

A Graduate Option in Engineering Management for Non-Engineers

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Abstract

We have found a number of employees in high technology companies who are interested in graduate education in engineering management but do not meet the admission requirement of having an undergraduate degree in engineering or a closely related field. Often these individuals manage technical contributors or work closely with engineering functions in the company, and as a result, would like to improve their management success probability in the high technology environment through technical management education. We find professionals in customer service, production planning, marketing, and sales that fall into this category in a typical company. In addition, we even occasionally have an interest from individuals from non-traditional engineering organizations such as physicians and biologists. To serve this population we have recently created a Professional Certification in Engineering Management. This certification broke new ground on the Boulder campus being the first of this type to be approved by the Graduate School.

Background

The Lockheed Martin Engineering Management Program (the Program) is in its 12th year of offering a Master of Engineering degree for working engineers preparing for early management assignments. The degree is offered both locally on campus, in the Denver metropolitan area via live television, and around the world asynchronously using videotapes. The nature and content of the degree program and the use of modern communication technology to engage remote students in this program have been describe previously by this author.¹⁻³

In recent years we have begun to receive some inquiries from non-engineering professionals that have become familiar with the Program. Some of these individuals work in the same companies where our the Program is being taken by engineers, while others have seen the Program described on our website.⁴ The nature of the inquiries is similar to that of the engineers who investigate our program. These professionals are seeking education in principles and concepts of technical management so that they can be successful in pursuing management opportunities in high technology industry and be capable of conversing on technical management issues with their engineering counterparts.

The problems that these individuals face with the graduate degree program are the admission requirement to have an undergraduate degree in engineering or a related physical science and the curriculum requirement to take nine semester hours of technical engineering courses to complete the degree. Usually, these individuals have undergraduate degrees in a business area or social science. In follow-up to these inquiries, we have learned that these professionals often are working in functions such as production control, marketing, accounting, and human resources.

Market Research

A market research project for our Program was conducted in 1996⁵. As part of this study, the possibility of offering a professional certification that did not require an undergraduate degree in engineering or involve graduate technical engineering courses was investigated. The results of the study indicated that certification is seen as on-going professional development, which is a very competitive market. Certification programs vary tremendously in scope, cost, and philosophy. At the same time, these programs are in a constant state of flux often disappearing as quickly as they emerge. One key finding of the study was the need to clearly differentiate a potential certification offering by the Program from the majority of such programs in objective, goals, and value for the customers. A second key finding was that individuals that potentially might pursue such a certification are attempting to address one of more of three critical needs: continuing professional development, expanding personal horizon, and adding new skills.

The Certification Option

Based on the market research study previously cited and the inquiries from individuals about a certificate option, we introduced a Professional Certification in Engineering Management in 1997 that is comprised of a choice of one of the core curriculum tracks shown in Figure 1.

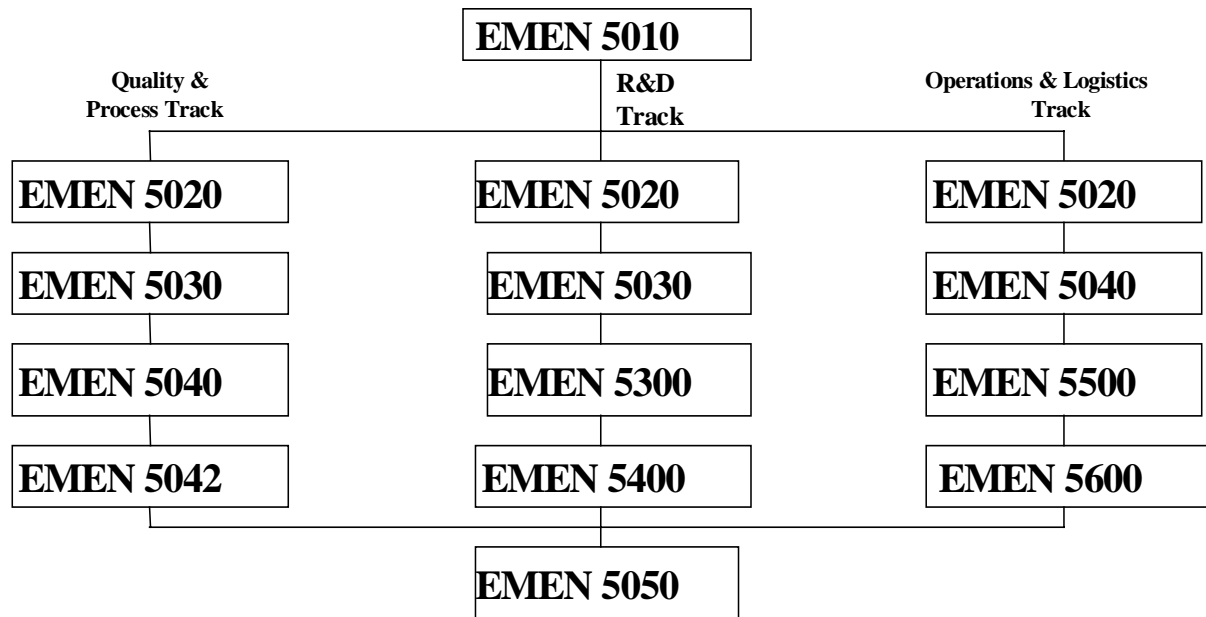


Figure 1. Technical Management Curriculum Tracks

As seen in this figure, a professional certification requires 18 hours of graduate technical management courses, 12 of which are in a selected track of concentration. The courses are highly integrated which provides a consistent reinforcement of key content. The objective is to provide a broad-based education in technical management, which includes philosophy, concepts, and specific skills. During the course of study leading to the graduate certificate, students are mixed with the graduate degree students in the classes covering the courses in the curriculum tracks. Upon completion of one of the tracks, the certificate students receive their professional certification while the degree students continue on with their technical electives and final capstone project.

The corresponding course titles are shown in Figure 2. The Program offers these tracks as highly integrated management courses providing a solid foundation of knowledge and skills for the new technical manager. The mixing of engineering degree program students with the certificate students provides an excellent collaborative learning environment.

EMEN 5010	Introduction to Engineering Management	EMEN 5050	Leadership and Management
EMEN 5020	Finance and Accounting for Engineers	EMEN 5300	Management of R&D
EMEN 5030	Project Management Systems	EMEN 5400	Principles of Product Development
EMEN 5040	Quality and Value Creation	EMEN 5500	Operations Management
EMEN 5042	Methods of Process Management	EMEN 5600	Operations Research

Figure 2. Engineering Management Course Titles

In addition to certificate students, we also have students from the MBA program in the College of Business who take some of our courses as electives. Feedback from these individuals indicates that working on assignments and class projects with engineering students is illuminating and adds valuable perspective. The non-engineering students in these courses do not seem to be at any disadvantage.

Critical Lesson Learned

The Professional Certification in Engineering Management was the first graduate certificate option offered within a single department or program in the College of Engineering and Applied Science (CEAS). It was also the first such certificate on the University of Colorado Boulder campus. Traditionally, individuals seeking professional development in technical management have not viewed the Boulder campus or the CEAS as a source provider. Increasing this awareness has been a major challenge, but it is getting easier as more certificate options are being introduced in the CEAS. As time passes, recognition of the CEAS as a supplier of continuing professional development will increase the visibility of our certificate option. The wide recognition of any school as a provider of professional development is an important

ingredient in any marketing effort. Our expectation is that enrollment will grow as the CEAS becomes more associated with continuing professional education.

An unanticipated factor is tuition reimbursement. The vast majority of our graduate degree students work full time and receive tuition reimbursement from their employers. We believed that tuition reimbursement would be extended to working professionals pursuing the professional certification. We have since learned that not all employers are willing to reimburse employees for non-degree continuing education. This has resulted in a less than anticipated interest in our program, especially given the number of courses required for certification.

The number of course itself is an issue. Many certificate programs require the completion of six to nine credit hours compared to our requirement of 18 hours. Our belief was the completeness and integration that such an extended program provides would offset the length and associated cost. However, the commitment to an extended course of study that does not yield a degree is often difficult to make.

We have found that non-engineers can successfully participate in technical management courses originally designed for engineers. In fact, the mixing of these two populations appears to have a positive effect on both. The perspective that each population brings to class discussions and assignments enriches the learning experience of both.

Conclusion

Since its introduction in 1997, we have had two students enter the professional certification option in the program. One student has now completed this option, and the feedback from this individual has been very supportive of it. This person held a B.S. in Business with emphasis in management information systems, which eventually led to a computer support position in the aerospace industry. Since the completion of the certificate option, this person has moved into increasingly more responsible positions at two different aerospace companies. She attributes both the certificate itself and specific curriculum content as having significant impact on her success in acquiring these positions⁶.

The number of inquiries about this option continues to be strong, but these inquiries are not yet translating into student enrollments. As the reputation of the College of Engineering and Applied Science grows as a viable source of continuing professional development, more students may choose our certification option. With the companies who do financially sponsor students in our graduate degree program, we need to directly address reimbursement for the professional certification. We have good working relationships with many of these companies, and as a result, we believe that we can influence those companies who do not now reimburse for professional development to reconsider. We recognize that the length of the program will probably always limit the size of the enrollment. This is a limitation that we have chosen to live with in order to provide the complete education in technical management that we believe is necessary for professionals to be successful in managing in a high technology environment. Finally, we have seen that non-engineering working professionals can be successful in management course for engineers and, in fact, thrive in that educational environment.

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