2013-2014 LONG SIGNATURE SHEET

UNC CHARLOTTE

Proposal Number: ____EMGT-121913 _____

Proposal Title: _____Curriculum Revision and MSEM Program Improvement ____

Originating Department: _____Systems Engineering and Engineering Management____

TYPE OF PROPOSAL: UNDERGRADUATE_____ GRADUATE__X___ UNDERGRADUATE & GRADUATE____
(Separate proposals sent to UCCC and Grad. Council)

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION	SIGNATURES
12/17/13	12/19/13	1/14/14	*Approved*	**DEPARTMENT CHAIR** Dr. Ertunga C. Ozelkan
			Approved	**COLLEGE CURRICULUM COMMITTEE CHAIR** Dr. Ed Morse
			Approved	**COLLEGE FACULTY CHAIR (if applicable)** Dr. Arindam Mukherjee
2/3/14	2/3/14	2/3/14	*Approved*	**COLLEGE DEAN** Dr. Robert Johnson
			Approved	**GENERAL EDUCATION** (if applicable; for General Education courses) [print name here:]
			Approved	**UNDERGRADUATE COURSE & CURRICULUM COMMITTEE CHAIR** (for undergraduate courses only)
1-24-14	2-4-14	2-18-14	*Approved*	**GRADUATE COUNCIL CHAIR** (for graduate courses only) Dr. Alan Freitag
				FACULTY GOVERNANCE ASSISTANT (Faculty Council approval on Consent Calendar)
				FACULTY EXECUTIVE COMMITTEE (if decision is appealed)

Revised 11/20/13
OAA/mjw

UNC CHARLOTTE

LONG FORM
COURSE AND CURRICULUM PROPOSAL

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

From: Dr. Tao Hong (SEEM Graduate Program Director)

Date: 1/14/2014

Re: Curriculum Revision and MSEM Program Improvement

The Long Form is used for major curriculum changes. Examples of major changes can include: creation of a new major, creation of a new minor, creation of a new area of concentration, or significant changes (more than 50%) to an existing program (Note: changing the name of an academic department does not automatically change the name(s) of the degree(s). The requests must be approved separately by the Board of Governors.)

Submission of this Long Form indicates review and assessment of the proposed curriculum changes at the department and collegiate level either separately or as part of ongoing assessment efforts.

*****Proposals for undergraduate courses should be sent to the Undergraduate Course and Curriculum Committee Chair. Proposals related to both undergraduate and graduate courses, (e.g., courses co-listed at both levels) must be sent to both the Undergraduate Course and Curriculum Committee and the Graduate Council.

University of North Carolina at Charlotte

Revised Graduate Course and Curriculum Proposal from: Systems Engineering & Engineering Management

PROPOSAL NUMBER: EMGT 121913

TITLE. Curriculum Revision and MSEM Program Improvement

II. CONTENT OF PROPOSALS

A. PROPOSAL SUMMARY.

1. SUMMARY.

The Systems Engineering and Engineering Management (SEEM) Department proposes to make the following revisions to the Master of Science in Engineering Management (MSEM) Curriculum and to the Graduate Catalog:

i. **Introduce new courses:**
   a. EMGT 6101 Engineering Management Fundamentals
   b. EMGT 6965 Energy Analytics

ii. **Add a new concentration on Systems Analytics**

iii. **Update MSEM catalog descriptions on**
   a. Description of additional admission requirements
   b. Documents to be submitted for admission
   c. Inclusion of "Entry From the SEEM Graduate Certificate Programs"
   d. Other changes in the catalog to reflect the new courses, concentration and new faculty.

B. JUSTIFICATION.

1. Identify the need addressed by the proposal and explain how the proposed action meets the need.

i. **Introduce new courses** to meet the growing market demand and increase the appeal of the degree program.
   a. EMGT 6101 Engineering Management Fundamentals

The proposed course is aimed to serve as a bridge course for those students, who are either interested to know more about the engineering management field or for those new MSEM students, who lack adequate statistical analysis and engineering economics skills to start the engineering management program. Over the past few years, many MSEM students who were conditionally admitted to the program had to take either statistics or engineering economics or both to overcome the deficiency in their education background. With the growth of the MSEM online program, the online students have been having difficulty to find adequate available online

statistics and/or engineering economics courses. This bridge course will help resolve this issue and help grow the MSEM program further.

b. EMGT 6965 Energy Analytics

William States Lee College of Engineering and UNC Charlotte have made significant investments in the area of energy systems engineering by building the Energy Production and Infrastructure Center (EPIC). In addition, UNC Charlotte currently has a university-wide initiative on big data and business analytics. This course is well aligned with the college and university strategy of making UNC Charlotte a leading institution in energy related research and education and big data analytics. The proposed energy analytics course will help systems engineering and engineering management students build necessary skills to meet the strong market demand of energy analysts in the era of smart grid and big data. The proposed course also enriches the energy systems concentration offering of the MSEM program.

ii. Add a new concentration on Systems Analytics

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 concentration 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 concentration 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.

iii. Update MSEM catalog descriptions on

a. Description of additional admission requirements

The SEEM faculty has agreed to waive the GRE for admission under certain cases as described below:

GRE Waiver conditions:

- GRE is waived for applicants with more than 2 years of relevant industry experience and a bachelor's degree in engineering from a US ABET accredited school.
- GRE is waived from applicants who have completed an SEEM Graduate Certificate Program with a GPA of 3.6 or higher.

The final determination of the waiver will be done by the SEEM Graduate Program Director.

By waiving GRE under certain conditions, the MSEM program will have an opportunity to attract industry professionals with good career standing to the program. Some of our local competition such as Northeastern uses a similar phrase, and have been successful attracting local students into their program. ASU which is marketing an Online Engineering Management here in Charlotte requires no GRE. Other MSEM programs that do not require GRE include New Jersey Institute of Technology. Florida International MSEM waives GRE if the GPA is 3.0 or higher. In

addition, American Society of Engineering Management, which certifies engineering management programs, does not have GRE in their requirements, but they do emphasize at least two years of relevant industry experience (http://asem.org/ASEM_Docs/EM_Masters_Program_Certification_-_Academic_Standards.pdf).

Note that a separate proposal for SEEM Graduate Certificate Programs is approved at the College of Engineering and is under review at the Graduate Council and the Graduate School.

b. Documents to be submitted for admission

Made the statement for language requirement for international students more robust by referring to graduate school requirements instead of listing specific exams and required scores.

c. Inclusion of "Entry From the SEEM Graduate Certificate Programs"

SEEM department has recently proposed 3 Graduate Certificate Programs on Energy Systems Analytics, Lean Six Sigma and Logistics and Supply Chain. Students from the graduate certificate programs will be able to transfer their courses into the MSEM program if they are admitted. Also the SEEM faculty has approved to waive the GRE requirements for the certificate students if they get a GPA of 3.6 or higher. These changes are reflected in the catalog.

d. Other changes in the catalog to reflect the new courses, concentration and new faculty.

To make the catalog current and consistent with the proposed changes.

2. Discuss prerequisites/corequisites for course(s) including class-standing, admission to the major, GPA, or other factors that would affect a student's ability to register.

EMGT 6101 does not require other courses as prerequisites or corequisites. The pre-or corequisite of EMGT 6965 is EMGT 5961/SEGR 4961, or STAT 5123, or ECON 6113, or consent of the instructor.

Please see Appendix for a syllabus for each of the proposed courses.

3. Demonstrate that course numbering is consistent with the level of academic advancement of students for whom it is intended.

UNC Charlotte course numbering guidelines were followed for each courses proposed.

4. In general, how will this proposal improve the scope, quality and/or efficiency of programs and/or instruction?

The proposed changes will enhance the quality of the MSEM program from admissions and curriculum perspectives. Thus, it will help making it more attractive to prospective students.

5. If course(s) has been offered previously under special topics numbers, give details of experience including number of times taught and enrollment figures.

The proposed courses have not been offered before.

C. IMPACT. Changes to courses and curricula often have impacts both within the proposing department as well as campus-wide. What effect will this proposal have on existing courses and curricula, students, and other departments/units? Submit an Impact Statement that fully addresses how you have assessed potential impacts and what the impacts of this proposal might be. Consider the following:

1. What group(s) of students will be served by this proposal? (Undergraduate and/or graduate; majors and/or non-majors, others? Explain). Describe how you determine which students will be served.

The main audience for the proposed courses and curriculum changes is MSEM students. Both courses are available to other UNC Charlotte students as electives.

2. What effect will this proposal have on existing courses and curricula?

a. When and how often will added course(s) be taught?

Both courses will be offered on demand.

b. How will the content and/or frequency of offering of other courses be affected?

Other courses will not be affected.

c. What is the anticipated enrollment in course(s) added (for credit and auditors)?

EMGT 6101 Engineering Management Fundamentals is expected to attract 10 to 15 students. EMGT 6965 Energy Analytics is expected to attract 10 to 20 students.

d. How will enrollment in other courses be affected? How did you determine this?

No significant impact is expected on the enrollment in the other EMGT courses. EMGT6101 is the bridge course for the students being conditionally admitted to the MSEM program. These students used to take undergraduate courses to fulfill the deficiency in statistics and/or engineering economics. The offering of EMGT 6965 will attract more students to join the

MSEM program to take the energy concentration, which will offset the potential impact to the other energy concentration courses.

e. Identify other areas of catalog copy that would be affected, including within other departments and colleges (e.g., curriculum outlines, requirements for the degree, prerequisites, articulation agreements, etc.)

The other areas will not be affected.

III. RESOURCES REQUIRED TO SUPPORT PROPOSAL.

When added resources are not required, indicate "none". For items which require "none" explain how this determination was made.

A. PERSONNEL. Specify requirements for new faculty, part-time teaching, student assistants and/or increased load on present faculty. List by name qualified faculty members interested in teaching the course(s).

EMGT 6101 Engineering Management Fundamentals will be taught by an adjunct or a full-time SEEM faculty member. All SEEM faculty would qualify to teach this course. EMGT 6965 Energy Analytics will be taught by Dr. Tao Hong, who was recently hired by EPIC to lead the area of energy analytics. There is no other increased load due to the addition of the new concentration, because the only new course in this concentration is EMGT6965, which will be taught by Dr. Tao Hong.

B. PHYSICAL FACILITY. Is adequate space available for this course?

YES.

C. EQUIPMENT AND SUPPLIES: Has funding been allocated for any special equipment or supplies needed?

N/A.

D. COMPUTER. Specify any computer usage (beyond Moodle) required by students and/or faculty, and include an assessment of the adequacy of software/computing resources by available for the course(s).

The proposed courses do not have any special computer requirements. Existing Mosaic Computing labs will be utilized when needed to support teaching.

E. AUDIO-VISUAL. If there are requirements for audio-visual facilities beyond the standard classroom podiums, please list those here.

All engineering management courses are offered both in on campus and online formats. Williams States Lee College of Engineering has already invested in online learning infrastructure. EPIC

building has several online delivery capable classrooms. Most recently Cameron 101, 154 and 213 have been equipped with lecture capture capability as well.

F. OTHER RESOURCES. Specify and estimate cost of other new/added resources required, e.g., travel, communication, printing and binding.

N/A.

G. SOURCE OF FUNDING. Indicate source(s) of funding for new/additional resources required to support this proposal.

EMGT 6101 Engineering Management Fundamentals will be taught in Summers and the cost will be covered by the Extended Academic Programs. EMGT 6965 Energy Analytics will be taught by Dr. Tao Hong, who was recently hired by EPIC to lead the area of energy analytics.

IV. CONSULTATION WITH THE LIBRARY AND OTHER DEPARTMENTS OR UNITS

A. LIBRARY CONSULTATION. Indicate written consultation with the Library Reference Staff at the departmental level to ensure that library holdings are adequate to support the proposal prior to its leaving the department. (Attach copy of ***Consultation on Library Holdings***).

See Appendix.

B. CONSULTATION WITH OTHER DEPARTMENTS OR UNITS. List departments/units consulted in writing regarding all elements outlined in IIC: Impact Statement, including dates consulted. Summarize results of consultation and attach correspondence. Provide information on voting and dissenting opinions (if applicable).

No consultation was done as the courses are not expected to impact other departments.

V. INITIATION, ATTACHMENTS AND CONSIDERATION OF THE PROPOSAL

A. ORIGINATING UNIT. Briefly summarize action on the proposal in the originating unit including information on voting and dissenting opinions.

Offering the new energy concentration course EMGT 6965 was proposed by SEEM graduate program director and EPIC associate Dr. Tao Hong and supported by EPIC director Dr. Johan Enslin and SEEM interim chair Dr. Ertunga Ozelkan.

The other changes such as the new bridge course EMGT 6101 and changes in the admission criteria was approved by SEEM faculty via email on Nov 19, 2013. The addition of the new concentration was approved by SEEM faculty via email on Jan 3, 2014.

B. CREDIT HOUR. **(Mandatory if new and/or revised course in proposal)** Review statement and check box once completed:

☒ The appropriate faculty committee has reviewed the course outline/syllabus and has determined that the assignments are sufficient to meet the University definition of a credit hour.

C. ATTACHMENTS.

1. CONSULTATION: Attach relevant documentation of consultations with other units.

N/A

2. COURSE OUTLINE/SYLLABUS: For undergraduate courses attach course outline(s) including basic topics to be covered and suggested textbooks and reference materials with dates of publication. For Graduate Courses attach a course syllabus. Please see Boiler Plate for Syllabi for New/Revised Graduate Courses.

See Appendix.

3. PROPOSED CATALOG COPY: Copy should be provided for all courses in the proposal. Include current subject prefixes and course numbers, full titles, credit hours, prerequisites and/or corequisites, concise descriptions, and an indication of when the courses are to be offered as to semesters and day/evening/weekend. Copy and paste the current catalog copy and use the Microsoft Word "track changes" feature (or use red text with "~~strikethrough~~" formatting for text to be deleted, and adding blue text with "underline" formatting for text to be added).

a. For a new course or revisions to an existing course, check all the statements that apply:

____ This course will be cross listed with another course.
_X__ There are prerequisites for this course.
_X__ There are corequisites for this course.
____ This course is repeatable for credit.
____ This course will increase/decrease the number of credits hours currently offered by its program.
____This proposal results in the deletion of an existing course(s) from the degree program and/or catalog.

For all items checked above, applicable statements and content must be reflected in the proposed catalog copy.

2013-2014 Graduate Catalog

Department of Systems Engineering and Engineering Management
seem.uncc.edu

Graduate Program Director
~~Dr. Ertunga C. Ozelkan~~
Dr. Tao Hong

Graduate Faculty

Badrul Chowdhury, Professor
Alfred D'Ambrosio, Adjunct Professor
Tao Hong, Assistant Professor and Graduate Program Director
Churlzu Lim, Associate Professor
Mike Ogle, Assistant Professor and Undergraduate Program Director
Agnes Galambosi Ozelkan, Adjunct Professor
Ertunga C. Ozelkan, Associate Professor and ~~Director~~ Interim Department Chair
Srijib Mukherjee, Adjunct Professor
Yesim Sireli, Associate Professor
S. Gary Teng, Professor

Master of Science in Engineering Management

The Master of Science Degree in Engineering Management program prepares professionals for careers in managing projects, programs, systems, and organizations. Industrial, research, consulting, and commercial firms now demand engineering managers with both cutting-edge technical competence and the management skills necessary to forge linkages with the systems and business sides of these organizations. These managers must be able to form and manage high performance teams and manage business and technological operations. The program of study is necessarily multidisciplinary, combining elements of advanced study in various engineering disciplines with studies of business and system operations and organizational behavior.

Additional Admission Requirements

In addition to the general requirements for admission to the Graduate School, the Engineering Management program seeks the following from applicants to the M.S. in Engineering Management program:

1. 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

2. Undergraduate coursework in engineering economics, calculus, or statistics

3. An average grade of 3.0 (out of 4)

4. GRE or GMAT.

GRE Waiver conditions:

1. GRE is waived for applicants with more than 2 years of relevant industry experience and a bachelor's degree in engineering from a US ABET accredited school.
2. GRE is waived from applicants who have completed an SEEM Graduate Certificate Program with a GPA of 3.6 or higher.

Documents to be Submitted for Admission

1. Transcript(s) showing a baccalaureate degree in engineering, engineering technology, or a scientific discipline, or a baccalaureate degree in business administration from an accredited college or university
2. A satisfactory score on the General Test of the GRE or GMAT
3. Written descriptions of any relevant and significant work experience
4. Applicants whose native language is not English, will need to satisfy the UNC Charlotte Graduate School's English proficiency requirements.
5. ~~If the applicant's native language is not English, an overall score of 575 (paper-based test), 230 (computer-based test), or 90 (Internet-based test) in the Test of English as a Foreign Language (TOEFL)~~

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 ~~Civil, Electrical, Mechanical, or Systems~~ Engineering, or Engineering Technology at UNC Charlotte may be admitted to the M.S. in Engineering Management program as an Early-Entry student provided they meet all other requirement of admission except the first item of the admission requirements.

Entry From the SEEM Graduate Certificate Programs

SEEM Graduate certificate students can apply for admission for the MSEM Program. They will be eligible to transfer their graduate certificate course credits if they received a B or above. GRE will be waived for students who graduated from the SEEM Graduate Certificate Program with a GPA 3.6 or higher.

Degree Requirements

Thirty semester hours of approved graduate work within one of two options:

Option 1

Successful completion of 30 semester hours of graduate-level coursework.

Option 2

Successful completion of 24 semester hours of graduate-level coursework and 6 hours of thesis research.

The curriculum consists of six core courses and four additional courses (or two courses with the thesis option) selected from an approved list of electives. Students are expected to complete a Plan of Study that identifies a concentration such as Energy Systems, Systems Engineering, Lean Six Sigma, or Logistics and Supply Chains.

Students who do not have the required background in fundamental concepts in engineering economics and/or statistics will be required to take the following course on top of the 30 credits required for an MSEM degree.

- EMGT 6101 Engineering Management Fundamentals (Course credit does not count towards degree requirement)

Required Core Courses (12 hours)

- EMGT 6980 Industrial and Technology Management Seminars (1) *(EMGT students must earn three credits in this course, on-campus students need to register for 091, 092, and 093 sections sequentially, online students need to register 081, 082, and 083 sections sequentially)*

Core A - Systems Management

One to two courses from the following:

- EMGT 6142 Quality and Manufacturing Management (3)
- EMGT 6901 Advanced Project Management (3)
- EMGT 6904 Product and Process Design (3)
- EMGT 6920 Logistics Engineering and Management (3)
- EMGT 6924 Lean Six Sigma Practice and Management (3)
- EMGT 6930 Capital Cost Estimating (3)
- EMGT 6950 Engineering Systems Integration (3)
- ~~EMGT 6985 Engineering Management Project (3)~~

Core B - Systems Analytics

One to two 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)

Concentrations (12 credits)

Systems Analytics Concentration

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)

Energy Systems Concentration

- EMGT 5961 Introduction to Energy Systems (3)

Plus three of the following:

- EMGT 5962 Energy Markets (3)
- EMGT 5963 Energy Systems Planning (3)
- EMGT 5964 Case Studies in the Energy Industry (3)
- EMGT 6965 Energy Analytics (3)

Lean Six Sigma Concentration

- EMGT 6905 Designed Experimentation (3)

- EMGT 6924 Lean Six Sigma Practice and Management (3)
- EMGT 6926 Lean Supply Networks (3)

Plus one of the following:

- EMGT 6901 Advanced Project Management (3)
- EMGT 6904 Product and Process Design (3)
- EMGT 6142 Quality and Manufacturing Management (3)

Logistics and Supply Chains Concentration

- EMGT 6920 Logistics Engineering and Management (3)
- EMGT 6926 Lean Supply Networks (3)

Plus two of the following:

- EMGT 5963 Energy Systems Planning (3)
- EMGT 6142 Quality and Manufacturing Management (3)
- MBAD 6193 Global Business Environment (3)
- MBAD 6208 Supply Chain Management (3)

Note: Based on department approval, students may request to take other graduate courses related to their selected concentration. Students are responsible for fulfilling the prerequisites of the courses they plan to take from other graduate programs.

Interdisciplinary Elective Courses

Depending on the degree and concentration options selected, remaining credit hours may be filled by taking elective courses. Any course from the Engineering Management Program, including the ones below, may be taken as an elective course.

- EMGT 5090 Special Topics (3)
- EMGT 5150 Leadership For Engineers (3)
- EMGT 5961 Introduction to Energy Systems (3)
- EMGT 5962 Energy Markets (3)
- EMGT 5963 Energy Systems Planning (3)
- EMGT 5964 Case Studies in the Energy Industry (3)
- EMGT 6090 Financial Management for Global Engineering Operations (3)
- EMGT 6090 Special Topics (3)

- EMGT 6142 Quality and Manufacturing Management (3)
- EMGT 6901 Advanced Project Management (3)
- EMGT 6902 Legal Issues in Engineering Management (3)
- EMGT 6904 Product and Process Design (3)
- 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 6920 Logistics Engineering and Management (3)
- EMGT 6924 Lean Six Sigma Practice and Management (3)
- EMGT 6926 Lean Supply Networks (3)
- EMGT 6930 Capital Cost Estimating (3)
- EMGT 6950 Engineering Systems Integration (3)
- EMGT 6952 Engineering Systems Optimization (3)
- EMGT 6955 Systems Reliability Engineering (3)
- EMGT 6965 Energy Analytics (3)
- EMGT 6985 Engineering Management Project (3)

Two relevant graduate courses from other programs may be taken as elective courses for the engineering management degree with approval of the SEEM program. Courses completed from other departments as part of the M.S. concentrations count towards the two allowed electives. Students are responsible for fulfilling the prerequisites of the courses they plan to take from other graduate programs.

The following are recommended MBAD courses for electives:

- MBAD 6141 Operations Management (3)
- MBAD 6161 Human Behavior in Organizations (3)
- MBAD 6164 Executive Communications (3)
- MBAD 6195 Negotiation and Conflict Management (3)

Note: Students are required to have adequate preparation prior to taking the required MBAD (Master of Business Administration) courses. Traditionally, this consists of at least completing courses in engineering economics, foundations of economics, and mathematics through differential and integral calculus. Students are advantaged by having completed courses in foundations of accounting and statistics.

Admission to Candidacy Requirements

Each student is required to submit a Plan of Study to the Department's Graduate Director. Upon completion of a substantial amount of the graduate work, each student must file an Admission to Candidacy form to the Graduate School by the filing date specified in the University Calendar.

Application for Degree

Students preparing to graduate must submit an online Application for Degree by the filing date specified in the University Calendar. If a student does not graduate in the semester identified on the Application for Degree, then the student must update his/her Admission to Candidacy and submit a new Application for Degree for graduation in a subsequent semester.

PROPOSED CATALOG COPY OF COURSES

(Only affected course descriptions are listed below)

EMGT 6101: Engineering Management Fundamentals. (3) The main objective of this course is to cover fundamental skills for engineering managers in the area of engineering economics, probability and statistical analysis. The students will utilize spreadsheet models and statistical packages to apply these skills in the analysis of engineering management problems. Course credit does not count towards MSEM degree requirement. (On demand)

EMGT 6965: Energy Analytics. (3) Pre-or corequisite: EMGT 5961, or SEGR 4961, or STAT 5123, or ECON 6113, or consent of the instructor. Other recommended courses are EMGT 5962 and EMGT 5963. Energy analytics is an interdisciplinary area applying techniques and methodologies of engineering management, economics, statistics and electrical engineering to solve real-world analytical problems in the energy industry. This course is designed for current and future analysts, operators, planners and their managers in the energy industry. It covers major energy related applications of descriptive, predictive and prescriptive analytics. The topics include energy data analysis, load forecasting, price forecasting, renewable generation forecasting, energy trading and risk management, demand response and customer analytics, and utilities outage analytics. (On demand)

b. If overall proposal is for a new degree program that requires approval from General Administration, please contact the facultygovernance@uncc.edu for consultation on catalog copy.

N/A.

4. ACADEMIC PLAN OF STUDY **(UNDERGRADUATE ONLY)**: Does the proposed change impact an existing Academic Plan of Study?

☐ Yes. If yes, please provide updated Academic Plan of Study in template format.

☒ No.

5. STUDENT LEARNING OUTCOMES (UNDERGRADUATE & GRADUATE): Does this course or curricular change require a change in Student Learning Outcomes (SLOs) or assessment for the degree program?

☐ Yes. If yes, please provide updated SLOs in template format.

☒ No.

6. TEXTBOOK COSTS: It is the policy of the Board of Governors to reduce textbook costs for students whenever possible. Have electronic textbooks, textbook rentals, or the buyback program been considered and adopted?

☒ Yes. Briefly explain below.

☐ No. Briefly explain below.

Electronic textbooks are offered as options for many of the required texts. Based on the relative small quantity of required texts in the program, textbook rental is likely not available.
Most reading materials of EMGT 6965 are available in electronic format.

IMPORTANT NOTE: A Microsoft Word version of the final course and curriculum proposal should be sent to facultygovernance@uncc.edu upon approval by the Undergraduate Course and Curriculum Committee and/or Graduate Council chair.

Appendix: Syllabus for Proposed Courses

THE UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

The William States Lee College of Engineering
Engineering Management Graduate Program

EMGT 6101: Engineering Management Fundamentals

Course Description:

The main objective of this course is to cover fundamental skills for engineering managers in the area of engineering economics, probability and statistical analysis. The students will utilize spreadsheet models and statistical packages to apply these skills in the analysis of engineering management problems.

Communication Platform: The primary communication platform for this course is Moodle.

Office Hours: TBD in person, online or on the phone or by appointment.

Prerequisite: None.

Textbook: Systems Engineering with Economics, Probability and Statistics, C. Jotin Khisty
Jamshid Mohammadi, Adjo A. Amekudzi, 624 pages, Publisher: J. Ross Publishing; 2 edition (January 3, 2012), ISBN-10: 1604270551, ISBN-13: 978-1604270556

Supplementary Materials: Other handouts and materials will be provided through Moodle2.

Learning Objectives:

After completing the course, the students will be able to

1. Understand and apply fundamental engineering economics concepts with relevance to engineering management
2. Understand and apply fundamental probability concepts with relevance to engineering management
3. Understand and apply fundamental statistics concepts with relevance to engineering management

Course Contents & Tentative Schedule

No.	Discussion	Topics
1	Engineering Economics for Engineering Managers	Introduction to Engineering Management
2		Engineering Cost and Cost Estimation
3		Interest and Equivalence
4		Present Worth Analysis
5		Annual Cash Flow Analysis
6		Rate of Return Analysis
8	Probabilistic Analysis for Engineering Managers	Bayes Theorem
9		Probability Distributions
10		Goodness of Fit
11	Statistical Analysis for Engineering Managers	Descriptive Statistics
12		Confidence Intervals
13		Hypothesis Testing
14		Analysis of Variance
15		Regression & Correlation Analysis

Course Requirements and Assessment:

1. **Assignments**: Students will be required to do 5-6 assignments. Assignments must be returned on the specified due dates. Late submissions are not allowed. For some assignments students will be working in groups, but Individual Assignments should be completed independently. Students who are plagiarizing from other sources or handing in assignments identical or copied from others (except for assignments submitted as a group) will be violating scholastic honesty regulations and will not receive credit and will be subject to university's procedures and policies!

2. **Term Project**: The students will work in teams (2-3 people) on an applied or theoretical project topic related to engineering management fundamentals. Each team will write a proposal and a final report and present their work during the last week of the class. Specific interests of students related to their job or research work will also be taken into account. Each team needs to follow the due dates for the project milestones and provide their respective project deliverables as indicated in the course schedule above. The final deliverables are 1) soft copy of the final report, 2) soft copy of the final presentation, 3) presentation in the class.

3. **Class Attendance & Participation – Online Discussions**: For participation the students are expected to 1) post replies to at least 3 of the posted lecture discussion questions, 2) write a (constructive) comment for at least one of the other classmates' postings under at least two of the lecture discussion questions, and 3) follow-up with the questions and responses. These postings (except for follow-ups) should be substantial in content having at least 100 words each. Due date for the participation is within a week's time from the posting date of the lecture discussion questions. Late postings will not receive participation points.

4. **Due dates for deliverables**: The initial posted dates should be followed for deliverables unless they are changed by the instructor during the run of the course. Any change will be announced or indicated as the assignment is posted.

5. **Team Evaluations**: It is expected that each team member contributes to the group assignments and the term project. A team evaluation will be conducted for all group assignments and for the term project to ensure a balanced effort among the team members. In this evaluation each team member will evaluate themselves as well as the rest of the team members. The evaluations will be taken into account to identify the final grade for each team member at the end of the semester.

6. **Team Formation for group assignments**: For the group assignments and the project, we will form teams. If you have any preference please do let me know asap. I am going to facilitate the team formations taking into account your preferences. For this course, the recommended number of students in each team is 2-3.

Grading Policy:

Assignments	50%
Term Project	25%
Class Attendance & Participation	25%
Total	100%

Standard Grading Scale is: A: 90+, B: 80-89, C: 70-79, U: 0-69

The Code of Academic Integrity:

See UNCC Code of Student Academic Integrity at **http://www.legal.uncc.edu/policies/ps-105.html**

Appendix: Syllabus for Proposed Courses

THE UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

The William States Lee College of Engineering
Systems Engineering and Engineering Management

EMGT 6965: Energy Analytics

Course Description:

Energy analytics is an interdisciplinary area applying techniques and methodologies of engineering management, economics, statistics and electrical engineering to solve real-world analytical problems in the energy industry. This course is designed for current and future analysts, operators, planners and their managers in the energy industry. It covers major energy related applications of descriptive, predictive and prescriptive analytics. The topics include energy data analysis, load forecasting, price forecasting, renewable generation forecasting, energy trading and risk management, demand response and customer analytics, and utilities outage analytics.

Instructors: Prof. Tao Hong

Phone: (704) 687-1957 **E-mail**: tao.hong@uncc.edu

Office: CAR218, **Office Hours:** by appointment

Pre-or corequisite: EMGT 5961/SEGR 4961, or STAT 5123, or ECON 6113, or consent of the instructor.

Recommended: Students are encouraged to take SEGR 4962/EMGT 5962 Energy Markets, and SEGR 4963/EMGT 5963 Energy Systems Planning.

Textbook:
None.

References:
Rob J. Hyndman and George Athanasopoulos, "Forecasting: Principles and Practice", OTexts (available online: https://www.otexts.org/fpp)

Supplementary Materials:

1. Carl D. Meyer (2000) Matrix Analysis and Applied Linear Algebra. SIAM.
2. R. Lyman Ott and Michael T. Longnecker (2008) An Introduction to Statistical Methods and Data Analysis. Cengage Learning.
3. Michael Kutner, Christopher Nachtsheim, John Neter and William Li (2004) Applied Linear Statistical Models. McGraw-Hill/Irwin.

4. William W. S. Wei (2005) Time Series Analysis: Univariate and Multivariate Methods. Addison Wesley.
5. George Box, Gwilym M. Jenkins, and Gregory Reinsel (1994) Time Series Analysis: Forecasting and Control. Prentice Hall.
6. John C. Brocklebank, and David A. Dickey (2003) SAS for Forecasting Time Series. SAS Publishing.
7. H. Lee Willis (2002). Spatial Electric Load Forecasting. CRC Press.
8. Tao Hong (2008). Long Term Spatial Load Forecasting. M.S. thesis, NCSU.
9. Rafal Weron (2006). Modeling and Forecasting Electricity Loads and Prices: A Statistical Approach. Wiley.
10. Tao Hong (2010). Short Term Electric Load Forecasting. Ph.D. dissertation, NCSU.
11. James W. Taylor, Lilian M. de Menezes, Patrick E. McSharry (2006). A comparison of univariate methods for forecasting electricity demand up to a day ahead. International Journal of Forecasting.
12. Shu Fan and Rob J. Hyndman (2012). Short-term load forecasting based on a semi-parametric additive model. IEEE Transactions on Power Systems.
13. Shu Fan, K. Methaprayoon, and Wei-Jen Lee (2009). Multiregion load forecasting for system with large geographical area. IEEE Transactions on Industry Applications.
14. H. S. Hippert, C. E. Pedriera and R. C. Souza (2002). Neural networks for short-term load forecasting: A review and evaluation. IEEE Transactions on Power Systems.
15. Bo-Juen Chen, Ming-Wei Chang and Chih-Jen Lin (2004). Load forecasting using support vector Machines: a study on EUNITE competition 2001. IEEE Transactions on Power Systems
16. Tao Hong, Jason Wilson and Jingrui Xie (2014). Long term probabilistic load forecasting with hourly information. IEEE Transactions on Smart Grid.
17. Rob J. Hyndman and Shu Fan (2010). Density forecasting for long-term peak electricity demand. IEEE Transactions on Power Systems.
18. Pierre Pinson, Christophe Chevallier, George N Kariniotakis (2007). Trading wind generation from short-term probabilistic forecasts of wind power. IEEE Transactions on Power Systems
19. C Monteiro, R Bessa, V Miranda, A Botterud, J Wang, G Conzelmann (2009). Wind power forecasting: state-of-the-art 2009. Argonne National Laboratory.
20. Tao Hong, Shu Fan and Pierre Pinson (2014). Global Energy Forecasting Competition 2012. International Journal of Forecasting.

Lecture notes and other reading materials will be provided through the course website on Moodle2.

Learning Objectives:

Upon completion of the course the students will be able to:

1. Understand basic concepts of analytics, including descriptive analytics, predictive analytics and prescriptive analytics;
2. Understand applications of Analytics in the energy industry;
3. Know how to use advanced statistical or mathematical software such as SAS, R or other commercial packages for energy Analytics;
4. Know how to apply exploratory data analysis to energy data;
5. Know how to develop load, price, wind and solar forecasts;
6. Know how to accommodate forecast errors during unit commitment and economic dispatch practice;
7. Know how to make trading decisions under uncertainties of energy forecasts.

Course Contents & Tentative Schedule

	Topic	**Week**
1	Greetings; Basic concepts of Analytics	1
2	Introduction to energy analytics	2
3	Describing and visualizing the energy data	3
4	Forecasting and optimization	4
	EXAM 1	5
5	Energy forecasting I: load forecasting	6
6	Energy forecasting II: price forecasting	7
7	Energy forecasting III: wind forecasting	8
8	Energy forecasting IV: solar forecasting	9
	EXAM 2	10
9	Energy trading and risk management	11
10	Emerging topics I: demand response and customer analytics	12
11	Emerging topics II: utilities outage analytics	13
12	Overview of energy analytics	14
	TERM PROJECT FINAL PRESENTATION	

Course Requirements and Assessment:

1. **Assignments**: Students will be required to do 5 assignments. Assignments must be returned on the specified due dates. Late submissions will not receive credits. For some assignments students will be working in groups, but individual assignments should be completed independently. Students who are plagiarizing from other sources or handing in assignments identical or copied from others (except for assignments submitted as a group) will be violating scholastic honesty regulations and will not receive credit and will be subject to university's procedures and policies!

2. **Term Project**: The students will work in teams (2-3 people) on an applied or theoretical project topic related to energy analytics. Each team will write a proposal and a final report and present their work during the last week of the class. Specific interests of students related to their

job or research work will also be taken into account. Each team needs to follow the due dates for the project milestones and provide their respective project deliverables as indicated in the course schedule above. The final deliverables are 1) soft copy of the final presentation, 2) presentation in the class (an online synchronous session will be scheduled for this-details will follow), 3) soft copy of the final report,

3. **Exams**: There will be two exams. Exam 1 is a take-home written exam to be completed individually. Exam 2 is a take-home written exam to be completed by each project team as a group effort.

4. **Class Attendance & Participation – Online Discussions**: For participation the students are expected to reply to questions/discussion questions every week 1) post replies to each posted lecture discussion question every week, 2) write a follow-up (constructive) comment for at least one of the other classmates' postings every week, and 3) follow-up with the questions and responses every week. These postings (except for follow-ups) should be substantial in content having at least 100 words each. Due date for the participation is within a week's time from the posting date of the lecture discussion questions. Follow-up comment should be within 10 days time from the posting date of the lecture discussion questions. Late postings will not receive participation points.

4. **Due dates for deliverables**: The dates above should be followed for deliverables unless they are changed by the instructors during the run of the course. Any change will be announced or indicated as the assignment is posted.

5. **Team Evaluations**: It is expected that each team member contributes to the group assignments and the term project. A team evaluation will be conducted for all group assignments and for the term project to ensure a balanced effort among the team members. In this evaluation each team member will evaluate themselves as well as the rest of the team members. The evaluations will be taken into account to identify the final grade for each team member at the end of the semester.

6. **Team Formation for group assignments**: For the group assignments and the project, we will form teams. If you have any preference, please send your request to Prof. Tao Hong by **the end of the fourth week of the semester**. Your preferences may be taken into account when formulating the project teams. For this course, the recommended number of students in each team is 2-3.

Grading Policy:

Assignments	20%
Exam 1	20%
Exam 2	20%
Term Project	20%
Class Attendance & Participation	20%

Total	100%

Standard Grading Scale is: A: 90+, B: 80-89, C: 70-79, U: 0-69

Terms and Conditions:

1. The standards and requirements set forth in this syllabus may be modified at any time by the course instructor. Notice of such changes will be by announcement in class, or by written or email notice, or by changes to this syllabus posted on the course website on Moodle2.
2. Students in this course seeking accommodations to disabilities must first consult with the Office of Disability Services and follow the instructions of that office for obtaining accommodations.
3. All students are required to abide by the UNC Charlotte Sexual Harassment Policy and the policy on Responsible Use of University Computing and Electronic Communication Resources. Sexual harassment, as defined in the UNC Charlotte Sexual Harassment Policy, is prohibited, even when carried out through computers or other electronic communications systems, including course-based chat rooms or message boards.
4. All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are set forth in the Code. The Code is available from the Dean of Students Office or online.
5. Faculty may ask students to produce identification at examinations and may require students to demonstrate that graded assignments completed outside of class are their own work.

Appendix: Library Consultation

UNCCHARLOTTE

J. Murrey Atkins Library

Consultation on Library Holdings

To: **Ertunga C. Ozelkan**

From: **Alison Bradley**

Date: **1/8/13**

Subject: **MSEM Curriculum Revisions**

Summary of Librarian's Evaluation of Holdings:

Evaluator: **Alison Bradley** **Date:** **12/2/13**

Check One:

1. Holdings are superior _____
2. Holdings are adequate __x__
3. Holdings are adequate only if Dept. purchases additional items. _____
4. Holdings are inadequate _____

Comments:
Library holdings should be adequate to support student research for both courses proposed in this curriculum revision (see list of items held by subject heading below). Students will have access to relevant databases including Compendex, Inspec, IEEE Xplore, Business Source Complete, and many others.

LC Subject Heading	Books	Journals
Systems Engineering	1800	103
Engineering Management	771	63
Electric Power Production	227	30
Engineering Statistical methods	96	4

Alison Bradley

_____

Evaluator's Signature

12/2/13

_____

Date