

Engineering Management - The Minor of Choice

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Abstract

The minor in engineering management provides several real benefits to undergraduate engineering and engineering technology students, not the least of which can be a substantially larger starting salary. The other benefits it offers students are in the skill sets developed (project management, engineering economics, organization behavior / principles of management, and either statistical concepts or decision techniques), the preparation to start an engineering management graduate degree, and the bridging of the competency gaps identified in several national surveys. This paper addresses the benefits of the minor to engineering management programs.

I. Introduction

Old Dominion University's College of Engineering and Technology, like many other universities, allows students in its bachelor's programs in engineering and engineering technology to minor in another field of engineering or engineering technology. At ODU the most popular engineering minor is the minor in engineering management offered by the Department of Engineering Management. Approximately 150 students each year graduate with this minor.

The Department of Engineering Management offers no undergraduate degrees in engineering management but its graduate degrees include a Masters in Engineering Management, a Master's of Science in Engineering Management, and a Doctor of Philosophy in Engineering Management. The department has traditionally taught the undergraduate course in engineering economy as a service course for the college. The four-course minor grew from this course.

The courses in the minor are key skills for an engineering manager or an engineer working in a high technology, project-driven environment. These courses, while not prerequisites for ODU's graduate programs in engineering management (with the exception of a courses in statistical concepts), provide a firm foundation for graduate study in engineering management. The courses in the minor are taught by a mix of regular faculty, adjunct faculty, and highly qualified graduate students in the department's graduate programs. All courses in the program have a full-time faculty member serving as the course manager. The course manager provides a common source of guidance for adjunct faculty and graduate students teaching the course for the first time as well as mentoring to graduate students in the art of teaching. The course manager is normally the faculty member teaching the topic in the master's programs in engineering management.

II. The Curriculum

The minor in engineering management is open to juniors and seniors and is intended for students majoring in engineering, engineering technology and other science-based field (such as computer science, mathematics, and the physical sciences). The goal of the minor is to develop several skills that are highly sought after by employers – an ability to function effectively in a team environment, interpersonal communication skills, decision-making skills, project management skills, leadership skills, and statistical analysis skills. To accomplish these goals the minor requires a student to take four courses. These courses are:

- EMNA 301 Engineering Management
 - EMNA 302 Engineering Economics
 - ENMA 401 Project Management
 - ENMA 420 Statistical Concepts in Engineering Management
- or
- ENMA 421 Decision Techniques in Engineering

The courses are offered such that a student can take one of the courses in the minor per semester during the junior and senior years. The students often take multiple courses in the minor in a single semester to fill voids in their schedules or to offset starting the minor after the start of their junior year.

III. Student Benefits

Approximately 150 students graduate with this minor each year. This represents 35% of the graduates of the College of Engineering and Technology. Some engineering technology graduates with the minor have reported that this minor increased their initial salary upon graduation by up to \$10,000. Expectations of higher starting salaries are believed to be a factor in many students' decisions to enroll in the minor. About 50% of the engineering technology students apply for admission to the minor. These students and their advisors clearly perceive the minor as providing skills that employers' desire.

Several studies (by EAC/ABET and the Society of Manufacturing Engineers¹ to name two) have identified gaps in the skills that engineers and engineering technologist graduate with. ABET has listed skills that graduating engineers are expected to have². The skills addressed by the minor – project management, teamwork, engineering economics, organizational behavior, decision-making, the statistical nature of the data engineers collect and use, and communications – are those that many undergraduate engineering degree programs are struggling to address successfully. Engineering management undergraduate programs address these skills and have courses targeted to these skills already. Graduate programs in engineering management address these same skills but at an advanced level.

IV. Department Benefits

The Department of Engineering Management receives several benefits from offering this minor. They include:

- A large number of undergraduate student credit hours. For 150 graduates with the minor, 1800 student credit hours are required. This benefit is not without cost – four courses per year with multiple (2 to 4) sections to handle the volume. Enrollment management may be needed to balance resources with demand. Demand at ODU is threatening to outgrow the department’s ability to support the minor with the quality of instruction the department demands.
- Demonstration of the desirability of the skills engineering management programs develop. The students in the minor include students who are working full and part-time in engineering-related positions. These working students often express how they are using or will be able to use those concepts covered in the courses in the minor. When this occurs in class, it has a positive impact on the other students in the class.
- A ready source of students for the graduate degree programs that the engineering management department offers – from personal exposure to engineering management subjects and their ready application in the workplace regardless of the underlying degree. Both engineering and engineering technology students in the minor courses often ask about the graduate programs and express an intent to continue their education on a part-time basis with a master’s degree in engineering management after graduation.

V. Conclusions and Recommendations

Engineering management skills are desired by many of the students in undergraduate engineering and engineering technology degree programs. By providing courses, which address fundamental areas in engineering management, engineering management departments provide a real and valuable service to the college and university. Just like the mechanical engineering courses in static’s and electrical engineering courses in circuits, the engineering management courses in project management, engineering management, engineering economics, and applications of statistics are (or should be) basic to any degreed engineers’ education. A minor is a way to provide this basic component to an engineer’s education on an optional basis to those who see its benefit before they start their careers.

Engineering management departments should consider a minor in engineering management to improve visibility for their graduate degree programs and to demonstrate the value of the skills engineering management degrees at all levels develop. Why are engineering management degrees at the master’s level the fastest growing demand by practicing engineers? It can be argued that these degrees provide the skills needed to successfully apply other engineering skills in the workplace.

VI. Additional Research

The authors will be expanding this idea with a case study on the development of the minor offered by ODU’s Department of Engineering Management. Data collection on the minor’s impact on starting salary is being started and will be reported in a later paper as well as other

data collected as part of a long term assessment of the minor. The authors are interested in working with faculty from other departments, which offer similar programs, to collect and disseminate the results (benefits) of engineering management skills being added to other engineering departments' curriculums.

Bibliographic Information

1. *Criteria For Accrediting Engineering Programs*, Engineering Accreditation Commission, Accreditation Board for Engineering and Technology, Inc., Baltimore, MD, 2001
2. *Manufacturing Education Plan: Phase I Report*, Society of Manufacturing Engineers, Dearborn, MI, 1997

Bibliography

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