

## **Council on Multidisciplinary Design:**

Jessica Brakora, Dave Chesney, Brian Gilchrist, Nilton Renno,  
Steve Skerlos, Toby Teorey, Pete Washabaugh, Daryl Weinert,  
*and others...*

## **With special thanks:**

Dave Munson, James Holloway, Panos Papalambros,  
Provost Committee on Multidisciplinary Learning & Team Teaching

# A PROPOSAL FOR MINORS IN MULTIDISCIPLINARY DESIGN

9/16/2007



Michigan**Engineering**



# Overview: Proposal for Minors in Multidisciplinary Design

- What “mega-trend” does this proposal respond to?
- Why is UM well-positioned to transform eng. education?
- What are the goals of the minor program?
- What is the structure of the program?
- What would the program look like to students?
- Closing remarks



# What are we responding to?

“In a world where applied science and technology are available to practically anyone for a few rupees or yuan on the dollar, we have to ask ourselves: ***What will the U.S. engineer have to offer that is not available in the global market for a fraction of the cost?*** If we decide to compete with other countries using the traditional definition of engineering, we will certainly succeed in converting engineers into a commodity.

A better response lies in changing the scope and significance of what engineering is and, perhaps more important, who engineers are – namely, technically adept people who serve humanity through the application not simply of math and science, but of a wide array of disciplines. ***This new breed of engineer will be not only a truly comprehensive problem solver, but a problem definer, leading multidisciplinary teams of professionals in setting agendas and fostering innovation***”

-- Domenico Grasso (Univ of Vermont), David Martinelli (Univ of West Virginia)

Reference: March 16, 2007 — The Chronicle of Higher Education



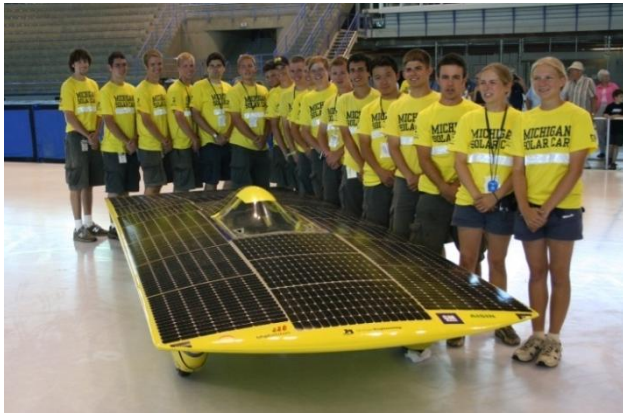
# What are we responding to?

*Today's engineer needs to be a problem definer, problem solver, and solution implementer*

- Work across boundaries
  - ▣ Disciplinary boundaries, geographic boundaries, cultural boundaries
- Have a broader perspective to solve complex problems
- Hit the ground running
  - ▣ On-the-Job training is too slow, and too costly
- Globally competitive, not technicians doing commoditized work
- Apply their *rigorous analysis skills* in the context of developing *creative solutions* to critical problems that *they identify* and finding a *pathway for the solution to reach society*.



# Opportunity for UM Edge



***We have students that are excellent models for the 21<sup>st</sup> century.  
They gained their experiences largely from extra-curricular activity!***

- Let's build on what is working well
- Use design approach to motivate problems to work on and as a *reinforcing platform to ingrain analysis skills*
- Expose students to an array of disciplines: *UM is almost best at everything!*
- Interact with a diverse population of students
- Teach teamwork, mentorship, and leadership



# Goals of the Minor in Multidisciplinary Design

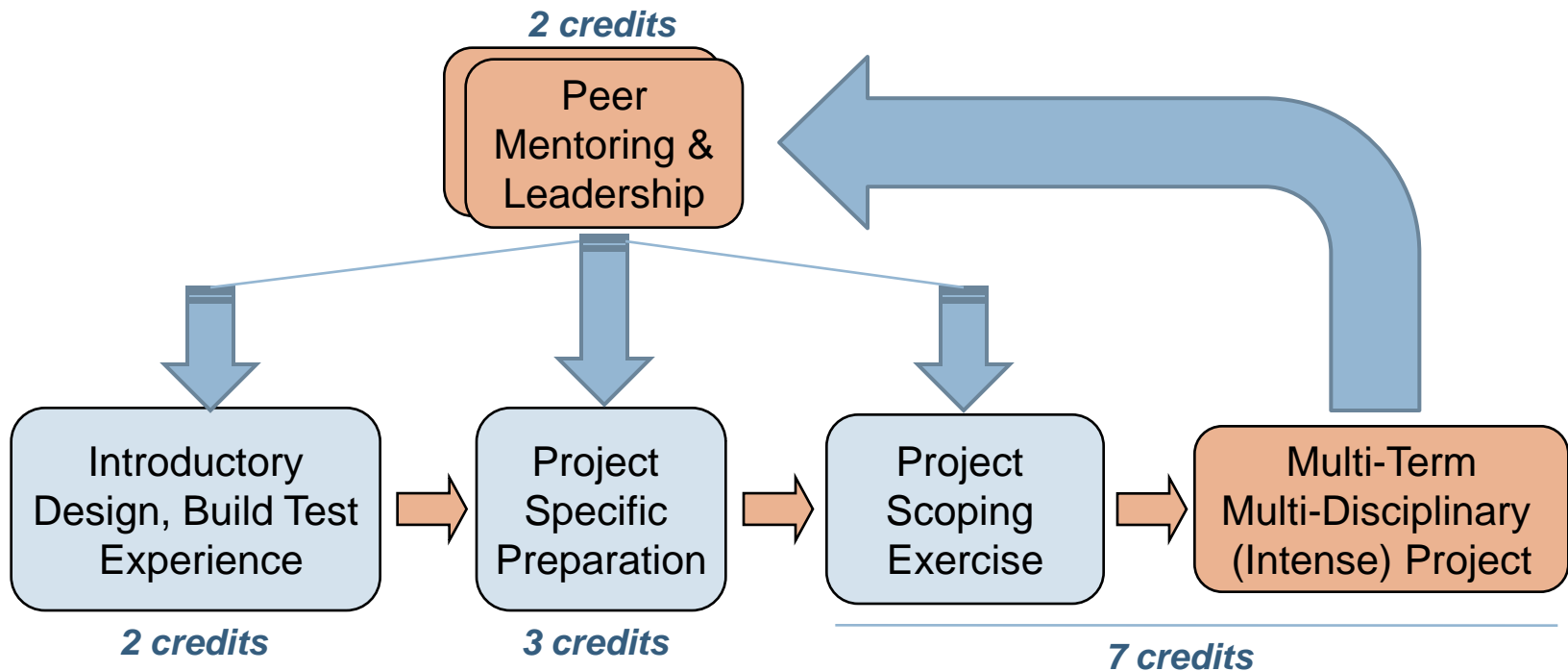
*We aim to create a series of experiences that:*

- Create a generation of leaders capable of addressing major technological and societal challenges.
- Create a generation of opportunity definers, creative problem solvers, and entrepreneurial solution implementers.
  - Teach students how analysis problems are formulated and allow them to apply their solution skills to open-ended and real-world problems.
- Provide a natural intersection point for engineering students to work with students outside of CoE.
  - A program widely known by the student body that creates a knowledge and cultural link to disciplines outside of engineering
- Are available to all students interested in pursuing the opportunity



# Approach: Minor in Multidisciplinary Design

*A structured collection of hands-on and leadership experiences*



**Year 1**

*Minor = 15 credits in these Categories*

**Graduation**



# Multidisciplinary Design Minor “Flavors”

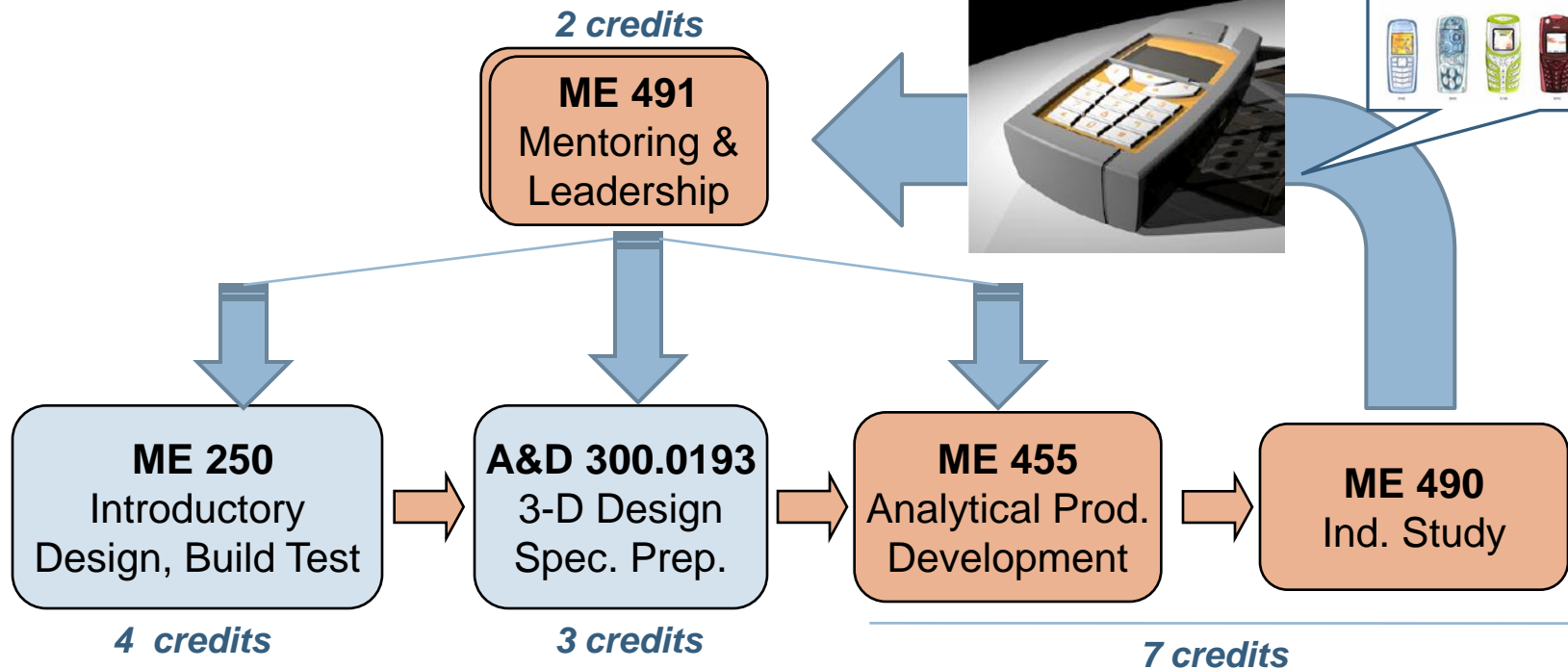
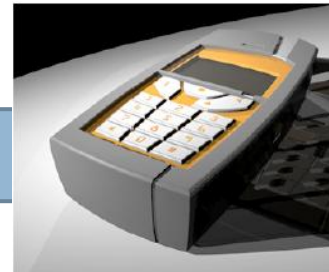
- ***General Minor in MD Supported by AD for UG Education (Holloway)***
  - *Advisory Council will facilitate*
- ***Specializations initiated by faculty and faculty groups welcomed :***
  - *E.g., Minor in Multidisciplinary Design with Specialization in Space Systems*
  - *Under development:*
    - Space Systems
    - Solar Vehicle Systems
    - Sustainable Design
    - Service Learning
  - *Also being discussed:*
    - Global Health
    - Product Innovation
    - Mechatronics





# Sample Student: Minor in Multidisciplinary Design with Specialization in Product Innovation

*ME Student wants to start company via brand of cool used cell phones*



**Year 1**

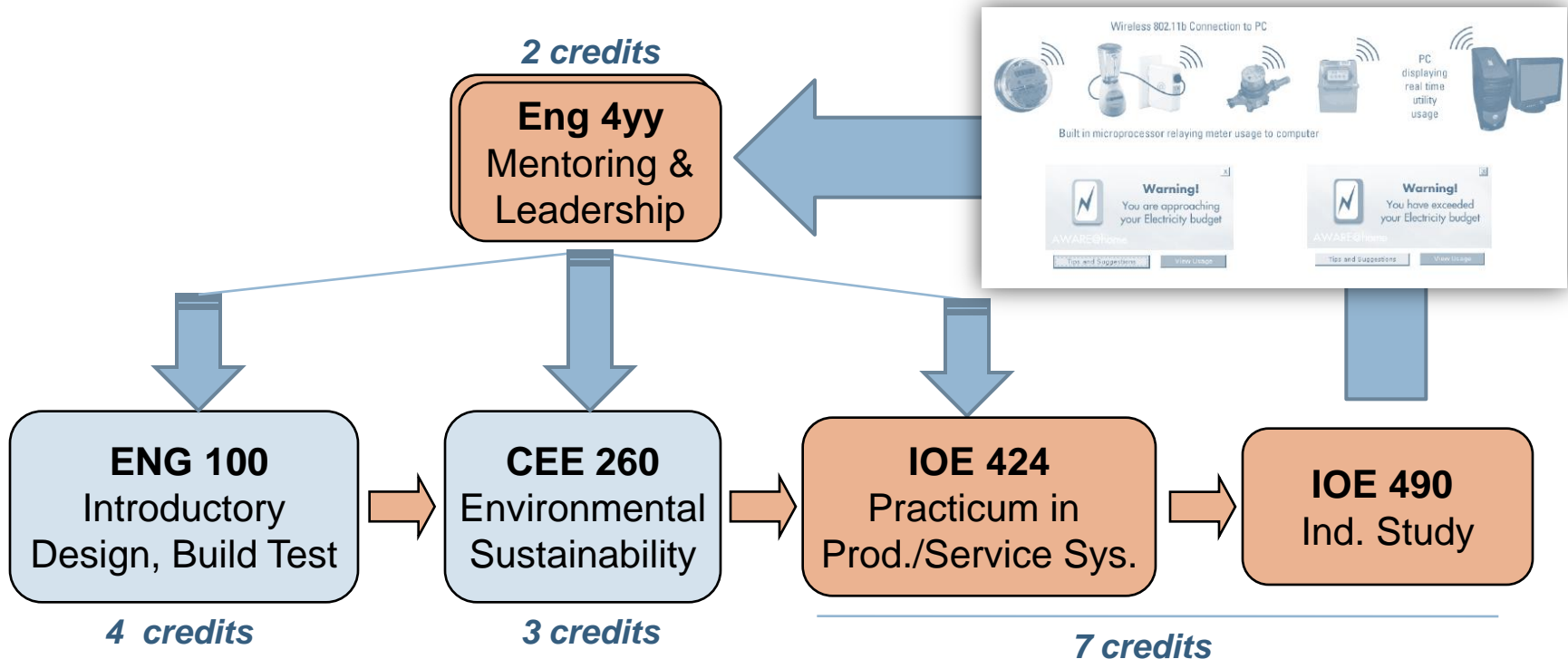
*Minor = 15 credits in these Categories*

**Graduation**

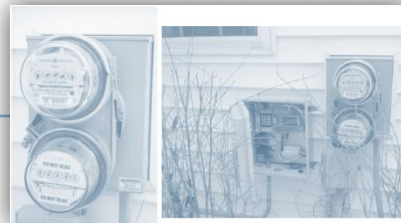
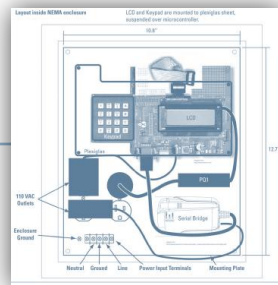


# Sample Student: Minor in Multidisciplinary Design (General Pathway)

*IOE Student wants to perform cost / environmental assessment of AWARE@home*



**Year 1**



**Graduation**



# In Closing: We are enthusiastic and believe this is an important program for CoE

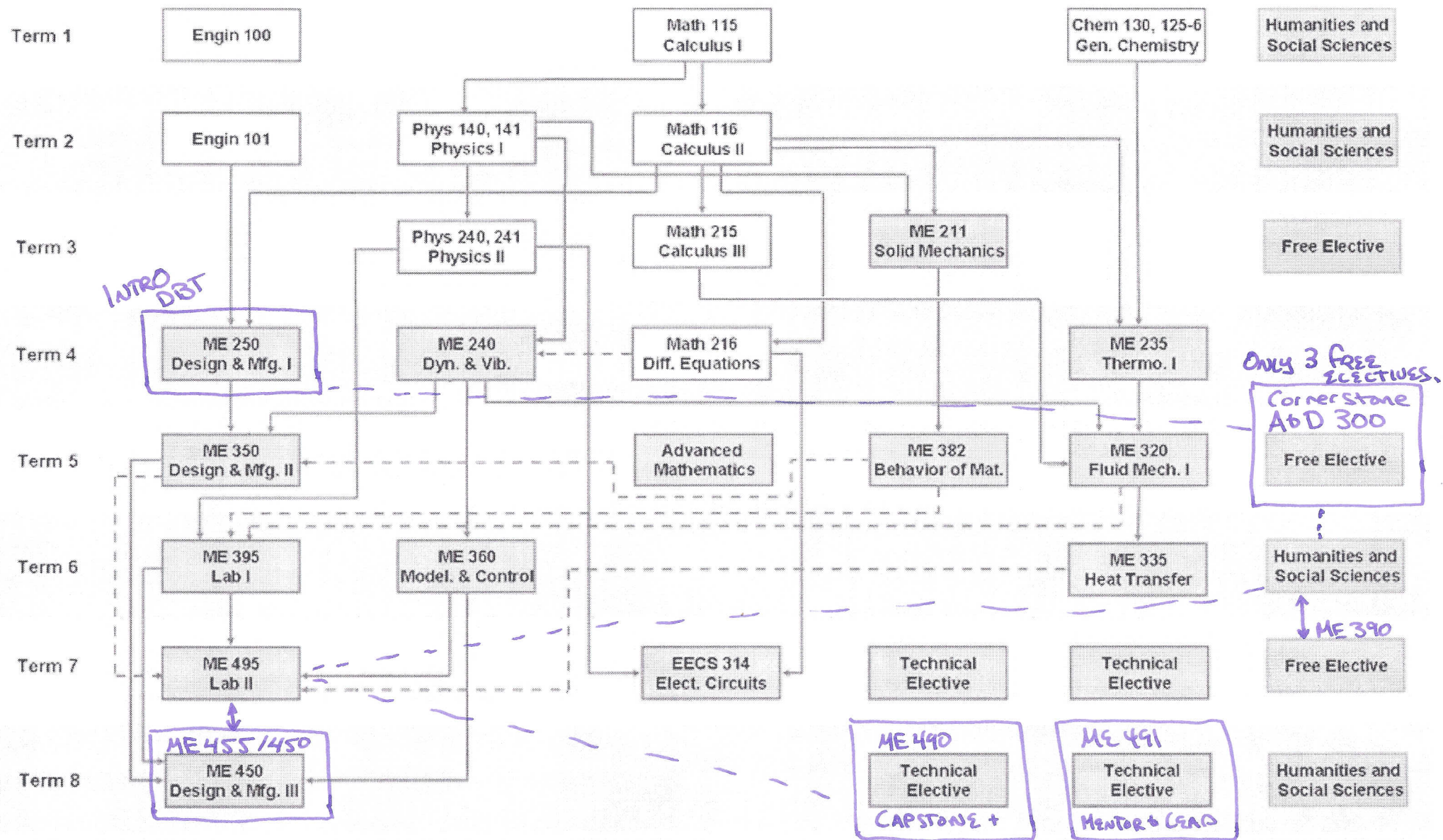
## The CoE External Advisory Council Agrees:

**“We want an engineer to identify opportunities, not just problems.”**

*Do you think our [Interdisciplinary Practicum Concentration, IPC] approach will differentiate a Michigan Engineering education and provide our students with the skills and experiences necessary for success in your organizations and in the 21st century global economy?*

- “Interdisciplinary Practicum Concentration”: “I love this concept, but can’t pronounce it.”
- “Build on past success. The University had tremendous success with mini-practicums, e.g., the solar car, the first-year course. Tell students up front that this will take weekends and a lot of extra time. There is a need, want and desire for this on the part of the student, but also on the part of the employers.”
- Absolutely yes. It is the most efficient use of capital. It takes three to five years to get these skills after hire. We believe this can be better done at the university level with programs like IPC.





Legend



Subjects required by the Department of Mechanical Engineering  
A Total of 64 Credit Hours (45 Hrs of Program Subjects, 4 Hrs of Related Program Subjects, 3 Hrs of Advanced Mathematics, 12 Hrs of Advanced Technical Electives)



Subjects required by all programs within the College of Engineering  
A Total of 39 Credit Hours



Subjects elected by student  
A Total of 25 Credit Hours (16 Hrs of Humanities and Social Sciences, which include one course in micro- or macro econ, 9 Hrs of Free Electives)

— Prerequisite

- - - Preceded or Accompanied By



# IOE UNDERGRADUATE AUDIT

[For students entering the COE as freshmen or transfer students in Fall 2004]

Name: \_\_\_\_\_  
 UMID: \_\_\_\_\_  
 COE Bulletin Used: 2004/2005

## COLLEGE WIDE CORE REQUIREMENTS

Course	Req.	Cr.	Grade	Term
MATH 115	4			
MATH 116	4			
MATH 215	4			
MATH 214	4			
CHEM 130	3			
CHEM 125/6	2			
PHYS 140	4			
PHYS 141	1			
PHYS 240	4			
PHYS 241	1			
* ENGR 100	4	4	DBT	
ENGR 101	4			

REQUIRED: 39 0

## IOE PROGRAM CORE REQUIREMENTS

Course	Req.	Cr.	Grade	Term
IOE 201	2			
IOE 202	2			
IOE 265	4			
IOE 310	4			
IOE 316	2			
IOE 333	3			
IOE 334	1			
IOE 366	2			
IOE 373	4			
IOE 474	4			
* IOE 424/481	4	Capstone		

[SR. DESIGN]

REQUIRED: 32 0

## NON-IOE ENGINEERING CORE

-Select 12 hours; 4 hours each from any three different groups:

- A — ME 211 or CEE 211 or ME 240
- B — ME 230 or ChE 230 or ME 235
- C — MSE 220 or ME 382
- D — BIOE 458 or EECS 314 or EECS 270
- E — CEE 260 or NERS 211
- F — EECS 280 or EECS 283

Course	Cr.	Grade	Term
* CEE 260	4	CORNER	

REQUIRED: 12 0

## HU/SS REQUIREMENTS

Humanities : 6 hours (two or more courses totaling at least 6 credit hours)

HU/SS set : at least two courses in either the humanities or social sciences, or both, totaling at least 6 credit hours. The set must be from the same department or division, one of which must be a 300-level or above.

HU/SS SET	Cr.	Grade	Term

REQUIRED: 16 0

## TECHNICAL ELECTIVES

-Select at least 12 hours from IOE; at least one course must be from three of the following four groups:

- A — IOE 441, 447, 449
- B — IOE 416, 460, 461, 465, 466
- D — IOE 432, 436, 438, 439, 463
- E — IOE 421, 422, 425, 452, 453

-Technical Communication 380 required [2cr]

-The remaining 6 hours may be selected from any IOE course listed above and/or from an approved list of non-IOE Technical Electives

Course	Cr.	Grade	Term
TechComm 380 [2cr]			
IOE 490	3	Capstone(+)	

REQUIRED: 20 0

## FREE ELECTIVES

Course	Cr.	Grade	Term
* ENGR 244	2	Mentor to LEAD.	

REQUIRED: 9 0

TOTAL CREDITS EARNED: 0

Minor in MD = 17 CREDITS  
 Only 2 FREE ELECTIVES.