



UNC CHARLOTTE

Office of the Chancellor

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August 29, 2012

Dr. Chris Brown
Vice President for Research and Graduate Education
General Administration
University of North Carolina
Post Office Box 2688
Chapel Hill, North Carolina 27515-2688

Dear Dr. Brown:

Enclosed is UNC Charlotte's updated request for authorization to plan a M.S. in Applied Energy and Electromechanical Systems. The enclosed request has been revised to meet the requirements of the newly established academic program review and approval process. This program will offer innovative opportunities to meet current technology needs and will prepare students to enter the energy sector workforce while closely aligning with the work in our new Energy Production and Infrastructure Center (EPIC) building.

Thank you for your consideration of this request. Provost Joan Lorden or I would be pleased to respond to any questions that you may have.

Cordially,

A handwritten signature in cursive script, appearing to read "Phil".

Philip L. Dubois
Chancellor

cc: Provost Joan F. Lorden
Dean Robert Johnson

APPENDIX A
UNIVERSITY OF NORTH CAROLINA
REQUEST FOR AUTHORIZATION TO PLAN
A NEW DEGREE PROGRAM

THE PURPOSE OF ACADEMIC PROGRAM PLANNING: Planning a new academic degree program provides an opportunity for an institution to make the case for need and demand and for its ability to offer a quality program. The notification and planning activity to follow do not guarantee that authorization to establish will be granted.

Date: August 30, 2012

Constituent Institution: The University of North Carolina at Charlotte

CIP Discipline Specialty Title: Energy Management and Systems Technology

CIP Discipline Specialty Number: 15.0503 Level: B M C.A.S.

Exact Title of the Proposed Program Applied Energy and Electromechanical Systems

Exact Degree Abbreviation (e.g. B.S., B.A., M.A., M.S., C.A.S.): M.S.

Does the proposed program constitute a substantive change as defined by SACS? Yes No

The current SACS Substantive Change Policy Statement may be viewed at:
<http://www.sacscoc.org/pdf/081705/Substantive%20Change%20policy.pdf>

If yes, please briefly explain.

As required by the Policy Statement on Substantive Change for Accredited Institutions of the Commission on Colleges, the University of North Carolina at Charlotte (UNC Charlotte) is required to submit a letter of notification prior to implementation for new degree programs. Notification of this new degree program will be provided to SACS after approval by the University of North Carolina Board of Governors and prior to implementation.

Proposed date to establish degree program: August year 2013

1. **Describe the proposed new degree program. The description should include:**
 - a. **a brief description of the program and a statement of educational objectives**

The Department of Engineering Technology and Construction Management (ETCM) proposes the creation of an Applied Energy and Electromechanical Systems (MSEEM) degree program to prepare graduates to work in the energy and power industries. Students will be given a solid background in energy production and generation, power transmission and conversion, systems dynamics, and mechatronics.

The program will consist of a 15-credit hour common core and a capstone experience comprised of either a sequence of 15-credit hours of major electives or a sequence of 6-credit hours of major elective courses, a 3-hour Research and Analytical Methods course and a formal 6-credit hour graduate research thesis. The 30-credit hour degree program is outlined below:

Common Core Courses (15-credit hours)

ENER 6120	Energy Generation and Conversion	3 credit hours
ENER 6135	Energy Transmission and Distribution	3 credit hours
ENER 6150	Systems Dynamics	3 credit hours
ENER 6170	Applied Mechatronics	3 credit hours
*ETGR 5272	Engineering Analysis IV	3 credit hours

Students select major elective courses from the following list:

*CMET 5270	Operation of Constructed Facilities	3 credit hours
*CMET 6130	Building Information Modeling	3 credit hours
*CMET 6140	Building Energy Management	3 credit hours
*CMET 6155	Facility Instrumentation and Controls	3 credit hours
*ENER 5250	Analysis of Renewable Systems	3 credit hours
*ENER 5260	Hydrogen Production and Storage	3 credit hours
*ENER 5275	Air Conditioning Systems	3 credit hours
*ENER 5280	Fuel Cell Technologies	3 credit hours
*ENER 5285	Applied Noise and Vibration Control	3 credit hours
ENER 5290	Advanced Instrumentation	3 credit hours
ENER 6000	Special Topics in Applied Energy or Electromechanical Systems	1-3 credit hours
ENER 6220	High Voltage Technology	3 credit hours
ENER 6235	Advanced Transmission	3 credit hours
ENER 6260	Computation Fluid Dynamics for Energy Applications	3 credit hours
ENER 6270	Dynamic Systems Control and Design	3 credit hours
ENER 6800	Independent Study	1-3 credit hours

Coursework Sequence (15-credit hours)

Major Electives (5)	15 credit hours
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Master's Thesis and Research Sequence (15-credit hours)

Major Electives (2)	6 credit hours	
*CMET6160	Research and Analytical Methods	3 credit hours
ENER 6900	Master's Research and Thesis	6 credit hours

*Denotes existing courses in the Department.

Program Educational Objectives: The Department of Engineering Technology and Construction Management is committed to providing the environment and expertise to ensure that its graduates make substantive contributions in their professional endeavors after graduation, both in the areas of technical proficiency and community involvement. Accordingly, the MSEEM program alumni will contribute to society as productive technical professionals and engaged citizens by:

1. Applying general and discipline-specific concepts and methodologies to identify, analyze, and solve technical problems.
2. Articulating technical material in a professional manner to potentially diverse audiences and in a variety of circumstances.
3. Contributing within team environments, demonstrating ethical, respectful and professional behavior in all associations.

4. Recognizing and appreciating the environmental, societal and fiscal impact of the technical professions in a local, national and global context.
5. Demonstrating an individual desire and commitment to pursue continuous self-improvement and lifelong learning.

b. the relationship of the proposed new program to the institutional mission

The proposed graduate program meshes nicely with the institutional mission and strategic plan. It fits well with the mission of the new Energy Production and Infrastructure Center (EPIC). As the third graduate level program to be housed in the Department of Engineering Technology and Construction Management (ETCM), the program will increase the ability of the ETCM Department and its faculty to become active participants in the institutional goal of raising the University's graduate research and scholarly profile.

The UNC Charlotte mission statement reads, "UNC Charlotte is North Carolina's urban research university. It leverages its location in the state's largest city to offer internationally competitive programs of research and creative activity, exemplary undergraduate, graduate, and professional programs..."

In their mission statement, the William States Lee College of Engineering "provides quality educational experiences and discovers and disseminates knowledge that serves the citizens and industries of local, national and international communities."

The Department mission statement indicates that our "programs exist to serve the citizens of North Carolina and the industries in this region and beyond by supplying highly competent" graduates. The proposed program is positioned to support the Department, College and University missions by providing intellectual capital and by educating North Carolina citizens to meet the challenges of the region, state and nation.

c. the relationship of the proposed new program to existing programs at the institution and to the institution's strategic plan

The proposed MSEEM is a new program which includes development of four new courses (12 credits) in the core curriculum and as well as additional electives. Currently, 33 credit hours of courses already exist to serve the program. Other elective courses will be developed to meet student and industry needs. The proposed program will be located in the Department of Engineering Technology and Construction Management, and will serve students graduating from the Department's existing BSET in Electrical Engineering Technology (ELET) and Mechanical Engineering Technology (MET) programs.

This graduate program could also accommodate students graduating from the College of Engineering's Mechanical (ME), Computer Engineering (CpE), and Electrical Engineering (EE) programs. It is also anticipated that working professionals from local and regional industries seeking to maintain or upgrade their job skills will also avail themselves of the program as will graduates of other MET, ELET, ME, CpE, and EE programs throughout the Southeast.

The proposed MSEEM program contributes to all goals of the Department's 2010-2015 Strategic Plan as listed below. In particular, the proposed program contributes

to Goal 1 of the Department's strategic plan, which is to add/develop graduate level programs in niche areas. Opportunities for substantive contributions in student leadership and professional development, along with increased faculty participation in centers as additional research is initiated may also be realized through the proposed program. Additionally, the MSEEM program will be a major contribution to Goal 5 of the Department's strategic plan, which is the planned development of a School of Technology with graduate level programs.

GOAL #1: Add/Develop graduate level programs in niche areas to develop and extend the research capacity of the School. (as funding support is provided)

- A. Implement and grow MS in Construction & Facilities Management program (2011-15).
- B. Implement and grow Master of Fire Protection & Administration program (2011-15).
- C. Plan/Add MS in Energy & Electromechanical Systems (2011-13)
- D. Plan/Add PhD in Interdisciplinary Integrated Technologies or similar title (2014-15)

GOAL #2: Foster and further develop culture of excellence for our programs, students, faculty and staff.

- A. Obtain a successful ABET reaccreditation during 2010-2011.
- B. Enhance student leadership, professional development and community service opportunities within the School.
- C. Promote staff excellence through training and communication of expectations.
- D. Promote faculty excellence through incentives and expectations for excellence.
- E. Increase faculty participation in Centers in the COE and University.
- F. Partner with other entities in COE to enlarge the Industrial Solutions Laboratory to promote and facilitate further faculty and industry collaboration.
- G. Provide adequate facilities to support expanding program offerings and facilitate applied research and outreach missions of the School.
 1. Modify/Renovate Smith Building to provide adequate support for current and planned programs for short term (2010-2015)
 2. Plan new facility to support growing School as part of CRI Campus (2015)

GOAL #3: Continuing with sustainable infrastructure theme, add new and/or restructure existing undergraduate programs, tracks and/or options in specific niche areas of Applied Design & Integrated Technologies to 1) foster economic growth and development in the greater Charlotte region and the State of North Carolina, and 2) provide our students with the education and skills necessary for success in a global workplace. (as funding support is provided)

GOAL #4: Increase the quantity, quality, and diversity of students studying in the School.

GOAL #5: Establish School to house existing programs and proposed programs outlined in the strategic plan. Preliminary name for the School is Applied Design & Integrated Technologies.

This plan has been reviewed at various stages of development and endorsed by our stakeholders.

d. **special features or conditions that make the institution a desirable, unique, or cost effective place to initiate such a degree program**

The UNC Charlotte William States Lee College of Engineering is home to the Energy Production and Infrastructure Center (EPIC) which has a mission to “enhance the available technical workforce, advance technology, and facilitate strategic industry-university collaboration for the global energy industry while supporting the Carolinas’ economic and energy security development.” The proposed MS program in Applied Energy and Electromechanical Systems aligns with and supports the mission of EPIC by providing a program to prepare students to enter the energy sector workforce and a graduate program to support energy-related research. UNC Charlotte would be the only institution in the UNC system with an energy-focused graduate degree program.

2. **Provide documentation of student demand and evidence of the proposed program’s responsiveness to the needs of the region, state, or nation.**

It is estimated that initial enrollments will range from 5 to 15 students depending upon timing of approval and subsequent recruiting efforts. With reasonable marketing and brand development, enrollments are expected to increase to 25 to 30 full-time students and another 5 to 15 part-time students within a few years. These estimates are considered conservative given the high demand for technical energy specialists and the popularity of similar programs across the nation. The size of the Charlotte metropolitan area, coupled with the large energy hub located here provides unique opportunities for a Master of Science in Applied Energy and Electromechanical Systems.

Graduates of the proposed program, which is inherently multidisciplinary in nature, will fill the types of positions that will benefit the surrounding industrial community and the economy of the entire country. The energy generation/distribution industry, with large companies such as Duke Energy, Siemens, General Electric, Shaw and Areva, relies on graduates that understand the link between mechanical work and electrical energy production. Graduates of the program will understand the mechanisms for coupling those two domains and with the energy production and distribution methodologies. Technical positions in energy product design and development, system integration, field installation and commissioning will need graduates who understand the interface between the electrical and mechanical domains, as well as the hands on, applied type of research experience our graduates will have the opportunity to complete as a part of their studies. Additionally, the aerospace economy, increasingly prevalent in the Carolinas, will employ these graduates. Complex aviation systems used in aircraft production, deployment of aircraft, fleet operations and repair/ maintenance operations will require graduates with a multidisciplinary approach to solving problems presented by complex systems. Graduates of the program will also be employed in numerous industrial capacities that require a multidisciplinary approach to solving problems and implementing solutions presented by complex electro-mechanical and mechatronic systems.

3. **List all other public and private institutions of higher education in North Carolina currently operating programs similar to the proposed new degree program. Identify opportunities for collaboration with institutions offering related degrees and discuss what steps have been or will be taken to actively pursue those opportunities where appropriate and advantageous.**

Currently, there are no institutions in North Carolina offering graduate degree programs in Applied Energy Systems or Electro-Mechanical Systems.

4. **Are there plans to offer all or a portion of this program to students off-campus or online?** No

Note: If a degree program has not been approved by the Board of Governors, its approval for alternative, online, or distance delivery is conditioned upon BOG program approval. (400.1.1[R], page 3)

5. **Estimate the total number of students that would be enrolled in the program during the first year of operation: *Full-Time* 12 *Part-Time* 6**

Estimate the total number of students that would be enrolled in the program during the fourth year of operation: *Full-Time* 24 *Part-Time* 10

6. **Will the proposed program require development of any new courses** Yes **If yes, briefly explain.**

Significant coursework for the proposed degree currently exists at UNC Charlotte. Thirty-three credit hours of core and elective courses exist to support this program. The degree leverages existing coursework within the MS Construction & Facilities Management program and other existing energy-related courses in the Department. The following new graduate level courses (12 credits) will be created and developed as part of the core requirements:

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

In addition, the following new elective courses are planned for development to supplement existing core and elective courses in the Department and meet the needs of our students, industry partners and curriculum objectives:

ENER 5290: Advanced Instrumentation	3 credit hours
ENER 6220: High Voltage Technology	3 credit hours
ENER 6235: Advanced Transmission	3 credit hours
ENER 6260: Computational Fluid Dynamics for Energy Applications	3 credit hours
ENER 6270: Dynamic Systems Control and Design	3 credit hours

7. **Will any of the resources listed below be required to deliver this program? (If yes, please briefly explain in the space below each item, and state the source of the new funding and resources required.)**

a. **New Faculty:** Yes No

It is anticipated that this new enrollment stream will warrant the addition of four new faculty members over the next four years to adequately deliver the program. Faculty in the Electrical and Mechanical Engineering Technology programs will be added through the campus' faculty line allocation process. These positions will be justified through enrollment growth and student credit hour production targets being met. Additionally, research capability and production will increase as new faculty and graduate students are added.

b. Additional Library Resources: Yes _____ No X

Current monograph and journal holdings are adequate to support a portion of the proposed program. Library holdings related to energy infrastructure and production are currently being purchased to support graduate level research and with the addition of resources added through the allocation of funds for EPIC research, sufficient resources will be available by the time that the program begins. Available databases include: IEEE Xplore, ACM DigitalLibrary, and Compendex.

Program faculty will work with the EPIC director and the Engineering Librarian to identify additional books, periodicals, publications, databases and electronic resources appropriate for support of the program. Funding already in place has been designated to bolster holdings to a level deemed appropriate by the library and faculty. Ongoing support for the resources described will be provided via normal operating procedure.

c. Additional Facilities and Equipment: Yes _____ No X

The proposed MSEEM program will share facilities with the existing Construction Management, Civil, Electrical and Mechanical Engineering Technology programs in the Smith Building. Laboratories currently exist to support fluid mechanics, stress analysis, thermodynamics, electronics, power, programmable logic control, and instrumentation and controls experimentation. Existing facilities are adequate to support the on-campus program at commencement and during the next decade.

d. Additional Other Program Support: Yes X No _____
(for example, additional administrative staff, new Master's program graduate student assistantships, etc.)

Current administrative support staff levels in the Department are adequate to support the program; however, an additional technical support staff member will be required to support additional laboratory needs and efforts. This position will be provided internally through academic affairs allocation process. With respect to student assistantship support, it is anticipated that master's program student assistantships for this program will be provided internally through the UNC Charlotte Graduate School in relative alignment with other programming on campus.

8. For graduate programs only:

a. Does the campus plan to seek approval for a tuition differential or program specific fee for this new graduate program? Yes _____ No X

The College of Engineering (COE) at UNC Charlotte has graduate student tuition differential in place for all COE graduate programs as shown in the tuition and fee schedule below. We will request same structure for this program. The tuition increment for a full-time graduate student is \$900 and is incremented for part-time students based on number of credit hours as shown in the following table:

UNC CHARLOTTE - LEE COLLEGE OF ENGINEERING				
	0 - 2 Credit Hour	3 - 5 Credit Hour	6 - 8 Credit Hour	9+ Credit Hour
Tuition NC Resident	\$491.25	\$982.25	\$1,473.50	\$1,964.50
Tuition Non-Resident	\$2,027.00	\$4,054.00	\$6,081.00	\$8,108.00
Tuition Increment	\$225.00	\$450.00	\$675.00	\$900.00

Ed & Tech Fee	\$53.25	\$53.25	\$100.25	\$200.50
General Fee	\$311.75	\$311.75	\$601.75	\$988.00
ID Fee	\$6.00	\$6.00	\$6.00	\$6.00
UNC System Assoc Fee	\$0.15	\$0.15	\$0.25	\$0.50
Transportation Fee	\$15.00	\$15.00	\$15.00	\$15.00
Total Cost –NC Resident	\$1,102.40	\$1,818.40	\$2,871.75	\$4,074.50
Total Cost – Non-Resident	\$2,638.15	\$4,890.15	\$7,479.25	\$10,218.00

b. If yes, state the amount of tuition differential or fee being considered, and give a brief justification. N/A

9. For doctoral programs only: N/A

10. List the names, titles, e-mail addresses and telephone numbers of the person(s) responsible for planning the proposed program.

Anthony Brizendine, Professor and Department Chair
 Engineering Technology & Construction Management
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Nan Byars, Professor and Coordinator
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Deborah Sharer, Associate Professor and Coordinator
 Electrical Engineering Technology Program
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 704-687-3484

This request for authorization to plan a new program has been reviewed and approved by the appropriate campus committees and authorities.

Chancellor Philip Rubin Date 9/5/12