

Curricular Affairs Committee of the Faculty Senate

MEMO

To: The UVM Faculty Senate
From: Curricular Affairs Committee of the Faculty Senate, Laura Almstead, Chair
Date: December 8, 2017
Re: Approval of a proposal for a new Master of Science in Engineering Management submitted by the College of Engineering and Mathematical Sciences in Conjunction with the Graduate College

At its meeting on December 8, 2017, the Curricular Affairs Committee approved the actions recommended in the following memo.

The Curricular Affairs Committee approved a proposal for a new Master of Science in Engineering Management, submitted by the College of Engineering and Mathematical Sciences (CEMS) in conjunction with the Graduate College and the Grossman School of Business (GSB). It will be a tagged degree program and have the major code MSEM. The proposed program will be directed by Professor Dryver Huston in the Department of Mechanical Engineering, and involves departments in both CEMS and GSB. If approved by the Faculty Senate and Board of Trustees, the program will be offered beginning fall 2018.

Program Description and Rationale

The proposed Master of Science in Engineering Management (MS in EM) is a professional degree program available as a regular coursework-only MS or as a project-based MS. Both options will require a total of 30 credits (see Curriculum section for details). An Accelerated Master's Program (AMP) option will be available for UVM undergraduates majoring in Biomedical Engineering, Civil Engineering, Electrical Engineering, Environmental Engineering, or Mechanical Engineering.

Engineering Management is the art and science of planning, organizing, allocating resources, and directing and controlling activities that have a technological component. The proposed MS in EM is designed for students who intend to pursue careers related to the management of engineering, largely in private sector industry or government service. Specific objectives include training in the management of engineering, statistical quality control for manufacturing and product delivery, and engineering management information systems.

CEMS currently offers a BS in Engineering Management, and the MS program will allow these students, as well as others interested in engineering management, to further their studies in this field. Although a high percentage of students obtaining undergraduate degrees in the field of engineering management is small compared to other areas of engineering, masters-level programs in EM are in high demand nationwide. The proposed MS in EM at UVM will rely on existing courses in CEMS and GSB, with the exception of one new course. The proposed MS further supports UVM's mission to increase STEM education across campus.

Justification and Evidence for Demand

Enrollment in engineering management programs nationwide has grown by an average of 6% annually since 2005, and is the eighth most popular engineering master's program. The proposers cite a 2010 Financial Times article that indicated a high demand for EM programs at Northwestern and Dartmouth and positive employment prospects for graduates of these programs. The presence of "heavy engineering" corporations in Vermont and New England (e.g. Global Foundries, United Technologies, and General Dynamics) suggests a local/regional need for management engineers. The proposers indicate that they expect the MS in EM to attract students who have recently earned BS degrees in engineering and physical sciences. Employment prospects for those with the BS degree in EM remain strong, but the MS will give its students a competitive edge.

Relationship to Existing Programs

The MS in EM is similar to, but more advanced than the BS in EM at UVM. There are no other masters-level programs at UVM that offer training in this area. Nationwide, various institutions offer MS programs in engineering management. Notably, there is a consortium of elite schools known as the "Master of Engineering Management Programs Consortium," which includes Cornell, Dartmouth, Duke, MIT, Johns Hopkins, Purdue, Tufts, Northwestern, Stanford, and the University of Southern California. In New England, Dartmouth, MIT, Northeastern, UMass-Amherst, and Tufts offer the MS. The University of Maine and Clarkson offer dual masters' degrees in engineering management and business. The proposed MS in EM will allow UVM to capitalize on the high interest in MS degree programs in EM already recognized by other institutions offering similar programs.

Curriculum

Completion of the proposed MS in EM will require a total of 30 credits. Two tracks will be available for students enrolled in the program: a coursework only track consisting of ten three-credit courses, and project track consisting of 24 to 27 credits of coursework (six to nine courses) and an additional three to six credits of project-related work. The degree code will be MSEM, and the major code will be EMGT.

Required Courses (all 3 credit courses)	
EMGT 201	Engineering Project Management
BSAD 306	Fundamentals of Accounting
<i>Two courses from:</i>	
MATH 221	Deterministic Models Operations Research
STAT 211	Statistical Methods 1
STAT 224	Stats for Quality and Productivity
<i>Two courses from:</i>	
BSAD 230	Technology Entrepreneurship and Commercialization
BSAD 270	Quantitative Analysis for Managerial Decisions
BSAD 273	Supply Chain Management
BSAD 293	Integrated Product Development
Elective Coursework	
Coursework Only Track	12 elective credits chosen from defined list (minimum of

	three Engineering courses)
Project Track	6 to 9 elective credits chosen from defined list (minimum of three Engineering courses)

EMGT 201 is the only new course, and a proposal has been initiated in Courseleaf. Most of the existing courses are currently below full enrollment capacity. The proposal includes specific list of elective courses; however, other courses at the 200 and 300 levels may also be taken for credit with permission.

Admission Requirements and Process

Selection of candidates for the MS program will be done by the MS in EM program coordinator in consultation with a committee of affiliated faculty members. Students may have a BS in Engineering from an ABET-accredited institution (Accreditation Board for Engineering and Technology), a BS in Engineering Management, or an unaccredited BS in Engineering or physical sciences. Those without an accredited degree may have to take additional courses before qualifying for admission, which will be identified by the MS in EM curriculum committee. CEMS will offer an Accelerated Master's Program (AMP) admission to this program for exceptional undergraduate students majoring in Engineering. Students accepted into the AMP may apply up to six credits of their undergraduate Engineering courses at the 200-level taken at UVM toward their MS degree. These courses must be approved in advance by the Graduate Committee, and students must complete any additional requirements for taking these courses for graduate credit. Only courses taken after the admission to AMP can be counted toward a graduate degree. Interested students will need to apply before the second semester of the junior year to have time to plan two courses that can be used toward their MS degree.

Anticipated Enrollment and Impact on Current Programs

The anticipated enrollment for the MS in EM program is up to 15 full and part-time students per year, with approximately 30 at any given time in various stages of degree completion. Students will be recruited as an add-on to existing CEMS recruiting efforts.

As noted previously, most of the courses that make up the proposed program have capacity for additional students, and it is not expected that new sections will be required. However, additional teaching support (e.g. grading) may be needed for core courses.

Advising

Incoming students will be given a full group advising session at the start of their first and second years. Individual advising will largely be performed by faculty members affiliated with the program, in both CEMS and GSB, and led by the Engineering Management Graduate Program Coordinator. The primary goals of advising will be three-fold: to ensure that students enroll in the proper courses to progress smoothly toward degree completion; to advise students on projects (for those who choose the project option); and to offer post-degree and career advice. Advising will be done by program faculty in CEMS and GSB within the specifications of each faculty member's workload agreement.

Assessment Plan

In addition to regular review through UVM's Academic Program Review process, the MS in EM curriculum committee will assess the program annually using the following tools and metrics:

- Course evaluations
- Additional student surveys
- Enrollment numbers
- Graduation numbers
- Post-graduation placement

Staffing Plan, Resource Requirements, and Budget

All but one of the courses offered in the program already exist, so no new classrooms will be needed. Existing library resources and equipment needs are sufficient to meet the needs of the program. One new full-time Senior Lecturer will be hired to teach courses in Engineering Management and to provide programmatic leadership. Adjunct faculty will be hired as needed. A projected budget submitted with the proposal indicates that the MS in EM is anticipated to be revenue-generating by year three. The proposal includes a chart of expected revenue and expenses for the first five years of the program. After relatively small deficits the first two years, the program is expected to generate net positive revenue the third and succeeding years. The projected revenue in year three is significantly greater than the loss in years one and two combined.

Evidence of Support

The proposal was unanimously approved by the Graduate College Executive Committee. Letters of support from individuals listed below accompanied the proposal.

Cynthia Forehand, Dean, Graduate College

Luis Garcia, Dean, College of Engineering and Mathematical Sciences

Sanjay Sharma, Dean, Grossman School of Business

Mandar Dewoolkar, Chair, Civil and Environmental Engineering

Kurt Oughston, Acting Chair, Electrical & Biomedical Engineering

Yves Dubief, Interim Chair, Mechanical Engineering

Jeff Buzas, Chair, Mathematics and Statistics

Margaret Eppstein, Chair, Computer Science

Barbara Arel, Associate Dean and Chair, Grossman School of Business Graduate Curriculum Committee

Summary

The proposed Master of Science in Engineering Management makes use of existing resources and collaborations spanning the College of Engineering and Mathematical Sciences and the Grossman School of Business. It will allow UVM to offer a program in a field where a high demand exists for master-level degrees and there are significant job opportunities for individuals with MS degrees. With options for a coursework only or project track and electives in a variety of areas, students enrolled in the newly proposed MS in EM will have the ability to tailor their educational experience to their individual interests and goals. Therefore, the MS in EM will be a valuable addition to UVM's portfolio of offerings.