

AC 2007-120: GRADUATE CERTIFICATES AS RECRUITING AND ENTRY VEHICLES

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Graduate Certificates as Recruiting and Entry Vehicles For the MSEM Degree

Abstract

The Engineering Management and Systems Engineering department at the University of Missouri – Rolla has introduced a group of 12-hour graduate certificates primarily focused at working engineers and technical professionals. These certificates are of a practical nature and provide these individuals the opportunity to obtain focused continuing graduate education in areas of interest to them while at the same time providing them the option of using the certificate as an entry point for future study for the MSEM degree. The types of certificates offered, the mechanism for entry into the MSEM program, and success of these certificates in serving their stated purpose is discussed.

Introduction

The Engineering Management and Systems Engineering (EMSE) department at the University of Missouri-Rolla (UMR) is one of the top producers of MS graduates in the United States.¹ A significant number of the MS student population represents working engineers who are taking advantage of the non-thesis distance education option to obtain their degrees. The number of students in this group continues to grow, and in the last academic year, there were 200 students enrolled in graduate study through distance education in the department. In the last few years, enrollment in the MS program in Engineering Management by distance students has been virtually flat while there has been growth in the enrollment in the MS program in Systems Engineering. In the latter case, this growth is due to a relationship between UMR and the Boeing Corporation to provide graduate study in this field. However, even in this situation many students still follow the certificate route. The certificates are made up of four-course bundles of interconnected courses. The obvious reason for growth due to these certificates is a pent-up demand for specialized continuing professional education by working engineers, but there are two less obvious, but nonetheless important side benefits of these certificates. Interaction with potential students at education fairs, company visits, and through electronic inquiries has revealed a potential barrier that the certificates remove. Normal admission to the MS degree program requires the submission of recent GRE scores that meet certain score standards in the three areas of the exam. However, many potential applicants have been out of school for 3-5 years or more, and the prospect of preparing for and taking the GRE is daunting. One particular group of students strongly affected by this requirement is the Corp of Engineer Army Captains at Fort Leonard Wood.² These individuals, if they meet admission requirements, are able to complete the MSEM degree while they are at the fort for career training. Many of these individuals are now coming to this program straight from war zones in Iraq or Afghanistan, making it very difficult to prepare for and take the GRE. Overall, some potential students have simply said they would not take the exam and planned to look elsewhere for their graduate education. These individuals are often indignant that as successful professional engineers, they would be required to take the GRE. The introduction of graduate certificates has provided a path to bypass the GRE for these working adults while at the same time providing them

with valuable specialized graduate education. The mechanism for entering the MS degree program in this fashion is described below. The second benefit is the ability for working engineers to “try out” graduate study as a non-degree student to see if they can regain old study habits, can compete with full time graduate students, and really have the time to take on a graduate course.

Graduate Certificate Structure

Graduate Certificates in the EMSE department have the general structure of four three-credit hour courses in a focused area of study. The current suite of certificates is shown in Table 1. This certificate format is actually fairly common, but there are a variety of formats found at various universities.³⁻⁹ A number of these programs indicate that completion of a certificate provides a direct path into the MS course of study, and no mention is made of GRE requirements. At UMR, two of the certificates, Systems Engineering and Network Centric systems, are provided for students interested specifically in our Systems Engineering program, four of them are in Engineering Management, and the one in Military Construction Management is strictly for Army Captains in the Fort Leonard Wood program.

Table 1
Graduate Certificates in The EMSE Department

Graduate Certificate	Courses	Status
Project Management	EMGT 308 Economic Decision Analysis EMGT 361 Project Management EMGT 362 Case Studies in Project Management EMGT 461 Global Project Management	Implemented Certified by PMI
Military Construction Management	EMGT 313 Managerial Decision Making EMGT 314 Management for Engineers and Scientists CE345 Construction Methods CE 442 Construction Administration and Planning or CE 380 Water Resources and Wastewater Engineering	Implemented
Systems Engineering	SYSE 368 Systems Engineering Analysis I SYSE 468 Systems Engineering Analysis II SYSE 469 Systems Architecting One course from SYSE elective options	Implemented
Network Centric Systems	SYSE 419 Network Centric Systems Architecting and Engineering SYSE 449 Network Centric Systems Reliability and Security Two courses from SYSE elective options	Implemented
Engineering Management	EMGT 314 Management for Engineers and Scientists EMGT 352 Financial Decision Analysis EMGT 361 Project Management	Approved

	EMGT 365 Operations Management Science	
Financial Engineering	EMGT 408 Advanced Engineering Economy EMGT 480 Investment EMGT 481 Financial Engineering EMGT 482 Advanced Financial Engineering	Submitted for approval
Leadership in Engineering Organizations	Engineering Management 313 Managerial Decision Making Psychology 316 Psychology of Leadership Psychology 374 Organizational Psychology Engineering Management/ 401 Leadership for Engineers	Submitted for Approval

Initially, the development of these certificates has been in response to feedback from potential students and industry relative to what engineers need as they develop their careers. Some of these areas are well known such as project management and quality engineering, and it would not be surprising to expect interest in these. Financial Engineering and network centric systems are relatively new, but there is already significant demand for these new certificate options. Of course, a number of working engineers already hold advanced degrees and do not want to obtain a second one. They are more interested in filling gaps in their personal knowledge base, and the certificates readily meet their needs in that regard. However, the certificates do also serve two other important needs for working engineers who do wish to pursue an advanced degree.

The Certificate Advantages

The graduate certificates provide a relatively safe way to try out a graduate program and to avoid the trauma of the GRE. Graduate certificate programs in the EMSE department are governed by the following conditions.¹⁰

1. Students must formally apply and be accepted as a certificate student.
2. To be admitted a student must:
 - a. Hold a B.S. degree in engineering or a related field
 - b. Have a 3.0 or greater cumulative GPA in all previous study
 - c. Have one year of professional experience after the B.S. degree

Students accepted into a certificate program hold non-degree status but earn graduate credit for the courses completed in the certificate program of choice. One immediate benefit for students from this certificate option is the ability to “try out” graduate study at UMR in a non-degree status. Some potential students do have concerns in these areas:

- Can they regain old study habits?
- Can they compete with full time graduate students?
- Do they really have the time to take a graduate course?

The certificate option seems to be a low impact way to answer these questions. Our experience at UMR is that the vast majority have little trouble with the first two. The third one has proven problematic for a few students.

Successful completion of a certificate program requires passing each course in it with a grade of B or better. If that requirement is met, then the student is accepted into the MSEM program without having to take the GRE. This acceptance is also predicated on the student having an engineering, applied mathematics, or hard science degree.

Therefore, the working engineer can use the certificate option as a way to determine if graduate study is viable while they can continue working and if so, they can enter the MSEM program without having to take the GRE with the successful completion of one of the graduate certificates offered by the department.

Experience to Date

The first three graduate certificates shown in Table 1 have been in place for a year or more, so there is some data available on how the graduate certificates are fairing relative to the role as entry vehicles to the MSEM degree.

The Military Construction Management certificate is somewhat unique. The four courses in it, while set up as individual three hour courses, are actually part of the Corp of Engineers' Career Course program that the Army Captains go through. The coursework includes instruction by UMR professors as well as qualified Army instructors in a collaborative arrangement. So, all the Army Captains complete these "shared" courses by design. Prior to implementing the condition of using a successful certificate to enter the MSEM program without the GRE, all Army captains in the program had to take the GRE while they were engaged in the four certificate courses. These individuals are taking the four shared courses and completing other Corp of Engineers specialized training over a span of four weeks. This highly intense program leaves little time to prepare for the GRE, and many did not meet the required scores the first time. The EMSE department historically required the exam to be taken a second time, and while a fair number passed the exam on the second try, several did not. At that point, a waiver was usually granted if the student's undergraduate work was good and from a reputable school such as the U.S. Military Academy. Our experience with these groups of Army captains is that virtually all of them made a "B" grade or better in the certificate courses and also complete the MSEM degree with the same results. This experience extends back prior to the introduction of the certificate as an entry vehicle and extends forward to the present. In essence, what the data shows is that the GRE was not a success predictor or differentiator for this group of students, and it was really more of a nuisance and source of aggravation. The MSEM program at Fort Leonard Wood is now more streamlined with the elimination of the exam as an admission requirement.

The expectation for the project management certificate was that it would be a terminal course of study taken by individuals who were really looking for this specialized knowledge and not as a path to the MSEM degree. However, the participants in the project management certificate program are clearly taking full advantage of the side benefits of the certificate as a path to the MSEM degree. Since its inception one year ago 24 people have enrolled in it. Six have graduated and used the certificate to enter the MSEM degree. 18 students are currently enrolled, and all but one of those people intends

to enter the MSEM program after completing the certificate. The one who is not already has the MSEM degree. Feedback has indicated that some students in this group would have preferred a more general engineering management certificate as a gateway to the MSEM degree. This has precipitated the creation of the fifth certificate shown in Table 1 labeled as Engineering Management. It is composed of the four required core courses in the MSEM degree program. We expect that this certificate will be the one of choice for many professional engineers wishing to take this route to admission to the MSEM degree.

The two certificates related to systems engineering shown in table 1 are dramatically different in how students perceive them. In the range of 80-90% of the working engineers who apply for the systems engineering certificate intend to pursue the MS in systems engineering degree. The few that don't plan on pursuing the MS degree either have already taken the GRE in the last five years or already have an MS degree. The network centric certificate seems to be truly one being taken more for the knowledge content. It is very specialized, and as such, it is not perceived as readily as an entrance vehicle for the MS degree in systems engineering. There are a few students who use this certificate as a springboard for Master's degree entry, but not many. The network centric certificate case is expected to be replicated in the two newest certificates about to come on board in financial engineering and leadership for engineers. These are highly specialized, and are more likely to attract individuals interested in the knowledge content, rather than as a vehicle to enter the MSEM degree program. The general engineering management certificate comprised of the four required MS core courses would be a more general approach and ground individuals in the fundamental prior to entering the MS degree program.

Summary

The original intent of the graduate certificate programs offered by the EMSE department was to make available to working engineers modules of specialized knowledge. The department believed there was pent up demand for this kind of professional education, and the short-history to date supports that thinking. However, the certificates have also proven to be a way for working engineers a few years out of school to try out graduate study through distance education and to avoid the GRE if they choose to pursue the MS degree. Both of these are valid reasons for pursuing a certificate. Certainly there is some trepidation on the part of busy professional engineers about jumping into a graduate degree program through distance education. That becomes truer the longer these individuals are out of school. As time goes on they are farther and farther removed from their study habits as students, and the responsibilities and time commitments to their profession steadily increase. A number of potential students are actually rather indignant at being asked to take the GRE when they have had a successful engineering career. They do not understand the need for or appreciate the value of taking the exam given their track record of success. In fact, the experience to date with students who have entered through the certificate process without taking the GRE is excellent. No one has failed to finish the MS program successfully due to their inability to master the subject matter. Occasionally, personal or professional events have caused people to leave the program but none for academic reasons.

The certificate option adds a breadth to any department's portfolio of graduate offerings without the need to develop new degree programs. They can be based, in many cases, on existing courses, bundled together as specialized modules. Clearly, if these modules can be properly framed as potential entrance vehicles to the MS degree that will increase their popularity and serve a very practical purpose for the potential working engineer interested in further professional graduate education.

The EMSE department at UMR will continue to evaluate the market for new interests in specialized bundles of knowledge as well as continuing to assess interest in the current certificates. Over time, current certificates may evolve into new forms or may disappear altogether, while new ones will be added as interest and demand dictate. The flexibility to handle these in this fashion is a real strength of the certificate options.

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