously improve the curriculum design and offerings. The results are also shared and discussed during the regular Sustainable Energy board meeting every semester.  Based upon the feedback, team work experience was enhanced in the class exercises and project assignment. Interaction among faculty and students is actively encouraged to enhance the leadership and organizational skills and knowledge by students. |
| 3. Students will be able to apply critical thinking and problem solving skills in the areas of sustainable energy. (CGS goal: Effective critical thinking and problem solving) | Students will be assessed in the following venue: CERE 5983 Sustainable Energy Practicum  At the end of the semester, assessment data will be submitted by faculty when the practicum is offered. So far, the practicum has been offered during spring semester. | Students possess critical thinking and problem solving skills, related to sustainable energy. | Out of 11 students enrolled in the practicum during Spring 2017 semester,  All students (or 100%) exceeded expectations. | The faculty in charge of assessing critical thinking through practicum is: Dr. Cloward (Practicum Coordinator).  The assessment results are shared and discussed among CENCERE members, to look for ways to continuously improve the curriculum design and offerings. The results are also shared and discussed during the regular Sustainable Energy board meeting every semester.  Following the feedback from the program assessment, we have expanded practicum activities beyond the Renewable Energy Center at EIU. For example, during Spring 2017, students toured Prairie State Generation Company in Marrisa, IL. Students were exposed extensively to coal mining and electricity generation operations. Two trips were also arranged to visit Lake Land College for the applications of roof top solar arrays and campus wide geothermal heating and cooling systems. The broad experience in practicum enhanced significantly the connection between students’ knowledge and their ability to apply the knowledge. |
| 4. Students will be able to conduct intellectual research related to sustainable energy. (CGS goal: Advanced scholarship through research or creative activity) | Students will be assessed in the following course:  CERE 5953  At the end of student’s graduate study, a certification form will be submitted by faculty supervising the research, after the student has been certified for their Sustainable Energy Research. | Students possess ability to conduct meaningful research, related to sustainable energy. | This (Sustainable Energy Research) is a part of the degree requirement. Students are expected to successfully complete their research projects and produce something deemed publishable before they can be certified for graduation.  Out of 7 students graduating during Spring 2017, 5 students (71%) exceeded the expectations, and 2 students (29%) met the expectations.  Completion of Sustainable Energy Research is a part of the degree requirement. Students enrolled in the project at early stage of their graduate studies, and continue on their research work until the end of their graduate study.  This is an activity that was well received by students. They believe that the Sustainable Energy Research enabled them to interact with faculty on one-to-one basis and they gained a significant knowledge and hands-on skills through the research. | The faculty in charge of assessing students’ research ability is: faculty members supervising students’ research. There is a committee of three (3) faculty members reviewing the research and presentation, at the end of the graduate study.  The assessment results are shared and discussed among CENCERE members, to look for ways to continuously improve the curriculum design and offerings. Faculty members are also in constant contact with the CENCERE director in terms of student progress and program improvement.  Completion of Sustainable Energy Research is a part of the graduate degree requirement. Students enrolled in the project at early stage of their graduate studies, and continue on their research work until the end of their graduate study.  Committee members may also gain a sense how students worked at the research, based upon their presentation and through the Question and Answer session. This knowledge and experience enable faculty to adjust their approach for future students. |
| 5. Students will develop effective oral and written communication skill (CGS goal: effective oral and written communication) | Students will be assessed in the following course: CMN/ENG 5260  Written communication is assessed through the final project, the culminating assignment for the semester.    Oral communication is assessed through presentation of the final project.  At the end of semester when the course is offered, assessment data will be submitted by the faculty team teaching the course. | Students possess effective oral and written communication skills, related to sustainable energy.  To meet expectations, students perform at a B+ level in each area of criteria established for written communication.    To meet expectations, students perform at a B+ level in each area of criteria established for oral communication, as measured by a rubric. | Out of 12 students enrolled in the class in Spring 2017,  1 students (or 8%) met expectations for written communication,  4 students (or 33%) exceeded expectations for written communication, and  6 students (or 50%) did not meet the expectations for written communication. *Note: One student received an Incomplete for the course and is not accounted for in the written communication data.*    Out of 12 students enrolled in the class in Spring 2017,  2 students (or 17%) met expectations for oral communication,  6 students (or 50%) exceeded expectations for oral communication, and 4 students (or 33%) did not meet the expectations for oral communication.  Note: This course is offered for Sustainable Energy program and open for other graduate programs. Thus, most students enrolled in the course are in the major.  During the exit interview, students expressed a very high level of satisfaction on CMN/ENG 5260 Communication in Science and Technical Organizations. Students were impressed by the fact that this type of course content was included in the interdisciplinary program, and they gained useful knowledge and skills from this course, which may not be possible without. | The faculty members in charge of communication skills are: Drs. Fredrick and Jenssen-Danyi.  The assessment results are shared and discussed among CENCERE members during a board meeting every semester, to look for ways to continuously improve the curriculum design and offerings. The results are also shared and discussed during the regular Sustainable Energy board meeting every semester. |

**PART TWO**

*Describe your program’s assessment accomplishments since your last report was submitted. Discuss ways in which you have responded to the CASA Director’s comments on last year’s report or simply describe what assessment work was initiated, continued, or completed.*

1. ***Competency or Comprehensive Knowledge Assessment on Graduates:***

In addition to regular assessment or evaluation during classes, practicum and research activities, graduates were assessed of their competency and comprehensive knowledge in the field of Sustainable Energy at the conclusion of their graduate study. As a sampling method, students are asked one question related to Sustainable Energy during the graduates’ exit interview. The questions are not released ahead of time, and may vary from student to student. The following lists some sample questions:

1. What is the green house gas? What is its effect on humans living on Earth?
2. What is the impact of renewable energy vs. fossil fuel?
3. How is electricity generated?
4. How is bio-ethanol produced?
5. How is bio-diesel produced? What happens in the process (chemical reaction)?
6. How to measure the energy needed to heat or cool a building or a room?
7. How does a wind mill (solar PV, or solar water heater) work?
8. Show me one typical chemical reaction in an energy conversion process, such as gasification, ethanol fermentation, or ...
9. What will be the impact of dedicated energy crops on agriculture or ecological systems?
10. What kind of policy will be needed to promote sustainability and/or sustainable energy?
11. What sustainable energy process is the solution to our energy crisis?
12. What is HPLC or GC? How are they related to bio-energy?
13. Describe "combustion reactions of hydrocarbons."

Based upon the student response to the question, the program director will further ask related or follow up questions to clarify the response, and he will assign a score for student’s comprehensive knowledge in Sustainable Energy. A maximum score will be 100 and minimum will be 0. Since this is used only for program assessment purpose, the score will not be shared with students. Continuing monitoring of the score is expected since the inception of the graduate program. Consequently, the assessment results provide a gauge independently on the outcome of student learning in the program.

As of Spring 2017, a composite score of 96% was achieved for the Sustainable Energy knowledge acquisition by all the graduates from the program. This fact is something worth celebrating and commending.

1. ***Program Outcome:***

An exit interview is conducted with every graduate from the Sustainable Energy program, at the conclusion of students’ graduate study. Graduates are asked about questions related to the program outcome, and asked to provide a score for each question, with a scale from 0 to 10, 0 being strongly disagree, and 10 strongly agree. Additional comments are also solicited for each question and recorded.

The following illustrates the program outcome, as of Spring 2017:

1. ***Practicum: I would agree I receive significant benefits from the Practicum experience.***The score for the question is 7.5 out of 10 since the inception of the program, and as of Spring 2017. Students highly value the job-shadowing at Renewable Energy Center, which is a unique experience provided on campus among all science and engineering programs in the country. This is similar to the experiential learning a medical school provides for the first year professional students, which is not readily available in other science or engineering programs in US.

Students are also appreciative to the exposures offered through off campus visits, including roof top solar energy arrays, wind and geothermal applications at Lake Land College. They are especially pleased about the opportunity to visit Prairie State Generating Facility at Marrisa, IL. The visit was made possible thanks to our active collaboration with Coles Moultrie Electric Cooperative in Mattoon.

1. ***Research: I learned significant amount of knowledge and gained skills through "sustainable energy research."***   
   The cumulative score for this assessment category is 9.4 out of 10 as of Spring 2017 since the inception of the program. Students were highly satisfied by the opportunity to interact with faculty members on one-to-one basis, and they highly praised the hands-on involvement during their research. Depending upon individual’s interests, students are able to customize their own study to develop a deep understanding on the subject of their choosing. Many students presented their research at national conferences and at research symposia at EIU. The School of Technology highly values the student engagement in the learning process, and provides its best support for students to go to national conferences. EIU has been well represented on those national conferences for the past years.
2. ***Faculty Interaction: I would describe the interaction with faculty during graduate study in Sustainable Energy as positive and constructive.***

The cumulative score for this question is 9.5 out of 10 since the inception of the program, and as of Spring 2017. It was anticipated that the student-faculty interaction may be a challenge due to the interdisciplinary nature of the program and the fact that students may not know their faculty well. Nevertheless, the overwhelming response to this question is highly positive. Students shared their high levels of satisfaction toward faculty members. This shows the fact that faculty in our contributing departments/schools are all committed and dedicated to the students’ success, which is very encouraging for an interdisciplinary graduate program.

1. ***Faculty Expertise: I would describe the teaching and research competency of the faculty during graduate studies as sound and effective.***   
   The cumulative score for this question is 8.7 out of 10 since the inception of the program, and as of Spring 2017. Faculty members are well respected by students, while being approachable. The collaborative culture in the interdisciplinary program enables students and faculty members to learn together and grow together intellectually.
2. ***Academic Programs: I am satisfied with the overall academic preparation afforded me by my graduate study in Sustainable Energy.***

The cumulative score for this question is 8.8 out of 10 since the inception of the program, and as of Spring 2017. It is noted that students are highly satisfied with the academic program offered in Sustainable Energy, which is indicative of high quality education at EIU.

1. ***Overall Experience: I would describe the overall experience in Master of Science in Sustainable Energy program as superior.***

The cumulative score for this question is 9.0 out of 10 since the inception of the program, and as of Spring 2017. It is observed that students highly regard their superior experience in MS in Sustainable Energy program. Kudos to all faculty members involved in the delivery of this interdisciplinary program, which is across 10 departments/schools, spanning from three major academic colleges, and in collaboration with Facility Management and Planning.

1. ***Employment Outlook: I feel confident as a highly competitive candidate for employment in the renewable energy market.***   
   The cumulative score for this question is 8.7 out of 10 since the inception of the program, and as of Spring 2017. We are pleased to report that many individuals grow and mature significantly as a result of their graduate studies. Graduates from the program have become confident in the job market of renewable and sustainable energy field.   
     
   Many students expressed their satisfaction on their growth in communication skills thanks to the CMN/ENG 5260 course implemented in the program. This type of course is highly unusual in many traditional science and technology programs.

**PART THREE**

*Summarize changes and improvements in* ***curriculum, instruction, and learning*** *that have resulted from the implementation of your assessment program. How have you used the data? What have you learned? In light of what you have learned through your assessment efforts this year and in past years, what are your plans for the future?*

* 1. **Fine Tuned Content Delivery of Science-Related Courses:**

Based upon the assessment feedback, faculty members adjusted their way of instruction so that scientific content can be readily understood by students with non-science background. Students are encouraged and they are highly satisfied with the breadth offered by the interdisciplinary program.

During the exit interview, students expressed a high level of satisfaction on CHM 5007 Energy Chemistry, especially the way Dr. Periyanna interacts with students. The way Dr. Daniels teaches PHY 5233 was also commendable by graduates.

* 1. **Teamwork Experience Enhanced:**

Based upon the feedback, team work experience was enhanced in the class exercises and project assignment for both TEC 5103 Leadership in Technology and TEC 5133 Total Quality Systems. Interaction among faculty and students is actively encouraged to enhance the leadership and organizational skills and knowledge by students.

* 1. **Practicum Expansion:**

Following the feedback from the program assessment, we have expanded practicum activities beyond the Renewable Energy Center at EIU, which is a unique feature for science and engineering program in the country. For example, during Spring 2017, students toured Prairie State Generation Company in Marrisa, IL. Students were exposed extensively to coal mining and electricity generation operations immediately next to the coal mine-mouth. Two (2) trips were also arranged to visit Lake Land College for the applications of roof top solar arrays and campus wide geothermal heating and cooling systems. The broad experience in practicum significantly enhanced the connection between students’ knowledge and their ability to apply the knowledge.

* 1. **Highlight of Communication Skill Gains by Students**

Students are uniformly positive about the inclusion of Communication Studies/English course (CMN/ENG 5260) in the program, which is team taught by faculty from respective department. This is a strength gained through the openness and collaboration among disciplines among science and technology, and humanities. We are pleased to report that many individuals grow and mature significantly as a result of their graduate studies. Graduates from the program have become confident in the job market of renewable and sustainable energy field, in part thanks to their improved communication skills.