**COMMISSION ON COLLEGES**

**SOUTHERN ASSOCIATION OF COLLEGES AND SCHOOLS**



**SUBSTANTIVE CHANGE PROSPECTUS**

**UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE**

**MASTER OF SCIENCE IN APPLIED ENERGY AND ELECTROMECHANICAL SYSTEMS (MSEEM)**

|  |  |
| --- | --- |
| **Name of Institution:**  University of North Carolina at Charlotte | |
| **Location:**  9201 University City Blvd., Charlotte, NC 28223 | |
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**Abstract**

In 1965, the North Carolina legislature approved bills creating the University of North Carolina at Charlotte (UNC Charlotte), the fourth campus of the statewide university system. In 1969, the University began offering programs leading to master’s degrees. In 1992, it was authorized to offer programs leading to doctoral degrees.

UNC Charlotte serves as North Carolina’s urban research university and the only doctoral research university in the Charlotte area. It is the fourth largest of the 16 institutions within the University of North Carolina system. The University comprises seven professional colleges and currently offers 19 doctoral programs, 64 master’s degree programs, and 86 bachelor’s degrees. More than 900 full-time faculty members comprise the University’s academic departments and the 2013 fall enrollment exceeded 26,000 students. UNC Charlotte is committed to expanding graduate education options to serve the greater Charlotte region.

During a series of legislative sessions between 2008 and 2011, UNC Charlotte and the UNC Board of Governors requested and received allocations totaling $76 million from the North Carolina General Assembly to plan and build a University-owned Energy Production and Infrastructure Center (EPIC) Building on the Charlotte Research Institute campus. Construction of the facility began in 2010 and was completed in July 2012. An additional $5M in recurring operating funds was also provided by the Legislature while approximately $17M in gifts from industry has been received to date in support of the EPIC initiative.

In September 2013, the UNC System Board of Governors approved the Master of Science in Applied Energy and Electromechanical Systems (MSEEM) degree program at UNC Charlotte to begin as early as January 2014.

The MSEEM program will serve a broad group of students, many of whom are expected to have graduated from one of the Department of Engineering Technology and Construction Management’s (ETCM) existing baccalaureate programs, such as Electrical Engineering Technology (ELET) and Mechanical Engineering Technology (MET). The graduate program will also be attractive to students with undergraduate degrees in Mechanical Engineering (ME), Computer Engineering (CpE) and Electrical Engineering (EE). The MSEEM will be the first applied interdisciplinary masters level program in energy and electromechanical systems in the UNC system and, as such, it is anticipated this program will be attractive to local professionals and undergraduates as a means of continuing their education with an energy or electromechanical emphasis. 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 20 to 30 full-time students and another 5 to 15 part time students within the first few years. These estimates are considered conservative given the high demand for technical energy specialists and the expected popularity of this program.

Student enrollments are expected to begin first summer term 2014, pending approval from SACS. The MSEEM program will be delivered in traditional on-campus, in-class format on the main campus on an ongoing basis with a fall, spring and summer course schedule.

**Background Information**

The University of North Carolina at Charlotte (UNC Charlotte) has been a constituent institution of the University of North Carolina since the North Carolina General Assembly initially established the state [University system in 1965.](file:///C:\Users\crobi112\Desktop\Evidence\NCGA%201965.pdf) [Section 116-4](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\General%20Statute%20116-4%20Composition%20of%20University%20of%20NC.pdf) of the General Statutes of North Carolina establishes UNC Charlotte as one of 16 baccalaureate degree-granting institutions that, along with the North Carolina School of Science and Math, a high school for gifted students, comprise the University of North Carolina (UNC). The authority to plan and develop a coordinated system of higher education in North Carolina is vested in the UNC Board of Governors (the trustees of the University of North Carolina). [Section 116-11](file:///F:\MSEEM%20Supporting%20Documentation\General%20Statute%20116-11%20Powers%20and%20Duties%20of%20BOG.pdf) of the General Statutes authorizes the UNC Board of Governors to determine the functions, educational activities, and academic programs of the constituent institutions and to determine the types of degrees to be awarded. UNC Charlotte is authorized by the UNC Board of Governors to offer baccalaureate, master’s, and doctoral degrees and post-baccalaureate and post-master’s certificates.

UNC Charlotte provides educational opportunities to residents of the largest metropolitan area in North Carolina and is located in one of the fastest growing energy hubs in the country. Charlotte is home to 240 companies that employ about 27,000 workers in Charlotte’s energy sector.

The MSEEM 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) building. 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 UNC Charlotte’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 ETCM Department mission statement indicates that “our programs serve the citizens and industries of North Carolina and support the global workforce of the 21st century by supplying highly competent, liberally educated, technically capable graduates.” The MSEEM 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. Furthermore, this program will address industry workforce needs in the energy sector.

The U.S. Department of Energy August 2006 report to the U.S. Congress, [*Workforce Trends in the Electric Utility Industry*](file:///F:\MSEEM%20Supporting%20Documentation\Workforce_Trends_Report_090706.pdf) emphasized the necessity of power engineering education as well as expressing concern of the availability of educators to meet future demands. This fact, in conjunction with the focus of engineering education to satisfy the short-term application focus of industry, yielded the conclusion “To foster innovation to keep the United States on the forefront of technological advancement and to maintain our leadership position amidst international competition, strong support of strategic research at universities is critical.” An October 17, 2012, memorandum from the Electricity Advisory Committee provided numerous recommendations that the Department of Energy, in conjunction with other federal agencies, industry stakeholders, and academic institutions may adopt to optimize efforts in addressing challenges in the development and maintenance of an educated and effective workforce.

The Department of Energy report concludes “Despite industry’s apparent ability to meet short-term workforce demand on the applications side, the decline in support for basic power systems research and education is of concern. It is an engine for innovation, exploration and ingenuity, and is necessary for sustaining scientific advancement to maintain our competitive position in the world. In addition, due to the reticence in the electric industry, incremental decisions usually last 30-40 years, requiring a broader, long-term perspective. Thus the public-private partnerships should be considered to keep America’s power research capabilities strong and secure.” The unique combination of the status of Charlotte as an energy hub, the existence of EPIC on the UNC Charlotte campus and the MSEEM program will provide this critical public-private partnership for both educational and research endeavors.

The mission of EPIC, as articulated by its director, is to “enhance the available technical and business workforce, advance energy technology, and facilitate strategic industry-university collaboration for the global energy industry while supporting the Carolinas’ economic and energy security development.” The MSEEM 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. In September 2013, the UNC System Board of Governors approved the MSEEM for delivery at UNC Charlotte. With this approval, UNC Charlotte is the only institution in the UNC system to offer an applied energy-focused graduate degree program.

**Assessment of Need and Program Planning/Approval**

As North Carolina’s urban research university, UNC Charlotte’s mission is to address the cultural, economic, educational, environmental, health, and social needs of the greater Charlotte region. To fulfill that mission, the University must engage the working professionals of North Carolina’s largest city. For the Division of Academic Affairs this means offering access to a portfolio of educational programs that is forward-looking and responsive to the intellectual, cultural, and economic needs of the region. One example of that forward-looking programming is the Energy Production and Infrastructure Center (EPIC) at UNC Charlotte.

The MSEEM program described herein will be one component of the broad-based commitment to energy education by the University of North Carolina at Charlotte and the William States Lee College of Engineering. As previously described, the State of North Carolina provided $76M in funding for a new EPIC Building and $5M in continuing operating funds while industry partners have provided an additional $17M in gifts. In addition, the University has upgraded other facilities supporting energy education in the College of Engineering through renovation projects.

This program will prepare graduates to work in the energy and power industries, as well as provide an important resource for applied energy-related research. The MSEEM will help to meet the educational and workforce needs of Charlotte’s growing and thriving power and energy related industries by presenting a multidisciplinary approach to problem solving and implementation of complex energy, electromechanical and mechatronic systems.

*Assessment of Need*

A number of large energy-based companies have major facilities located in the Charlotte area including: Duke Energy, the nation’s largest electric utility; CB&I (formerly The Shaw Power Group); AREVA; Siemens; Westinghouse; Fluor; Toshiba; Babcock & Wilcox; Saertex USA: and Celegard. According to Jeff Merrifield, Senior Vice President of CB&I, “A lot of companies are coming from around the country and around the world, placing facilities here and creating a network…” (Charlotte Chamber of Commerce, News 14)

Growth in Charlotte’s energy sector has accelerated recently, and the MSEEM will help to meet increasing needs for specially trained technical employees. Merrifield states, “In the case of The Shaw Group, 5 years ago we had 40 people here in town and today we have about 1110.” According to Mark Pringle of Siemens Energy, “We just announced we’re adding gas turbine to our manufacturing and service capabilities here and we're going to build a 450,000 sq. ft. addition to the factory and hire over 1,000 people in the next 4 years.” He adds, “I think it started with Duke Energy and they brought in some of their suppliers who came here and then Siemens, who was here, decided to make our hub in North America and we just keep building off each other.” (News 14)

The Charlotte area is also home to nearly 100 renewable energy and energy efficiency businesses, and this portion of the energy sector is expected to grow as well. Since 2004, the North Carolina General Assembly has passed about 70 renewable energy and energy efficiency bills, resulting in more than 1,130 sustainable energy business employing 10,250 people. (*Charlotte Business Journal*)

According to the 2012 [Charlotte Major Employers Directory](file:///F:\MSEEM%20Supporting%20Documentation\MajorEmployers2012.pdf), “Charlotte was recently dubbed ‘The New Energy Capital’ by Duke Energy and peer *Fortune 500* firms because of significant investment in recent years by energy environmental sector companies.”

This robust climate of growth for energy and power-based industry in the Charlotte region made UNC Charlotte an ideal fit for the MSEEM program. UNC Charlotte’s Department of Engineering Technology and Construction Management (ETCM) has provided quality technical education for over 30 years. ETCM programs have met rigorous standards for specialized accreditation, and have a long history of supplying graduates for the greater Charlotte region and throughout North Carolina. A large number of the departmental faculty has significant industrial and research expertise that will ensure the delivery of a technically robust and industrially relevant program. The MSEEM program will enhance the Department’s outreach and integration with the community, enlarge its scholarly research capacity, and produce much needed graduates for Charlotte’s growing energy sector.

Currently, there are no programs like the MSEEM in North Carolina; i.e., none specifically in energy or electromechanical in the CIP code designation of the MSEEM. According to industry executives, Charlotte will thrive as an energy hub only if a ready pool of talent is available to the energy industries in the state. Clearly, some of those needs are being met with programming in traditional engineering and technology disciplines, but those needs will be more thoroughly met with additional programming and graduate study in targeted energy programs. A substantial recent investment in EPIC by UNC Charlotte, the state and industry was underpinned by the need for such programming. EPIC was formed to meet these needs and to create the programming necessary to sustain Charlotte and North Carolina as energy leaders in the US. The addition of this applied energy and electromechanical systems program, complemented by a new program in electrical power systems at North Carolina State University (2011), and an existing renewable energy concentration at Appalachian State University, will certainly move North Carolina toward meeting this clear gap in technical education of energy professionals.

Graduates of the MSEEM program will fill 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, CB&I 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 electromechanical and mechatronic systems.

*Program Planning*

Within Academic Affairs, all departments complete [five-year strategic plans](file:///F:\MSEEM%20Supporting%20Documentation\2010-2015%20Strategic%20Plan%20Template.pdf) that address outcomes based on strategic goals linked to institutional goals (Section III of departmental Strategic Plans entitled “New Strategic Goals, Action Plans, and Performance Outcomes”). These reports include action plans to achieve goals (Section C), effectiveness measures and methods to assess outcomes and goal attainment (Section D), assessment schedules (Section E), and performance outcomes (Section G). Progress is annually reported toward the accomplishment of each strategic plan by completing the annual progress and assessment of performance outcomes (Section I) and follow-up plans to make changes as a result of assessment findings (Section J). In addition to the strategic plan, colleges and departments submit an [Annual Report](file:///F:\MSEEM%20Supporting%20Documentation\2011-12%20Annual%20Report%20Template.pdf) which highlights the major accomplishments for the year.

The ETCM Department’s [2012-2013 Annual Progress Plan](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\2012-13%20ETCM%20Annual%20Report2.pdf) includes the MSEEM program addressed in this prospectus. The proposed MSEEM program contributes to several of the goals of the ETCM Department’s 2010-2015 Strategic Plan which are 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 with graduate level programs.

The MSEEM program also supports the Academic Affairs goal of “offering a portfolio of educational programs” and the University goal of “delivering high quality, affordable, and effective educational programs that produce educated and responsible citizens and a competitive workforce”. The ETCM Department goals are listed below:

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)

* Implement and grow MS in Construction & Facilities Management program (2011-15).
* Implement and grow Master of Fire Protection & Administration program (2011-15).
* Plan/Add MS in Energy & Electromechanical Systems (2011-13).
* Plan PhD in Interdisciplinary Technologies or similar title or partner to become participants in an existing Interdisciplinary PhD program (2014-15).

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

* Obtain a successful ABET reaccreditation during 2010-2011.
* Enhance student leadership, professional development and community service opportunities within the School.
* Promote staff excellence through training and communication of expectations.
* Promote faculty excellence through incentives and expectations for excellence.
* Increase faculty participation in Centers in the COE and University.
* Partner with other entities in COE to enlarge the Industrial Solutions Laboratory to promote and facilitate further faculty and industry collaboration.
* Provide adequate facilities to support expanding program offerings and facilitate applied research and outreach missions of the School.
* Modify/Renovate Smith Building to provide adequate support for current and planned programs for short term (2010-2015)
* Plan new facilitate 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 and its goals was reviewed at various stages of development and endorsed by our stakeholders, including department and program Industrial Advisory Boards, alumni and employers.

With respect to the MSEEM program, the ETCM Department Chair and Program Coordinators from ELET and MET led the effort to submit the intent to plan, request to establish and develop the curriculum proposal. The curriculum and courses were developed by ETCM faculty with input from industry advisory groups. Relevant components from the Department’s existing master’s programs were incorporated where appropriate and faculty members associated with these programs were engaged accordingly. Colleagues from the Departments of Electrical and Computer Engineering and Mechanical Engineering and Engineering Science were consulted to ensure programs being developed are complimentary and not duplicative.

*Program Approval*

The approval process for graduate courses establishes the review procedures for all new and modified courses. This process begins with review and approval at the departmental level, proceeds through collegiate curriculum committees and deans before reaching the Graduate Council; this is a subcommittee of the Faculty Council and consists entirely of faculty. The Graduate Council is also responsible for ensuring the quality and content of the curriculum, as well as the resulting course and [curriculum approvals](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\MSEEM%20Long%20Form%20Signature.pdf). Finally, any proposals to establish new courses or programs (or modification of existing courses or programs) are reviewed by the Faculty Executive Committee and the Faculty Council for approval and implementation consideration. The UNC Charlotte [Graduate Council approved](file:///F:\MSEEM%20Supporting%20Documentation\Request%20to%20establish%20a%20MS%20Applied%20Energy%20%20Faculty%20Governance.pdf) the MSEEM program on 5/30/2013.

This program received input from faculty, administrators and industry boards at UNC Charlotte throughout the development of the proposal. In addition to the UNC Charlotte campus review process, the UNC System approval process now involves distribution of proposed new graduate programs to all institutions in the UNC System for review and comment prior to action by the UNC System Board of Governors. Comments, suggestions and questions received during this review process were addressed and incorporated at each step of the review process. The UNC System [Board of Governors approved](file:///F:\MSEEM%20Supporting%20Documentation\BOG%209-12-13%20Approval.pdf) the MSEEM program on 9/13/2013.

In summary, the approval process for this proposal included formal review and input from the many in faculty governance, industry and UNC System board and campus review groups. A brief overview of the reviews and approvals are as follows:

Curriculum Proposal Reviews by Faculty Governance and Industry Advisors at UNC Charlotte

ETCM Department Curriculum Committee: Approved November 17, 2011

Industry Advisory Board: Approved December 8, 2011

College of Engineering Academic Policy & Curriculum Committee: Approved April 6, 2012

College of Engineering Graduate Committee: Approved April 6, 2012

UNC Charlotte Graduate Council: Approved May 30, 2013

UNC System Approvals

Intent to Plan document submitted to UNC System General Administration: October 19, 2011

Revised Intent to Plan submitted to UNC System General Administration: September 10, 2012

Intent to Plan approved by to UNC System General Administration: November 29, 2012

Request to Establish submitted to UNC System General Administration: February 7, 2013

UNC System 16-campus External Review Comment / Response Period: Summer 2013

Revised Request to Establish submitted to UNC System GA: July 30, 2013

UNC System Board of Governors Education Planning Committee Review: September 12, 2013

UNC System Board of Governors: Approved September 13, 2013

**Description of the Change**

The MSEEM is designed to serve students who have graduated from the Department’s existing undergraduate programs, with particular synergies for alumni of the BSET in Electrical Engineering Technology (ELET) and Mechanical Engineering Technology (MET) programs. This graduate program will also accommodate students graduating from the William States Lee College of Engineering Mechanical Engineering (ME), Computer Engineering (CpE), and Electrical Engineering (EE) programs. It is 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 Student Learning Outcomes (SLOs) for the program are in alignment with other graduate programs in the William States Lee College of Engineering and focus on competencies in advanced topics in engineering/technology as well as the ability to effectively communicate technical information. The [SLOs and the assessment plan](file:///F:\MSEEM%20Supporting%20Documentation\MSEEM%20SLO%20Assessment%20Plan.pdf) for the program are included.

This 30-credit hour MS program consists of a 15-credit-hour common core and options for either thesis or non-thesis. The core of the program will provide competencies in mechatronics and system dynamics, along with a broad introduction into the areas of renewable energy, power engineering (generation, conversion and transmission), energy efficiency and sustainability. Elective courses may be selected from a broad range of topics from among: renewable energy systems, HVAC systems, fuel cell technologies, hydrogen production and storage, noise and vibration control, high voltage transmission, advanced transmission, advanced instrumentation, CFD for energy applications, dynamic systems control and design, building information modeling, building energy modeling, facility instrumentation and controls, operation of constructed facilities, directed study in either electromechanical systems or applied energy, and various other energy-related courses across the university.

Table 1 indicates anticipated course offerings for the new program. Courses indicated with an asterisk constitute the MSEEM core requirements. Additional courses will be developed and offered as interest and demand warrants.

**Table 1. Schedule of Anticipated Course Offerings**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Number** | **Course Title** | **Fall 2014** | **Spring 2015** | **Summer 2014** | **\*\*On Demand** |
| CMET 5270 | Operation of Constructed Facilities |  | X |  |  |
| CMET 6130 | Building Information Modeling |  | X |  |  |
| CMET6140 | Building Energy Management | X |  |  |  |
| CMET 6155 | Facility Instrumentation and Controls |  |  |  | X |
| CMET 6160 | Research and Analytical Methods | X | X |  |  |
| ENER 5140 | Energy Management |  | X |  |  |
| ENER 5250 | Analysis of Renewable Systems |  | X |  |  |
| ENER 5275 | Air Conditioning Systems | X |  |  |  |
| ENER 5285 | Applied Noise and Vibration Control |  | X |  |  |
| ENER 5290 | Advanced Instrumentation |  |  |  | X |
| ENER 6000 | Special Topics in Energy /Electromechanical Systems |  |  |  | X |
| \*ENER 6120 | \*Energy Generation and Conversion | X |  |  |  |
| \*ENER 6135 | \*Energy Transmission and Distribution |  | X |  |  |
| \*ENER 6150 | \*System Dynamics | X |  |  |  |
| \*ENER 6170 | \*Applied Mechatronics |  | X |  |  |
| ENER 6220 | High Voltage Technology |  |  |  | X |
| ENER 6235 | Advanced Transmission |  |  |  | X |
| ENER 6260 | CFD for Energy Applications |  |  |  | X |
| ENER 6270 | Dynamic Systems Control & Design |  |  |  | X |
| ENER 6800 | Independent Study |  |  |  | X |
| ENER 6900 | Research and Thesis | X | X | X |  |
| \*ETGR 5272 | \*Engineering Analysis IV |  |  | X |  |

*\*Required Core (Core courses, ENER 6120, 6135, 6150 and 6170 are being taught this academic year AY13-14.*

*\*\*Courses listed as On Demand will generally be offered every third or fourth semester on a rotating basis or less frequently based upon demand.*

*\*\*\*All CMET and ETGR courses have been delivered previously.*

*Program Admissions and Graduation*

Requirements for admission and graduation are consistent with other master’s programs in the ETCM Department and are in alignment with the requirements of the UNC Charlotte Graduate School. Applicants must possess a bachelor’s degree or its equivalent from a regionally accredited college or university (or the equivalent of a regionally accredited college or university if the degree was earned at a foreign institution), an overall grade point average of at least a 3.0 (based on a 4.0 scale) for all work attempted after high school, and provide a statement of purpose, three recommendations, and official transcripts from all higher education institutions attended. Students must also be in good standing at the last higher education institution attended. To graduate, students must complete at least one-third of credits toward a graduate degree to be earned through instruction offered at the University. A master’s student is expected to satisfactorily complete a minimum of 30 semester hours of approved graduate level courses. Also, no more than six semester hours of graduate transfer credit may be applied toward the degree.

*Definition of A Credit Hour*

The course and curriculum development process is governed by the [Standing Rules of the Faculty Council](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Standing%20Rules%20of%20the%20Faculty.pdf). Faculty members in academic departments develop and complete appropriate course short forms for new courses and revisions to courses. As part of the proposal, faculty is asked to provide a [draft catalog copy](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Faculty%20Governance%20-%20New%20Course%20Proposals.pdf) for the course which includes the amount of credit to be awarded. Graduate faculty must also submit a [draft course syllabus](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Graduate%20School%20Syllabus%20Guidelines.pdf) that includes the number of credits. The departmental and collegiate curriculum committees are responsible for verifying the credit hours for new courses and revisions to courses based on documentation of the amount of work expected by faculty in the class.

Existing and new courses represent best practices of credit calculations nationwide by following the federal definition of Carnegie Units. It is recommended that faculty members include the [Suggested Standard Syllabus Policies](file:///F:\MSEEM%20Supporting%20Documentation\Suggested%20Standard%20Syllabus%20Policies.pdf) (p. 2). All departments are required to verify that the credit awarded for new courses conform to federal and Commission policy and will indicate such through a checkbox on the [Short Form](file:///F:\MSEEM%20Supporting%20Documentation\Short%20Form.pdf) (p.4) Course and Curriculum Proposal and [Long Form](file:///F:\MSEEM%20Supporting%20Documentation\Long-Form.pdf) (p.5) Course and Curriculum Proposal.

*Program Oversight*

The MSEEM program will be administered by the Department of Engineering Technology and Construction Management (ETCM). Each graduate program within ETCM has a Program Director who administers the program and reports to the Department Chair. The Department Chair has ultimate responsibility for programs within the Department, reporting to the Dean of the William States Lee College of Engineering, who in turn reports to the Provost.

At the University of North Carolina at Charlotte, the Dean of the Graduate School is the administrative officer with primary responsibility for the supervision of graduate programs. The Dean is responsible for the executive and administrative affairs of the Graduate School in accordance with policies determined by the UNC Charlotte Graduate Council, the graduate faculty, and the Faculty Council. The Graduate School is responsible for monitoring the quality of graduate programs, the final admission of graduate students, appointments to the Graduate faculty, and the enhancement of research activities essential to the conduct of graduate programs.

**Faculty**

Initially, all faculty members directly involved in the MSEEM program will be full-time faculty members from the Department of Engineering Technology and Construction Management (ETCM) in the William States Lee College of Engineering. The ETCM faculty is an interdisciplinary group of faculty consisting of members with education and expertise spanning the following disciplines: mechanical, electrical, energy, power, construction, civil, chemical, environmental, and fire protection.

The ETCM faculty is composed of 35 full-time faculty members and several part-time faculty members. Generally, only full-time graduate faculty will teach in the new MSEEM program. Therefore, both the number and percentage of full-time faculty is adequate to perform the basic functions of the academic programs. The graduate faculty members expected to teach in this proposed program are identified in the [faculty roster](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Proposed%20MSEEM%20Roster%2014-15rev1.pdf) and it demonstrates that faculty possess the required credentials or demonstrated competencies and achievements to teach in in the MSEEM program. [Descriptions for all courses](file:///F:\MSEEM%20Supporting%20Documentation\Course%20Descriptions.pdf) taught by MSEEM program faculty during the previous academic year (AY12-13 to include Fall 2012/Spring 2013 semesters) are provided**.** Course descriptions for the new ENER courses in the MSEEM degree are also included for convenience.

All courses listed with the CMET prefix are taught by current CIET/CM faculty. The MS in Construction and Facilities Management, for which the CMET courses have been developed and delivered, has been in existence since Fall 2011. Courses with the ENER prefix will be taught by CIET, CM, ELET or MET faculty as appropriate based on course content and faculty expertise. Multiple faculty members have the experience and expertise to teach each of these courses and the load will be distributed to achieve equitable workloads. The standard teaching load in ETCM for tenured and tenure-track faculty is typically three courses per semester unless release time is granted for administrative duties or buyouts for research. The Department has several full-time lecturers available to teach undergraduate courses. Only faculty members currently holding graduate faculty status will be assigned courses in the MSEEM program. There will be no negative impact on faculty load with the initiation of the MSEEM, as three additional full-time tenure-track faculty positions and some part-time funding have been programmed at the university level within the first four years to accommodate the expected growth of the program. In addition, the ETCM Department is currently searching for a tenure-track faculty member in the energy area to fill a vacant position.

**Library and Learning Resources**

The primary library facility will be the [J. Murrey Atkins Library](file:///F:\MSEEM%20Supporting%20Documentation\J.%20Murrey%20Atkins%20Library.pdf) on the UNC Charlotte main campus. The Atkins Library facilities contain approximately 285,000 square feet, most of which is devoted to the Library’s million-volume collection. The Library’s main collections consist of materials in many formats, the most important of which include:

Books and bound journals: Over 1,087,000

Current unique serial titles: 47,000

Licensed databases 350

Ebooks 55,000

The Atkins library has 87 employees, including 30 faculty members and 57 support staff.

The library has seating capacity for over 3,000 students, and there are 31 group study rooms that allow students to work privately on collaborative projects. The library currently has 558 computers, laptops, and servers in use by faculty, staff and students. The print collections are housed in open stacks and students have access to the collection during all the hours the library is open (24/5 while classes are in session).

A full range of research and instructional services is available to all engineering students, faculty, and staff, including research assistance, assistance with electronic databases and other scientific and technical resources, classroom and one-on-one library instruction, collection development, and literature searching. MSEEM students will have access to research assistance either in person, or by phone, chat, text or email from the subject librarian as well as the general reference staff. The [subject librarian](file:///F:\MSEEM%20Supporting%20Documentation\Subject%20librarian.pdf) provides research consultations, citation assistance, and general instruction in literature searching and other research skills, both individually and in the classroom. Library staff members who can assist with access to and use of library resources are available at all times that the library is open. During most of the semester, additional support with general library inquiries and research assistance is available 24 hours a day via a state-wide chat consortium. Online [research guides](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Library%20-%20Research%20Guides.pdf) are provided for 24 hour support with using many of the institution’s electronic resources.

Current monograph and journal holdings are adequate to support the implementation of the MSEEM program as determined by the library staff. Significant holdings supporting the primary research areas for the program (see the results of a current catalog search by subject heading below) are shown in Table 2 below.

**Table 2. Library Holdings for the MSEEM primary research areas**

|  |  |  |  |
| --- | --- | --- | --- |
| **LC Subject Heading** | **Books/Government Documents** | **eBooks** | **Journals** |
| Power Resources | 1239 | 349 | 247 |
| Electric Power | 1732 | 790 | 164 |
| Electric Power Plants | 401 | 101 | 50 |
| Electric Power Distribution | 222 | 132 | 20 |
| Electric Power Systems | 615 | 352 | 42 |

Additional materials related to energy infrastructure and production are currently being purchased to support graduate level research, using the funds allocated to the library to support the research agenda of the Energy Production & Infrastructure Center. Program faculty will work with the EPIC director and the subject librarian to identify books, periodicals, publications, databases, and other resources appropriate for support of the program. The library’s participation in an interlibrary loan consortium provides another means of effectively supporting research and instructional needs.

The library provides access to a range of engineering-related online databases, including Engineering Village (Compendex and Inspec), IEEE/IEE Electronic Library, ASTM Digital Library, ASME Digital Library, the ASCE Digital Library and CEDB, the Proquest Science and Technology Collection, ScienceDirect, IngentaConnect, and ISI Web of Knowledge. We also provide access to databases in related subject areas, including ACM Digital Library, ACS Web Editions and Journal Archives, Avery Index to Architectural Periodicals, GeoRef, Institute of Physics Package Z (comprehensive), IOP Historic Archive, MathSciNet, Royal Society of Chemistry Pkg. B, and SciFinder Web. A substantial collection of relevant eBooks is available, including CRC Engineering Handbooks, the MIT Press eBooks Library from IEEE, the Synthesis Digital Library, and the Elsevier 2013 eBook series, plus their Legacy collection in Materials Science.

Students in the MSEEM program will also have access to the following:

* Space for quiet as well as group study in the library, William States Lee College of Engineering (COE) buildings and research laboratories;
* COE computing laboratories in all COE buildings (at least one computing lab in each building available 24x7), wireless access in all COE buildings for personal computer use, networked and/or stand-alone computers in research laboratories; and
* University networked computers and wireless access across the UNC Charlotte campus.

*Use of Technology*

Multiple UNC Charlotte departments are involved in fostering, training, and supporting the use of technology to enhance student learning. The primary mission of the Center for Teaching and Learning (CTL) is to help faculty develop meaningful and pedagogically sound approaches to their teaching. The Center provides professional development workshops, software, and support to allow faculty to teach effectively with technology. Working in conjunction with the Center are the [Information and Technology Services Departments (ITS),](file:///F:\MSEEM%20Supporting%20Documentation\Information%20&%20Technology%20Services%20-%20Departments.pdf) the Atkins Library and IT departments in each of the colleges.

ITS provides both the [software](file:///F:\MSEEM%20Supporting%20Documentation\Information%20&%20Technology%20Services%20-%20Lab%20Software.pdf) and the [training](file:///F:\MSEEM%20Supporting%20Documentation\Information%20&%20Technology%20Services%20-%20Online%20Training.pdf) for students to make the best use of the extensive technology resources available on campus. In addition, a wide variety of professionally developed training courses are provided through the [Skillport System](file:///F:\MSEEM%20Supporting%20Documentation\Information%20&%20Technology%20Services%20-%20Skillport.pdf). The Atkins Library Information Commons (IC) staff provides online resources and classes for students in the Library. The curriculum ranges from foundational instruction for the first-year writing program to differentiated instruction in upper-level and graduate courses. The college IT groups provide dedicated local support for faculty and students to help them make the best use of the technology in discipline-specific ways. Assistance provided by the college IT groups includes helping faculty find pedagogically appropriate technologies for their classroom instruction, tailoring computer labs to specific instructional needs, and assisting students with their needs.

The William States Lee College of Engineering (COE) [MOSAIC](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Mosaic%20Computing.pdf) computing service administers and maintains laboratories and software utilized by COE students, faculty and staff. MOSAIC also maintains a suite of remote access computers, has negotiated a wide range of software at free or low cost, and maintains a Personal Computer Support (PCS) group to assist with numerous services for students, faculty and staff for personally owned laptops or desktop systems.

The [Office of Classroom Support](file:///F:\MSEEM%20Supporting%20Documentation\Office%20of%20Classroom%20Support.pdf) provides support for the video conferencing and teleclass facilities that support both traditional educational programs and distance learning programs, and state-of-the-art technology for the classrooms on campus and ensures that faculty have access to modern tools such as smartboards and video capture.

ITS and the Center for Teaching and Learning provide a comprehensive suite of online technology resources that support instruction on campus, online, and through distance education. The principle vehicle for this delivery is our Learning Management System (LMS). This integrated platform (Moodle) is the center point for the delivery of technology in support of teaching. Every student enrolled at the University automatically has access to Moodle. In addition, the LMS is the single point of entry for other important learning tools such as Video Content Management, Document Collaboration, Secure Testing, Synchronous Learning (Wimba), integrated response systems (clickers) and plagiarism detection.

**Student Support Services**

The [Graduate School’s](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Graduate%20School%20website.pdf) role is to foster excellence in all dimensions of post-baccalaureate studies as the primary advocate for graduate education and for graduate students at the University. It administers student admissions, financial aid, orientation, professional development, student mentoring, peer advising, funding support, and training for Teaching Assistants.

* The Graduate School strategically plans, implements, and evaluates services and programs to facilitate student enrollment and success. This unit collaborates with many offices in Academic Affairs, such as Financial Aid, Residency Determination and the Registrar’s Office, to facilitate seamless services for graduate students. The Graduate School also coordinates with graduate program directors in each program to ensure that admitted students receive the faculty support needed to be successful.
* The [Center for Graduate Life](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Center%20for%20Graduate%20Life%20website.pdf) provides graduate students with centralized space dedicated to their needs and creates a stronger graduate community by promoting shared experiences, discourse, and activities designed to support interdisciplinary learning. Professional development courses and workshops which are provided support the development of “core competencies” in teaching, research, writing, leadership and ethics of graduate students. Mentoring support, teaching assistant training, and personal development programs are also offered through the Center.
* Consistent with the institution’s mission of promoting student learning and development of its students, the [Graduate and Professional Student Government](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Graduate%20&%20Professional%20Student%20Government%20website.pdf) works closely with the Assistant Dean for Student Affairs in the Graduate School to promote student self-governance and student leadership.

The Graduate School partners with many units on campus to offer services that enrich and support the graduate student community. Working with offices in the Division of Academic Affairs and the Division of Student Affairs, students have access to a broad range of services that support their educational experience and success. Examples of university level student support programs, services, and activities that support student learning and success include, but are not limited to:

* The [Counseling Center](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Counseling%20Center%20website.pdf) provides individual, couples, and group counseling services, consultation, and outreach to all students. Periodic support groups for doctoral or master’s students working on terminal papers is also offered. Psychiatric services are available through referrals to the Student Health Center.
* [Dean of Students Office](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Dean%20of%20Students%20Office.pdf) manages a variety of activities such as women’s programs, new student programs, volunteer outreach, student conduct, off-campus student services, SAFE mentoring program, sorority and fraternity life, Niner Nation Family program, and veteran students outreach.
* [Disability Services](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Disability%20Services%20website.pdf) ensures access to academic programs and campus facilities by providing verification of medical documentation, academic accommodations, counseling, testing, note-taking, and scholarships.
* [Office of International Programs](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\International%20Programs%20website.pdf) works with international students and scholars, and organizes activities related to acclimating to an American model of higher education. International graduate students benefit from specialized orientations and trainings, coordinated through this office.
* [Multicultural Academic Services](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Multicultural%20Academic%20Services%20website.pdf) Office is committed to assisting traditionally underrepresented populations in the awareness and availability of academic support services.
* [Residency Determination Office](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Residency%20Determination%20Office%20website.pdf) assigns residency classifications and responds to student inquiries.
* [University Career Center](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\University%20Career%20Center%20website.pdf) offers career assessment, internships, co-ops, service-learning, job preparation, and job interview opportunities. This center connects industry and community partners with graduate students in a variety of ways.
* [University Center for Academic Excellence](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\University%20Center%20for%20Academic%20Excellence%20website.pdf) offers activities such as tutoring, supplemental instruction, academic success workshops, peer mentoring, academic success seminars, a learning lab, and individual consultations, all to support the effort to retain and graduate students.
* [Writing Resources Center](file:///C:\Users\sdicken7\Downloads\MSEEM%20Supporting%20Documentation\Writing%20Resources%20Center%20website.pdf) offers one-to-one writing instruction in writing across the disciplines from first-year to graduate, presentations, and workshops. Consultations, on-line services, and a library of writing-related instructional materials are also available. The WRC hires graduate students as tutors, helping to meet the need for advanced writing assistance.

**Physical Resources**

The MSEEM program will share facilities with the existing Construction Management, Civil, Electrical, Fire Safety and Mechanical Engineering Technology programs in the Smith Building on the UNC Charlotte main campus. Some two dozen instructional and research laboratories currently exist to support fluid mechanics, stress analysis, thermodynamics, electronics, power (generation, transmission and distribution), programmable logic control, and instrumentation and controls experimentation, among others.   In addition, the program will have access to the EPIC laboratory facilities.  Space for graduate students is currently available to support the program. Existing facilities and services are adequate to support the on-campus program at commencement and during the next decade.  This includes laboratory, faculty and student space.

All electrical/electronic laboratories include multiple bench top setups that include 60MHz dual channel digital storage oscilloscopes, 20MHz 2-channel function generators, multiple dc power supplies, multimeters, variable components and protoboards. In addition to educational purposes, these labs are intensively used for building and testing of signal conditioning circuits, instrumentation, computer-based communication with instruments, data acquisition and physical system control, using principally National Instrument Data Acquisition devices and LabView software. Specialized equipment for microprocessor/microcontroller experimentation and development includes logic analyzers and Field Programmable Gate Arrays (FPGAs). Additional equipment, in terms of digital spectrum analyzers, 100MHz oscilloscopes and advanced function generators are available for advanced undergraduate/ graduate level experimentation and application development.

Allen-Bradley Programmable Logic Controllers (PLCs) utilizing RSLogix provide an industry standard interface in the automation of electromechanical processes and allows development of control strategies for a myriad of physical and industrial systems. In addition to the existing custom designed Water Transfer System unit and PLC trainer boards, the current Department of Labor Mission Critical Operator project allocates funds for the purchase of additional equipment which may include robotic arms and scale versions of industrial assembly lines for on-site and remote control applications. NI ELVIS II boards provide a design and prototyping platform for development of application oriented instrumentation and control systems. An NI PXI system with signal generators, digitization and switching board modules incorporated in the base chassis is in development to support research efforts. Industry standard NI Multisim and Labview software are available through MOSAIC to all faculty and students in the William States Lee College of Engineering. Upon simulation and verification, double sided prototype circuit boards can be fabricated in house through the printed circuit board fabricating system.

The Power Laboratory allows for simulation of transmission lines, a 300W power electronics servo machine test system, as well as bench top systems for three phase power supply, power semiconductor devices, switched mode power supplies, DC and AC asynchronous and induction machines, stepping and linear motors. Research efforts will be enhanced by a 10kV high voltage amplifier, electrometer, and a 400V electrostatic voltmeter.

The Stress Analysis, Instron & MTS Laboratories include test equipment to perform nondestructive testing and failure mode testing for numerous physical and material properties. This facility contains four 30,000 lb hydraulically loaded universal testing machines (UTM) and an Instron electronic screw driven UTM with two electric load cells having load capacities of 22,000 and 200 lb. An MTS unit with capability to perform cyclic loadings in consort with an environmental chamber for broad range of temperature control is available. These facilities also contain strain gage extensometers, transmission polar scope, a rotating beam fatigue tester, a heat treat furnace, spray booth /fume hood, and various other equipment.

The Fluid Mechanics laboratory provides equipment to investigate the fundamental principles of fluid mechanics, as applied to static equilibrium, internal and external flow, pumps and hydrostatic transmissions. The laboratory is equipped with an array of experimental equipment including multiple hydraulic benches, a hydrostatic test bench, and bench-scale apparatus suitable for experimental verification of theoretical principles. A large scale flow device for simulating open channel flow, two centrifugal fans with controls, a fluid power test stand including dynamometer, viscometers, hydrometers, vacuum pumps, transducers and associated amplifier and read-out systems.

The Thermodynamics/Heat Transfer/Building Systems Laboratory houses devices such as a vapor compression cycle trainer, transparent 4-stroke engine demonstrator, steam cycle demonstrator and steady-state linear heat transfer trainer to measure and analyze principles of heat transfer and thermodynamics. These capabilities, in addition to the building systems laboratory will allow demonstration of basic theory and practical applications of heating, ventilation, air conditioning, plumbing and electrical systems.

The Hydrogen and Fuel Cell Laboratory houses two fuel cell test stations, one for low temperature Polymer Electrolyte Membrane (PEM) fuel cells and one for high temperature Solid Oxide fuel cells (SOFC). In addition the lab has all necessary materials and supplies to perform experimentation and testing, including materials for single PEM and SOFC membranes, cathodes, anodes, seals and other components to assemble the fuel cells, supply of hydrogen, air and nitrogen gases. Ovens and furnaces are available as well and the fuel cell software needed to control parameters and to post-process results.

Physical prototypes of verified designs are accommodated through the Rapid Prototyping Laboratory. This laboratory contains two rapid prototyping machines that offer both “breakaway” support and “soluble” support structures, with full support for modeling in natural as well as various colors of materials.

Advanced laboratory capabilities for research include the Sustainable Material and Renewable Technology (SMART) Laboratory and the Thermal Analytical Research Laboratory. The SMART lab consists of a material development and processing facility and a material characterization and testing facility. Prototypes of a variety green composite material and structure members can be produced by extrusion, compression and lamination process. The material characterization and testing facility has the ability to conduct profound testing including material mechanical and thermal properties from the nano to macro scale. Technical capabilities include computer analysis, advanced visualization, and multi-scale microscopy. The Thermal Analytical Research Laboratory houses a suite of thermal analysis instruments that enable the development of advanced materials for energy conservation, production, conversion, storage, and distribution. This facility is equipped for work in energy, sustainable materials, fire safety and other related areas. The major equipment includes: a dynamic mechanical analyzer (DMA) to determine the thermo-mechanical properties of task-specific sustainable materials for improving the energy efficiency of new constructions; a multi-purpose differential scanning calorimeter (DSC) to enable determination of heat capacity, transition temperature, enthalpies of transition for a wide range of materials include building materials, as well as task-specific materials and working fluids for energy storage, transport, and conversion; a rheometer to determine the viscosity of task-specific materials and working fluids for energy storage, transport, and conversion; a thermal conductivity analyzer capable to measure thermal conductivity of bulk materials within a second at temperature range from -50 to 200 °C.; and a thermogravimetric analyzer (TGA) to enable studies into the thermal degradation of materials in various environments, including the long-term stability of energy storage materials under cycling conditions.

In addition to facilities in the Smith Building, MSEEM students and faculty will have access to resources in the EPIC Building. The Duke Energy Smart Grid Lab contains a Real Time Digital Simulator (RTDS) provides a means of experimentation and model validation utilizing state of the art communication, instrumentation and control equipment. The Power Systems Education Laboratory provides additional equipment from US Didactic allowing emulation of power transmission and distribution, generation from conventional and renewable sources and energy storage/metering functionality.

**Financial Support**

The United States Department of Education has imposed no limitations, suspensions, or terminations with respect to the Title IV student financial aid programs.  UNC Charlotte operates on the electronic transfer/advance payment method with respect to its federal funds and has not been placed on the reimbursement method. It has not been obligated to post a letter of credit on behalf of the Department of Education or other financial regulatory agency. There have been no complaints filed with the Department of Education regarding UNC Charlotte, and there are no impending litigation issues with respect to financial aid activities. The University is not aware of any infractions to regulations that would jeopardize Title IV funding.

The North Carolina Legislature, as part of the overall budget for the state of North Carolina, allocates funding for the University of North Carolina system, including UNC Charlotte. Within the UNC Charlotte budget, the State allocates a building reserve fund to cover maintenance and operation of existing facilities (housekeeping, maintenance, information technology, utilities, security, etc.), administered by the UNC Charlotte Division of Business Affairs. Day-to-day operating costs (office supplies, phone service, student workers, etc.) are funded through the Division of Academic Affairs, under the direction of the Provost. The year one budget for the MSEEM program is included as Table 3.

Incremental continuing costs are expected to be minimal and are summarized in the table below for year one. It should be noted that grants/ contracts received by ELET and MET faculty to date has met the one FTE graduate stipend projected for year one.

Year one estimates for faculty/instructional positions are provided and include one new faculty position in year one. Technical Services Support/Laboratory Manager staff are adequate to support the MSEEM program in year one. Current administrative support staff levels in the Department are adequate to support the program. In addition, non-academic administrative support for the program in the Graduate School, computing, and business support functions can be absorbed with current staffing.

UNC Charlotte will seek enrollment increase funds to implement and sustain the program. The Department projects that this new graduate program will add new students and, as a result, has projected enrollment increase funding from the UNC system beginning in the second year of the program.  In the event that enrollment increase funds are not available from the UNC General Administration, we are prepared to reallocate resources internally to support the program. The MSEEM program can be implemented and sustained without enrollment increase funding. UNC Charlotte has prioritized this program among its top three curriculum initiatives and will prioritize the program for funding due to the critical importance of this program to students, the EPIC initiative and our industry constituents.

**Table 3. Estimated Year One Budget for MSEEM Program**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **YEAR 1 BUDGET - BY SOURCE AND PROJECTED EXPENDITURE CATEGORIES** | | | | | |
|  | Reallocation of Present Institutional Resources ($) | \*Projected Differential Tuition ($) ($1800 X 15 FTE) | Enrollment Increase Funds ($) | Other New Allocations (Grants/ Contracts) ($) | Total ($) |
| New faculty  (One tenure track) | 90,000.00 | - | - | - | 90,000.00 |
| \*\*PT Instructional | 15,000 | 5,700 | - | - | 20,700.00 |
| Benefits (Social security, Retirement, Medical Insurance) | 26,100.00 | - | - | - | 26,100.00 |
| Graduate Stipends  3 FTE in Year 1 (one funded by new grants/ contracts) | 30,000.00 | - | - | 15,000.00 | 45,000.00 |
| Supplies and Materials | - | 12,100.00 | - | - | 12,100.00 |
| Current Services | - | 1,750.00 | - | - | 1,750.00 |
| Travel | 1,300.00 | 3,400.00 | - | - | 4,700.00 |
| Communications | - | 1,350.00 | - | - | 1,350.00 |
| Printing and Binding | - | 450.00 | - | - | 450.00 |
| Advertising | 2,200.00 | - | - | - | 2,200.00 |
| Space Rental/Building Lease | - | - | - | - | - |
| Fixed Charges | - | 2,250.00 | - | - | 2,250.00 |
| Software | - | - | - | - | - |
| Libraries\*(Costs covered by EPIC budget allocation) | - | - | - | - | - |
| **TOTAL ADDITIONAL COSTS ($)** | **$164,600.00** | **$27,000.00** | **-** | **$15,000.00** | **$206,600.00** |

*\*Projected Differential Tuition ($) ($1800 X 15 FTE Students = $27,000)*

*\*\*One additional tenure-stream faculty member in year one, followed by two additional in subsequent years. Part-time instructional funds will be utilized to backfill for full-time faculty teaching graduate courses with part-time lecturers in the released undergraduate courses until all allocated positions are staffed by full-time tenure-track faculty.*

No facility renovations are required to deliver this program. There will be no expenditures to external institutions or organizations for contractual or support services. Funding for equipment necessary to deliver the program has been expended and equipment is in place to deliver the program. Library resources have been budgeted / expended in advance of program initiation as part of the EPIC initiative. Ongoing library appropriations are sufficient to support the program.

The William States Lee College of Engineering (COE) at UNC Charlotte has a graduate student tuition differential in place for all COE graduate programs as shown in the tuition and fee schedule below. The same structure will be in effect for the MSEEM program. The tuition increment for a full-time graduate student is $900 per semester and is incremented for part-time students based on number of credit hours as shown in Table 4.

**Table 4. Tuition Increment for William States Lee College of Engineering Graduate Programs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UNC CHARLOTTE – 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 |

Revenues generated from this pool will be used to support continuing expenses, including laboratory equipment purchase and maintenance, computing equipment, and consumable supplies for the program.

**Evaluation and Assessment**

*Student Learning Outcomes*

As part of the Annual Report, departments must also submit an annual [Student Learning Outcomes Assessment Plan and Report](file:///F:\MSEEM%20Supporting%20Documentation\Student%20Learning%20Outcomes%20Assessment%20Plan%20&%20Report%20Template%202011-2012.pdf). For each program this report documents student learning outcome assessment plans (which consist of student learning outcomes, effectiveness measures, assessment methodology, and performance outcomes), assessment data, changes made based on assessment data, and the impact of changes on student learning. Student learning outcomes for programs offered through the online delivery mode are the same as for programs offered face-to-face. Student Learning Outcomes Assessment Plans and Reports from all colleges at both the undergraduate and graduate levels and from online and face-to-face delivery modes are required to be completed. Sample [Student Learning Outcomes Assessment Plans and Reports for the College of Engineering](file:///F:\MSEEM%20Supporting%20Documentation\College%20SLO%20reports.pdf) are provided.

UNC Charlotte utilizes a decentralized model for student learning outcomes assessment.  Assessment Leads are appointed to oversee student learning outcomes assessment. Assessment Leads work with department chairs on the development of student learning outcomes assessment plans and evaluation rubrics, documentation of assessment data, and the use of assessment data for continuous improvement.  The Director of Assessment provides training and guidance to the Assessment Leads.  The Director also chairs the Academic Affairs Assessment Team (AAAT) which oversees the student learning outcomes assessment processes at UNC Charlotte.

*Planning*

Each year, each division develops expected outcomes and measurement plans to assess the accomplishment of its goals and objectives. Upon completion, the units subsumed in each division will align their plans with the division plans. At the division level, vice chancellors use [report templates](file:///F:\MSEEM%20Supporting%20Documentation\Division%20Strategic%20Plan%20Reports.pdf) and [scorecards](file:///F:\MSEEM%20Supporting%20Documentation\Divison%20Scorecards.pdf) to note the accomplishment of division goals and objectives and continuous improvement. The Institutional Effectiveness Oversight Committee (IEOC) uses these completed reports and scorecards to annually review and prepare a [University scorecard](file:///F:\MSEEM%20Supporting%20Documentation\2013%20University%20Strategic%20Plan%20Scorecard%20Results.pdf) of findings to the Chancellor for discussion with his Cabinet.

As indicated previously, all colleges and departments within Academic Affairs complete five-year strategic plans. In addition, colleges and departments submit an Annual Report which highlights the major accomplishments for the year. A [sample of reports](file:///F:\MSEEM%20Supporting%20Documentation\COE%20sample%20reports.pdf) from the William States Lee College of Engineering is provided. These reports are used to complete the Academic Affairs Annual [Highlights](file:///F:\MSEEM%20Supporting%20Documentation\Academic%20Affairs%202013%20highlights.pdf) and [Scorecard](file:///F:\MSEEM%20Supporting%20Documentation\AA_Strategic%20Plan%20Scorecard%20Template%202012_2013.pdf).