MEMORANDUM

TO: President Robert M. Gates

SUBJECT: Approval of University Curriculum Committee Item (FS.23.82)

At its regular meeting on December 12, 2005, the Faculty Senate approved the following curriculum item from the University Curriculum Committee and submits it for your approval. Attached is a copy of the material sent to our Senators.

Special Consideration
Dwight Look College of Engineering
Certificate in Engineering Project Management

Thank you for your time and consideration. Please inform me of your action on this matter.

John L. Fike
Speaker

Attachment

cc: Dr. David Prior
Dr. Karan Watson
Dr. Paul Meyer
Ms. Linda Lacey
Dr. G. Kemble Bennett

Approved:

Robert M. Gates, President

2-12-06 Date
MEMORANDUM

TO: Linda Lacey
FROM: Jo W. Howze

The Dwight Look College of Engineering is proposing an undergraduate certificate program in Engineering Project Management. The proposed certificate has been developed by Drs. John Niedzwecki, Jo Howze and Kenneth F. Reinschmidt. This package includes:

- Proposed Undergraduate Certificate Program in Engineering Project Management
- New Course Request for CVEN 333 Project Management for Engineering
- New Course Request for INEN 333 Project Management for Engineering
- New Course Request for MEEN 333 Project Management for Engineering
- Support Letter from the Mays Business School

The intention is to have the new courses approved and listed in Catalog 129 for Fall 2006 and to initiate offering the certificate program at the same time.
Reason for Being

Engineering-related projects are often complex projects, which require engineers from various disciplines and assistance from construction and manufacturing trades. The management of these projects entails not only technical knowledge and engineering skills but also management skills, particularly in multidisciplinary projects. There is a growing body of knowledge in project management, which involves an increasing degree of professionalism as exemplified by the growth of the Project Management Institute and its PMI Certification program, increased research, and a growing number of specific project management skills that are not commonly taught in traditional disciplinary undergraduate engineering curricula. Success in managing projects requires additional skills, and success in working as an engineer inside project organizations commands more and more knowledge of how projects work.

Industry has made clear its dissatisfaction with the status quo in typical engineering curricula. Engineering graduates are expected to know something about working on projects and are typically assigned to projects with no formal training in project functions. Recent graduates are often promoted or assigned to project management duties without training or sufficient experience. The previous approach of informal on-the-job training of engineers, promotion of the best engineers into project management, and survival of the fittest is breaking down in many areas as downsizing, market demands, and other factors do not allow enough time for the traditional system to work. Moreover, industry is aware of the number of projects that fail (exceed budget, fail to meet schedule deadlines, fall short of performance specifications, etc.) due to failures in project management.

As a consequence, there has been a rapid growth in short courses, continuing education, and Master's degree programs in project management aimed at engineers working in industry. The costs of these programs are often supported by their employers through paid time off and tuition and travel reimbursement. However, many employers are looking for project management knowledge from engineering BS graduates directly out of college.

For example in 2004, the Dwight Look College of Engineering sent out 90 questionnaires to members of various College and Department-level industry advisory groups, most of whom were Former Students. Of these 90 questionnaires, 50 were returned with usable data. Of these responses, 86% said that Texas A&M engineering BS graduates received too little education in project management (12% said about the right amount; 2% had no
opinion, and none said there was too much). In reply to a question regarding the skills most lacking in TAMU engineering graduates, 64% said project management skills (21% said general management skills, and 15% said people skills were most lacking). Of the respondents saying that graduates received too little education in project management, 68% said curriculum improvements were needed at both the undergraduate and graduate levels, 30% said improvements were needed only at the undergraduate level, and only 2% said improvements were needed only at the graduate level. Improvements sought by the industry advisors at the undergraduate level included increased project management exposure in senior capstone design courses, a sequence of project management courses at the junior and senior levels, and an undergraduate certificate program in conjunction with the Mays Business School.

These results, as well as more informal discussions with industry leaders, indicate that there is a considerable unsatisfied demand for project management education for engineering undergraduates, particularly on a multidisciplinary basis. The need is present at the undergraduate, graduate, and continuing education (distance learning) levels, but the priority given by the industry advisors is at the undergraduate level. Therefore, this proposal for an undergraduate Certificate Program in Engineering Project Management is being submitted. As this certificate develops, more departments will be included in the program. Once the program is established, a certificate option at the graduate level will be pursued.

This certificate will be advertised through departmental advisors and on the Engineering Academic Programs Office website. It will be marketed as value added to the student’s curriculum, similar to other certificate programs and an internship or co-op assignment.

**Who and What the Program is Designed For**

The Undergraduate Certificate Program in Engineering Project Management is intended to meet the requirements of industry by educating engineering BS graduates to understand projects, project organizations, and project management methods in order to:

- Work effectively as engineers within engineering project organizations immediately after graduation.
- Advance to positions in engineering project management more rapidly and successfully.

The Undergraduate Certificate Program in Engineering Project Management proposes to address the needs of undergraduate engineering students who anticipate spending their careers in organizations that function through projects by:

- Preparing graduates to work effectively as engineers in project organizations by understanding how projects work; why projects are organized the way they are; what project managers do; and what systems, methods, and skills are used in project management.
- Encouraging undergraduate students to pursue careers in project management by better understanding the roles of project managers, the skills they require, and the rewards and satisfactions of successful project management.
- Providing undergraduates with the foundation for graduate (MS) study in project management.

Benefits

Industry (and government agencies) will benefit from the proposed undergraduate Certificate Program in Engineering Project Management by being able to hire graduating engineers who can fit more easily and readily into interdisciplinary project organizations and who have the knowledge and skills to advance into project management and ultimately corporate management positions. These graduates will be more valuable to employers; therefore, the proposed certificate program will add value to industry.

Engineering graduates will benefit from the proposed undergraduate Certificate Program in Engineering Project Management by being able to work more effectively in project organizations immediately after graduation. Graduates with an interest in project management as a possible career path will profit by being able to advance more rapidly into project management positions and to function more effectively as project managers. Engineering graduates with entrepreneurial interests in starting their own companies will have better managerial skills and a more clear understanding of how new projects are identified, funded, organized, and managed.

Description

The proposed undergraduate Certificate Program in Engineering Project Management will consist of (4) three-hour courses for a total of 12 credit hours. Two of the courses will be technical electives, which will count for 6 credits toward the student's departmental engineering degree. Core courses will include CVEN 333 (or departmental equivalent)* and MGMT 363. The additional six hours will be comprised of (1-2) three-hour engineering electives and (0-1) three-hour management electives in the Mays Business School.

* The Departmental Request for a New Course for CVEN 333 is attached. It has been taught as CVEN 489 two previous times with 22 students completing the Spring 2003 course and 26 students completing the Spring 2004 course.
Courses Included

*Fundamentals of Engineering Project Management (Core Courses)*:

Civil Engineering  
CVEN 333 – Project Management for Engineers

Computer Science  
Will utilize CVEN 333

Electrical Engineering  
Will utilize CVEN 333

Industrial Distribution  
Will utilize CVEN 333

Industrial Engineering  
INEN 333 – Cross-listed with CVEN 333

Mechanical Engineering  
Will utilize CVEN 333

Management  
MGMT 363 – The Management Process

Petroleum Engineering  
Will utilize CVEN 333

*Engineering Technical Elective in Project Management*

Civil Engineering  
CVEN 349 – Civil Engineering Project Management  
CVEN 405 – Managing Construction Projects and Project Risks  
CVEN 473 – Engineering Project Estimating and Planning

Computer Science  
CPSC 431 – Software Engineering  
CPSC 437 – Engineering Software Projects

Industrial Engineering  
INEN 303 – Engineering Economic Analysis  
INEN 411 – Engineering Management Techniques  
INEN 489 – Decision Making for Engineers
Petroleum Engineering
   PETE 400 – Reservoir Description
   PETE 403 – Petroleum Project Evaluation

Mays Business School

MGMT 372 – Managing Organizational Behavior
MGMT 373 – Managing Human Resources
MGMT 424 – Organizational Design, Change, and Development
MGMT 452 – International Management
MGMT 460 – Managing Projects

Expected Number of Students

Two or three sections of CVEN 333 will be offered at the start of the program. These sections will be assessed, and the number of sections available will then be increased.

Resources

The J.L. Frank/ Marathon Ashland Petroleum LLC Chair in Engineering Project Management was established to support the effort of promoting Project Management in engineering.

List of Faculty

Civil Engineering:
   K. F. Reinschmidt
   D. F. Ford
   S. Anderson
   W. Hitchcock

Electrical Engineering
   J. McDougall

Industrial Engineering
   E. Bickel
   D. Smith

Mechanical Engineering
   T. Lalk
Course Syllabi

See Below.

Statement Whether the Certificate is Dependent on Conferral of Degree

The proposed undergraduate Certificate Program in Engineering Project Management will be conferred upon completion of the BS in Engineering degree and award of the diploma.

Appendix: Departmental Request for a New Course, Course Syllabi
TEXAS A&M UNIVERSITY  
Department of Civil Engineering  
CVEN 489 Special Topics:  
Introduction to Project Management for Engineers  

Course Syllabus, Fall 2005

COURSE DESCRIPTION
This course provides a general introduction to project management for engineers of all disciplines. It covers projects from identification of mission need or commercial opportunity through project economic justification; preproject definition, planning and programming; evaluation of technical and business risks, integrated cost estimation and scheduling; cost, time, and performance risk assessment; work breakdown structures; project networks; managing to the budget; setting contingency allowances and management reserves; contracting and subcontracting; make-or-buy decisions; integrated project teams; managing multidisciplinary projects; progress and productivity measurement; change management; risk management, forecasting time and cost; etc. Practitioners give examples of actual projects. The objective is to convey how projects are initiated, developed, started up, and managed to completion.

COURSE OBJECTIVES
This course is primarily intended to

- Prepare graduates to work effectively in project organizations.
- Encourage students to pursue careers in project management.
- Provide the foundation for further study in project management.

Graduates are expected to be able to:

- Understand the nature of projects and the goals of project management.
- Function effectively as engineers in project organizations.
- Prepare project business plans.
- Prepare Statements of Work and Work Breakdown Structures.
- Schedule projects using networks and critical path methods.
- Assess project uncertainties and actively manage risks.
- Prepare effective project management plans.
- Measure and evaluate project progress using Earned Value methods.
- Understand the management of project scope, quality, cost, and schedule.

COURSE PREREQUISITES
Junior or Senior classification in engineering, or approval of instructor.

INSTRUCTOR
Dr. Kenneth F. Reinschmidt  
Professor of Civil Engineering  
J. L. Frank/Marathon Ashland Petroleum LLC Chair in Engineering Project Management

Telephone: 845-8599  
E-mail: kreinschmidt@civil.tamu.edu
CLASS MEETINGS (Preliminary)

- Tuesdays 11:10 am – 12:25 pm
- Thursdays 11:10 am – 12:25 pm

TEXT


COURSE REQUIREMENTS

Students are expected to participate actively in class discussions, especially project case studies. Completion of class assignments is required to build proficiency and understanding. One term project is required. All students will make both oral and written presentations. Reading assignments will be made from the assigned text, from class handouts, and from other sources.

GRADING (Preliminary)

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<th>Assignment</th>
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<tr>
<td>Assignments - proficiency exercises</td>
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<tr>
<td>Class participation and discussion</td>
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<tr>
<td>Midterm Examination</td>
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<tr>
<td>Term project - Oral presentation</td>
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<tr>
<td>Written presentation</td>
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<td>Final examination</td>
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<td>Total</td>
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CLASS SCHEDULE (Preliminary – subject to change and availability of industry speakers)

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<th>Week</th>
<th>Tuesday Class Session</th>
<th>Thursday Class Session</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction. Project economics.</td>
<td>What project managers do</td>
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<td>2</td>
<td>Project economics. Present worth</td>
<td>Business planning process</td>
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<td>3</td>
<td>Preparing project budgets and bids.</td>
<td>Identification of business opportunities</td>
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<td>4</td>
<td>Organization. Requirements definition</td>
<td>Planning. Statement of Work (SOW)</td>
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<td>5</td>
<td>Work Breakdown Structure (WBS)</td>
<td>Integrated project management plans</td>
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<tr>
<td>6</td>
<td>Contracting; subcontracting; make-or-buy</td>
<td>Risk assessment. Progress monitoring.</td>
</tr>
<tr>
<td>7</td>
<td>Risk assessment. Contingency analysis.</td>
<td>Multidisciplinary engineering projects</td>
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<tr>
<td>8</td>
<td>Midterm Examination</td>
<td>Quality management; dispute resolution</td>
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<td></td>
<td>Earned Value Management (EVM)</td>
<td>Tracking, evaluating, controlling projects</td>
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<tr>
<td>10</td>
<td>Project Networks – activity on arrow</td>
<td>Project dynamics: feedback loops, rework</td>
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<tr>
<td>11</td>
<td>Project precedence networks</td>
<td>Integrated cost and schedule;</td>
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<td>12</td>
<td>Critical Path Method (CPM)</td>
<td>Managing to the budget (cost, time).</td>
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<tr>
<td>13</td>
<td>Project organizational structures</td>
<td>Team Project presentations.</td>
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<td>14</td>
<td>Team Project presentations</td>
<td>Team Project presentations.</td>
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<td>15</td>
<td>Final Exam – date and time TBD</td>
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Texas A&M University  
Department of Industrial Engineering  
INEN 489  
Special Topics in:  
Decision Making for Engineers  

Course Syllabus, Date TBD

Course Description
Whether it is the design of an offshore structure or the level of redundancy built into a jet airliner, engineering is fundamentally a decision-making discipline. Engineers apply scientific understanding and allocate scarce resources to produce positive changes for society. Yet, most engineers receive little formal training in the principals of decision making. Worse yet, psychological research has shown that humans are prone to making mistakes in decision making and reasoning if left untrained and unaided. In the realm of engineering, this can and has led to disastrous consequences.

In this course we will discuss the fundamentals of decision making. Drawing on contributions from psychology, mathematics, economics, and engineering, you will learn how to make better decisions, avoid common pitfalls, and help others with their decision making.

Course Objectives
This course is intended to provide students with the ability to:
- Bring engineering principals to bear on decision making
- Appreciate the challenges faced when making decisions, particularly decisions that must be made in the face of uncertainty
- Make better decisions in their personal and professional lives
- Play an active role in helping their employers and society make better decisions
- Communicate their choices and recommendations clearly

Selected Topics
- Framing decisions
- Generating alternatives
- Dealing with uncertainty
- Making choices
- Risk Tolerance
- Valuing information
- Avoiding common pitfalls and biases
- Group decisions
- Communicating insights

Course Prerequisites
Junior classification in engineering or approval of instructor.
Instructor
J. Eric Bickel, PhD *
Assistant Professor
Industrial Engineering
236B-Zachry Engineering Center
845-4347
ebickel@tamu.edu

Texts
- Instructor lecture notes
- Selected readings

Grading

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<th>Component</th>
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<td>Class participation and discussion</td>
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<tr>
<td>Exam 1</td>
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<tr>
<td>Exam 2</td>
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<tr>
<td>Homework</td>
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<tr>
<td>Group Term Project</td>
<td>15%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
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Americans with Disabilities Act (ADA) Policy Statement
The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room 126 of the Koldus Building, or call 845-1637.

Academic Integrity:
"An Aggie does not lie, cheat, or steal or tolerate those who do." It is the responsibility of students and instructors to help maintain scholastic integrity at the university by refusing to participate in or tolerate dishonesty. (http://www.tamu.edu/aggichonor)
MEMORANDUM

October 20, 2005

To: Jo W. Howze, Associate Dean, Look College of Engineering
Through: Jerry Strawser, Dean, Mays Business School
Through: R. Duane Ireland, Head, Department of Management
From: Martha L. Louder, Associate Dean, Mays Business School
Subject: Proposed Certificate Program in Engineering Project Management

Mays Business School enthusiastically supports the concept of the proposed program, which will require that students take at least one course in the Mays School’s department of management. Details about other management courses that may be taken as an elective by program participants will be determined at a later date. We look forward to another successful and mutually beneficial relationship between the two colleges.