The University of Michigan
College of Engineering
Curriculum Committee

Agenda
September 18, 2007
1:30-3:00 p.m.
GM ROOM 4th Floor
Lurie Engineering Center

1. Course Approval Forms
2. Proposed Change in ChE Curriculum
3. International Minor
4. Multidisciplinary Design Minor
5. Language Credit in HU

COURSE APPROVAL FORMS

For September 18, 2007 CoE CC Meeting

CEE 260 Modification—Changing title from: Environmental Principles
to: Environmental and Sustainable Engineering Principles; changing description.

CHE 520(X-listed with PHRM 761 (Home Dept) New Course

EECS 483 Modification—Adding a discussion section

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING
Course Approval Request
College Curriculum Committee, 1420 Lurie Engineering Center Building

Print

Form Number 1823

Action Requested

○ New Course
◉ Modification of Existing Course
○ Deletion of Course

Complete the following sections:
New Courses - B & C completely
Modifications - A modified information, B & C completely
Deletions - A & C completely

Date 3/20/2007
Effective Fall 2007

A. CURRENT LISTING

Home Department	Div #	Course Number

Cross Listed Course Information:

Course Title: Environmental Principles

TITLE ABBREVIATION	Time Sched Max = 19 Spaces	Environ. Prin.
	Transcript Max = 20 Spaces	Env. Prin.

Course Description:
Basic principles which govern the use of chemicals, their fate and transport in the environment, and their removal from waste streams. Toxicology, perception of risk, government regulation, and ethics as they pertain to the design of treatment processes for the removal of environmental contaminants, Pollution prevention.

PROGRAM OUTCOMES:
☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ l

Degree Requirements: ○ Degree Requirement ○ Tech Elective ○ Core Course ○ Other ○ Free Elective

Prerequisites: ○ Enforced ○ Advised

Credit Restrictions:

Level of Credit: ☐ Undergrad only ☐ All Credit types ☐ Rackham Grad ☐ Rckhm Grad w/add'l Work ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad

Credit Hours Min / Max:

Contact Hrs/Wk:

Number of Wks:

C.

Repeatability (Indi Research, Dir. Study, Dissertation:
Is this course repeatable? ○ Yes ○ No
Maximum Hours? Maximum Times?
Can it be repeated in the same term? ○ Yes ○ No

Class Type(s): ☒ Lec ☐ Rec ☐ Sem ☐ Lab ☐ Dis ☐ Ind ☐ Other

Graded Section: ◉ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other

Grading: ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y

Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension

B. REQUESTED LISTING

Home Department	Div #	Course Number
Civil and Environmental Engineering	248	260

Cross Listed Course Information:

Course Title: Environmental and Sustainable Engineering Principles

TITLE ABBREVIATION	Time Sched Max = 19 Spaces	Env & Sustain Engrg
	Transcript Max = 20 Spaces	Env & Sustain Engrg

Course Description for Official Publication (Max = 50 words):
Mass balance modeling of contaminant fate and transport in the environment; pollutant types, sources, controls and treatment processes; pollution prevention, life-cycle assessment and economic decision-making concepts for minimizing global, regional and local environmental impact in engineering design; government legislation and regulation, exposure pathways and health risks of priority pollutants.

PROGRAM OUTCOMES:
☒ a ☐ b ☒ c ☐ d ☒ e ☒ f ☐ g ☒ h ☐ i ☒ j ☒ k

Degree Requirements: ◉ Degree Requirement ○ Tech Elective ○ Core Course ○ Other ○ Free Elective

Prerequisites: Chem 130, Math 116
○ Enforced ⊙ Advised

Credit Restrictions:

Level of Credit: ☒ Undergrad only ☐ All Credit types ☐ Rackham Grad ☐ Rckhm Grad w/add'l Work ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad

Credit Hours Min: 4 Max: 4

Contact Hrs/Wk: 4

Number of Wks: 14

Printing Information (Optional)
☒ Print the course in the Bulletin
☒ Print the course in the Time Schedule

Terms & Freq. of Offering: ☒ I ☒ II ☐ IIIa ☐ IIIb ☐ III
☒ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years

Half term ☐ 1st ☐ 2nd

Cognizant Faculty Member: Kim Hayes **Title** Professor

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval

☐ Curriculum Comm. _____
☐ Faculty _____
☐ Rackham _____
☐ Cross listed Unit 1 _____
☐ Cross listed Unit 2 _____

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department: Roman D. Hrycw 4/30/07
Home Dept. Roman D. Hrycw, Interim Chair and Professor
Cross-listed Dept(s). _____

Form Number

1823

SUPPORTING STATEMENT

The title change and course description change more accurately reflect the current course content.

Are any special resources or facilities required for this course? ☐ Yes ☒ No

Detail the Special requirements

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING
Course Approval Request
College Curriculum Committee, 1420 Lurie Engineering Center Building

Print

Form Number **1839**

Action Requested

- (•) New Course
- ( ) Modification of Existing Course
- ( ) Deletion of Course

Complete the following sections:
New Courses - B & C completely
Modifications - A modified information, B & C completely
Deletions - A & C completely

Date 8/30/2007
Effective Winter 2008

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department / Div # / Course Number	Home Department: Pharmaceutical Sciences / Div #: PharmSci / Course Number: 761
Cross Listed Course Information	Cross Listed Course Information: Chemical Engineering / ChE / 520
Course Title	Course Title: Population Pharmacokinetics
TITLE ABBREVIATION — Time Sched Max = 19 Spaces	Population PK
TITLE ABBREVIATION — Transcript Max = 20 Spaces	Population PK
Course Description	Course Description for Official Publication (Max = 50 words): This course teaches the basic concepts in population pharmacokinetic (PK) and pharmacodynamic (PD) modeling and its application in drug development. The material covers both the theoretical practical aspects of the population approach. Software (WINNONLIN, NONMEM, and SPLUS) will be installed in a centralized area for hands-on training and learning.
PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k	**PROGRAM OUTCOMES:** ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k
Degree Requirements: (•) Degree Requirement (•) Core Course (•) Free Elective ( ) Tech Elective ( ) Other	Degree Requirements: ( ) Degree Requirement ( ) Core Course ( ) Free Elective (•) Tech Elective ( ) Other
Prerequisites: ( ) Enforced ( ) Advised	Prerequisites: ( ) Enforced (•) Advised
Credit Restrictions	Credit Restrictions: PharmSci560 or permission of instructor
Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Worl; Credit Hours Min / Max; Contact Hrs/Wk; Number of Wks	Level of Credit: ☐ Undergrad only ☒ Rackham Grad ☒ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min 2 / Max 2; Contact Hrs/Wk 2; Number of Wks 14
C. Repeatability (Indi Research, Dir. Study, Dissertation): Is this course repeatable? ( ) Yes (•) No; Maximum Hours? ; Maximum Times? ; Can it be repeated in the same term? ( ) Yes ( ) No	Printing Information (Optional): ☑ Print the course in the Bulletin ☑ Print the course in the Time Schedule
Class Type(s): ☒ Lec ☐ Rec ☐ Sem ☐ Lab ☐ Dis ☐ Ind ☐ Other; Graded Section: (•) Lec ( ) Rec ( ) Sem ( ) Lab ( ) Dis ( ) Ind ( ) Other; Grading: ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y; Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension	Terms & Freq. of Offering: ☐ I ☒ II ☐ IIIa ☐ IIIb ☐ III; ☒ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years; Half term ☐ 1st ☐ 2nd
	Cognizant Faculty Member: Henry Wang; Title: Professor
	Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval

- ☐ Curriculum Comm.
- ☐ Faculty
- ☐ Rackham
- ☐ Cross listed Unit 1
- ☐ Cross listed Unit 2

Submitted By: ☐ Home Dept. ☒ Cross-listed Dept.

Name, Signature & Department
Home Dept. DESmith David Smith, Pharmaceutical Sciences
Cross-listed Dept(s) Ronald Larson, Chemical Engineering

Form Number

1839

SUPPORTING STATEMENT

This is an essential course for the pharmaceutical engineering program. It has been taught two terms as ChE 696, Special Topics in ChE.

Are any special resources or facilities required for this course? ☐ Yes ☒ No

Detail the Special requirements

CHEMICAL ENGINEERING 696

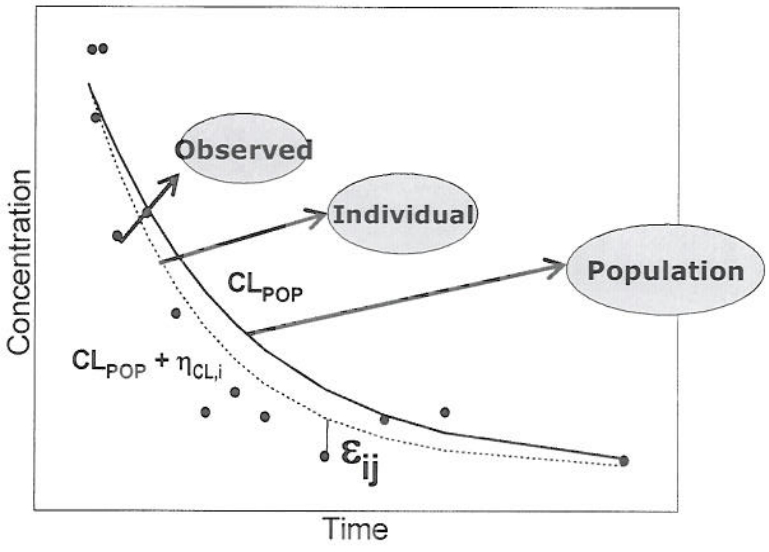
POPULATION PHARMACOKINETICS

Rose Feng Ph.D, fengmr@umich.edu

2007 Winter Semester, Mondays, 9:30-11:30am, Dow #3150

With the rapidly changing health care and research environments, it has become essential that the drug development process achieves greater efficiency, cost-effectiveness and timeliness. The value of population pharmacokinetics and pharmacodynamics modeling (pharmacometrics) in drug discovery, development and regulatory review is increasingly being appreciated.

The "POPULATION PHARMACOKINETICS" will be a 2 credits course with a weekly 2-hour class. This course will teach basic concepts involved in population pharmacokinetic (PK) and pharmacodynamic (PD) modeling and its application in drug development. The material will cover both the theoretical and practical aspects of the population approach, and allow benefits for participants with diverse backgrounds. Software (WINNONLIN, NONMEM, and SPLUS) will be installed in a centralized area for hands-on training and learning. Students will be provided with data sets to practice coding control streams, running various models, and evaluating the results in plots as well as in text. Graduate students and selected senior undergraduate students with a background in Pharmaceutical Sciences, Pharmaceutical Engineering, Chemical and Biomedical Engineering, and Biostatistics may apply for the course. Course outline and agenda are listed below.



		Speaker	Topics
1/8/2007	Week 1	Dr Rose Feng (UM)	Introduction of Population PK/PD Analysis
1/15/2007	Week 2	Dr Rose Feng (UM)	Non-Linear PK/PD Modeling Using WINNONLIN
1/22/2007	Week 3	Dr Rose Feng (UM)	Hands-on Training of Non-Linear PK/PD Modeling Using WINNONLIN (hands-on problem solving)
1/29/2007	Week 4	Dr Simon Zhou (Wyeth)	Graphical PK/PD Analysis Prior to NONMEM
2/5/2007	Week 5	Dr Yaning Wang (FDA) (Tele-conference)	Introduction to Nonlinear Mixed Effect Modeling (NONMEM)
2/12/2007	Week 6	Dr Danielle Ouellette (Pfizer)	Coding Control Streams in NONMEM
2/19/2007	Week 7	Dr Rose Feng (UM)	NONMEM & S-plus Graphic Exercise (hands-on problem solving)
3/5/2007	Week 8	Drs Matt Hutmacher (Pfizer) / Rose Feng (UM)	(1) Discussion of NONMEM/S-plus Output (2) NONMEM & S-plus Graphic Exercise
3/12/2007	Week 9	Dr Rose Feng (UM)	NONMEM Exercise: Population PK analysis With Covariates
3/19/2007	Week 10	Dr Rose Feng (UM)	(1) Discussion of NONMEM/S-plus Output (2) NONMEM & S-plus Graphic Exercise
3/26/2007	Week 11	Dr Brian Corrigan (Pfizer)	CATD for Phase 1 & 2 Go and No Go Decision
4/2/2007	Week 12	Dr Sunny Chapel (Pfizer)	S-plus Scripts (lecture + hands-on exercise)
4/9/2007	Week 13	Dr Sunny Chapel (Pfizer)	S-plus Scripts (lecture + hands-on exercise)
4/16/2007	Week 14	Dr Rose Feng (UM)	Exam and student team project presentation

THE UNIVERSITY OF MICHIGAN

David E. Smith, Ph.D.
Professor and Chair
Department of Pharmaceutical Sciences
Member, Upjohn Center for Clinical Pharmacology
Member, Comprehensive Cancer Center

Address Correspondence to:
4302A Upjohn Center
1310 E. Catherine Street
The University of Michigan
Ann Arbor, MI 48109-0504

June 7, 2007

To: Rackham Course Approval Officer

From: David E. Smith David E. Smith

Re: PharmSci 761 (Population Pharmacokinetics) – Qualified Faculty

This request is for Dr. Rose Feng to teach a course on Population Pharmacokinetics in the Department of Pharmaceutical Sciences, College of Pharmacy. Dr. Feng was formerly an Associate Research Fellow in the Department of Pharmacokinetics, Pharmacodynamics and Drug Metabolism at Pfizer, Ann Arbor, and has 15 years of experience in this very specialized area. No other faculty in our department are qualified to teach this type of material. It is also important to recognize that Dr. Feng has already taught this course for the College of Engineering (i.e., as ChemE 696) and, in fact, this request is really just a change of home departments for the course.

Please feel free to contact me should you have any questions or concerns!

Telephone: (734) 647-1431 • Facsimile: (734) 763-3438 • Email: smithb@umich.edu

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING
Course Approval Request
College Curriculum Committee, 1420 Lurie Engineering Center Building

Print

Form Number 1841

Action Requested

- ○ New Course
- ◉ Modification of Existing Course
- ○ Deletion of Course

Complete the following sections:
New Courses - B & C completely
Modifications - A modified information, B & C completely
Deletions - A & C completely

Date 8/30/2007
Effective Winter 2008

A. CURRENT LISTING			B. REQUESTED LISTING		
Home Department	Div #	Course Number	Home Department	Div #	Course Number
			EECS	252	483
Cross Listed Course Information			Cross Listed Course Information		
Course Title			Course Title: Compiler Construction		
TITLE ABBREVIATION — Time Sched Max = 19 Spaces			TITLE ABBREVIATION — Time Sched Max = 19 Spaces		Compiler Construction
TITLE ABBREVIATION — Transcript Max = 20 Spaces			TITLE ABBREVIATION — Transcript Max = 20 Spaces		Compiler Construction
Course Description			Course Description for Official Publication (Max = 50 words): Introduction to compiling techniques including parsing algorithms, semantic processing, and optimization. Students implement a compiler for a substantial programming language using a compiler generating system.		

PROGRAM OUTCOMES:

A	B	C	D	E	F	G	H	I	J	K	L
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Degree Requirements: ○ Degree Requirement ○ Tech Elective ○ Core Course ○ Other ○ Free Elective

Prerequisites: ○ Enforced ○ Advised

Credit Restrictions

Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work

Credit Hours: Min ____ Max ____

Contact Hrs/Wk ____ Number of Wks ____

C.

Repeatability (Indi Research, Dir. Study, Dissertation:
Is this course repeatable? ○ Yes ○ No
Maximum Hours? ____ Maximum Times? ____
Can it be repeated in the same term? ○ Yes ○ No

X

Class Type(s): ☐ Lec ☐ Rec ☐ Sem ☐ Lab ☐ Dis ☐ Ind ☐ Other ____

Graded Section: ○ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other

Grading: ☐ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y

Location: ☐ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension

PROGRAM OUTCOMES:

A	B	C	D	E	F	G	H	I	J	K	L
☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☒	

Degree Requirements: ○ Degree Requirement ◉ Tech Elective ○ Core Course ○ Other ○ Free Elective

Prerequisites: EECS 281or EECS 398, Winter 2005, Sec 001 or Graduate Standing
⊙ Enforced ○ Advised

Credit Restrictions

Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☒ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work

Credit Hours: Min 4 Max 4

Contact Hrs/Wk 4 Number of Wks 14

Printing Information (Optional) ☐ Print the course in the Bulletin ☐ Print the course in the Time Schedule

Terms & Freq. of Offering: ☐ I ☒ II ☐ IIIa ☐ IIIb ☐ III ☒ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years

Half term ☐ 1st ☐ 2nd

Cognizant Faculty Member: Scott Mahlke, Trevor Mudge — **Title** Assistant Professor, Professor

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval

- ☐ Curriculum Comm. ____
- ☐ Faculty ____
- ☐ Rackham ____
- ☐ Cross listed Unit 1 ____
- ☐ Cross listed Unit 2 ____

Submitted By: ☐ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department
Home Dept. EECS
Cross-listed Dept(s). ____

Form Number
1841

SUPPORTING STATEMENT

The purpose of changing the format of EECS 483 is to provide the students with an opportunity to interact more closely with the teaching staff on the course project material. Lectures alone were found to be insufficient due to their formality and the extent to which the four programming projects are the dominant part of the class. Thus, a separate discussion section is believed to provide a good setting to promote more interaction with the students that can focus specifically on the projects.

Are any special resources or facilities required for this course? ☐ Yes ☐ No

Detail the Special requirements

UNIVERSITY OF MICHIGAN
COLLEGE OF ENGINEERING
DEPARTMENT OF CHEMICAL ENGINEERING

3074 H. H. DOW BUILDING
2300 HAYWARD
ANN ARBOR, MICHIGAN 48109-2136
734 764-2383 FAX 734 763-0459

September 11, 2007

Toby Teorey
Chair, College Curriculum Committee

Re. Change in credit hours for ChE biology/life science elective requirement

Dear Toby,

I am writing to request College Curriculum Committee approval for a minor change in our curriculum. In the past we have had a 3 credit biology/life science elective, though in reality the course most students took to fulfill it was a 4 credit course. As the introductory biology life science sequence has been updated such that the 4-credit Biology 172, Introductory Biology – Molecular, Cellular, and Developmental Biology is the course most students will take, it seems more honest to change the biology/life science requirement to 4 credits. This will be accomplished by decreasing our general elective requirement from 10 credits to 9 credits. As other departments have had prior approval for 9 credits of general electives, our request does not set a precedent.

I've attached the proposed sample schedule for consideration by the College Curriculum Committee.

Thanks,

Susan Montgomery

Susan Montgomery, PhD
Lecturer, Undergraduate Program Advisor
Representing the ChE dept Undergraduate Program Committee

attach. Proposed Fall 2007 ChE Sample Schedule

Proposed BSE Chemical Engineering curriculum Fall 2007

	Hours	1	2	3	4	5	6	7	8
Subjects required by all programs									
Mathematics 115+,116+,215+,216 +	16	**4**	**4**	**4**	**4**				
Engineering 100, Introduction to Engineering+	4	**4**							
Engineering 101, Computing +	4		**4**						
Chemistry 130+	3	**3**							
Physics 140+/141+, 240+ /241+	10		**5**		**5**				
Humanities and Social Sciences	16	4				4		4	4
(to include a course in economics)									
Advanced Science									
Biology / life science elective (1)	4						**4**		
Chem 210, 211, Struct and Reactiv I and Lab +	5		**5**						
Chem 215,216, Struct and Reactiv II and Lab +	5			**5**					
Chem 261, Introduction to Quantum Chemistry +	1				**1**				
Chem 241/2 Analytical Chemistry	4					**4**			
Related Technical Subjects									
Materials elective (MSE 250 or MSE 220)+	4							**4**	
Technical Electives (2)	6							**4**	**2**
Program Subjects									
ChemE 230, Material & Energy Balances +	4			**4**					
ChemE 330, Chemical and Engin. Thermodynamics +	3				**3**				
ChemE 341, Fluid Mechanics +	4				**4**				
ChemE 342, Heat and Mass Transfer +	4					**4**			
ChemE 343, Separation Processes +	3					**3**			
ChemE 344, Reaction Engr and Design +	4						**4**		
ChemE 360, ChemE Lab I +	4						**4**		
ChemE 460, ChemE Lab II	4								**4**
ChemE 466, Process Control and Dynamics	3							**3**	
ChemE 487, Chem Proc Sim and Design	4								**4**
	37								
Free Electives	9			3			3		3
Total	**128**	15	18	16	17	15	15	15	17

(1) See department for list of courses that satisfy the Biology/Life Science elective requirement.

(2)Technical electives must include a minimum of 2 credits of engineering elective, with the other 4 credits coming from engineering electives, advanced science, or advanced math courses. See department for list of courses that meet the engineering electives, advanced science and advanced math requirements. At least one course must be outside of Chemical Engineering. Engineering courses are to be at the 200 or higher level. Courses in AOSS are not considered engineering courses for this purpose. See department for other exceptions.

(+) Students must earn a "C-" or better in prerequisite courses indicated by the (+)

Memorandum

Date: September 9, 2007

To: Toby Teorey, Chair
College of Engineering Curriculum Committee

From: James Holloway, Associate Dean for Undergraduate Education
Volker Sick, Chair of the Task force on International Programs
Brian Gilchrist, Chair of the Multidisciplinary Design Committee

Subject: Proposal for International Minor and Multidisciplinary Design Minor

---

I. Introduction

A cacophony of both national and UM reports have echoed the call to educate more engineers, and to do so across disciplinary boundaries. Many of our undergraduate engineering students can benefit from participation in coherent curricular programs that do not naturally reside within their home departments, including international studies and multidisciplinary design. These studies represent significant value added to an engineer's education, and while some of our students currently pursue these activities in an extracurricular way, we need to develop mechanisms by which students willing to pursue them in a more rigorous and defined way can earn curricular credit for the effort.

Multidisciplinary projects and international studies are two vital areas that the college has not been able to support academically because they are areas that do not live easily in departments. Instead they require cross-departmental programs. Yet they are both important to undergraduate engineering education in the 21st century. Our Engineering Advisory Council tells us that our students need to have experience of other cultures and the resourcefulness that develops by living in another country. They need to learn to work across the engineering disciplines, since that is where engineering firms believe that value is most likely to be created. Our industrial advisors tell us that they need our graduates to be functioning and innovating very quickly after starting employment, and must be very flexible in their technical and organizational capability in order to provide the added value that justifies their cost compared to less expensive engineers from the rest of the world. We all know the same science; our undergraduate students cannot compete based on purely technical knowledge, but must have additional attributes like those provided by international experience or by experience in multidisciplinary design.

We are therefore proposing the creation of two minors, called:

1. The International Minor for Engineers
2. The Minor in Multidisciplinary Design

In creating these minors, we should also consider creation a general template for minors in the CoE, so that these first two are understood to be standard academic credentials and not ad hoc certificates. In addition, we must recognize the possibility that other groups of faculty will discover opportunities to broaden our students' educational opportunities through the creation of additional minors.

The *minor* has been selected to give curricular recognition to international experiences and to multidisciplinary design because "minor" is a widely recognized credential. Parents, students, and employers all have an instant understanding of and appropriate respect for a minor. The closest existing structure is the CoE concentration, but the concentrations are department generated for their own students. Concentrations have been used in different ways and to different degrees by different departments, but are designed to give students within a specific department some specialization tailored to the needs of that department's students. Our goal, in contrast, is to provide curricular structures that provide all College of Engineering students with opportunities for breadth, independent of the department in which they major.

Attached to this memo are, therefore, three documents:

1. A proposal for the International Minor for Engineers.
2. A proposal for the Minor in Multidisciplinary Design.
3. A proposed template for minors in the College of Engineering, based largely on the template for minors in LSA, modified to be consistent with both our rules for using LSA minors and with our needs. The template addresses curricular structure, student requirements, and issues related to auditing.

Resources to support both of the proposed minors are already in place or planned by the CoE administration.

We ask that the curriculum committee consider these as 3 distinct proposals, albeit related, and recommend them for adoption by the College Faculty.

Proposal for an
International Minor for Engineers

Memorandum

Date: September 10, 2007

To: Toby Teorey, Chair
College of Engineering Curriculum Committee

From: James Holloway, Associate Dean for Undergraduate Education
Volker Sick, Chair of the Task Force on International Programs
Amy Conger, Director of International Programs

Subject: Proposal for International Minor for Engineers

I. Introduction

The global business environment demands engineers who are able to combine technical expertise with international understanding. Today's graduates work in multinational teams, create products for a global marketplace, and solve problems that cross national borders and cultures. Yet, despite these professional demands, the 2006 Global Engineering Excellence Study reports that "preparation for global practice is generally not viewed as central to an engineer's education" (Continental A.G., 2006, p. 2).

In February 2007, Dean Munson charged a College-wide task force with addressing these challenges and defining the future of international programs in engineering. A key recommendation of the task force was establishing an International Minor that would help engineering students develop intercultural skills and gain overseas experience before they graduate. We believe that the prestige and official recognition associated with a minor will motivate more CoE students to purse study abroad, overseas internships, and foreign language proficiency.

The proposed International Minor would be the first official minor in the history of the College of Engineering and would bring greater structure to students' international coursework and experiences. At present, CoE undergraduates with global academic interests must choose from LSA minors (e.g. German or Spanish) or the Program in Global Engineering (PGE), an international concentration that is housed in the International Programs Office. PGE currently enrolls 110 undergraduates, but the growth of this program is limited by its minimum GPA requirement (3.0), minimal foreign language study (2 semesters), shortage of formal opportunities for developing

intercultural communication skills, and lack of awareness about the concentration. The International Minor would replace PGE and appeal to a broader range of CoE undergraduates. Based on student survey data, PGE participant feedback, and study abroad enrollment trends, we anticipate that the International Minor will attract a significantly higher number of students than our existing Program in Global Engineering. The introduction of the International Minor will not affect other International Programs such as the Engineering Global Leadership (EGL) Honors Program. International study and work abroad programs will continue to be available to all CoE students, regardless of participation in the new minor.

II. Proposed Structure

The key elements of this interdisciplinary minor include foreign language proficiency, an international course sequence, an international engineering seminar, and an overseas experience. At present, no LSA department offers a globally-oriented minor with this combination of courses and skills. The International Minor for Engineers addresses this need and conforms with existing CoE degree requirements. This means that with proper guidance and planning, CoE students can apply their humanities, social science and free elective credits towards the minor without extending their time to degree.

In total, the minor would require 17-20 credits to complete. This assumes that students will meet the 8-10 credit foreign language pre-requisite before declaring the minor. These pre-requisites and credit totals are comparable to several LSA minors that are popular with engineering students (e.g. Economics, German, Mathematics, and Physics) and are consistent with recent trends in AP credit and foreign language placement for incoming CoE freshmen. Data from the Registrar's Office indicate that 64.6% of fall 2006 freshmen entered the CoE with AP credit and 17% placed out of foreign language. This means that 183 students from the fall 2006 cohort would have already satisfied the language prerequisites for the International Minor. Detailed minor requirements are listed in Figure 1.

Figure 1. Proposed Requirements for the International Minor for Engineers

Pre-requisites for Declaring Minor

- Two semesters of College Level foreign language or equivalent.
- May be satisfied by a placement exam.
- Cannot be English.
- Good Academic Standing. First semester students who have not earned a UM GPA are eligible.

Foreign Language Proficiency (7-10 credits)

- Foreign language proficiency (other than English) equivalent to fourth-semester College-level.
- May be satisfied by UM courses, transfer credit, or intensive language programs abroad.
- Students with prior foreign language proficiency (fourth-semester or above) must fulfill the 7-credit requirement by completing a combination of: additional credits of the same foreign language (advanced level) or additional courses from the international sequence list.

International Sequence (9 credits)

- Students select 2 humanities/social science courses from the same LSA department. At least one of these courses must be at the 300-level or above; both courses must focus on non-US cultures or countries.
- Students select one comparative/global perspectives course from the approved list.

International Engineering Seminar (1 credit)

- One or two-credit seminar; offered the fall semester of each year.
- International perspectives on engineering field, business practices, and global careers.
- Intercultural communication skills.
- Exposure to engineering work in various countries through guest speakers and self-directed research.

Relevant Overseas Experience

- Study, work, research, or organized volunteer abroad.
- Minimum of 6 week program length not including pre- and post-program travel.
- International students may not satisfy this requirement through programs in their home countries.
- Overseas experiences must be approved by the IPE office.

III. Advising and Oversight

The Associate Dean for Undergraduate Education will oversee this College-wide minor, with administrative and advising duties delegated to International Programs in Engineering. We also propose that a member of the CoE International Programs Committee be designated as the official faculty advisor for the minor. The faculty advisor will oversee the minor requirements and curricular decisions, while IPE staff will cover the day-to-day responsibilities of student advising and auditing. In addition, the IPE office should be responsible for approving all overseas experiences used to satisfy the minor and verify program accreditation, credit transfer, and other requirements. IPE is a natural choice for this task because the same staff members already manage CoE study abroad programs, have expertise in international education, and work with our students on program applications, admissions, and overseas course evaluations.

Strong connections with CoE departments will also be crucial to the success of the minor. The faculty advisor and IPE staff will work with department advisors (both faculty and staff) to raise awareness about the minor and develop advising templates that will help students from each CoE major incorporate the minor requirements into their four-year degree plans. IPE will host advisor training sessions, provide sample planning worksheets, and maintain an International Minor web page that includes declaration forms, minor requirements, and approved course listings. A sample worksheet that CoE advisors and students could use to record their progress toward the Minor is listed in Figure 2. Cooperation from the CoE Registrar and other Student Affairs staff will be needed to include minor requirements in the CoE advising database and MAIS applications.

We believe that the International Minor could serve as a significant driver for study and work abroad, as well as a model for future enhancements to the undergraduate curriculum (e.g. entrepreneurship, practicum projects, etc.). A target date for the implementation of the International Minor for Engineers is Fall 2008.

Figure 2. Sample Student Worksheet for International Minor for Engineers

Worksheet for College of Engineering International Minor

Name ___XXXXXX_____ **UMID** __XXXX XXXX_____
Email _____ **Phone** _____

Two semesters of College-level foreign language or equivalent

International Minor Requirement	Course/Exam/Transfer Credit	Semester	Credits
Pre-requisite			
Pre-requisite			

Foreign Language Proficiency Courses Taken (7 - 10 credits)

International Minor Requirement	Course	Semester	Credits
Foreign Language (3rd-semester)			
Foreign Language (4th-semester)			

International Sequence Courses Taken (9 credits)

International Minor Requirement	Course	Semester	Credits
International Sequence: LSA HU/SS			
International Sequence: LSA HU/SS			
International Sequence: Comparative/Global Perspectives			

International Engineering Seminar Course Taken (1 credit)

International Minor Requirement	Course	Semester	Credits
International Engineering Seminar	ENGIN 390		1

Required Overseas Experience

International Minor Requirement	Program/Country	Semester	IPE Approval

Total Credits (≥ 17): _____

Reference

Continental A.G. (2006). In Search of Global Engineering Excellence: Educating the Next Generation of Engineers for the Global Workplace. Available on-line: http://www.global-engineering-excellence.org/uuid/2e03623f1054241c15d9bf645795df86.

Sample Student Schedule
BSE in Aerospace Engineering with International Minor and French Language

Credit Application Key
Core = Core BSE Subject
HU/SS = Humanities/Social Sciences
Aero Eng = Aerospace Engineering Requirement
Aero Sci = Aerospace Science Requirement
TE = Technical Elective
GE = General Elective
Adv Math = Advanced Math Requirement
Tech Core = Related Technical Core Subjects
Int'l Min = International Minor Requirement

BSE Aerospace Requirements = 128 credits to graduate
39 Core Subject Requirement credits
16 Humanities/ Social Science credits
3 Advanced Math credits
12 Related Technical Core Subjects
24 Aerospace Science required credits
16 Aerospace Engineering required credits
9 Technical Electives
9 General Electives

Term 1	**Course**	**Credits**		**Term 2**	**Course**	**Credits**
Core	Math 115	4		Core	Math 116	4
Core	Engin 100	4		Core	Engin 101	4
Core	Chem 130/125/126	5		Core	Physics 140/141	5
HU Intl Min Req	French 101	4		HU Intl Min Req	French 102	4
	Total:	***17***			***Total:***	***17***
AY Total: 34						

Term 3	**Course**	**Credits**		**Term 4**	**Course**	**Credits**
Core	Math 215	4		Core	Math 216	4
Core	Physics 240/241	5		Tech Core	ME 240	4
Aero Eng	Aero 245	4		Aero Sci	Aero 215	4
HU Intl Min Req	French 231	4		HU Intl Min Req	French 232	4
	Total:	***17***			***Total:***	***16***
AY Total: 33						

Spring Term	Course	Credits
Intl Minor Requirement	Study Abroad: GEA Aerospace, France	
TE	Technical Electives	6
	Total:	***6***

Term 5	Course	Credits		Term 6	Course	Credits
Tech Core	MSE 220or250	4		Tech Core	EECS 314	4
Aero Sci	Aero 225	4		Aero Sci	Aero 335	4
Aero Sci	Aero 315	4		Aero Eng	Aero 305	4
Adv Math	Math 371	3		GE Intl Min Req CoE Seq	PolSci 340** (SS)	3
GE Intl Eng Sem	Engin 390	1				
	Total:	***16***			***Total:***	***15***
AY Total: 31						

Term 7	Course	Credits		Term 8	Course	Credits
Aero Sci	Aero 325	4		Aero Sci	Aero 345	4
Aero Eng	Aero 405	4		Aero Eng	Aero 481 or 483	4
GE Intl Min Req CoE Seq	PolSci 358** (SS)	3		Tech Elec	XXX	3-4*
GE Int Min Req (global)	Geog 245 (SS)	3				
	Total:	***14***			***Total:***	***11-12***
AY Total:25-26						

*Student only needs 3 credits of Technical electives, but if s/he needs to maintain full-time status then a 4-credit course must be chosen.

**No pre-requites required; only junior standing required. If a 100-level Political Science class is preferred in place of one of the 300-level class, then PoliSci 160 can be taken for 4 credits.

Total credits = 129-130

39 Core
16 HU/SS
3 Adv Math
12 Related Technical Core
24 Aerospace Science
16 Aerospace Engineering
10 Technical electives (one extra for full-time status in last semester; could take 3 credit class)
10 General Electives (one extra for International Engineering Seminar)

Worksheet for College of Engineering International Minor

Name ___XXXXXX_____ **UMID** __XXXX XXXX_____
Email __xxxx@umich.edu_____ **Phone** _____

Two semesters of College-level foreign language or equivalent

International Minor Requirement	Course/Exam/Transfer Credit	Semester	Credits
Pre-requisite	French 101	Term 1	4
Pre-requisite	French 102	Term 2	4

Foreign Language Proficiency Courses Taken (7 - 10 credits)

International Minor Requirement	Course	Semester	Credits
Foreign Language (3rd-semester)	French 231	Term 3	4
Foreign Language (4th-semester)	French 232	Term 4	4

International Sequence Courses Taken (9 credits)

International Minor Requirement	Course	Semester	Credits
International Sequence: LSA HU/SS	Political Science 340 (Govts & Politics in Western Europe)	Term 6	3
International Sequence: LSA HU/SS	Political Science 358 (Politics of the European Union)	Term 7	3
International Sequence: Comparative/Global Perspectives	Geography 245 (Global Interdependence)	Term 7	3

International Engineering Seminar Courses Taken (1 credit)

International Minor Requirement	Course	Semester	Credits
International Engineering Seminar	Engin 390	Term 5	1

Required Overseas Experience

International Minor Requirement	Program/Country	Semester	IPE Approval
Study Abroad	GEA Aerospace, France	Spring	√

Total Credits (≥ 17): 18

Sample Student Schedule
BSE in Chemical Engineering with International Minor and Turkish Language

Credit Application Key
Core = Core BSE Subject
HU/SS = Humanities/Social Sciences
ChemE = Chemical Engineering Dept Requirement
Adv Sci = Advanced Science
TE = Technical Elective
GE = General Elective
Int'l Min = International Minor Requirement

BSE ChemE Requirements = 128 credits to graduate
37 Core Subject credits
16 Humanities/Social Science credits
9 General Elective credits*
19 Advanced Science credits*
10 Related Technical Subject (includes Technical Electives) credits
37 ChemE credits

Term 1	**Course**	**Credits**		**Term 2**	**Course**	**Credits**
Core	Math 115	4		Core	Math 116	4
Core	Engin 100	4		Core	Engin 101	4
Core	Chem 130	3		Core	Physics 140/141	5
HU	AAPTIS 151**	4		HU	AAPTIS 152	4
GE Intl Eng Sem	Engin 390	1				
	Total:	***16***			***Total:***	***17***
AY Total: 33						

Term 3	**Course**	**Credits**		**Term 4**	**Course**	**Credits**
Core	Math 215	4		Core	Math 216	4
Adv Sci	Chem 210/211	5		ChemE	ChemE 330	3
ChemE	ChemE 230	4		HU	AAPTIS 252	4
HU	AAPTIS 251	4		ChemE	ChemE 341	4
	Total:	***17***			***Total:***	***15***
AY Total: 32						

Term 5	Course	Credits		Term 6	Course	Credits
Adv Sci	Chem 215/216	5		**Study Abroad: GE3 METU, Turkey**		
ChemE	ChemE 342	4		Adv Sci	Bio/Life Sci Elec	4*
ChemE	ChemE 343	3		ChemE	ChemE 344 Equiv.	4
SS Intl Min Seq (Global)	Econ*** (International/ Comparative)	3		GE Intl Min Seq CoE Seq	AAPTIS 351 Equiv (Adv. Turkish Lang) (HU)	3
				Core	Physics 240/241	5
				Adv Sci	Chem 261	1
	Total:	***15***			***Total:***	***17***
AY Total: 32						

Term 7	Course	Credits		Term 8	Course	Credits
ChemE	ChemE 466	3		ChemE	ChemE 460	4
ChemE	ChemE 360	4		ChemE	ChemE 487	4
TE	X	3		TE	X	3
Gen Elec Int Min Seq CoE Seq	AAPTIS 339 (SS)	3		TE	MSE 250 or 220	4
Adv Sci	Chem 214/242	4				
	Total:	***17***			***Total:***	***15***
AY Total: 32						

*This 4-credit Bio/Life Science requirement reflects a change from what is currently stated in the CoE bulletin. Pending approval from the curriculum committee this Fall, this requirement will be increased from 3 to 4 credits to accommodate the Biology 172 course and general electives will be reduced from 10 to 9 credits.

**Note 7/20/07: LSA language courses no longer have the 'LR' designation as of Fall 2006 that defaults them to Humanities courses according to the CoE Bulletin. AAPTIS (Arabic, Armenian, Persian, Turkish, & Islamic Studies) Language courses should still count towards Humanities requirements and CoE website should be updated.

***If an international/comparative economics class can not be taken, then 3 more credits will be added to the total because the student needs to fulfill the ChemE dept's econ requirement in addition to the global/comparative course requirement for the minor.

Total credits = 129

37 Core
26 Hu/SS + General Electives
19 Adv. Science
10 Tech Electives
37 ChemE

Worksheet for College of Engineering International Minor

Name ___XXXXXX_____ **UMID** __XXXX XXXX_____
Email __xxx@umich.edu_____ **Phone** _____

Two semesters of College-level foreign language or equivalent

International Minor Requirement	Course/Exam/Transfer Credit	Semester	Credits
Pre-requisite	AAPTIS 151 (Elem. Turkish I)	Term 1	4
Pre-requisite	AAPTIS 152 (Elem Turkish II)	Term 2	4

Foreign Language Proficiency Courses Taken (7 - 10 credits)

International Minor Requirement	Course	Semester	Credits
Foreign Language (3rd-semester)	AAPTIS 251 (Intermediate Turkish I)	Term 3	4
Foreign Language (4th-semester)	AAPTIS 252 (Intermediate Turkish II)	Term 4	4

International Sequence Courses Taken (9 credits)

International Minor Requirement	Course	Semester	Credits
International Sequence: LSA HU/SS	AAPTIS 351 (Advanced Turkish Language)	Term 6	3
International Sequence: LSA HU/SS	AAPTIS 339 (Turkey: Language, Culture & Society)	Term 7	3
International Sequence: Comparative/Global Perspectives	International Economics	Term 5	3

International Engineering Seminar Course Taken (1 credit)

International Minor Requirement	Course	Semester	Credits
International Engineering Seminar	Engin 390	Term 1	1

Required Overseas Experience

International Minor Requirement	Program/Country	Semester	IPE Approval
Study Abroad	GE3, Middle Eastern Technical University (METU), Turkey	Term 6	√

Total Credits (≥ 17): 18

Sample Student Schedule
BSE in Electrical Engineering with International Minor and Spanish Language

Credit Application Key
Core = Core BSE Subject
HU/SS = Humanities/Social Sciences
EE = Electrical Engineering Dept Requirement
TE= Technical Elective
- Flex = Flexible Technical Requirements
- Core = Core Electives
- Up = Upper Level EE Technical Electives
- MDE = Major Design Experience

GE = General Elective
Intl Min = International Minor Requirement

BSE Requirements = 128 credits to graduate
39 Core Subject Credits
16 Humanities/Social Sciences credits
12 General Electives
29 EE credits
33 Technical Electives credits (=14 Flex, 8 Core, 7 Up & 4 MDE)

Term 1	**Course**	**Credits**		**Term 2**	**Course**	**Credits**
Core	Engin 100	4		Core	Engin 101	4
Core	Math 115	4		Core	Math 116	4
Core	Chem 130/125/126	5		Core	Physics 140/141	5
HU Intl Min Req	Span 101	4		HU Intl Min Req	Span 102	4
	Total:	***17***			***Total:***	***17***
AY Total: 34						

Term 3	**Course**	**Credits**		**Term 4**	**Course**	**Credits**
			Study Abroad: GE3 Tec de Monterrey, Mexico			
Core	Math 216	4		Core	Math 215 Equiv	4
Core	Physics 240/241	5		TE (flex)	X	3
EE	EECS 215	4		TE (flex)	X	3
HU Intl Min Req	Span 231	4		GE Intl Min Req	Global/Comp Course	3
				HU Intl Min Req	Span 232 Equiv	3
	Total:	***17***			***Total:***	***16***
AY Total: 33						

Term 5	Course	Credits		Term 6	Course	Credits
EE	EECS 216	4		TE (up)	EECS 330	4
EE	EECS 230	4		EE	EECS 320	4
EE	EECS 280	4		TE (core)	EECS 311	4
GE Intl Engin Sem	Engin 390	1		GE Intl Min Req CoE Seq	HIST 347 (SS)	4
EE	TCHNCLCM 300	1				
	Total:	***14***			***Total:***	***16***
AY Total: 30						

Term 7	Course	Credits		Term 8	Course	Credits
EE	EECS 401	4		TE (core)	EECS 353	4
TE (up)	EECS 421	4		TE (MDE)	EECS 430	4
TE (flex)	ME 235	4		EE	EECS 496	2
GE Intl Min Req CoE Seq	HIST 358 (SS)	3		EE	TCHNCLCM 496	2
				TE (flex)	EECS 499	4
	Total:	***15***			***Total:***	***16***
AY Total: 31						

Total credits = 128
Core = 39
EE = 29
TE Flex = 14
TE Core = 8
TE Upper Level = 8
TE MDE = 4
HU/SS + General Electives = 26

Worksheet for College of Engineering International Minor

Name __XXXXXXX_____ **UMID** _XXXX XXXX_____
Email ___xxx@umich.edu_____ **Phone** _____

Two semesters of College-level foreign language or equivalent

International Minor Requirement	Course/Exam/Transfer Credit	Semester	Credits
Pre-requisite	Span 101	Term 1	4
Pre-requisite	Span 102	Term 2	4

Foreign Language Proficiency Courses Taken (7 - 10 credits)

International Minor Requirement	Course	Semester	Credits
Foreign Language (3rd-semester)	Span 231	Term 3	4
Foreign Language (4th-semester)	Span 232	Term 4	3

International Sequence Courses Taken (9 credits)

International Minor Requirement	Course	Semester	Credits
International Sequence: LSA HU/SS	Hist 347 (Latin America: The Colonial Period)	Term 6	4
International Sequence: LSA HU/SS	Hist 358 (Topics in Latin American History)	Term 7	3
International Sequence: Comparative/Global Perspectives	Global/Comparative class taken abroad (e.g. International Political Economy)	Term 4	3

International Engineering Seminar Course Taken (1 credit)

International Minor Requirement	Course	Semester	Credits
International Engineering Seminar	Engin 390	Term 5	1

Required Overseas Experience

International Minor Requirement	Program/Country	Semester	IPE Approval
Study Abroad	GE3: Tec de Monterrey, Mexico	Term 4	√

Total Credits (≥ 17): 18

Sample Student Schedule
BSE in Mechanical Engineering with International Minor

Credit Application Key
Core = Core BSE Subject
ME = Mechanical Engineering Subjects
HU/SS = Humanities and Social Science
TE = Technical Elective
GE = General Elective
Intl Min = International Minor Requirement

BSE Requirements = 128 credits to graduate
39 Core Subject Credits
45 ME credits
4 Related Technical Subject credits
3 Advanced Math credits
12 Technical Electives credits
16 Humanities/Social Sciences credits
9 General Electives

Term 1	**Course**	**Credits**		**Term 2**	**Course**	**Credits**
Core	Engin 100	4		Core	Engin 101	4
Core	Math 115	4		Core	Math 116	4
Core	Chem 130/126/125	5		Core	Physics 140/141	5
HU	German 101	4		HU	German 102	4
	Total:	***17***			***Total:***	***17***
AY Total: 34						

Term 3	**Course**	**Credits**		**Term 4**	**Course**	**Credits**
Core	Physics 240/241	5		ME	ME 250	4
Core	Math 215	4		Core	Math 216	4
ME	ME 211	4		ME	ME 240	4
HU	German 231	4		ME	ME 235	3
	Total:	***17***			***Total:***	***15***
AY Total: 32						

Spring	**Course**	**Credits**
Study Abroad: TU Berlin		
GE & Intl Min Seq.	Engin 350	3
HU	German 232	3 (transfer 200-level German credits)
	Total:	***6***

Term 5	Course	Credits		Term 6	Course	Credits
ME	ME 350	4		ME	ME 395	4
Rel. Tech Req.	EECS 314	4		ME	ME 360	4
ME	ME 382	4		ME	ME320	3
Adv Math Req.	MA417	3		GE & CoE Seq. & Intl Min Req.	German 326 (HU)	3
GE Intl Eng Sem	Engin 390	1		ME SS Req	Econ 101*	3
	Total:	***16***			***Total:***	***17***
AY Total: 33						

Term 7	Course	Credits		Term 8	Course	Credits
ME	ME 495	4		ME	ME 450	4
TE	ME 335	3		TE	ME 420	3
TE (400-level)	ME 452	3		TE	ME 458	3
GE & CoE Seq Intl Min Req	German 330 (HU)	3		TE	ME 336	3
	Total:	***13***			***Total:***	***13***
AY Total: 26						

* The additional 3-credits come from ME's economics course requirement and the allotment of only 9 general electives.

Total: 131
Core = 39
ME = 45
Tech Elec = 12
Related Sub = 4
Adv Math = 3
HU/SS + General Electives = 28

Worksheet for College of Engineering International Minor

Name SAMPLE **UMID** XXXX XXXX
Email xxx@umich.edu **Phone** _____

Two semesters of College-level foreign language or equivalent

International Minor Requirement	Course/Exam/Transfer Credit	Semester	Credits
Pre-requisite	German 101	Term 1	4
Pre-requisite	German 102	Term 2	4

Foreign Language Proficiency Courses Taken (7 - 10 credits)

International Minor Requirement	Course	Semester	Credits
Foreign Language (3rd-semester	German 231	Term 3	4
Foreign Language (4th-semester)	200-level German Transfer Credit (German 232)	Spring Term	3

International Sequence Course Taken (9 credits)

International Minor Requirement	Course	Semester	Credits
International Sequence: LSA HU/SS	German 326 (Intermediate German)	Term 6	3
International Sequence: LSA HU/SS	German 330 (German Cinema)	Term 7	3
International Sequence: Comparative/Global Perspectives	Engin 350 International Laboratory	Spring Term	3

International Engineering Seminar Course Taken (1 credit)

International Minor Requirement	Course	Semester	Credits
International Engineering Seminar	Engin 390	Term 5	1

Required Overseas Experience

International Minor Requirement	Program/Country	Semester	IPE Approval
Study Abroad	TU Berlin / Germany	Spring Term	√

Total Credits (≥ 17): 17

Proposal for a
Minor in Multidisciplinary Design

Proposal for Minors in Multidisciplinary Design

Undergraduate students enrolled in a College of Engineering degree program can benefit from practical experience designing technology systems in collaboration with students from other disciplines both inside and outside of engineering. This experience requires students to apply their in-depth disciplinary analysis skills to projects that also require broader multidisciplinary concepts and approaches. This will expose participating students to systems engineering and will help them succeed in the fast-paced, global and entrepreneurial market for graduate students and professionals in the 21st Century.

A Minor in Multidisciplinary Design requires students to exercise their acquired disciplinary expertise in the context of a significant multi-semester design project[1]. These projects must be multi-disciplinary and involve concepts and approaches from at least two other disciplines to be completed successfully[2]. The projects must also require the following elements: 1) problem definition based on qualitative and/or quantitative requirements, 2) generation of creative solution concepts, 3) analysis of the quality of proposed concepts, 4) selection and optimization of a final concept, 5) evaluation of the final concept through the *building* and *testing* of prototypes or virtual models, and 6) iteration and/or detailed recommendation for improvement of the final concept based on the lessons learned from steps 1 through 5. These design projects are conducted during or after the student has taken a defined set of preparatory courses and ideally features a meaningful connection with at least one discipline outside of CoE.

The Minor in Multidisciplinary Design will be comprised of 15 credits and can be sponsored by individual faculty, groups of faculty and by the Office of the Associate Dean for Undergraduate Education for the purpose of supporting cross-departmental or college programs. An Advisory Council supporting the program will seek to engage other units outside of engineering to promote joint student projects and parallel curricular outcomes (e.g., non-engineering minors in multi-disciplinary design). Sponsoring faculty within CoE can develop their own *specialization* within the template for minors in multidisciplinary design provided below. For example, specializations that have been proposed so far include Space Systems, Environmental Sustainability, Service Learning, and Solar Vehicle Systems. A student completing the requirements for a specialization within the Minor in Multidisciplinary Design can elect to have this specialization reflected on his or her transcript (e.g., "Minor in Multidisciplinary Design with Specialization in Space Systems Design", "Minor in Multidisciplinary Design with Specialization in Service Learning", etc.). While these specializations can be tailored to the passions of specific faculty groups and students, an umbrella Minor in Multidisciplinary Design will also exist that is supported by the Office of the Associate Dean for Undergraduate Education and serves as the template for all specializations.

---

[1] We allow the interpretation of a multi-semester design project to include a series of linked single-semester multidisciplinary design experiences in appropriate circumstances.

[2] Here we note the possible distinction between discipline and department/program: it is possible for students in the same department/program to practice different disciplines, as it is possible for students in different departments/programs to practice the same discipline. The goal is disciplinary diversity, not programmatic diversity per se.

Program Requirements
A Minor in Multidisciplinary Design is granted after completion at least 15 credit hours of coursework, including at least 2 upper division courses, distributed as follows[3]:

A. Completion of at least 2 credits of introductory "Design, Build, Test" (DBT) experience.

- Examples include appropriate sections of ENG 100, ME 250, AERO 205, and possibly a new ENG course at the 200 level that is currently under discussion.

B. Completion of at least 3 credits of "cornerstone" coursework that serves to prepare the student *in depth* for his or her multi-semester project work.

- The Minor in Multidisciplinary design is best served if the cornerstone experience meets the needs of the project and exceeds the nominal preparation associated with the student's major discipline. Therefore the student must identify a cornerstone course, outside the set of his or her required classes, which will serve to prepare the student for his or her specific project work.
- This course is to be taken prior to completing the final 3 credits of project work and should be identified during the project scoping exercise (see item C below).
- Specializations can require students to take a specific cornerstone class.

C. Completion of at least 7 credits of multidisciplinary design project work[4].

- Ideally this project features consecutive semesters of in-depth work on the same design project[5].
- These credits cannot all be taken in the same semester.
- The project work can occur within departmental design courses (e.g., ME 450 and ME 455), independent study courses (e.g., ME 490), or in the ENG curriculum (e.g., ENG 350, ENG 390, and/or ENG 450)[6].
- Prior or at the beginning of this multi-semester project experience, the student must complete a thoughtful project scoping exercise that details the project objectives, approach to completing the objectives and how the student intends to contribute his or her expertise to the completion of the project. Courses the student plans to take to complete the minor should also be identified at this time.

D. **Completion of at least 2 credits of formal leadership and/or mentorship activities within the Multidisciplinary Design program[7].**

---

[3] Completion of the minimum credit hours for each category A-D adds up to 14 credit hours; therefore the student needs at least one extra credit hour in one of the categories. This will be straight forward. For example, all sample courses in A are 3-4 credits.
[4] A "multidisciplinary design project" is operationally defined as a design project containing a significant engagement and integration of students, faculty, or course projects from three distinct disciplines. Ideally one of these disciplines is outside the College of Engineering. Students must be prepared for these projects to be extensive, often involving co-curricular (non-graded) and extra-curricular activities.
[5] Exceptions can be considered under appropriate circumstances.
[6] Co-ops and research projects can be considered if they reflect the spirit of the program and are appropriately reflected in graded coursework.
[7] The two credits of mentorship/leadership activity can carry pass/fail grades.

Additional Administrative Points
Creation of the template for minors in multidisciplinary design requires approval by the College of Engineering Curriculum Committee. If approved, the proposal will be forwarded to the CoE faculty for final approval/disapproval. Once the template is approved, the CoE Curriculum Committee will be responsible for approving specializations. This will involve assuring specializations meet the template requirements and are sustainable programmatically for at least 4 years. After 4 years, the specialization will be reviewed and either phased-out or re-approved.

The Associate Dean for Undergraduate Education will convene an Advisory Council of faculty. This Advisory Council, with appropriate staff support, is responsible for administering the minor. The staff will perform activities such as advising, maintaining relations with partner units, and providing timely auditing during the student's final term. The Advisory Council faculty will be responsible for approving variances to the minor requirements, approving use of the umbrella minor, developing course lists for program requirements, establishing multidisciplinary contacts across campus, and maintaining the rigor of the program.

In addition to the normal rules for a CoE minor, the following rules apply to the Minor in Multidisciplinary Design:

i. Transfer credit may not be used to fulfill the multidisciplinary design project course requirement (item C above) or the mentorship/leadership course requirement (item D above).

ii. Only the 2-credit mentorship and leadership requirement can be fulfilled by taking Pass/Fail courses.

iii. The Advisory Committee of the Multidisciplinary Design Program is responsible for approving any variance in course requirements for a minor. Such variances are usually proposed by the student, ideally during the project scoping activity in item C above.

Sample Paths for Completing a CoE Minor in Multidisciplinary Design

Scenario for Student #1: This is a Mechanical Engineering student pursuing a Minor in Multidisciplinary Design with Specialization in Product Innovation[8]*. The specific project the student will perform is to design a stylish cellular telephone housing that can accept the electronics components from numerous models of working and discarded cell phones. The idea is to develop a "brand" of second-hand phones that looks good, is low cost, functions properly despite the input variability, and reduces demand for natural resources. This specialization lies at the intersection of engineering product design and industrial design. Other students on the project are looking at business and market development aspects – rounding out the project's multi-disciplinarity. The project is supported by the BLUElab.*

A. Completion of at least 2 credits of introductory "Design, Build, Test" experience.

- Student takes ME 250 (4 cr)

B. Completion of at least 3 credits of "cornerstone" coursework that serves to prepare the student in depth for his or her multi-semester project work.

- Student takes Art and Design 300.0193[9] (3 units).

C. Completion of at least 7 credits of multidisciplinary design project work. Prior to or at the beginning of this multi-semester project experience, the student must complete a detailed project scoping exercise that details the project objectives, approach to completing the objectives and how the student will contribute his or her expertise to the completion of the project.

- Student takes ME 455 (4 cr) and does the project scoping exercise during the first month of the class and submits it for approval.
- Student takes ME 490 (3 cr) the following semester and completes the sequence.

D. Completion of at least 2 credits of formal leadership and/or mentorship activities within the Multidisciplinary Design program.

- Student takes ME 491 (2 cr, Pass/Fail)

---

[8] Placeholder title.

[9] 3-D Design: From Concept to Realization: An exploration of design principles and methodologies resulting in the design of original three dimensional and functional objects. Emphasis will be placed on defining unique problems, refining problem solving techniques, developing conceptualization and visualization skills and exploring 3D form development. Students will develop their own concepts through to highly crafted three dimensional appearance models of functional objects appropriate to mass production and for use by diverse users.

Scenario for Student #2: This is an Industrial and Operations Engineering student interested in entrepreneurship, clean technology, and sustainable development and is pursuing the general Minor in Multidisciplinary Design. The design project the student will perform is a part of AWARE@home, a system of intuitive interfaces for homeowners to understand and reduce their consumption of utilities such as gas, electric, and water. The student will develop cost estimates for mass production of system elements and recommend manufacturing partners. The student will also evaluate the environmental impact of the product relative to the reduction in environmental emissions that the system is expected to achieve. Other students on the project are looking at circuit design, user interfaces and consumer behavior aspects – rounding out the project's multi-disciplinarity. The project is supported by the BLUElab.

A. Completion of at least 2 credits of introductory "Design, Build, Test" experience.

- Student takes ME 250[10] (4 cr)

B. Completion of at least 3 credits of "cornerstone" coursework that serves to prepare the student in depth for his or her multi-semester project work.

- Student takes CEE 260 (4 units).

C. Completion of at least 7 credits of multidisciplinary design project work. Prior to or at the beginning of this multi-semester project experience, the student must complete a detailed project scoping exercise that details the project objectives, approach to completing the objectives and how the student will contribute his or her expertise to the completion of the project.

- Student takes IOE 424 (4 cr) and does the project scoping exercise during the first month of the class and submits it for approval.
- Student takes IOE 490 (3 cr) or ME 589 (3 cr) in a subsequent semester and completes the sequence.

D. Completion of at least 2 credits of formal leadership and/or mentorship activities within the Multidisciplinary Design program.

- Student takes ENG 4yy (2 cr)
  - New course to be developed that provides template for leadership and mentorship activities appropriate in the context of design projects.

[10] IOE students can take ME 250, and some do already. There is a big problem however if ME 250 becomes the "catch-all" for students not in ME and who didn't take a DBT version of ENG 100. ME 250 is already maxed out in terms of enrollment.

An easy requirement would be to change all ENG 100 so they are DBT (maybe not realistic!). This still wouldn't address transfer students or LSA students. An alternative is to make ENG 270 a possible DBT.

Template for
Minors in Engineering

9/6/07

Proposal for Engineering Minors

Undergraduate students enrolled in a College of Engineering degree program can often benefit from study and practice at some depth outside of their major. An engineering minor is a coherent program of study, but with requirements far less comprehensive than those of a BS or BSE degree. Engineering minors can be sponsored by CoE departments, programs, or, for the purpose of supporting cross-departmental programs, sponsored by the Office of the Associate Dean for Undergraduate Education. An engineering minor is not intended to provide specialization within a student's major field.

An engineering minor will require:

1. At least 15 credit hours, including some upper division courses.
2. A minor must contain some structure and coherence and cannot simply be a requirement for a number of credit hours. A minor can contain grouping of courses and provide students with approved menus of courses within these groups.
3. Courses used to satisfy BSE or BS requirements can also be used to satisfy minor requirements.
4. Courses taken to meet the requirements of a minor must be taken for a grade. However, a minor may articulate reasons to specify a limited number of courses or credits that are graded Pass/Fail.
5. An engineering minor can require prerequisites.
6. To create a minor the sponsoring CoE unit will submit a curricular plan for the minor to the College of Engineering Curriculum Committee for consideration and approval/disapproval. If approved the engineering minor proposal will be forwarded to the CoE faculty for final approval/disapproval. The CoE Curriculum Committee must approve all subsequent modifications to the minor requirements (including adding or removing courses from a menu of courses).
7. The sponsoring unit is responsible for administering the minor, and must submit with the curricular plan an administrative plan that: identifies faculty/staff positions responsible for providing advising and timely auditing of the minor requirements during the student's final term. The advisor for an engineering minor will be responsible for approving variances to minor requirements for individual students.
8. For minors sponsored by the Office of the Associate Dean for Undergraduate Education, the ADUE will identify faculty to provide advising and staff to assist with advising and auditing.
9. Students taking an engineering minor will have a notation on their CoE audit. When the student applies for her diploma the CoE registrar will contact the unit(s) sponsoring her minor(s) to request an audit of the minor requirements.
10. The program advisors for a minor, and their designated staff, are responsible for responding to the CoE Registrar's request for the audit of the minor requirements.

Student rules:

A. Completion of an academic minor is optional; no student can be required to complete an engineering minor.
B. A student's enrollment period will not be extended for the purpose of completing a minor (once a student has completed the requirements for their BS/BSE degree, they should not remain enrolled for the sole purpose of completing a minor).
C. A student can complete one or more engineering minors, along with one or more LSA minors. However, a minor is not intended to provide specialization within a student's major field. Therefore, the posted rules for each minor will outline any restrictions on the availability of a minor for students in particular programs, e.g. "A student seeking a BSE in NERS cannot earn the minor in NERS."
D. Advanced Placement credits may not be used to meet the requirements of an academic minor, but may be used to meet the prerequisites to a minor.
E. Transfer credit may generally be used to fulfill the requirements of a minor, but specific minors may have limitations on the use of transfer credit.
F. Courses taken to satisfy the requirements of a minor must be taken for a grade, unless the course was specifically approved as Pass/Fail within the requirements of that minor.
G. A student must earn an overall GPA of at least 2.0 in courses taken to meet the requirements of an academic minor.
H. Students are responsible for notifying both the sponsoring program and their major department of their intention to pursue a minor. Such notification must take place no later than the 3rd week of the term in which they intend to graduate. Ideally notification should take place much earlier.
I. The advisor for each minor is responsible for approving any variance in course requirements for a minor.
J. Responsibility for auditing completion of requirements for a minor lies with the sponsoring unit (Ideally the MAIS system will make such auditing relatively easy).
K. Students will always be allowed to count courses towards an approved minor retroactively, as long as the minor is approved before the date of their graduation.
L. Engineering minors will be noted on a student's academic transcript, but not on her diploma.

Notes on significant differences from LSA minors:

I. LSA minors require 10 credits to be taken in residence (we allow any number to be taken on other campuses).
II. LSA minors and concentrations (majors) allow double counting only one course (we allow any number of courses to be used for both major and minor; this is consistent with current CoE policy regarding LSA minors).
III. LSA minors do not allow any double counting of courses between minors (we allow any number of courses to be double counted between minors)
IV. LSA minors do not allow any Pass/Fail grading in courses used for a minor (we allow some Pass/Fail graded courses in a minor, if specifically approved in the design of the minor).

LANGUAGE REQUIREMENT "LR"

Date: Thu, 13 Sep 2007 14:06:56 -0400
From: teorey@eecs.umich.edu
To: 2007-2008DSA@umich.edu
Subject: Language Requirement in CoE Bulletin (Revision 1)

This clarification will be presented to the CoE Curriculum Committee as an information item September 18, 2007.
****

A couple of years ago LSA decided to make the "LR" designation for language courses only apply to the last course in each sequence of foreign language requirements for LSA majors. Previously all qualifying foreign language courses carried the "LR" designation, but not any more. For instance, note in the current LSA Bulletin that German 100 level courses all say "excl", and "LR" is not used until German 230 and above.

The good news is that this change has not affected the language courses that engineering students take to satisfy the humanities requirement, and has not affected the audit process that the College uses to verify the humanities requirement.

The main problem we see is that the CoE Bulletin needs to be updated in two places to reflect this change and avoid confusion by the students, faculty, and staff. Just looking up a course and seeing whether it is designated as "LR" will not work any more.

College of Engineering Bulletin

1. Core CoE Requirements, Foreign Languages

The last sentence in this section currently reads:

Students earning language credit by completing qualifying courses at the University of Michigan, designated by LR or HU, or by transfer credit of equivalent courses from any other institution of higher learning, may apply all credits earned towards humanities.

It should be changed to:

Students earning language credit by completing qualifying courses at the University of Michigan or by transfer credit of equivalent courses from any other institution of higher learning, may apply all credits earned towards humanities.

2. Core CoE Requirements, Definitions and Exceptions

Item 2, first sentence, reads:
Language courses, those designated as "LR" are counted as humanities.

It should be changed to:

Language courses are counted as humanities (HU) unless they are designated with one of the exceptions listed in item 3 (see below).

Toby Teorey
Director of Academic Programs, CoE

Humanities and Social Sciences

The Humanities and Social Sciences Requirements offer a variety of academic choices for all students working toward an undergraduate Engineering degree. It is designed to provide the students with social, cultural, political and economic background crucial to fulfilling the College of Engineering's purpose of "preparing our graduates to begin a lifetime of technical and professional creativity and leadership in their chosen field".

To provide a breadth of education, each program in the College identifies a certain number of credit hours of elective courses (a minimum of 16) concerned with cultures and relationships--generally identified as humanities and social sciences. Students are encouraged to select a cluster theme for their humanities/social science electives. This is a unifying theme (such as psychology, economics, or history) that focuses the student's HU/SS electives.

Requirements:

The specific requirements for all students are listed below:

I. Humanities (6 credit hours):
   At least two courses totaling at least six credit hours.
II. Sequence of humanities or social sciences courses (six credit hours):
   A sequence of at least two courses in either the humanities or social sciences (or both) totaling six or more credit hours, must be taken from the same department or division (e.g., History), at least one of which must be an upper level (numbered 300 or above). This requirement may, of course, overlap requirement 1.
III. The remaining credit hours may be satisfied with elective courses in either humanities or social sciences.

Definitions and Exceptions:

These requirements can often be satisfied by a number of courses from the College of Literature, Science and the Arts (LSA), or in part by Advanced Placement, A levels or IB credit or by courses taken at another university. For purposes of this College of Engineering requirement a course is defined as being a humanities or social science as follows:

1. Any course that is designated as "HU" or "SS" by the College of Literature, Science and Arts meets this requirement as humanities or a social science, respectively.
2. Language courses, those designated as "LR" are counted as humanities. However, advanced placement credit, A levels, IB or University of Michigan placement credit for language courses at the 100-level and below are not to be used to satisfy this requirement. These may be counted instead as General Electives.
3. Courses that are designated as "BS", "CE", "MSA", "NS", "QR", "experiential", "directed reading or independent study", or course titles that include the terms or

partial phrases "composition", "conversations:", "intro composition", "math", "outreach", "performance", "physics", "practice", "practicum", "statistics", "studio", "tutor" may not be used to satisfy this requirement.

4. For the purposes of this requirement, courses not covered by items 1, 2 & 3 above will be defined as *humanities* courses if they are offered by the following departments or divisions:

    - American Culture
    - Architecture (non-studio)
    - Art (non-studio)
    - Classical Archaeology
    - Classical Studies
    - Comparative Literature
    - Dance (non-performance)
    - Film and Video Studies
    - Great Books
    - History of Art
    - Asian, English, Germanic, Romance (French, Italian, Portuguese, Spanish) and Slavic Languages and Literatures
    - Music (non-performance)
    - Music History and Musicology
    - Philosophy
    - Religion
    - Theatre and Drama (non-performance)

Similarly, courses not covered by items 1, 2 & 3 above will be defined as *social sciences* if they are offered by the following departments:

- Afro-American and African Studies
- Cultural Anthropology
- Communication Studies
- Armenian, Judaic, Latin American and Caribbean, Latina/Latino, Middle Eastern and North African, Native American, Near Eastern, Russian and East European Studies
- Economics
- History
- Linguistics
- Political Science
- Psychology
- Sociology
- Women's Studies