IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

College of Engineering
Engineering College Curriculum Committee
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To: Jan Thompson, Chair, Faculty Senate Curriculum Committee

From: Vern Schaefer, Chair, Engineering College Curriculum Committee Vernon R Schaefer

Subject: Discontinuation of Engineering Studies Minor

Last year the Engineering College Curriculum Committee (ECCC) conducted a review of the Engineering Studies Minor (attached). As a result of the review, the ECCC voted 6-1-1 on March 8, 2011 to recommend discontinuation of the minor for the following reasons:

1. Minor is not serving the intended purpose and audience
2. Low enrollment of students in the minor
3. Reduction in college resources to manage the minor including resources for potential new course offerings

Subsequent to the ECCC recommendation, the recommendation was discussed at a College of Engineering faculty meeting on March 24, 2011 and submitted for electronic voting to the College of Engineering faculty. 146 faculty voted on the issue, with 115 (78.8%) voting yes and 31 (21.2%) voting no. Thus, the ECCC and the College of Engineering faculty recommend discontinuance of the Minor in Engineering Studies.

We now pass this onto the Faculty Senate Curriculum Committee for their action.

Please let me know if you have any questions or need additional information.

Periodic Review of Engineering Minor

1) Name of the minor:

Minor in Engineering Studies, also known as Engineering Studies Minor

2) Name of the departments involved:

The team that is involved with teaching, visiting lectures etc are

Electrical and Computer Engineering
Material Science
Industrial Engineering
ABE

3) Administration of minor including names of director and/or steering committee:

Mani Mina Director ECpE
Paul Castleberry

Allen Russell Material Engineering
Carolyn Heising Industrial Engineering
Tom Brumm ABE
Diane Rover ECpE

Mack Shelley has done some evaluations for effectiveness of some of the classes

Original Members who are not active

John Schuh Educational leadership
Steven Mickelson ABE and CELT

4) General description of the minor:

The official description in the catalog

The College of Engineering offers an undergraduate minor in engineering studies for non-engineering students designed to improve their understanding of engineering.

This minor is not intended to train non-engineering students to do the work of practicing, degree-holding engineers. Rather, students who complete the minor in

engineering studies will be able to work more effectively in their primary field by better appreciating the nature, capabilities, and limitations of engineering.

The minor in engineering studies is structured so that no student will be excluded due to insufficient preparation in mathematics or the sciences. The required courses in the minor and many of the elective courses are specifically designed to offer a range of prerequisites, so that students from all curricula will find coursework that supports an accessible and intellectually stimulating program of study.

5) Information available to inform students, faculty, and advisors about academic and career opportunities related to the minor:

We have a website that is meant to communicate with the students and we do have presentations to the interested departments such as business and LAS about MES. We also have close communication with the Industrial Design program and the program director of the program.

6) Objectives of the minor including the student learning outcomes and how the learning outcomes are assessed:

The main objective of the MES at Iowa State is to provide a technological education to non-engineering students with various backgrounds. This is not an engineering degree. It should be noted that this is not a "minor in engineering" but a "minor in engineering studies." The students are not trained as engineers (and cannot compete for engineering jobs), but will acquire a conceptual understanding of engineering, engineering design processes, technology, and technology-related concepts. This program is trying to build basic literacy in engineering, and the first goal is to provide students with a conceptual framework and working perspective so they can appreciate engineering and technological issues.

The current student learning outcomes of the Iowa State MES are as follows.
The MES graduate will be able to:

- Explain the role of engineering in society and the interactions of engineering with their major field of study
- Perform simple calculations and estimations using the engineering method
- Make simple cost-benefit and risk-benefit analyses
- Appreciate the importance of the underlying assumptions used to produce the cost-benefit and risk-benefit analyses presented by engineers
- Make informed decisions about the desirability of engineering activities by weighing the benefits of those activities against their environmental risks
- Explain the interdependence of the economic, environmental, and sociological aspects of technological change
- Assess the validity and possible weaknesses in predictions of economic, environmental, and sociological consequences of technological change presented by others
- Carryout a basic engineering design process
- Explain why particular materials and processes are used to produce simple engineering devices and systems

- Describe the capabilities and limitations of basic manufacturing processes and engineering systems

MES Student Constituents

The program is designed to be an effective minor to supplement the students' non-engineering degree programs.

This program is designed to help students who:

- Are not engineering majors but are interested in understanding "how things work"
- Are looking at directorship, management, technical marketing, sales, and related careers in an industry that continues to involve more technology
- Are possibly interested in public policy decisions impacting government, education, industry, religious institutions, health care, and other areas of societal impact
- Are thinking about working in bioengineering areas, but not on the technical side

Consequently, students of mathematical sciences such as physics, chemistry, and mathematics may also pursue a minor in engineering studies.

7) Student interest and demand for the minor, including historical student enrollment (provide enrollment statistics for courses developed specifically for the minor), number of minor graduates, and anticipated enrollments:

MES had a slow start. The first few years of the program we had few very dedicated students but our classes did not become more than 5 or 6 students.

However, there has been a turn in the program since Fall 2010. Starting Fall 2010, MES program is experiencing 25+ students (and will grow) due to the participation of the students from the new program in the college of design, Industrial Design.

Industrial Design program has required E St 260 and E St 270 in students program of study. Many of the students who are taking these classes are working to also enroll in the MES program. Our team is helping many of our current 260 students and out Fall 270 students to choose the right courses to graduate with Engineering Studies minor.

The two group of students who have shown the most interest have been the students in college of design and students in Business college. We are seeing students from other LAS programs also showing interest in the program.

A complete list of enrollments of the classes is available and is included with this report

8) Employer interest and demand for students with the minor:

We have introduced and presented MES ideas and perspectives to EABs of the department and college level in different occasions and they have shown positive interest. Their recommendations have included

1. Making sure that this is technological literacy that helps graduates have better understanding of working with engineering
2. Perhaps creating a certificate for those who are already in the companies
3. Help possible future policy makers be educated in technology and related areas

9) Relationship of the minor to other programs at Iowa State University:

Currently, MES is providing technological literacy to students in the newly created program in the college of design, Industrial Design. We have had meetings with the director of that program, and are working with him to make sure we offer the right classes at the right time for their students to take. Since we will have over 25 students in these classes most of them from the industrial design program, working with the college of design and the industrial design team has been an essential part of growing the minor of engineering program.

Starting with Fall 2010 our classes E St 270 and E St 260 have been seeing 25+ students who are mostly from the industrial design program. We are working with that department to make sure we provide the right material and perspectives for their students as well as our other students from Design, business, LAS, and other programs.

10) Relationship of the minor to the strategic plans of the university, of the college, and of department or program:

Since Minor in Engineering studies is a Technological Literacy program, it is important for couple of reasons.

1. Offers a technological perspective to all non-engineering students
2. It offers technological literacy to non technical students, which is a national level effort suggested by NAE, ASEE and other organizations
3. It provides the engineering perspectives to non-engineering students so they would have better understanding of engineering process and issues and would hopefully result in better future working relationships with engineers and technological processes.

11) Program requirements and procedures, including:

a. *Prerequisites for prospective students:*

We do not have any prerequisite. However, we assume students have had high school algebra and very basic science. Consequently, when E St 260 and E St 270 required basic trig, we do have special lectures on trig for the students to know and practice.

b. *Application and selection process:*

The process is self selecting, students who would like to be in the minor program have to fill the form and get approval from their department and the MES coordinators

c. *Courses and seminars available for credit toward the program:*

A list is available for the students, we also accept ANY engineering class in our program of study.

The following classes are offered by MES program, classes just for the minor students
E St 260
E St 265
E St 270

Please see the course descriptions in the attachment.

Professor Vik Dalal offered E St 351 which allows MES students to interact with the EE and material engineering students

Professor Heising is working on a Nuclear engineering class that allows engineering students and MES students to interact

d. *Advising of students*:

Student advising has mostly be done by Mani Mina and Paul Castleberry

12) General description of the resources currently available and future resource needs, in terms of:

a. Faculty members:

Mani Mina

Graduate students: Ryan Gerdes has taught 260, 265, and 270 during 2008 and 2009 with Mani Mina and then Fall 2010 he did 260 and is doing 270 with Mani Mina supervision

This is a part of our NSF program: Preparing Future Faculty of Engineering his reviews are great

Sasha Kemmet has helped with laboratory and experiments/hands on activities in Fall 2010

Sasha Kemmet and John Pritchard will be helping with 260 and 270 in Spring 2010 with hands-on and laboratory experiments

Prof. Allen Russell

Has been one of the program advisors and has provided lectures for E St 260

Prof. Carolyn Heising has also been a valuable advisor, has offered to teach anytime we need her help and also have been kind to provide numerous lectures on Nuclear energy, green energy etc.

Prof. Tom Brumm has been an advisor to the program and has been kind to provide numerous lectures on Biofuel and alternative energy and also has offered demonstrations (making biofuel) in class

b. *Computers, laboratories, and other facilities:*

Currently we do not need any physical facilities. He have been able to bring the material, and equipment into the class and have hands-on sessions for 260 and 270 classes

We use Electrical engineering equipment and well as PLTW (Project Lead the way) equipment. Other material such as making paper planes etc are just provided by the instructor.

c. *Library facilities (journals, documents, etc.) in the proposed area:*

The material that students need is provided via WebCT and instructors' websites

d. *Supplies, field work, student recruitment, etc.:*

We have done very little recruiting most of our advertizing and recruiting has been done by visiting some classes and providing informational sessions and visiting with the advisors in different colleges.

13) **If a governance document exists for the program, please attach.**
We do not have one.

Appendix

The following is provided to identify the history of what we have done in MES and show the new trend of having 25+ students in our 260 and 270 classes which will continue according to our discussions with Industrial Design program

1. How many and who has graduated with MES? 8

CRISPIN JOSEPH WILLIAM
CROUTHAMEL JOHN ROSS
HUSER KELLI ANNE
KELLY THOMAS MATTHEW
KUNZE MATTHEW THOMAS
MILLER TIMOTHY WADE
VINCENT KELSEY L
WHITCOMB RYAN DALE

2. How many students are in the program

Spring Semester 2011 Enrollment we have about 12 people who are working on their minor form and have not filed for the program

MAJOR_CURR	MIN E ST
ARC	1
ARTGR	1
ARTIS	1
FIN	1
MIS	1
TCOMM	1
Grand Total	6

3. How many students have been taking our classes up to know?

		E ST						
CCYY	SEM	260	265	270	351	351X	490	Grand Total
2008	Fall		5				1	6
2009	Spring			5		3		8
2009	Summer						1	1
2009	Fall	2	4	2				8
2010	Spring	3	4	3	6			16
2010	Fall	1	4	30				35
Grand Total		6	17	40	6	3	2	74

E St 260
Spring 2011
has 26

students in it.

Courses for Minor Studies

Total Credits Required for the Minor in Engineering Studies = 21

1) Required course #1a (Engr 160) or 1b (E St 260), but not both (3 cr.)
2) Required course #2 (E St 265) (3 cr.)
3) Required course #3 (E St 270) (3 cr.)
4) A minimum of 6 additional credits in courses that bear the designation "ES" (as described below) or courses offered by departments in the College of Engineering and expressly approved by that department's curriculum committee for use in the Minor in Engineering Studies.

The following is a partial listing of approved courses for the Minor in Engineering Studies. The designation "E St" is an abbreviation for "Engineering Studies" and indicates that the course will be administered by the Engineering College to serve students who are not majoring in Engineering. There are classes that have been suggested by different departments, however, except one (EE/E St 351) that has been offered successfully, the others are not on this list.

Additional courses may be added to this list by action of the individual Engineering College department curriculum committees, designating courses offered by their departments deemed suitable for inclusion on the approved course listing:

Engr 160. Engineering Problems with Computer Applications Laboratory. (2-2) Cr. 3. F.S.SS. *Prereq:* Satisfactory scores on mathematics placement examinations; credit or enrollment in Math 142, 165. Solving engineering problems and presenting solutions through technical reports. Significant figures. Use of SI units. Graphing and curve-fitting. Flowcharting. Introduction to material balance, mechanics, electrical circuits, statistics and engineering economics. Use of spreadsheet programs to solve and present engineering problems. Solution of engineering problems using computer programming languages.

E St 260. Engineering: Getting from Thought to Thing.
(3 Credits) - What is engineering, technology and their roles in society? Investigation of engineering methods through case studies of everyday objects. Explore questions about the impact of technology in society. Apply engineering methods to design and failure analysis. This class will have hands-on, demonstrations, and laboratory components.

E St 265. Survey of the Impacts of Engineering Activity (3 credits) - Survey of the economic, environmental, societal, and political benefits and problems resulting from engineering activity. Effects of engineering projects on human health, social structures, and the environment. Examination of improvements in economic opportunities and quality of life resulting from engineering activity. Case studies of the effects of engineering activity.

E St 270. Survey of How Things Work (3 credits) - An overview of the similarities and differences of the major engineering disciplines; methods used to manufacture products, build structures, and design systems. The goals of the class is to help students who are not from engineering background to understand how everyday things work, this includes engine, electricity, magnetism, communication, manufacturing, energy systems, and other technological items such as Cell phone, Internet, and other issues of interest to the students. This class does include hands-on, demonstrations, and laboratory components.

E E/ E St 351. Introduction to Energy Systems: An Engineering Perspective. (3-0) Cr. 3. Dalal. Energy-scientific, engineering and economic foundations. Energy utilization-global and national. Sectoral analysis of energy consumption. Relationship of energy consumption and production to economic growth and environment. Technology for energy production. Economic evaluation of energy
utilization and production. Scientific basis for global warming. Environmental impact of energy production and utilization. Renewable energy.

Hist 284. Introduction to History of Technology and Engineering I. (Same as M E 284.) (3-0) Cr. 3. F. Technology in various civilizations from Sumer and Egypt to early 18th century Europe.

Hist 285. Introduction to History of Technology and Engineering II. (Same as M E 285.) (3-0) Cr. 3. S. Technology in Western world in nineteenth and twentieth centuries.

Con E 380. Engineering Law. (3-0) Cr. 3. F.S. *Prereq: junior classification*. Introduction to law and judicial procedure as they relate to the practicing engineer. Contracts, professional liability, professional ethics, licensing, bidding procedures, intellectual property, products liability. Emphasis on development of critical thinking process, abstract problem analysis and evaluation. Nonmajor graduate credit.

Phil 343. Philosophy of Technology. (Same as T SC 343.) (3-0) Cr. 3. F.S. *Prereq: 6 credits of social science or T SC 341 and 3 credits of social science.* Conditions under which technological innovations contribute to human emancipation, relationship of technology and democracy, utility and limits of technical rationality, and problems of ensuring that benefits of technological advance are communally shared. Issues discussed with reference to contemporary developments in microelectronics, technology transfer to the Third World, etc. Nonmajor graduate credit.

Hist 380. History of Women in Science, Technology, and Medicine. (Same as W S 380.) (3-0) Cr. 3. *Prereq: sophomore classification*. Bix. History of women's relationship to the fields of science, technology, and medicine, as students and professionals, consumers,

subjects and patients, family members, workers and citizens. Concentrates especially on 19th and 20th century United States, concluding with an examination of current issues of special interest to women in science, technology, and medicine.

Agron 342. World Food Issues: Past and Present. (Same as Env S 342, FS HN 342, T SC 342, U St 342.) (3-0) Cr. 3. F. S. *Prereq: junior classification.* Salvador. World hunger and malnutrition in social, ethical, historical, and environmental context. Emphasis on the origins and effects of global inequity on population trends, socioeconomic policies, and food systems in the developing world. Exploration of directions and improvements for the future. Team projects. Nonmajor graduate credit. H. Honors Section. (For students in the University Honors Program only.)

Jl MC 474. Communication Technology and Social Change. (Same as T SC 474.) (3-0) Cr. 3. *Prereq: junior classification.* Examination of historical and current communication technologies, including how they shape and are shaped by the cultural and social practices into which they are introduced.

T SC 341. Technology: International, Social, and Human Issues. (3-0) Cr. 3. F. *Prereq: junior classification.* An interdisciplinary study of the international significance of technology and of the societal and human issues attending its development and adoption.

Engl 314. Technical Communication. (3-0) Cr. 3. F.S.SS. *Prereq*: *Engl 105, junior classification.* Theories, principles, and processes of effective written communication in the technical disciplines. Attention to the major strategies for composing technical discourse; techniques for analyzing audiences and writing situations, and for organizing data and information.

Engl 411. Technology, Rhetoric, and Professional Communication. (3-0) Cr. 3. S. *Prereq*: *Engl 310; 302, 309, 313, 314; junior classification.* Study of the implication of technologies, especially computer technology, for the writing and reading of business, technical, and academic texts. Focus on selected technology-related topics. Nonmajor graduate credit.

OCSM 320. Production/Operations Management. (3-0) Cr. 3. S. *Prereq*: *Stat 226.* Introduction and analysis of the basic concepts in production/operations management. Topics include: applied forecasting, aggregate planning, scheduling, shop floor control, total quality management, inventory management, facility layout, and project management.

MIS 437 Project Management. (3-0) Cr. 3. Study of team activities in the general project

management environment. Project management techniques, including the use of software tools; project initiation; risk assessment; estimating and contracts; planning; human factors; project execution; and standard methods. Case studies, personal experience, and real-world projects will be used to demonstrate tools and techniques.

ME 484/584 Technology, Globalization, and Culture. (Dual-listed with 584X; same as F LNG 484X; same as F LNG 584X.) Cr. 3. *Prereq: senior classification.* Bernard, Rectanus. Cross-disciplinary examination of the present and future impact of globalization with a focus on preparing student for leadership roles in diverse professional, social, and cultural contexts. Facilitate an understanding of the threats and opportunities inherent in the globalization process as they are perceived by practicing professionals and articulated in debates on globalization. Will use a digital forum for presenting and analyzing globalization issues by on-campus and off-campus specialists. Nonmajor graduate credit.

Phys 302. The Challenge of Contemporary Physics. (3-0) Cr. 3. S. *Prereq: Sophomore classification.* A largely nonmathematical but intellectually challenging exploration of physics which assumes no previous work in the field. Selected material from classical and modern physics establishes the conceptual framework for the study of a major area of contemporary physics, culminating in the discussion of topics at the frontier of present knowledge. Research topics may vary from year to year and may include new particles, quarks, superconductivity, lasers, nuclear fusion, liquid crystals, solid state devices, gravitational waves.

This list is expanding as new classes are identified by the program and are created across the campus.