TO: The Faculty of the Schools of Engineering

FROM: The Faculty of the Department of Freshman Engineering and
           The Freshman Engineering Curriculum Committee

DATE: March 24, 2004

SUBJECT: New First-Year Engineering Course

The Faculty of the Department of Freshman Engineering and the Freshman Engineering Curriculum Committee have approved the following new course, which will be required for First-Year Engineering students. This action is now submitted to the Engineering Faculty with a recommendation for approval.

ENGR 126   Engineering Fundamentals and Problem Solving

Sem 1 and 2. Class 2, lab. 2, cr 3.
Corequisite: MA 165 or equivalent, or consent of instructor.

Introduction to the engineering profession; development of skills in teamwork, problem solving, analysis, engineering design and utilization of computer tools; introduction to engineering fundamentals and basic engineering science concepts.

Reason:

This new course represents a significant departure from previous offerings in so far as it will have as its core teaching objectives the teaching of engineering fundamentals, problem solving strategies, design concepts, and an introduction to teaming, in contrast to teaching computer tools with a specific focus on logic development and algorithmic design, which will now be covered by CS 160. ENGR 126 is intended to replace ENGR 106 in the first-year curriculum.

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Kamyar Haghighi, Head
Department of Freshman Engineering

Supporting Documentation

Course Objectives

The purpose of the course is to introduce students to fundamental engineering concepts, problem solving strategies and the design process in order to provide a framework from which students can make key interdisciplinary connections to math and science. Course materials will be presented in a learner-centered environment and will focus on processes (how to pose questions, how to acquire information to address those questions, and how to assess the quality of information) in order for the students to gain a more complete understanding of the role of an engineer in problem solving and design.

Use of computer tools will not be abandoned. To the contrary, it is envisioned that students will simply have a more "introductory" exposure to computer tools, including Excel and MATLAB. It is still our objective to have students develop a basic understanding of computer tools and the advantages and disadvantages for implementing various solution strategies. In addition, we expect students to gain insight with regard to selecting the most appropriate tool to facilitate solving an engineering problem.

Course Learning Objectives

Successful completion of this course will enable a student to:

1. Understand engineering fundamentals and basic engineering science concepts so he/she can synthesize said concepts to create higher quality engineering solutions and designs;

2. Use the engineering problem solving process to translate a written problem statement into a mathematical model;

3. Understand how engineering problem solving is related to the design process;

4. Implement simple algorithmic solutions to engineering problems/designs using the most appropriate computer tool;

5. Perform basic file management tasks using an appropriate computer tool;

6. Apply the engineering problem solving/design process to model, analyze, predict and build an object of engineering interest.

7. Work effectively and ethically as a member of a technical team; and

8. Develop a work ethic appropriate for the engineering profession.

Topics (not necessarily in order)

- The engineering profession: (2 weeks)
  - Engineering disciplines and job functions
  - Ethics
  - Being a member of a technical team

- Engineering solutions: (2 weeks)
  - Problem solving strategies
  - The engineering design process and its relationship to problem solving
  - Engineering estimations and approximations
  - Dimensions, units systems and conversions

- Presentation of technical information: (2 weeks)
  - Tabular and graphical information
  - Curve fitting methods
  - Method of least squares

- Statistics: (2 weeks)
  - Descriptive statistics
  - Statistical inference
  - Histograms
  - Normal distributions
  - Other probability distributions

- Engineering Fundamentals: (5 weeks)
  - Forces, moments and free body diagrams
  - Conservation of mass
  - Conservation of energy
  - Conservation of charge

- Engineering Economics (2 weeks)
  - Time value of money
  - Uniform and non-uniform cash flows

The following topics will be integrated throughout the course with material being presented both in lecture and lab on an as needed and just-in-time basis.

- Introduction to computer tools:
  - Network communications
  - Unix and file structures
  - Excel: cell addressing; simple and complex formulas; built-in functions (including conditionals); and plotting
  - MATLAB: Basic MATLAB scripting practices; assignment statements and arithmetic; vectors and arrays; conditional constructs; repetition constructs; reading from files; basic formatting; and basic plotting