

Cornell University

Engineering College Council  
October, 2002

## **Undergraduate Education**

Resource Needs  
for the  
Next 5 Years

Over 2800 undergraduates

B.S. degrees

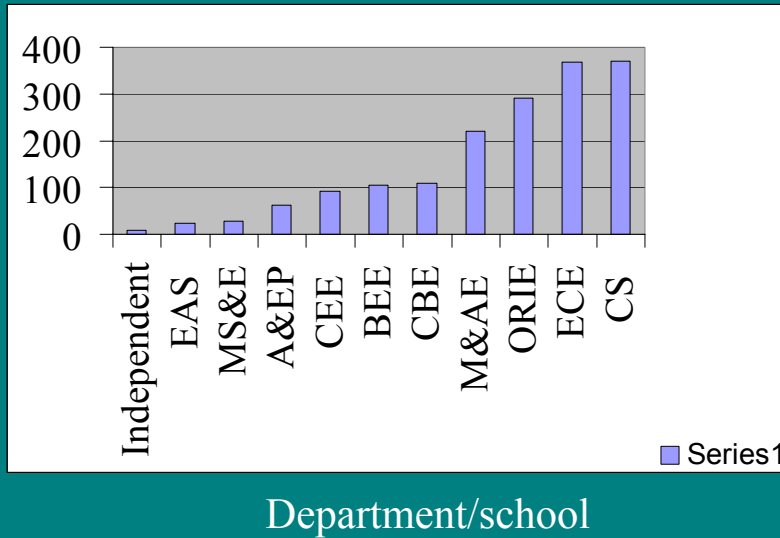
10 traditional fields (8 engr & engr science, 2  
science only)

1 independently designed

Formal Minors

- ❖ Same as Majors, Plus
- ❖ Biomedical Engineering
- ❖ Applied Math
- ❖ Information Technology

## Upperclass Enrollments

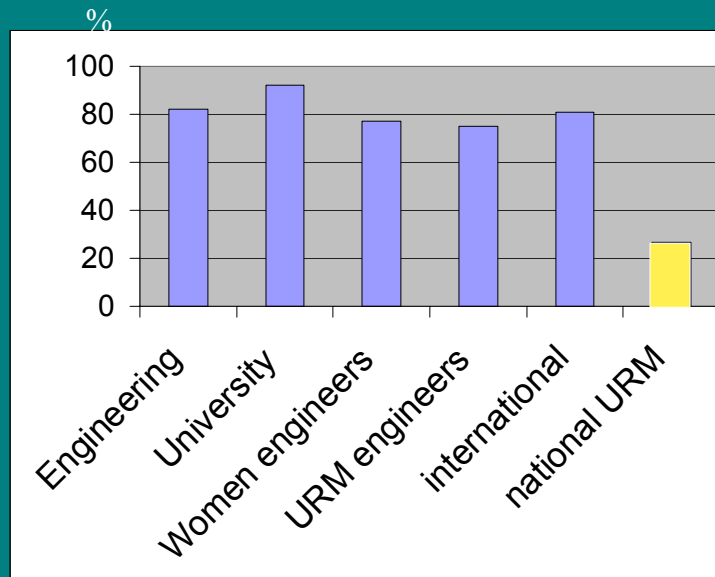


## Pace

4 Years to B.S. degree

4 Year Co-op Program

## Graduation of Freshman Engineers



## Engineering college functions

Services to enrolled students

Admissions

Career Services and Cooperative Education

Engineering Communications

Engineering Ethics

*Search for Bovay Chair continues*

Alternative pedagogical styles



## College Curriculum Governing Board

Math  
Physics  
Chemistry  
Computing  
Liberal studies  
Communications (FWS + Technical)  
Breadth of engineering sciences



## Delivery Approaches

### Classroom-Centered

- Traditional

### Inquiry-Based Learning

- Engineering Design Project Teams
- Field Education
- Co-op Program
- Research

## **Barriers to Inquiry Based Learning**

- Person-power
- Need lower student:faculty ratio than in classroom
- Technical staff not available
- Faculty credited for classroom efforts, but traditionally out-of-classroom is an overload
- Space
- Access to machine shops, vehicles, etc
- Direct costs high

## **Current State of Undergraduate Learning Facilities**

- 1. Inquiry-Based Learning**
- 2. Undergraduate Classrooms**
- 3. Undergraduate Teaching Laboratories**
- 4. Computer Facilities**

## **Staffing in Support of Undergraduate Learning**

# 1. Inquiry-Based Learning

- Engineering Design Project Teams
- Field Education
- Co-op Program
- Research

## *Project team space*

### Competitive teams:

**Robocup**

**Formula SAE**

**Micro Air Vehicle**

**Balsa Wood Bridge**

**Concrete Canoe**

**Advanced Interactive Discovery Environment**

**AUV (Autonomous Underwater Vehicle/BRAIN)**

**Odysseus**

**ACM Programming**

**Moonbuggy**

**Hybrid Electric Vehicle**

**Egg Protection Device**

**Steel Bridge**

**Total Space: ~6000 ft<sup>2</sup>**

Current Facilities

*Project team space*

Service & other teams:

ASTRO (Mars lander)

**Engineers Without Frontiers**

**CUBESAT**

**ASCE**

Phoenix Society

**Enigma project** (research journal)

**FIRST Robotics** (K-12 outreach)

Current Facilities

*Field Courses*

Earth & Atmospheric Sciences:

4 field-centered courses

- ❖ Ithaca area
- ❖ Argentina
- ❖ Hawaii

many other courses: field trips in NE

Other departments: Meng projects often include plant visits

”space” = University-owned vans & rented buses



Current Facilities

## *Undergraduate Research*

### Principal Participants

- MSE (all students)
- AEP (1/3 of students)
- CEE (~1/2 of students)

Many individual students (130 through college, others within departments)

### Facilities:

- Shared lab spaces
- In research laboratories

Current Facilities

## **2. Undergraduate Classrooms**

9% of college space (~50,000 ft<sup>2</sup>; ~50 rooms)

Utilization 25 hr/wk (vs. “ideal” 25-32 hr/wk)

Lecture halls – all “electronic”

### Classrooms

- maintenance done
- electronic conversions progressing
- match of teaching needs to furnishings undone

## Current Facilities

### 3. Undergraduate Teaching Laboratories

wet labs – 25,000 ft<sup>2</sup>

dry labs – 27,000 ft<sup>2</sup> --Includes Computer Labs

Utilization (10 scheduled hrs/week) below

university target (12-20 scheduled hrs/week)

Equipment & facilities maintained & upgraded through gifts to departments & savings

## Current Resources

### Staff Support for Undergraduate Learning (Technical, non-Faculty)

#### College (5 total):

- Engineering Communications: 3 (all teach)
- LIFE: 2 (pedagogy/education training)

#### Departments (~14 FTE) (plus contracts for software):

AEP 1.5	CBE 0
CEE 2	CS 1.25
EAS 0	ECE 1/2
MAE 4	MSE 2
ORIE 1	TAM 2

**2000 student enrollments/staff/yr**

## **Cornell Engineering Undergraduate Education**

### **Proposed Initiatives of Next 5 Years**

- I. Facilitate inquiry-based learning
- II. Decrease faculty teaching load and improve faculty interaction with undergraduates
- III. Better prepare students to be tomorrow's social responsibility leaders

**New Facilities/Resources  
Needed to  
Support  
Undergraduate Initiatives  
(now through 5 years)**

**New Facilities/Resources**

***I. Inquiry-Based Learning Center***

1. Endow a center that facilitates & administers inquiry-based learning activities (staff, project seed money)
2. Allocate ~8000 ft<sup>2</sup> of space and budget for regular replacement of equipment for use by project design teams

**New Facilities/Resources**

***II. Teaching Load & Faculty-Student Interactions***

1. Increase faculty size > 30 (within 5 years)
2. Assist faculty teaching (details below)

**New Facilities/Resources**

## **Assist Faculty Teaching**

1. Endow maintenance & renovation of classrooms, teaching laboratories, & equipment

Examples:

A&EP - \$192,000 introductory & advanced courses

CEE - \$7.1 million renovations of 3 teaching/research laboratories

**New Facilities/Resources**

## **Assist Faculty Teaching**

2. Ongoing training for faculty

- Classroom management & delivery
- Assessment and Grading
- Syllabus development
- Group learning strategies
- etc

**New Facilities/Resources**

## **Assist Faculty Teaching**

### 3. Qualified assistance in classrooms & labs

- More Teaching Assistants
- Adequate staffs of Ethics, Communications & LIFE that their experts can work intensively with faculty
- More departmental technical assistants

**New Facilities/Resources**

## **Assist Faculty Teaching**

### 4. Equip & staff Information Technology Center to facilitate teaching efforts, both classroom and outreach

### 5. Staff service center for K-12 outreach, to bring faculty expertise to the outside community

New Facilities/Resources

*III. Prepare our students to be tomorrow's  
leaders through*

- Integration of social, ethical, & environmental considerations with technical training
- Experience collaborating within a diverse community
- Leadership opportunities

New Facilities/Resources

*III. Prepare Tomorrow's Leaders*

1. Staff service-center for K-12 outreach, to broaden the pipeline to undergraduate engineering
2. Increase staffing of Minority Programs and Womens' Programs

New Facilities/Resources

### *III. Prepare Tomorrow's Leaders*

3. Dedicate space & finances to service-oriented design teams
4. Designate space, start-up funds, & program support to the Bovay Chair of Engineering Ethics

New Facilities/Resources

### *10-Year Plan*

Enhance opportunities for Faculty and Staff to jointly provide educational guidance to all Engineering College Students:

#### *Refurbish/construct building for*

Inquiry-Based Center

Student Services

Ethics

Communications

LIFE

library

(co-habiting with academic department)