

Session 2542

Engineering Management as an Outreach Degree
At the University of Idaho

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Abstract

Engineering Management is an emerging field of engineering which focuses on the needs of engineers who make the transition to managerial positions. Such a transition usually occurs after several years of traditional engineering practice. The University of Idaho recently implemented its Master's program in the area of Engineering Management. This advanced degree program sharpens the student's quantitative and personal skills necessary for the engineering manager's position. The program curriculum contains core courses and a suite of required business courses and is delineated in this paper. A distinct feature of this program is that it is available as a video outreach program and hence the student's study plan will not be disrupted with business travel or relocation. Instructor-student interaction is very effective and timely with the use of the web as a means of submitting and returning homework.

Introduction

The University of Idaho has offered engineering programs for nearly a century. The main campus is located in Idaho's panhandle at Moscow, Idaho. The University also offers engineering education through resident instruction centers in Idaho Falls, Boise and Coeur d'Alene. About ten years ago, in response to an emerging need to provide management education to practicing engineers at the Idaho National Engineering and Environmental Laboratory (INEEL) and elsewhere, the university began the planning and development of a Master's degree in Engineering Management. The program was carefully constructed to include all the skills that practicing engineers need as they make the transition from engineers to technical managers. The program was implemented two years ago and is offered to local students in Moscow, Boise, and Idaho Falls; and to outreach students practically anywhere. This program signals a pioneering effort in remote delivery of a graduate program. The program structure benefits the students by increasing the availability of courses and the exposure to a variety of teaching faculty in multiple locations.

University of Idaho

The University of Idaho is the state of Idaho's publicly supported land-grant institution and was founded in 1889. One of the primary areas of emphasis for the university is engineering. Today, the University of Idaho offers baccalaureate and advanced graduate degrees in all major engineering disciplines. The mission of the college of engineering is to prepare the students for professional practice, admission to advanced programs, and for leadership in their professions.

Roughly two decades ago, in order to provide statewide access to high quality educational programs, the college of engineering instituted an outreach course delivery system. The university is a founding member of the National Technological University (NTU) for video delivery of courses via satellite. In addition, the university delivers engineering courses to students across the state and region via live compressed video transmission and via pre-taped video tapes. The video tape mode of course delivery allows the university of Idaho to reach students beyond the state boundaries. The Engineering Outreach program of the University of Idaho was named as the number one producer of taped instruction in 1995 by the Association of Outreach Departments.

The Engineering Management program was implemented in 1995 in Idaho Falls. Starting in 1996, the degree of Master of Engineering in Engineering Management became part of the UI Engineering Outreach program. Now, this degree can be pursued by qualified students at virtually any location in the world.

University of Idaho at Idaho Falls

In response to a need for graduate engineering education in Idaho Falls by employees of the National Reactor Testing Station, which later evolved into INEEL, the University of Idaho opened a satellite campus in Idaho Falls in 1954. The number of faculty and the number of degree offerings have continually increased since that time. Currently, graduate degrees are offered in several engineering disciplines. Resident UI faculty are complemented by two-way compressed video instruction from Moscow, by pre-taped video courses, and by adjunct faculty who are typically employees for the INEEL or a local high-tech firm.

Engineering Management Program Administration

The Engineering Management program has been under development since mid 1980's; it was approved by the UI Board of Regents in 1988. Eight graduate courses were developed and implemented specifically for this program. The program was fully implemented in 1995 by the current program coordinator who is a member of the resident full-time faculty of the Idaho Falls campus. The bulk of the courses are taught by engineering and business faculty who reside on the Moscow campus of the university. The remainder of the courses are taught by the resident and adjunct faculty of the Idaho Falls campus.

Since the program was developed primarily as an outreach program, it is not necessary for the program coordinator to be located on the main campus. Rather, the coordinator should be at the location with the highest concentration of students in the program. Consequently, the program coordinator is a resident teaching faculty member at the Idaho Falls campus. The program coordinator serves as the major professor for local students pursuing this advanced degree. The coordinator also serves as the major professor and advisor for outreach students who enroll in the program while continuing their professional practice virtually anywhere in the world.

Students were enrolled in the program beginning in 1995. Since that time, fourteen students from Idaho Falls and one from Moscow have been admitted into the program. Another fourteen students have been admitted through the video outreach program. The outreach students primarily reside outside the state, although some Idaho residents have chosen to enroll as outreach students, in order to handle work travel obligations and/or in order to deal with non-proximity to one of our campuses.

Engineering Management Curriculum

This Master's degree is specifically constructed for seasoned practicing engineers. The admission requirements are a B.S. degree in an accredited engineering program with a minimum GPA of 2.8, and five years of responsible engineering experience. In order to fully integrate the pursuit of this degree with job responsibilities and constraints, a letter of recommendation from the current employer is also required. Given that this program is a non-thesis program, the capstone elements of the program include an independent project on a selected practical aspect of engineering management, and a comprehensive examination which will demonstrate the candidate's ability to integrate the course-work leading to this degree.

In addition to the independent project, the curriculum requires 32 semester hours, divided into the following categories:

Engineering Management Core Courses:

- Engineering Management 510, Fundamentals of Engineering Management
- Engineering Organization
- Total Quality Management
- Managing Project Teams
- Managing Projects
- Communications
- Managing Contracts
- Engineering Ethics

Civil Engineering 482, Project Engineering
Project Planning
Project Execution
Project Monitoring

Civil Engineering 484, Engineering Law and Contracts
Engineering Law
Specifications
Contracts

Engineering Management 502, Masters Project
Literature Search
Develop New Technique
Compile Data To Validate Technique
Develop Or Enhance Software Systems
Develop Presentation Package

Engineering Technical Electives
Two 500-Level Courses That Enrich The Student's Knowledge In The Chosen Area of
Technical Specialty

General Management Courses:

Business 530, Managing Technical Systems
Organizational Design
Group Process
Team Building
Motivation
Conflict Management
Leadership
Empowerment
Performance Appraisal

Business 531, Managing The Design Process
Product Development Strategy
Customer Focus
Quality Function Deployment
Product Life Cycle
Concurrent Design
Design For Manufacturability
Quality Management
ISO 9000

Business 533, Managing Complex Systems
Systems Approach
Cost Benefit Analysis
Risk Analysis
Game Theory
Simulation
Linear Programming

Business 534, Managing Technological Change
Technology Life Cycle
Technology For Competitive Advantage
Information Systems
Human-Technology Interactions

Managing Change
Group Decision Support Systems
Expert Systems
Technology Transfer

Accounting 582, Cost Management Systems
Activity-Based Cost Management
Cost Estimation
Performance Measurement
Capital Budgeting
Project Budget Elements

Engineering Management 511, Legal Environment for Engineers
General Legal Process
Legal Research
Legal Writing
Legal Reasoning

Outreach Mode of Course Delivery

When a course is being offered as part of this program, local students register through the normal registration channels, while outreach students register for the course through the UI Engineering Outreach process. The lecture is broadcasted in real time to other campuses.

The class lectures are taped for those students that are taking the course but do not reside in convenient proximity of one of our campuses or live outside the state of Idaho. The lecture tapes are shipped to the outreach students by the UI Engineering Outreach office in Moscow on a weekly basis. One of the major benefits of taping the lectures is that the course can be offered as a pre-taped option to students, who might reside anywhere, and who need to take the course but do not wish to wait until the next scheduled offering of the course.

Using the Web

The students may choose to receive the course syllabus and homework descriptions in hard copy form. However, the majority of class handouts are available for download through the course home page. In turn, the students may submit their completed homework by posting it to the instructor using electronic mail. Sometimes, students choose to fax their homework to the instructor. Using these two submittal media, instructors can adhere to a specific submittal date for all the students in class, independent of where the students may reside. The outreach students' residences span the country from coast to coast. In some occasions, the students reside overseas, and yet these students submit their homework in accordance with the designated Outreach submittal date. Graded homework is returned to the student through email or via fax, normally within a week of the due date.

Those students who have questions, may reach the instructor through an 800 number. The students call Engineering Outreach's 800 number and then are transferred to the instructor of their choice. Although the Outreach office is in Moscow, the students' calls get seamlessly transferred to instructors who may be in Boise or Idaho Falls, some 400 miles away.

Using the web and the taped-video outreach mode, students who reside outside of our residence centers can participate in class activities essentially the same as local students. In fact, the outreach mode has the advantage that if the student has to relocate as a result of work obligations, the course flow will not be disturbed. There have been cases where a student relocated several times during the semester, and yet the flow of course material and homework continued without any disruption.

In cases where, due to work obligations or due to lack of proximity to an educational center, it would have been impossible for a student to take a course otherwise, the outreach mode of instruction provides a great avenue for students to take a course, or even pursue a degree. However, the outreach course provides a set of unusual challenges for the instructor. By and large, the notes and presentations have to be more polished if the class is being taped. Once the instructor collects the homework through the internet and from the fax machine, they are graded in the usual manner. However, returning the homework to outreach students involves weekly mailing, faxing, or email-posting of the homework on an individual basis. Additionally, some instructors mail a summary earned-point sheet to inform the students of their individual progress. As for the phone contact with outreach students, the instructor may end up answering the same question several times due to the outreach nature of the course.

Conclusion

Part of the motivation for implementing the Engineering Management program as an outreach program is the sheer size of the State of Idaho. The distance between the three major population centers of the state, is typically about 300 miles; these population centers are the Northern Idaho, Southwestern Idaho, and Southeastern Idaho. This distance prohibits the implementation of a full complement of engineering management faculty for each population center. Our delivery method, including video outreach support, makes this program available to the students located in all of these three geographical areas. And yet, the students will, by and large, get the same experience as a local student in all of the courses. Further, the benefits of this mode of degree delivery extend to the video outreach students who have enrolled in the UI Engineering Management program, but they reside outside the state of Idaho. On reflection, the outreach mode of instruction might not replace the traditional classroom delivery mode, but it is exceptionally effective in reaching those students who, due to proximity or due to work obligations, would not have been able to pursue a degree otherwise.

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