

SEEM 3-14-14



**UNC CHARLOTTE**

**Department of Systems Engineering and Engineering Management  
PROPOSAL FOR GRADUATE CERTIFICATE IN SYSTEMS ANALYTICS**

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

From: Dr. Ertunga Ozelkan (SEEM Interim Chair)

Date: 3/14/14

Re: **Establishment of Graduate Certificate in Systems Analytics**

The following documentation is provided for the proposal of three graduate certificates 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
3/5/14	3/5/14	3/14/14	Approved	<u>DEPARTMENT CHAIR</u> Dr. Ertunga C. Ozelkan <i>Ertunga Ozelkan</i>
				<u>COLLEGE GRADUATE CURRICULUM COMMITTEE CHAIR</u> Dr. Ed Morse <i>Ed Morse</i>
				<u>COLLEGE FACULTY CHAIR (if applicable)</u> Arindam Mukherjee <i>Arindam Mukherjee</i>
				<u>COLLEGE DEAN</u> Dr. Robert Johnson <i>Robert Johnson</i>
3-14-14	4-1-14	4-17-14	Approved	<u>GRADUATE COUNCIL</u> Dr. Alan Freitag <i>Alan R. Freitag</i>

# UNC CHARLOTTE

## Department of Systems Engineering and Engineering Management

### PROPOSAL FOR GRADUATE CERTIFICATE IN SYSTEMS ANALYTICS

Proposal Format (No New Courses Required or Proposed)

#### **TITLE: Graduate Certificate in Systems Analytics**

##### A. Summary/Catalog Copy

The Graduate Certificate in Systems Analytics provides graduate students and professionals with the opportunity to reach a demonstrated level of competence in tools and techniques to make better decisions related to systems modeling, analysis and problem solving. The Systems Analytics Graduate Certificate is comprised of existing courses only. The graduate certificate may act as a standalone graduate option for post-baccalaureate and post-master's students, or may be pursued concurrently with a related graduate degree program at UNC Charlotte. The twelve credit hours in the certificate may be applied to the graduate programs in the Systems Engineering and Engineering Management (SEEM) department per approval of the department Program Director.

##### B. Program Requirements

The certificate will be awarded upon completion of four graduate level courses (12 credit hours) in the area of systems analytics. 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 related course substitutions may be approved at the discretion of the Program Director.

The students in this graduate certificate program will need to complete four courses from the following:

- EMGT 6905 Designed Experimentation (3)
- EMGT 6906 Processing Systems Simulation (3)
- EMGT 6910 Technological Forecasting and Decision-Making (3)
- EMGT 6912 Techniques and Intelligent Tools for Engineering Decision Support (3)
- EMGT 6915 Engineering Decision and Risk Analysis (3)
- EMGT 6952 Engineering Systems Optimization (3)
- EMGT 6955 Systems Reliability Engineering (3)
- EMGT 6965 Energy Analytics (3)

##### C. Admission Requirements

In addition to the general requirements for admission to the Graduate School, the Systems Engineering and Engineering Management department seeks the following:

- Either a bachelor's degree in engineering or a closely related technical or scientific field, or a bachelor's degree in business, provided relevant technical course requirements have been met
- Undergraduate coursework in engineering economics, calculus, and statistics
- An average GPA of 3.0 (out of 4.0)
- Applicants should submit written description of any relevant and significant work experience
- 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 Systems Engineering and Engineering Management

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Systems analytics is a core competency under the SEEM department and the MSEM program. The SEEM faculty have been offering systems analytics courses since the beginning of the MSEM program for the past 13 years. The main objectives of this new graduate certificate program is two fold: 1) to provide an official recognition to students completing systems analytics courses in their transcripts and 2) to better align the SEEM department with the recent developments and trends in the field of analytics. Subsequently, the graduate certificate program is expected to make the MSEM program thus UNC Charlotte more competitive and help increase the enrollment of MSEM program given the increasing market demand of systems engineers and analysts.

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 SEEM department. Since it is a relatively short and focused program (doable within a year in a part-time mode) it is expected to attract more industry professionals, and provide them a means to get familiar with the SEEM, COE and UNC Charlotte as a whole. It is expected that some of the certificate graduates will eventually transition into a more comprehensive Masters of Science degree program (such as MS in Engineering Management) within and outside of the SEEM department. Since the proposed courses exist and are already scheduled for ongoing concentrations, there will be minimal impact in terms of deployment.

E. Letters of support and consultation.

Please see the Appendix for the letters of support from Mr. Alfred D'Ambrosio (Sr. Manager, Hess Corporation), Dr. Jonathan Mayhorn (Lean Six Sigma Blackbelt, AT&T), Dr. Pu Wang, Sr. Statistician Developer, SAS Institute Inc.), and Mr. Jim Hartman (Corporate Business Development, Controls Southeast Inc./AMATEK).

F. UNC General Administration Inventory Information

- CIP code: 15.1501
- Program title and description: Graduate Certificate in Systems Analytics
- Required credit hours: 12 credit hours
- Program type and level: Graduate Certificate
- Date of initiation: May 2014 (if possible, if not August 2014)
- Mode of delivery: Face-to-face and Online
- Site (indicate "Internet" if program is online): UNC Charlotte and Online
- County (indicate "Statewide" if program is online): Mecklenburg and Statewide
- Whether program is on-campus or distance education: On-campus and Online

G. Student Learning Outcomes (SLOs)

- SLO1: Students analyze and evaluate advanced topics related to systems analytics.
- SLO2: Students effectively communicate technical information related to systems analytics.

Please see the attached Student Learning Outcomes Assessment Plan and Report document (GCP-SA-2014 SLOs Asst. Plan & Report Template.docx) for details on the assessment plan.

**UNC CHARLOTTE**  
**Department of Systems Engineering and Engineering Management**  
**PROPOSAL FOR GRADUATE CERTIFICATE IN SYSTEMS ANALYTICS**

**Appendix: Support Letter**



HESS CORPORATION  
1501 McKinney Street  
Houston, TX 77010

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**ALFRED W. D'AMBROSIO, P.E.**  
Senior Manager, Commercial – Bakken Asset

18<sup>th</sup> November 2013

Dr. Ertunga C. Ozelkan, Ph.D.  
Interim Chair & Associate Professor,  
Systems Engineering and Engineering Management  
Associate Director, Center for Lean Logistics and Engineered Systems  
UNC Charlotte, Room: Cameron 204  
9201 University City Blvd., Charlotte, NC 28223

Re: Support Letter of Support for Graduate Certificate Programs

Dear Dr. Ozelkan,

Having worked as a technical professional and a group manager in several aspects of the Energy Systems value chain; I applaud and whole heartily support the efforts you are making to provide programs which will enable individuals in industry to enhance their skills in this dynamic market. The explosion in technical advances, the globalization of business and the economic constraints that have occurred in last several years have brought changes to the market place well beyond anyone's expectations. The ability to keep up; much less get ahead is becoming ever more difficult.

Professionals and technicians need programs that will not only keep up with new innovations, but also provide those individuals with a credible recognition of having secured that knowledge. The Graduate Certificates you are proposing provide an excellent opportunity for full-time working professionals and technicians to secure timely and detailed training at a level greatly exceeding three to five day seminars without having to make the longer-term commitment to a graduate degree program.

As a group manager, I have found it most difficult to maintain a high level of broad technical awareness in my group through individual seminars or self-study programs. The certificate programs will fill that educational gap.

Please let me know if there is anything else I can do to help support your effort.

Sincerely,

*Fred D'Ambrosia*

**UNC CHARLOTTE**  
**Department of Systems Engineering and Engineering Management**  
**PROPOSAL FOR GRADUATE CERTIFICATE IN SYSTEMS ANALYTICS**



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AT&T Operations  
Room 1  
5708 Sustar Dr  
Monroe, NC 28110  
Jm2269@att.com

Jonathan Mayhorn  
Lean Six Sigma Master Black Belt  
Construction and Engineering  
AT&T Operations  
Ofc: 704.628.9022

November 14th, 2013

To: Dr. Ertunga Ozelkan  
From: Jonathan Mayhorn – Lean Six Sigma Master Black Belt- AT&T Operations  
Subject: Support Letter for Graduate Certificate in Systems Analytics

This letter formally serves as industry support for the proposed Graduate Certificate in Systems Analytics. As a Lean Six Sigma Master Black Belt for AT&T I believe this program will benefit students as well as the local Charlotte industry. Some of the benefits of such a program are listed below.

- Allow students to develop competitive skills for industry
  - As a manager within a Program Office at AT&T I have seen the types of skills needed to be successful now and in the near future. To improve existing systems one needs to be able to analyze the data output of those systems. This skill is starting to catch on within the industry and will become necessary as organizations gear up for 2020 workplace initiatives. There are two major benefits for those who go through a Systems Analytics training program. One is that they become better technical managers for the organization because of the intense focus on improving their skills in systems thinking, data analysis, and technical project management. The second major benefit is that they have a complete mindset change when it comes to solving major problems that plague the business using data rather than a gut reaction. Graduates of such a program learn how to be more proactive and less reactive when it comes to designing new systems or analyzing and improving existing systems. This mindset allows that participant to save the company a lot of time and money.
- Allow local organizations to choose more highly skilled individuals
  - Many companies are undergoing changes in their workforce as they prepare for technological improvements that will take place by 2020. Big data is the new push as systems become more complex to meet new consumer demands. Current and future employees will need to be able to analyze this data and then help their leaders make decisions based on their analysis. This is why obtaining Systems Analytics skills will become so important over the next six years. Graduates will be in high demand across many different industries. The Systems Engineering and Engineering Management department at UNCC is uniquely positioned to provide the training necessary to meet future organizational needs based on their proven track record in recent years.

Thank you for allowing me to comment on the proposed Graduate Certificate in Systems Analytics. I highly recommend this certificate program for approval to benefit both students and local industry.

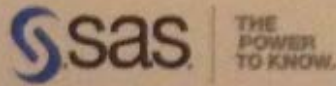
Sincerely,

*Dr. Jonathan Mayhorn*

Dr. Jonathan Mayhorn  
Lean Six Sigma Master Black Belt- AT&T



**UNC CHARLOTTE**  
**Department of Systems Engineering and Engineering Management**  
**PROPOSAL FOR GRADUATE CERTIFICATE IN SYSTEMS ANALYTICS**



March 17<sup>th</sup>, 2014

Pu Wang, PhD  
Senior Statistician Developer  
Applied Analytical Solutions R&D, SAS

Ertunga Ozelkan, PhD  
Interim Chair & Associate Professor  
Systems Engineering and Engineering Management  
University of North Carolina at Charlotte

RE: Support Letter of Support for Graduate Certificate in Systems Analytics

Dear Dr. Ozelkan,

I'm more than happy to write this letter to support your efforts of establishing a graduate certificate program in Systems Analytics. In today's world, many industries are flooded by big data. As a financial center and energy hub of the nation, a certificate program covering the interdisciplinary field of systems engineering and advanced analytics is highly beneficial to the continuing education of the local professionals. In addition, the on-line option of your course offering would be very appealing to many full-time workers who do not have the luxury coming back to school for a fixed schedule.

I fully support the idea of having the graduate certificate in Systems Analytics and look forward to its success. Please let me know if there is anything I can do to help with your effort.

Regards,

Pu Wang, PhD

[Pu.Wang@sas.com](mailto:Pu.Wang@sas.com)

**UNC CHARLOTTE**  
**Department of Systems Engineering and Engineering Management**  
**PROPOSAL FOR GRADUATE CERTIFICATE IN SYSTEMS ANALYTICS**



March 23, 2014

Dr. Ertunga Ozelkan  
Interim Chair and Associate Professor  
Systems Engineering and Engineering Management  
Associate Director, Center for Lean Logistics and Engineered Systems  
UNC Charlotte, Room: Cameron 204  
9201 University City Blvd., Charlotte, NC 28223

RE: Letter of Support for Graduate Certificate in System Analytics

Dear Dr. Ozelkan:

I have reviewed the plans for the Graduate Certificate in System Analytics and I support adding this to the SEEM offering. I believe that this certificate program can be beneficial to business professionals, prospective students and to UNCC's reputation as a provider of cutting edge skills to the professional community.

Business professionals are constantly challenged with making investment decisions in a resource constrained environment. Markets to pursue, sales channel alternatives and product development options are all examples of choices that need to be made, with business success at risk. In today's data rich world, tools to analyze and support complex decisions are needed. The eight classes offered as choices in this certificate will provide these type of needed tools for the professionals seeking skill improvement.

In addition to meeting the needs of today's business professionals, the certificate can also serve as an entry point for prospective Graduate students. Taking these classes will not only provide decision making support, but also give students a start to a graduate degree. Once they experience the four classes, they may decide to further their education by seeking a degree in the SEEM program. As they have the option to apply these classes, with department approval, that will give them an attractive way to continue their education and attract top talent into UNCC's College of Engineering.

In summary, I support the certificate initiative as a means of offering needed tools to business professionals and encouraging entry into UNCC graduate programs for qualified students.

Sincerely,

A handwritten signature in blue ink, appearing to read "Jim Hartman", is written over a horizontal line.

**Jim Hartman** | Corporate Business Development  
[Controls Southeast, Inc. / AMETEK](#) | PO Box 7500 | Charlotte, NC 28241  
Phone: 704-644-5005 | Mobile: 704-614-9766 | Email: [hartman@csiheat.com](mailto:hartman@csiheat.com)





**Spring 2014 and Fall 2014  
Student Learning Outcomes Assessment Plan and Report**

(Document student learning outcomes assessment plans and assessment data for each undergraduate and graduate degree program and certificate program, stand alone minor, and distance education program offered online only.)

**College:** The William States Lee College of Engineering

**Department:** Systems Engineering and Engineering Management Program

**Name of Degree or Certificate Program/Stand Alone Minor/Online Distance Education Program:**

Graduate Certificate in Systems Analytics

**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?

N/A - New Program

**Student Learning Outcome 1**

(knowledge, skill or ability to be assessed)

Students analyze and evaluate advanced topics related to systems analytics.

**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 - New Program



**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.

Project Written Report (WR), Project Oral Presentation (OP), and/or Exam (EX)

**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.

Use developed rubric for evaluating graduating class projects.

**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.)

The rubric for written reports:

<b>GLO #1: Students analyze and evaluate advanced topics in systems analytics.</b>				
<b>Avg. Score (enter for each criteria)</b>	<b>Criteria</b>	<b>1 Does Not Meet Expectations</b>	<b>2 Meets Expectations</b>	<b>3 Exceeds Expectations</b>
	<b>WR1a:</b> 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
	<b>WR1b:</b> 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
	<b>WR1c:</b> Compares and contrasts relevant aspects of the topic	Does not adequately compare/contrast relevant aspects of the topic; important similarities or	Adequately compares/contrasts relevant aspects of the topic; sufficient level of similarities and	Comprehensively compares/ contrasts relevant aspects of the topic; level of detail in similarities and

		distinctions are missing	distinctions are provided	distinctions offers additional breadth, depth, and/or new insights
	<b>WR1d:</b> <i>Evaluates scope of analytical methods/tools and selects the most appropriate one(s)</i>	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
	<b>WR1e:</b> <i>Identifies assumptions and constraints relevant to the analytical methods/tools selected</i>	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
	<b>WR1f:</b> <i>Develops an appropriate model for analysis</i>	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
	<b>WR1g:</b> <i>Analyzes topic beyond the previous level of coursework (BS or MS)</i>	Does not adequately analyze topic at the Graduate Certificate Program level; important aspects of analysis/ evaluation is missing	Adequately analyzes topic at the Graduate Certificate Program level; sufficient level of analysis/evaluation is provided	Comprehensively analyzes topic at the Graduate Certificate Program level; level of analysis/evaluation offers additional breadth, depth, and/or new insights
	<b>WR1h:</b> <i>Evaluates topic beyond the previous level of coursework (BS or MS)</i>	Does not adequately evaluate topic at the Graduate Certificate Program level; important aspects of analysis/ evaluation is missing	Adequately evaluates topic at the Graduate Certificate Program level; sufficient level of analysis/evaluation is provided	Comprehensively evaluates topic at the Graduate Certificate Program level; level of analysis/evaluation offers additional breadth, depth, and/or new insights

	<b>WR1i:</b> <i>Interprets results within the scope and context of the defined problem</i>	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
	<b>WR1j:</b> <i>Makes appropriate recommendations and/or identifies next steps</i>	Does not make recommendations or identify next steps <b>or</b> 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: 0 /30 PERFORMANCE TARGET: 80% of students with 20/30

Number of Students with a score of 20 or higher:		% of Students with a score of 20 or higher:	
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The target is 80% of students meet or exceed expectations.

The rubric for oral presentations:

<b>GLO #1: Students analyze and evaluate advanced topics in systems analytics.</b>				
<b>Avg. Score (enter for each criteria)</b>	<b>Criteria</b>	<b>1 Does Not Meet Expectations</b>	<b>2 Meets Expectations</b>	<b>3 Exceeds Expectations</b>
	<b>OP1a:</b> <i>Describes the scope and context of the defined problem</i>	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
	<b>OP1b:</b> <i>Demonstrates existing knowledge and emerging research on the topic</i>	Does not adequately demonstrate knowledge of existing and emerging research on the topic; important	Adequately demonstrates knowledge of existing and emerging research on the topic; sufficient	Comprehensively describes existing and emerging research on the topic; level of detail offers additional

		details are missing	level of detail is provided	breadth, depth, and/or new insights
	<b>OP1c:</b> <i>Compares and contrasts relevant aspects of the topic</i>	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
	<b>OP1d:</b> <i>Evaluates scope of analytical methods/tools and selects the most appropriate one(s)</i>	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
	<b>OP1e:</b> <i>Identifies assumptions and constraints relevant to the analytical methods/tools selected</i>	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
	<b>OP1f:</b> <i>Develops an appropriate model for analysis</i>	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
	<b>OP1g:</b> <i>Analyzes topic beyond the previous level of coursework (BS or MS)</i>	Does not adequately analyze topic at the Graduate Certificate Program level; important aspects of analysis/ evaluation is missing	Adequately analyzes topic at the Graduate Certificate Program level; sufficient level of analysis/evaluation is provided	Comprehensively analyzes topic at the Graduate Certificate Program level; level of analysis/evaluation offers additional breadth, depth, and/or

				new insights
	<b>OP1h:</b> <i>Evaluates topic beyond the previous level of coursework (BS or MS)</i>	Does not adequately evaluate topic at the Graduate Certificate Program level; important aspects of analysis/ evaluation is missing	Adequately evaluates topic at the Graduate Certificate Program level; sufficient level of analysis/evaluation is provided	Comprehensively evaluates topic at the Graduate Certificate Program level; level of analysis/evaluation offers additional breadth, depth, and/or new insights
	<b>OP1i:</b> <i>Interprets results within the scope and context of the defined problem</i>	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
	<b>OP1j:</b> <i>Makes appropriate recommendations and/or identifies next steps</i>	Does not make recommendations or identify next steps <b>or</b> 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

<b>GLO #1 SCORE:</b>	0	<b>/30</b>	<b>PERFORMANCE TARGET: 80% of students with 20/30</b>
<b>Number of Students with a score of 20 or higher:</b>		<b>% of Students with a score of 20 or higher:</b>	

The target is 80% of students meet or exceed expectations.

<b>Spring 2013-Fall 2013 Assessment Data</b>	<b>Spring 2014-Fall 2014 Assessment Data</b>



**Plans for 2015:** Based upon the 2014 assessment data included in this annual report, what changes/improvements will the program implement during the next academic year to improve performance on this student learning outcome?

**Office of Assessment and Accreditation (OAA) Comments on Student Learning Outcome 1:**

**Student Learning Outcome 2**  
(knowledge, skill or ability to be assessed)

Students effectively communicate technical information related to systems analytics.

**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 - New Program

**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.

Project Written Report (WR), Project Oral Presentation (OP), and/or Exam (EX)

**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.

Use developed rubric for evaluating graduate class projects.

**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.)

The rubric for written reports:

GLO #2: Students communicate technical information on systems analytics.				
Avg. Score (enter for each criteria)	Criteria	1 Does Not Meet Expectations	2 Meets Expectations	3 Exceeds Expectations
	<b>WR2a:</b> 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
	<b>WR2b:</b> Referencing format conforms to discipline standards	Does not conform to referencing format of the discipline	Conforms to referencing format of the discipline	N/A
	<b>WR2c:</b> 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: 0 /6 PERFORMANCE TARGET: 80% of students with 6/6

Number of Students with a score of 6:		% of Students with a score of 6:	
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The target is 80% of students meet or exceed expectations.

The rubric for oral presentations:

GLO #2: Students communicate technical information on systems analytics.				
Avg. Score (enter for each criteria)	Criteria	1 Does Not Meet Expectations	2 Meets Expectations	3 Exceeds Expectations

	<b>OP2a:</b> 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
	<b>OP2b:</b> Delivery is appropriately paced	Does not engage audience; pace too fast or too slow	Engages the audience at an appropriate pace	N/A
	<b>OP2c:</b> 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:

0 /6

PERFORMANCE TARGET: 80% of students with 6/6

Number of Students with a score of 6:

% of Students with a score of 6:

The target is 80% of students meet or exceed expectations.

Spring 2013-Fall 2013 Assessment Data	Spring 2014-Fall 2014 Assessment Data

**Plans for 2015:** Based upon the 2014 assessment data included in this annual report, what changes/improvements will the program implement during the next academic year to improve performance on this student learning outcome?

**Office of Assessment and Accreditation (OAA) Comments on Student Learning Outcome 2:**

**OAA Overall Comments**

## **Graduate Certificate in Systems Analytics**

This industry-relevant certificate provides professionals with the opportunity to reach a demonstrated level of competence in tools and techniques to make better decisions related to systems modeling, analysis and problem solving. The graduate certificate may act as a standalone graduate option for post-baccalaureate and post-masters students, or may be pursued concurrently with a related graduate degree program at UNC Charlotte. The twelve credit hours in the certificate may be applied to the graduate programs in the Systems Engineering and Engineering Management (SEEM) department per approval of the department Program Director.

Courses are available in both on-campus and online formats. This program accepts students in fall, spring and summer semesters.

### **Admission Requirements**

In addition to the general requirements for admission to the Graduate School, the Systems Engineering and Engineering Management department seeks the following:

Either a bachelor's degree in engineering or a closely related technical or scientific field, or a bachelor's degree in business, provided relevant technical course requirements have been met

- Undergraduate coursework in engineering economics, calculus, and statistics.

Students missing any of the prerequisite courses should register for EMGT 6101- Engineering Management Fundamentals (3 credits) offered online in the second summer session. This course satisfies the prerequisite requirement but does not count toward the 12 credit hours in the certificate.

- An average GPA of 3.0 (out of 4.0)
- Applicants should submit written description of any relevant and significant work experience.
- 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.

Students should complete the online [Graduate Application for Admission](#).



## **Program Requirements**

The certificate will be awarded upon completion of four graduate level courses (12 credit hours) in the area of systems analytics. 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 related course substitutions may be approved at the discretion of the Program Director.

The students need to take four of the following courses:

EMGT 6905 Designed Experimentation (3)

EMGT 6906 Processing Systems Simulation (3)

EMGT 6910 Technological Forecasting and Decision-Making (3)

EMGT 6912 Techniques and Intelligent Tools for Engineering Decision Support (3)

EMGT 6915 Engineering Decision and Risk Analysis (3)

EMGT 6952 Engineering Systems Optimization (3)

EMGT 6955 Systems Reliability Engineering (3)

EMGT 6965 Energy Analytics (3)