



History of the Online Master of Engineering Management Program at Rowan University

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Abstract

This paper describes in detail the planning, development, and growth of a new online engineering management program. Planning began for the new Master of Engineering Management (MEM) Program at Rowan University in January 2007 with a comprehensive online review of 41 engineering management programs nationwide. The goal of this review was to determine the most-common practices regarding engineering management programs and courses nationwide and the key courses required for an effective engineering management program. In Spring 2007, proposals for the new MEM program were submitted to the University Senate at Rowan University for university review and approval and to the Academic Issues Committee of the New Jersey President's Council for state review and approval. The MEM program was approved by the university and the state in Fall 2007 and the first courses in the MEM program were taught as hybrid courses beginning in Fall 2007. Conversion to 100% online courses was completed by Fall 2008. All courses are now offered fully online in an accelerated 8-week format. The program offers two courses per semester with a total of six courses per year. Graduation requirements call for students to complete 10 three-credit courses. Courses are currently scheduled such that students can complete their degree requirements in five consecutive semesters. Courses are structured such that students can begin the 10-course sequence at any point. To date, the program has admitted 142 students with the first graduate in Summer 2009. A total of 79 students have graduated from the MEM program.

Introduction

This paper describes the planning, development, and growth of a new online engineering management program. Beginning in the Fall of 2006, the author was strongly encouraged by the Provost at Rowan University (Dr. Ali Houshmand), by the Dean of the College of Graduate and Continuing Education (Dr. Horacio Sosa), and by the Dean of the College of Engineering (Dr. Dianne Dorland) to develop a new graduate engineering management program to be offered utilizing either hybrid or fully-online courses. Planning began for the new Master of Engineering Management (MEM) Program at Rowan University in January 2007 with a comprehensive online review of 41 engineering management programs nationwide (Table 1). The goal of this review was to determine the most-common practices regarding engineering management programs and courses nationwide and the key courses required for a successful engineering management program. The information gathered during this review included lists of core courses, specialization courses, and elective courses within these 41 existing programs; a list of specializations within these existing programs; a list of participating colleges within these existing programs; and a list of topics covered within the existing courses. This information was used by the author to develop proposals for the initial MEM program at Rowan University.

The selection of the schools listed in Table 1 was based on an internet search and thus these 41 schools represent all of the schools that were found (as of January 2007) that had engineering management programs with websites that included sufficient information (degrees offered, specializations offered, courses offered, etc.) to be of benefit in our analysis.

Table 1 – 41 Engineering Management Programs that were Reviewed for the MEM Program

Name of University or College	Name of Engineering Management Program(s)
University of Pennsylvania	Executive Masters in Technology Management
Stevens Institute of Technology	Master of Engineering in Engineering Management
Drexel University	Master of Science in Engineering Management
Widener University	Master of Engineering/MBA
New Jersey Institute of Technology	Master of Science in Engineering Management
Univ. of Maryland – Baltimore County	Master of Science in Engineering Management
The Catholic University of America	Engineering Management Program
Cornell University	Master of Science Program – Engineering Manage.
Duke University	Master of Engineering Management Program
Dartmouth College	Master of Engineering Management
California State University – Northridge	Master of Science in Engineering Management
University of Colorado at Boulder	Engineering Management
Washington State University	Engineering Management
University of North Carolina – Charlotte	Engineering Management
University of Texas at Austin	Engineering Management Program
Mercer University	Engineering/Technical Management
University of Michigan – Dearborn	Master of Science in Engineering Management
Louisiana Tech University	Master of Science in Engineer. and Tech. Manage.
University of Louisville	Master of Engineering in Engineering Management
Purdue University	Construction Engineering and Management
Old Dominion University	Master’s Degree in Engineering Management
George Washington University	Master of Science in Engineering Management
Tufts University	Master of Science in Engineering Management
University of Massachusetts – Amherst	Master of Science in Engineering Management
Northeastern University	Master of Science in Engineering Management
Southern Methodist University	Master of Science in Engineering Management
Colorado State University	Engineering Management Program
Portland State University	Master of Engineering in Engineering Management, Master of Science in Engineering Management
The University of Akron	Engineering Management
University of Tennessee – Chattanooga	Engineering Management Program
University of Kansas	Master of Science in Engineering Management
Rose-Hulman Institute of Technology	Master of Science in Engineering Management
Colorado School of Mines	Master of Science in Engineer. and Tech. Manage.
Florida Institute of Technology	Master of Science in Engineering Management
Santa Clara University	Master of Science in Engineering Management
Bridgeport University	Technology Management
University of Missouri – Rolla	Master of Science in Engineering Management
Walden University	Master of Science in Engineering Management
University of Wisconsin – Milwaukee	Engineering Management Masters Program
University of Florida	Engineering Management
University of Tennessee	Master of Science in Engineering Management

The schools listed in Table 1 are presented in the order in which they were found via internet search (as of January 2007) and thus the order in which they were evaluated and the order in which the information from these websites was incorporated into our database.

Initial MEM Program

The MEM program both initially and in its current form requires students to complete 10 three-credit courses (30 credits total). The proposals for the MEM program initially included three core courses – Human Relations and Team Building (which was to be taught by the College of Business at Rowan), Introduction to Engineering Management, and Engineering Economics. The proposals for the initial MEM program included four areas of specialization: the Project Management specialization, the Construction Management specialization, the Engineering Entrepreneurship specialization, and the Career-Based specialization. Each specialization included four proposed courses. The evolution of each specialization will be discussed later in this paper. Finally, the proposals for the initial MEM program included three elective courses for a total of 10 courses.

Program Approval

In Spring 2007, proposals for the new MEM program were simultaneously submitted to the University Senate at Rowan University for university review and approval and to the Academic Issues Committee (AIC) of the New Jersey President's Council for state review and approval. At Rowan University, the MEM program review and approval began within the Curriculum Committee of the College of Engineering (COE) and continued through the Curriculum Committee of the University Senate and through the Curriculum Committee of the Board of Trustees. During this university approval process, an initial partnership agreement was reached between the COE and the College of Business (COB) whereby the courses in the MEM program would be divided between the COE and the COB. In the current version of this partnership agreement, the COB offers two of the three core courses in the MEM program and one of the four courses in the Project Management Specialization. In addition, the initial agreement called for the Center for Entrepreneurship within the COB to offer three of the four courses in the Engineering Entrepreneurship Specialization. The MEM program was formally approved by the Board of Trustees and the Provost at Rowan University in Fall 2007.

In parallel with the university approval process, statewide approval was sought from the AIC of the New Jersey President's Council. This statewide process included the development of a detailed report by an outside consultant. This outside consultant is required to possess a doctoral degree and be an active professional in the program area. In our case, the outside consultant was Dr. Robert Iezzi who is a well-known chemical engineering manager in the Delaware Valley. In addition, statewide approval required the development of a separate program proposal that was submitted to all colleges and universities in New Jersey for review and comment. For the new MEM program at Rowan University, the report by Dr. Iezzi was submitted to the AIC and the MEM program proposal was circulated among all of the colleges and universities in New Jersey for review and comment in Spring 2007. For the MEM program, the report by Dr. Iezzi was approved by the AIC and the comments received from other colleges and universities in New

Jersey regarding the MEM program proposal were all letters of approval, congratulations, and/or good luck. Thus, the MEM program was formally approved by AIC in Fall 2007.

Course Selection

As noted above, the MEM program began with a comprehensive online review of 41 engineering management programs nationwide. As part of this review, a list of courses offered in each area of engineering management was developed. From this list, Table 2 was developed which shows the number of courses offered in each area of engineering management by the 41 engineering management programs that were reviewed. This list also includes the current MEM courses that are applicable. For some of the 41 engineering management programs that were reviewed, more than one course was offered in a given area.

Table 2 – Number of Courses Offered in Each Area by 41 Engineering Management Programs

Topic Area in Engineering Management	Number of Courses	Corresponding Rowan Engineering Management Course
Engineering Management	55	Management Skills for Engineers
Human Relations and Team Building	37	Managing Engineering Teams
Manufacturing Management	33	None
Systems Engineering	26	Systems for Engineering Management
Engineering Law and Ethics	22	Engineering Law and Ethics
Engineering Economics	21	Engineering Economics
Decision Making	17	Engineering Decisions
Project Management	17	Project Management for Engineers
Engineering Marketing	16	None
Quality Management	15	Quality in Engineering Management
Engineering Statistics	15	None
Engineering Accounting	10	None
Engineering Finance	10	None
Materials Management	10	None
Construction Management	8	None
Operations Research	7	None
Facilities Management	6	Facilities Management
Risk Management	6	Strategic Risk Management
Communications	5	None
Biochemical Management	4	None
Environmental Engineering Management	1	None
Optimization	1	None

Categorization of courses in Table 2 was based on course title and course description. The data presented in Table 2 was a key element in the selection of courses for our MEM program, but not the only criteria. Another major consideration was whether we felt that a given course would be of benefit to all of the students in the major including chemical, civil, electrical, and mechanical engineers. The facilities management course was chosen for this reason when compared with other possible courses that could have been offered. We felt that facilities management would

offer engineering management students background on managing university, industrial, and pharmaceutical campuses which they would not otherwise receive. This new course also fit in well with the two new medical schools that were recently added to the university.

As noted in Table 2, the MEM program does not include a course in manufacturing management despite the popularity of such courses within the 41 engineering management programs that were reviewed. It was felt that such a course would be too specialized to be a required course for all MEM students. However, we are currently considering this course as a possible elective.

Program Implementation

The first courses in the MEM program were taught as hybrid courses beginning in Fall 2007. All MEM courses have been and are being offered in an 8-week format with two courses per semester for a total of six courses per year. During the first year of the MEM program (Fall 2007, Spring 2008, and Summer 2008), all of the MEM courses were offered as hybrid courses with a maximum of 50% of the course content offered on campus and a minimum of 50% offered online. In general, less than 25% of these first MEM courses was offered on campus. To increase program enrollments and to enhance the ability of the MEM program to serve students beyond the southern New Jersey location of the Rowan campus, the decision was made in Spring 2008 to offer all MEM courses 100% online beginning in Fall 2008.

Enrollments

The MEM program began with an initial class of 14 students in Fall 2007 and grew steadily until Fall 2009. By Fall 2008, the number of students admitted to the MEM program had reached approximately 30 students and by Fall 2009 the total number of students in the program peaked at 69. Because of the initial course sequencing (which required 6+ semesters to graduate), the Fall 2009 list of admitted students continued to include 13 of the original 14 students from Fall 2007 who have since graduated. Also, the Fall 2009 list of admitted students included a number of students who were no longer actively pursuing their degrees because their employers had cut back or eliminated tuition reimbursement due to the harsh economic climate. The MEM course enrollments for Spring 2012 were down to about 35 students per course, but have since rebounded to about 45 students per course. In summary, the MEM program enrollments began with 14 students in Fall 2007, reached about 30 students in Fall 2008, peaked at 69 students in Fall 2009, dropped to approximately 35 students in Spring 2012, and have since rebounded to about 45 students at the present time.

Faculty

The three MEM courses that are taught by the College of Business were initially taught by full-time tenure-track faculty. Over the years, these three courses been taught by both full-time faculty and adjunct faculty. Initially, most of the MEM courses that were taught by the College of Engineering were taught by adjunct faculty. However, we currently have one full-time tenure-track engineering faculty teaching one MEM course and one three-quarter-time non-tenure track engineering faculty teaching three MEM courses. Thus, three to six of the current 10 MEM courses are taught by adjunct faculty. The current enrollments in the MEM courses are still

relatively high (40 to 45 students per course). When enrollments exceed 30 students, adjunct faculty begin to receive additional compensation beyond the regular adjunct rate. When enrollments exceed 35 students, adjunct faculty receive compensation at a level of 200% of the regular adjunct rate.

Evolution

The four original specializations in the MEM program have undergone considerable change since the original proposal in Spring 2007. The Engineering Entrepreneurship specialization has never been offered because the Center for Entrepreneurship did not develop the necessary courses and because student interest has been relatively low. The Career-Based specialization, which was originally set up to allow students to develop their own customized curriculum (with MEM advisor approval), has never been offered because student interest has been very low.

The Construction Management specialization was offered at the beginning of the MEM program, but only attracted a total of five students (all at the beginning of the MEM program in Fall 2007 or Spring 2008). The first MEM student to graduate was a Construction Management student in Summer 2009. To make the Construction Management specialization viable with only five students, the four required courses in this specialization were offered as electives for the Project Management students. Because of the very low enrollments and because of the ongoing objections by Project Management students to being required to take Construction Management courses as two of their three elective courses, the Construction Management specialization was phased out following the graduation of the last four of five original students in Spring 2010.

Current MEM Program

Since Spring 2010, the MEM program has featured only one area of specialization – Project Management. However, the other areas of specialization are being kept on the books in case student interest changes. At the present time, incoming MEM students are offered a 10-course sequence that includes the three core courses, the four Project Management specialization courses, and three elective courses. These 10 courses are offered consecutively so that students can complete their entire MEM degree part-time (two courses per semester) in five semesters. Courses are structured such that students can begin the 10-course sequence at any point. A major advantage to this 10-course sequence is that students qualify for student aid every semester. When the Construction Management specialization was offered, the 12 courses required for both areas of specialization were offered over a six-semester period with students taking only one course during two of their six semesters. Thus, for one-third of their semesters, MEM students were not eligible for student aid. The new 10-course sequence has eliminated this problem.

The core courses are now as follows: Managing Engineering Teams (College of Business), Management Skills for Engineers (College of Business), and Engineering Economics. The four courses that are currently in the Project Management Specialization include: Project Management for Engineers (College of Business), Strategic Risk Management, Quality in Engineering Management, and Engineering Decisions. The three elective courses that are currently offered are Engineering Law and Ethics, Facilities Management, and Systems for

Engineering Management. The two latter courses replace the four Construction Management specialization courses (Engineering Estimating, Cost Engineering, Construction Scheduling, and Construction Management) that were offered to the Project Management students as electives in the past. In addition, the three MEM elective courses were sequenced to coincide with three of the five 8-week online courses that were to be offered by Rowan University’s Certificate of Graduate Study in Sustainable Engineering. This would have provided MEM students with two choices for each elective. However the Certificate of Graduate Study in Sustainable Engineering is currently on hold due to low student enrollments.

While the descriptions for all 10 courses that are currently offered in the MEM program could have been included in this paper, we are in the process of getting feedback from our existing faculty in order to update the course descriptions to better-match the current course content. Thus, the current course descriptions, which are somewhat obsolete, are not included here. However, the current course descriptions can be found at the following website:
http://www.rowan.edu/colleges/engineering/graduate_program/#MEM

The goal of the course entitled Project Management for Engineers is to introduce students to the nine knowledge areas included in the Project Management Body of Knowledge¹. In addition to Project Management for Engineers, other courses in the MEM program can also be mapped unto the Project Management Body of Knowledge as shown in Table 3.

Table 3 – Project Management Body of Knowledge Comparison with MEM Courses (Excluding Project Management for Engineers)

Project Management Knowledge Areas	Rowan Engineering Management Courses (Excluding Project Management for Engineers)
Project Integration Management	Management Skills for Engineers, Engineering Decisions
Project Scope Management	Management Skills for Engineers, Engineering Decisions
Project Time Management	Management Skills for Engineers, Engineering Decisions
Project Cost Management	Management Skills for Engineers, Engineering Economics
Project Quality Management	Quality in Engineering Management
Project Human Resource Management	Managing Engineering Teams
Project Communications Management	Management Skills for Engineers
Project Risk Management	Strategic Risk Management
Project Procurement Management	Management Skills for Engineers

Challenges

As noted earlier, the proposal for the engineering management program had the full support the Provost, the Dean of Engineering, and the Dean of the Graduate School. One key challenge was working with the College of Business (COB) to determine an equitable division of courses and revenue. This work began after the proposal stage and required a great deal of effort. Initially,

the COB wanted to teach four of 10 MEM courses, while the College of Engineering (COE) wanted to teach eight of 10 courses. With the help of the Provost, a compromise was reached allowing the COB to teach three of 10 courses while COE taught seven of 10 courses. The revenue for the three COB courses goes entirely to the COB with all administrative costs covered by the COE. In addition to the quality of the COB courses, another benefit of having three COB courses in our engineering management program has been enhanced student enrollments. Our prospective students are very impressed with the COB courses in our curriculum. I would very strongly advise others who may be considering the development of an engineering management program to work with their COB early on during the proposal phase to reach a compromise regarding both course and revenue division.

Another key challenge was increasing enrollments in the MEM program early on. As noted earlier in the paper, this was accomplished by converting all courses from hybrid to fully online. This transition was not as difficult as anticipated because the instructors at the time already taught most of the courses online. Thus, each existing course only needed to be modified slightly to become fully online.

Future Growth

Proposed new areas of specialization are being evaluated on an ongoing basis. In addition, the existing areas of specialization that are on the books but are not being offered are re-evaluated on an ongoing basis. However, none of these new or existing (but not currently offered) areas of specialization have demonstrated enrollment potential that would justify expansion of the MEM program at this time. Thus, for the time being, the MEM program at Rowan University will be offered in a 10-course sequence with only the Project Management specialization available.

References

1. A Guide to the Project Management Body of Knowledge, PMI Standards Committee, Project Management Institute, Newtown Square, PA (1996).