ETCM 11-19-13

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UNCC Graduate School

UNC CHARLOTTE

Department of Engineering Technology & Construction Management
PROPOSAL FOR GRADUATE CERTIFICATE

To: Dr. Ed Morse (Engineering Graduate Committee Chair)

From: Dr. Anthony L. Brizendine

Date: 11/19/13

Re: Establishment of Graduate Certificate in Applied Energy

The following documentation is provided for the proposal of a graduate certificate following the published procedure: http://provost.uncc.edu/sites/provost.uncc.edu/files/media/Graduate-Certificate-Proposal-Procedures.pdf

Procedure for Certificate Program Approval:
Approval by the appropriate college committees and deans and the Graduate Council are forwarded to the Dean of the Graduate School (DGS). The DGS, having determined that all appropriate consultations have been conducted and that the home college has approved the proposal in wording consistent with that approved by the Graduate Council, forwards the recommendation to the Provost.

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION	SIGNATURES
				DEPARTMENT CHAIR Dr. Anthony L. Brizendine
				COLLEGE GRADUATE CURRICULUM COMMITTEE CHAIR Dr. Ed Morse
				COLLEGE FACULTY CHAIR (if applicable) Arindam Mukherjee
				COLLEGE DEAN Dr. Robert Johnson
12-10-13	1-14-14	3-19-14	approved	**GRADUATE COUNCIL** Alan R. Freitag ALAN R. FREITAG

UNC CHARLOTTE

Department of Engineering Technology & Construction Management

PROPOSAL FOR GRADUATE CERTIFICATES

Proposal Format (**No New Courses Required or Proposed**)

I. TITLE: Graduate Certificate in Applied Energy

A. Summary/Catalog Copy

This Graduate Certificate provides graduate students and professionals with the opportunity to reach a demonstrated level of competence in applied energy. Each course in this certificate currently exists and is applicable toward either the MS Applied Energy & Electromechanical Systems (MSEEM) or Master of Science in Construction & Facilities Management (MSCFM) degree requirements. The graduate certificate may act as a standalone graduate option for post-baccalaureate students, or may be pursued concurrently with the MSEEM or MSCFM degree program at UNC Charlotte.

B. Program Requirements

The certificate will be awarded upon completion of four graduate level courses (12 credit hours) in the area of applied energy. The cumulative GPA must be at least 3.0 and at most one course with a grade of C may be allowed toward the certificate. Requests for other energy-related course substitutions may be approved at the discretion of the department graduate director.

Four courses (12 credits) from the following:

ENER 5275	Air Conditioning Systems	3 credit hours
ENER 6120	Energy Generation and Conversion	3 credit hours
ENER 6135	Energy Transmission and Distribution	3 credit hours
ENER 6150	System Dynamics	3 credit hours
ENER 6170	Applied Mechatronics	3 credit hours
ETGR 5272	Engineering Analysis IV	3 credit hours
CMET 6140	Building Energy Management	3 credit hours
CMET 6155	Facility Instrumentation and Controls	3 credit hours

C. Admission Requirements

In addition to the general requirements for admission to the Graduate School, the ETCM department seeks the following:

- Either a bachelor's degree in engineering, engineering technology, construction management or a closely related technical or scientific field.
- Undergraduate coursework of at least 3 semesters in engineering analysis or calculus
- An average GPA of 3.0 (out of 4.0)
- Applicants whose native language is not English, will need to satisfy the UNC Charlotte Graduate School's English proficiency requirements.
- Early-Entry Program - Undergraduate students with a GPA of 3.2 or above and with at least 75 semester hours completed toward a baccalaureate degree in Engineering or Engineering Technology at UNC Charlotte may be admitted as an early-entry student provided they meet all other requirements of admission except the earned bachelor's degree.

D. Justification

1. Need for program

UNC CHARLOTTE

Department of Engineering Technology & Construction Management

PROPOSAL FOR GRADUATE CERTIFICATES

William States Lee College of Engineering and UNC Charlotte have made significant investments in the area of energy by building the Energy Production and Infrastructure Center (EPIC). This graduate certificate is well aligned with the department, college and university strategy of making UNC Charlotte a leading institution in energy related research and education.

2. Impact Statement (To include how the program affects the department's graduate program, any interdisciplinary programs (if applicable), and the Charlotte region.

The proposed certificate program is expected to have positive impact on the overall graduate enrollment in the ETCM department. Since it is a relatively short and focused program (doable within a year in a part-time mode) it is expected to attract industry professionals, and provide them a means to get familiar with the ETCM, COE and UNC Charlotte as a whole. It is expected that some of the certificate graduates will eventually transition into the MSEEM or MSCFM program.

E. Letters of support and consultation.

Please see the Appendix for a letter of support from Dr. Johan Enslin (Director of EPIC).

F. UNC General Administration Inventory Information

- CIP code: 15.0503
- Program title and description: Graduate Certificate in Applied Energy
- Required credit hours:12 credit hours
- Program type and level: Graduate Certificate
- Date of initiation: May 2014
- Mode of delivery: Face-to-face
- Site (indicate "Internet" if program is online): UNC Charlotte
- County (indicate "Statewide" if program is online): Mecklenburg
- Whether program is on-campus or distance education: On-campus

UNC CHARLOTTE

Department of Engineering Technology & Construction Management

PROPOSAL FOR GRADUATE CERTIFICATES

Appendix: Support Letters and Consultations

From: Lorden, Joan
Sent: Thursday, October 03, 2013 11:13 AM
To: Brizendine, Tony; Zenk, Leslie
Cc: Robinson, Christine; Smelser, Ron; Watson, Johnna; Raja, Jayaraman; Johnson, Bob
Subject: RE: Applied Energy -- SACS Prospectus Needed

Just a thought---You can offer the courses and could potentially organize the first 15 credits as a certificate, which might not be a bad idea in any case. But grad certificate students become eligible for financial aid.

==========

From: Enslin, Johan
Sent: Tuesday, November 19, 2013 10:23 AM
To: Brizendine, Tony
Cc: Guessford, Bev
Subject: RE: Letter of support for Applied Energy Graduate Certificate in ETCM

Tony,

That should fine. Any specific changes?

Bev, please draft the letter for Tony.

Johan

From: Brizendine, Tony
Sent: Tuesday, November 19, 2013 10:05 AM
To: Enslin, Johan
Cc: Guessford, Bev
Subject: Letter of support for Applied Energy Graduate Certificate in ETCM

Johan,

Will you provide me with a similar letter for our proposed Applied Energy Certificate in ETCM, please?

Thanks,

Tony

UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

Energy Production and Infrastructure Center (EPIC)

9201 University City Blvd, Charlotte, NC 28223-0001
t/ 704.687.1669 f/ 704.687.1819 www.epic.uncc.edu

November 20, 2013

Dr. Anthony Brizendine
UNC Charlotte
Engineering Technology & Construction Management
9201 University City Blvd.
Smith 274B
Charlotte, NC 28223-0001

Dear Dr. Brizendine,

With this letter I would like to extend my full support for your proposal to establish an applied energy graduate certificate within the Department of Engineering Technology & Construction Management program. This graduate certificate program is well aligned with the energy research and education strategy of UNC Charlotte, the William States Lee College of Engineering and the Energy Production and Infrastructure Center – EPIC.

EPIC at UNC Charlotte was formed in response to the need from industry to supply highly trained engineers qualified to meet the demands of the energy industry – through traditional and continuing education, and provide sustainable support the Carolina energy industry by increasing capacity and support for applied research. EPIC is a highly collaborative industry/education partnership that produces a technical workforce, advancements in technology for the global energy industry while supporting the Carolinas' multi-state economic and energy security.

The proposed program will serve the Greater Charlotte Region which is a major energy hub in the Carolinas, hosting large utility and energy research companies. The need for systems engineers and engineering managers with skills geared towards the energy industry has been steadily increasing and your graduate certificate program is timely.

Sincerely,

Johan Enslin, Director
Energy Production and Infrastructure Center (EPIC)

Student Learning Outcomes Assessment Plan

College: The William States Lee College of Engineering
Department: Engineering Technology and Construction Management
Name of Degree or Certificate Program/Stand Alone Minor/Online Distance Education Program: Certificate in Applied Energy

Reflection on the Continuous Improvement of Student Learning 1. List the changes and improvements your program planned to implement as a result of last year's student learning outcomes assessment data. 2. Were all of the changes implemented? If not, please explain. 3. What impact did the changes have on student learning?
New certificate program.

Student Learning Outcome 1 (knowledge, skill or ability to be assessed)
Students analyze and evaluate advanced topics in engineering.

Changes to the Student Learning Outcomes Assessment Plan: If any changes were made to the assessment plan (which includes the Student Learning Outcome, Effectiveness Measure, Methodology and Performance Outcome) for this student learning outcome since your last report was submitted, briefly summarize the changes made and the rationale for the changes.
N/A

Effectiveness Measure: Identify the data collection instrument, e.g., exam, project, paper, etc. that will be used to gauge acquisition of this student learning outcome and explain how it assesses the desired knowledge, skill or ability. A copy of the data collection instrument and any scoring rubrics associated with this student learning outcome are to be submitted electronically to the designated folder on the designated shared drive.
Measures of the acquisition of this learning outcome are obtained through analysis of the written papers, oral presentations, and review of written exams. **Separate criteria are defined for each of these data collection instruments, and are labeled: Written Report (WR) and/or Oral Presentation (OP), and/or Exam (EX)** **A scoring rubric is developed for each of these criteria, and performance measures are set for the combined score pertaining to this outcome.** **Mapping learning outcomes and effectiveness measures: filename GLO.pdf**

Scoring rubrics used: **filename: GLO Written Reports.pdf**
filename: GLO Oral Presentations.pdf
filename: GLO Exams.pdf

Course level student work is assessed with our standard ICAP evaluation process to assure achievement of outcomes and continuous improvement therein.

Methodology: Describe when, where and how the assessment of this student learning outcome will be administered and evaluated. Describe the process the department will use to collect, analyze and disseminate the assessment data to program faculty and to decide the changes/improvements to make on the basis of the assessment data.

Appropriate graduate faculty (advisor, committee members, exam writers) will evaluate the students during the written reports, oral presentations, and examinations. These data will be compiled by the graduate program directors and presented to the faculty at the summer/fall continuous improvement meeting each year. At this time, the assembled graduate faculty will discuss any necessary steps toward improvement.

Performance Outcome: Identify the percentage of students assessed that should be able to demonstrate proficiency in this student learning outcome and the level of proficiency expected. *80% of the students assessed will achieve a score of "meets expectations" or "Acceptable" or higher on the Oral Presentation Scoring Rubric, Writtet Report Rubric or Exam Rubric . (*Note: a copy of the scoring rubric, complete with cell descriptors for each level of performance, is to be submitted electronically to the designated folder on the designated shared drive.)

This assessment is based upon student performance on written reports, oral presentations, and examinations. 80% of the students assessed will achieve an average score of "meets expectations" or "Acceptable" or higher (rating of 2 or 3) on each criterion on the Oral Presentation Scoring Rubric, Written Report Rubric or Exam Rubric . In addition, 80% of students assessed will achieve cumulative score targets for all criteria on each of the scoring rubrics.

Student Learning Outcome 2 (knowledge, skill or ability to be assessed)
Students effectively communicate technical information.

Changes to the Student Learning Outcomes Assessment Plan: If any changes were made to the assessment plan (which includes the Student Learning Outcome, Effectiveness Measure, Methodology and Performance Outcome) for this student learning outcome since your last report was submitted, briefly summarize the changes made and the rationale for the changes.
N/A

Effectiveness Measure: Identify the data collection instrument, e.g., exam, project, paper, etc. that will be used to gauge acquisition of this student learning outcome and explain how it assesses the desired knowledge, skill or ability. A copy of the data collection instrument and any scoring rubrics associated with this student learning outcome are to be submitted electronically to the designated folder on the designated shared drive.
Measures of the acquisition of this learning outcome are obtained through analysis of written reports, oral presentations, and review of written exams. **Separate criteria are defined for each of these data collection instruments, and are labeled: Thesis Written Report (WR) and/or Oral Presentation (OP), and/or Exam (EX)** **A scoring rubric is developed for each of these criteria, and performance measures are set for the combined score pertaining to this outcome.** **Mapping learning outcomes and effectiveness measures: filename GLO.pdf** **Scoring rubrics used: filename: GLO Written Reports.pdf** **filename: GLO Oral Presentations.pdf** **filename: GLO Exams.pdf** Course level student work is assessed with our standard ICAP evaluation process to assure achievement of outcomes and continuous improvement therein.

Methodology: Describe when, where and how the assessment of this student learning outcome will be administered and evaluated. Describe the process the department will use to collect, analyze and disseminate the assessment data to program faculty and to decide the changes/improvements to make on the basis of the assessment data.
Appropriate graduate faculty (advisor, committee members, exam writers) will evaluate the students during the written reports, oral presentations, and examinations. These data will be compiled by the graduate program directors and presented to the faculty at the summer/fall continuous improvement meeting each year. At this time, the assembled graduate faculty will discuss any necessary steps toward improvement.

Performance Outcome: Identify the percentage of students assessed that should be able to demonstrate proficiency in this student learning outcome and the level of proficiency expected. *Example: 80% of the students assessed will achieve a score of "acceptable" or higher on the Oral Presentation Scoring Rubric. (*Note: a copy of the scoring rubric, complete with cell descriptors for each level of performance, is to be submitted electronically to the designated folder on the designated shared drive.)
This assessment is based upon student performance on written reports, oral presentations, and examinations. 80% of the students assessed will achieve an average score of "meets expectations" or "Acceptable" or higher (rating of 2 or 3) on each criterion on the Oral Presentation Scoring Rubric, Written Report Rubric or Exam Rubric . In addition, 80% of students assessed will achieve cumulative score targets for all criteria on each of the scoring rubrics.

Graduate Student Learning Outcomes: ***Exams****

GLO #1: Students analyze and evaluate advanced topics in engineering.				
Score	***Criteria***	**1 Does Not Meet Expectations**	**2 Somewhat Meets Expectations**	**3 Meets Expectations**
	Represents the problem schematically, graphically, or figuratively	Does not include a schematic, graph, or figure	Includes a schematic, graph, or figure but it is incomplete and/or contains some incorrect information	Includes a schematic, graph, or figure that is complete and correct
	Identifies appropriate assumptions and constraints	Does not include assumptions and constraints or they are incorrect	Includes assumptions and constraints but they are incomplete or contain some incorrect information	Includes assumptions and constraints that are complete and correct
	Identifies appropriate governing equation(s)	Identifies governing equations are that are incorrect or incomplete	Identifies governing equations that are partially correct or complete	Identifies governing equations that are entirely correct and complete
	Develops an appropriate model for analysis	Does not adequately develop an appropriate model for analysis; important aspects of the model are missing or extraneous aspects are included	N/A	Adequately develops an appropriate model for analysis; all obvious aspects of the model are included and justified
GLO #2 SCORE: _____/12 **TARGET: 9/12**			**PERFORMANCE**	
GLO #2: Students communicate technical information.				
Score	***Criteria***	**1 Does Not Meet Expectations**	**2 Meets Expectations**	**3 Exceeds Expectations**
	Evaluates scope of analytical methods/tools and selects the most appropriate one(s)	Does not adequately evaluate the scope of analytical methods/tools and/or did not select the most appropriate one; some viable options	N/A	Adequately evaluates the scope of analytical methods/tools and selected the most appropriate one; all obvious options were considered

		were not considered or the best was not chosen		and the best was chosen
	Analyzes topic beyond the BS level	Does not adequately analyze topic at the MS level; important aspects of analysis/evaluation is missing	N/A	Adequately analyzes topic at the MS level; sufficient level of analysis/evaluation is provided
	Correctly solves the problem	Provides a solution that is incomplete or incorrect	Provides a solution that is partially correct or complete	Provides a solution that is entirely correct and complete
GLO #2 SCORE: _____/9 PERFORMANCE TARGET: 8/9				
***TOTAL SCORE:* _____/21 PERFORMANCE TARGET: 17/21 (81%)**				
COMMENTS (required for total score < 17/21 or for any criterion with a score of 1):				

Graduate Student Learning Outcomes: ***Written Reports***

GLO #1: Students analyze and evaluate advanced topics in engineering.				
Score	***Criteria***	**1 Does Not Meet Expectations**	**2 Meets Expectations**	**3 Exceeds Expectations**
	Describes the scope and context of the defined problem	Does not adequately describe the scope and context of the problem; important details are missing	Adequately describes the scope and context of the problem; sufficient level of detail is provided	Comprehensively describes the scope and context of the problem; level of detail offers additional breadth, depth, and/or new insights

	Demonstrates existing knowledge and emerging research on the topic	Does not adequately demonstrate knowledge of existing and emerging research on the topic; important details are missing	Adequately demonstrates knowledge of existing and emerging research on the topic; sufficient level of detail is provided	Comprehensively describes existing and emerging research on the topic; level of detail offers additional breadth, depth, and/or new insights
	Compares and contrasts relevant aspects of the topic	Does not adequately compare/contrast relevant aspects of the topic; important similarities or distinctions are missing	Adequately compares/contrasts relevant aspects of the topic; sufficient level of similarities and distinctions are provided	Comprehensively compares/ contrasts relevant aspects of the topic; level of detail in similarities and distinctions offers additional breadth, depth, and/or new insights
	Evaluates scope of analytical methods/tools and selects the most appropriate one(s)	Does not adequately evaluate the scope of analytical methods/tools and/or did not select the most appropriate one; some viable options were not considered or the best was not chosen	Adequately evaluates the scope of analytical methods/tools and selected the most appropriate one; all obvious options were considered and the best was chosen	Comprehensively evaluates the scope of analytical methods/tools and selected the most appropriate one; new or optional analytical tools were also considered and the best was chosen
	Identifies assumptions and constraints relevant to the analytical methods/tools selected	Does not adequately identify assumptions and constraints relevant to the analytical method selected; important assumptions or constraints are missing	Adequately identifies assumptions and constraints relevant to the analytical method selected; all obvious assumptions and constraints are identified	Comprehensively identifies assumptions and constraints relevant to the analytical method selected; assumptions and constraints beyond the obvious offer additional breadth, depth, and/or new insights

	Develops an appropriate model for analysis	Does not adequately develop an appropriate model for analysis; important aspects of the model are missing or extraneous aspects are included	Adequately develops an appropriate model for analysis; all obvious aspects of the model are included and justified	Comprehensively develops an appropriate model for analysis; new and relevant aspects of the model offer additional breadth, depth, and/or new insights
	Analyzes topic beyond the previous level of coursework (BS or MS)	Does not adequately analyze topic at the MS/PhD level; important aspects of analysis/ evaluation is missing	Adequately analyzes topic at the MS/PhD level; sufficient level of analysis/evaluation is provided	Comprehensively analyzes topic at the MS/PhD level; level of analysis/evaluation offers additional breadth, depth, and/or new insights
Score	***Criteria***	**1 Does Not Meet Expectations**	**2 Meets Expectations**	**3 Exceeds Expectations**
	Evaluates topic beyond the previous level of coursework (BS or MS)	Does not adequately evaluate topic at the MS/PhD level; important aspects of analysis/ evaluation is missing	Adequately evaluates topic at the MS/PhD level; sufficient level of analysis/evaluation is provided	Comprehensively evaluates topic at the MS/PhD level; level of analysis/evaluation offers additional breadth, depth, and/or new insights
	Interprets results within the scope and context of the defined problem	Does not adequately interpret results within the scope and context of the defined problem; interpretation is incomplete or lacks rationale	Adequately interprets results within the scope and context of the defined problem; interpretation is complete and rational	Comprehensively interprets results within the scope and context of the defined problem; interpretation is complete, rational, and offers additional breadth, depth, and/or new insights
	Makes appropriate recommendations and/or identifies next steps	Does not make recommendations or identify next steps ***or*** recommendations and next steps are not justified based on	Makes recommendations and identifies next steps that are commensurate with results	Makes recommendations and identifies next steps beyond the scope of the project but which have other relevance

		results		
GLO #1 SCORE: _____/30 **TARGET: 20/30**				**PERFORMANCE**

GLO #2: Students communicate technical information.				
Score	***Criteria***	**1 Does Not Meet Expectations**	**2 Meets Expectations**	**3 Exceeds Expectations**
	Document conforms to format specified by the Graduate School (style, font size and type, margins, spacing, pagination, numbering, and organization)	Does not conform to format specified by the Graduate School	Conforms to format specified by the Graduate School	N/A
	Referencing format conforms to discipline standards	Does not conform to referencing format of the discipline	Conforms to referencing format of the discipline	N/A
	Quality of content, organization, and coherence of writing is at a level expected of professional publications	Is not at a level expected of professional publications; needs extensive revision	Is at a level expected of professional publications with minor or no revision	N/A
GLO #2 SCORE: _____/6 TARGET: 6/6				**PERFORMANCE**
***TOTAL SCORE:* _____/36 26/36 (72%)**				**PERFORMANCE TARGET:**
COMMENTS (required for total score < 26/36 or for any criterion with a score of 1):				

Graduate Student Learning Outcomes: ***Oral Presentations***

GLO #1: Students analyze and evaluate advanced topics in engineering.				
Score	***Criteria***	**1 Does Not Meet Expectations**	**2 Meets Expectations**	**3 Exceeds Expectations**
	Describes the scope and context of the defined problem	Does not adequately describe the scope and context of the problem; important details are missing	Adequately describes the scope and context of the problem; sufficient level of detail is provided	Comprehensively describes the scope and context of the problem; level of detail offers additional breadth, depth, and/or new insights
	Demonstrates existing knowledge and emerging research on the topic	Does not adequately demonstrate knowledge of existing and emerging research on the topic; important details are missing	Adequately demonstrates knowledge of existing and emerging research on the topic; sufficient level of detail is provided	Comprehensively describes existing and emerging research on the topic; level of detail offers additional breadth, depth, and/or new insights
	Compares and contrasts relevant aspects of the topic	Does not adequately compare/contrast relevant aspects of the topic; important similarities or distinctions are missing	Adequately compares/contrasts relevant aspects of the topic; sufficient level of similarities and distinctions are provided	Comprehensively compares/ contrasts relevant aspects of the topic; level of detail in similarities and distinctions offers additional breadth, depth, and/or new insights

Score	*Criteria*	1 Does Not Meet Expectations	2 Meets Expectations	3 Exceeds Expectations
	Evaluates scope of analytical methods/tools and selects the most appropriate one(s)	Does not adequately evaluate the scope of analytical methods/tools and/or did not select the most appropriate one; some viable options were not considered or the best was not chosen	Adequately evaluates the scope of analytical methods/tools and selected the most appropriate one; all obvious options were considered and the best was chosen	Comprehensively evaluates the scope of analytical methods/tools and selected the most appropriate one; new or optional analytical tools were also considered and the best was chosen
	Identifies assumptions and constraints relevant to the analytical methods/tools selected	Does not adequately identify assumptions and constraints relevant to the analytical method selected; important assumptions or constraints are missing	Adequately identifies assumptions and constraints relevant to the analytical method selected; all obvious assumptions and constraints are identified	Comprehensively identifies assumptions and constraints relevant to the analytical method selected; assumptions and constraints beyond the obvious offer additional breadth, depth, and/or new insights
	Develops an appropriate model for analysis	Does not adequately develop an appropriate model for analysis; important aspects of the model are missing or extraneous aspects are included	Adequately develops an appropriate model for analysis; all obvious aspects of the model are included and justified	Comprehensively develops an appropriate model for analysis; new and relevant aspects of the model offer additional breadth, depth, and/or new insights
	Analyzes topic beyond the previous level of coursework (BS or MS)	Does not adequately analyze topic at the MS/PhD level; important aspects of analysis/ evaluation is missing	Adequately analyzes topic at the MS/PhD level; sufficient level of analysis/evaluation is provided	Comprehensively analyzes topic at the MS/PhD level; level of analysis/evaluation offers additional breadth, depth, and/or new insights

Score	*Criteria*	1 Does Not Meet Expectations	2 Meets Expectations	3 Exceeds Expectations
	Evaluates topic beyond the previous level of coursework (BS or MS)	Does not adequately evaluate topic at the MS/PhD level; important aspects of analysis/ evaluation is missing	Adequately evaluates topic at the MS/PhD level; sufficient level of analysis/evaluation is provided	Comprehensively evaluates topic at the MS/PhD level; level of analysis/evaluation offers additional breadth, depth, and/or new insights
	Interprets results within the scope and context of the defined problem	Does not adequately interpret results within the scope and context of the defined problem; interpretation is incomplete or lacks rationale	Adequately interprets results within the scope and context of the defined problem; interpretation is complete and rational	Comprehensively interprets results within the scope and context of the defined problem; interpretation is complete, rational, and offers additional breadth, depth, and/or new insights
	Makes appropriate recommendations and/or identifies next steps	Does not make recommendations or identify next steps ***or*** recommendations and next steps are not justified based on results	Makes recommendations and identifies next steps that are commensurate with results	Makes recommendations and identifies next steps beyond the scope of the project but which have other relevance
GLO #1 SCORE: _____/30 **TARGET: 20/30**				**PERFORMANCE**

GLO #2: Students communicate technical information.				
Score	***Criteria***	**1** **Does Not Meet Expectations**	**2** **Meets Expectations**	**3** **Exceeds Expectations**
	Delivery follows a logical sequence	Lacks a logical sequence; key aspects of the project are unclear and/or lack a unified rationale	Follows a logical sequence; key aspects of the project are understood and present a unified rationale	N/A

	Delivery is appropriately paced	Does not engage audience; pace too fast or too slow	Engages the audience at an appropriate pace	N/A
	Delivery presents a convincing argument	Does not offer a convincing case; lacks substance and rationale based on scientific method	Offers a convincing case; substantive and rational based on identified method	N/A
GLO #2 SCORE: _____/6 **TARGET: 6/6**				**PERFORMANCE**
***TOTAL SCORE:* _____/36** **26/36 (72%)**				**PERFORMANCE TARGET:**
COMMENTS (required for total score < 26/36 or for any criterion with a score of 1):				