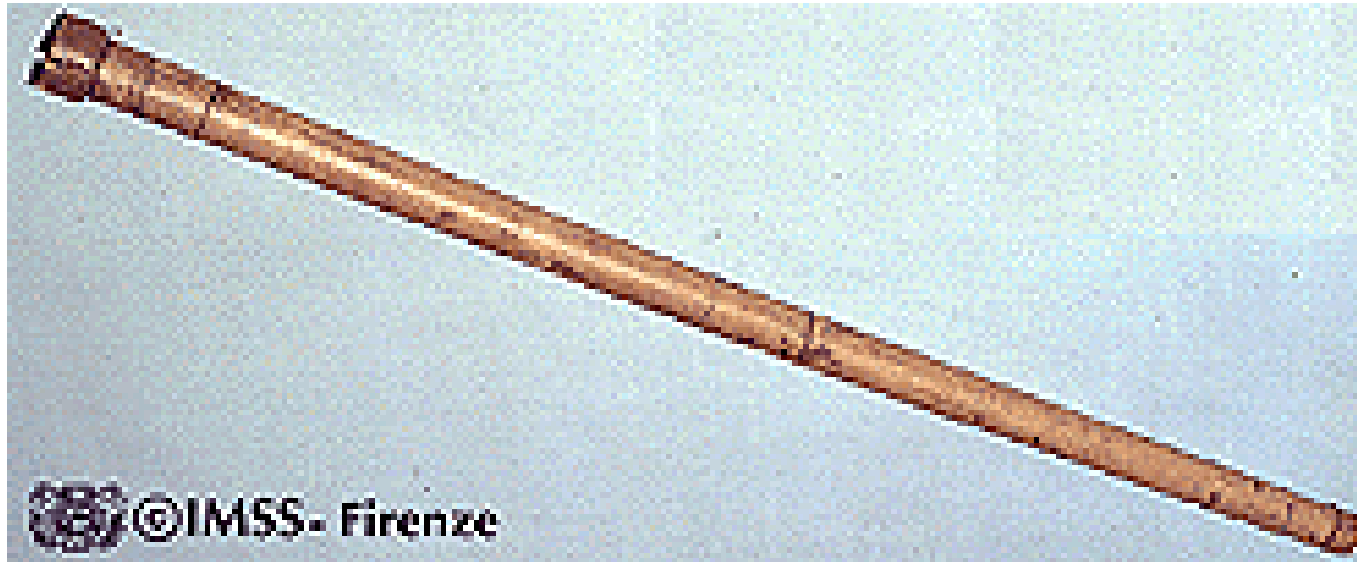


# Engineering Curricula



International Year of Astronomy  
2009

400 years since Galileo!



Refractor



Compound



Reflector

Images from Orion Telescopes

The beginning of wisdom is to call things by their right names  
– Chinese Proverb



Dioptric



Catoptric



Catadioptric

Images from Orion Telescopes



DERIVATION

A PARABOLIC MIRROR REFLECTS  
LIGHT THROUGH THE FOCAL  
POINT

# **ENGINEERING CURRICULA**

# Typical Entrance Requirements

- Math – 4 years at least through Trigonometry
- Science – 3- 4 years
  - Chemistry
  - Physics
  - Biology (for some programs)
- English – 4 years
- Foreign Language (Not required at UC)
- University Requirements

# UC Math Requirements

- After admission, all Engineering Students take the Math Placement Test. Maximum score 1450. Scoring is scaled.
  - The UC Mathematics Department has a lot of data on this test and a good statistical basis for decisions.
- A score of 670 (roughly 40% correct) is needed to get into Calculus I.
- Students scoring between 500 and 670 must take Calculus 0 – trigonometry and algebra review.
- Students scoring  $< 500$  ( $< 25\%$  correct)
  - Cannot take Chemistry
  - Must take Algebra II and Trigonometry

# Division of Curriculum

- Math
  - Calculus
  - Differential Equations
  - Matrix Algebra
  - Statistics
  - Advanced Topics as needed (i.e. Complex Numbers for EE)
- Science
  - Chemistry
  - Physics
  - Biology for some programs

# Division of Curriculum

- Engineering Sciences
  - Mechanics of Rigid Bodies (Statics/Dynamics)
  - Mechanics of Deformable Bodies
  - Thermodynamics/Heat Transfer
  - Fluid Mechanics
  - Electric Circuits
  - Computer Programming
  - Basic Material Science
- Actual courses taken are discipline specific

# Division of Curriculum

- Discipline Specific Courses
  - Required Courses – All students in the discipline must take.
    - Example - All students in CEE take Structural Analysis and Hydraulics, regardless of area of concentration.
  - Distributional Departmental Electives
    - Example – All students in CEE must a structures elective, a geotechnical elective, a hydraulics elective and an environmental elective.
  - Area of Concentration Electives
    - Example – Course specifically in environmental.

# Division of Curriculum

- English
  - General Composition
  - Technical Writing
- General Education Courses
  - In humanities, social sciences and the arts.
  - Distribution set by University rules.

# Typical First Year Curriculum

| Fall                           | Winter             | Spring              |
|--------------------------------|--------------------|---------------------|
| Calculus I                     | Calculus II        | Calculus III        |
| English I                      | English II         | Elective            |
| Chemistry I + Lab              | Chemistry II + Lab | Chemistry III + Lab |
| Introduction to<br>Engineering | Physics I + Lab    | Physics II + Lab    |
|                                |                    |                     |

# Sophomore Year

| Fall                        | Winter/Spring               |
|-----------------------------|-----------------------------|
| Calculus IV                 | Differential Equations      |
| Physics III + Lab           | Matrix Math                 |
| Departmental Courses        | Departmental Courses        |
| Engineering Science Courses | Engineering Science Courses |

# Typical Curriculum Breakdown

- Approximately 200 credit hours
- English = 9 hours
- Sciences = 25 – 30 hours
- Math = 31-35 hours
- Engineering Sciences = 0 – 24 hours
- General Education = 24 hours
- Departmental Courses are the remaining hours.
  - Most students take 18 – 24 hours of Departmental Electives.

CIVIL ENGINEERING (CE)

2004-2005

Name: Last, First  
Freshman Year (53 hrs.)

|                   |                   |                   |
|-------------------|-------------------|-------------------|
| CHEM101 Chem. I 4 | CHEM102 Chem.II 4 | CHEM103 ChemIII 4 |
| CHEM111 Lab. I 1  | CHEM112 Lab. II 1 | CHEM113 Lab.III 1 |
| ENGL101 EnglCmp 3 | ENGL102 EnglCmp 3 | MATH253 CalcIII 4 |
| MATH251 Calc. I 5 | MATH252 Calc.II 4 | MATH257 CalcLab 1 |
| CEE 100 Int.CEE 3 | MATH256 CalcLab 1 | PHYS202/3 Phys. 4 |
|                   | PHYS201 Phys. I 4 | CEE 102 Fr Sem 1  |
|                   | CEE 101 Fr Sem 1  | ENFD101 Mech I 3  |
|                   |                   | 36PD120 Coop4En 1 |

Aut 2005 \_\_\_\_\_

MATH264 Calculus IV ..... 5  
CEE 204 Intro Env Assess . 3  
CEE 272 CE Measurements .. 3  
ENFD102 Mechanics II ..... 3  
ENFD250 Graphics Fund. ... 3

Sum/Aut 2006 \_\_\_\_\_

ECON101 Economics I (BoK) 3  
ENGL492 Tech Writing (BoK) 3  
CEE 375 Comp Methods ..... 3  
CEE 475 Const Matls ..... 3  
ENFD371 Electric Circuits 3  
COOP120 Practice Eval ... #

Sum/Aut 2007 \_\_\_\_\_

Pub Spe Elec(BoK)\_\_\_\_\_ 3  
ECON102 Econ II (BoK) .... 3  
CEE (Env Des)Elec \_\_\_\_\_ 3  
CEE (Str Des)Elec \_\_\_\_\_ 3  
ENFD383 Fluid Mech ..... 3  
COOP120 Practice Eval ... #

Second Year (34 hrs.) Win/Spr 2006

MATH273 Differential Eqns. 5  
MATH276 Matrix Methods ... 3  
ENFD112 Fund. Programming 3  
ENFD375 Strength of Mat'l 3  
ENFD382 Basic Thermodyn. . 3  
COOP120 Practice Eval. ... #

Third Year (31 hrs.) Win/Spr 2007

GEOL374 Geology for Engrs 4  
CEE 340 CEE Systems ..... 3  
CEE 345 Envir. Matl. Bal. 3  
CEE 382 Structural Anal .. 4  
CEE 474 Mat/Conc Lab ..... 2  
COOP120 Practice Eval. ... #

Fourth Year (32 hrs.) Win/Spr 2008

MATH366 Engrg. Statistics 3  
CEE 351 Transport. Engrg. 3  
CEE 476 Soil Mechanics... 3  
CEE 477 Soil Mech. Lab... 2  
CEE 493 Hydraulic Systems 3  
CEE 494 Hydraulic Sys. Lab 2  
20PD502 Prof. Develop. II 1  
COOP120 Practice Eval... #

| <u>Aut 2008</u>    | <u>Win 2009</u>    | <u>Spr 2009</u>    | <u>Fifth Year (43 hrs)</u> |
|--------------------|--------------------|--------------------|----------------------------|
| CEE504 Desgn I 2   | CEE505 Desgn II 2  | CEE506 Desgn III 2 | U _____                    |
| CEE551 Reliab 3    |                    |                    | A _____                    |
| CEE561 Snr Sem 1   |                    |                    | W _____                    |
| CEE679 Con Man* 3  | CEE680 Con Plan* 3 |                    | S _____                    |
| COOP120 PracEval # |                    |                    |                            |

Additional Senior Year Courses

|           |   |                              |   |
|-----------|---|------------------------------|---|
| BoK _____ | 3 | CEE (GeoTech Des) Elec _____ | 3 |
| BoK _____ | 3 | CEE (Hydro Des) Elec _____   | 3 |
| BoK _____ | 3 | CEE Elec _____               | 3 |
| BoK _____ | 3 | CEE Elec _____               | 3 |
|           |   | CEE Elec _____               | 3 |
|           |   | CEE Elec _____               | 3 |

\*Take **either** CEE679 or CEE680. The other one may be taken as a CEE elective.

Students **MUST** take one design elective in each of these areas:  
Structures, Geotechnical, Environmental, Fluids/Water  
Resources.

Students **MUST** have an area of concentration in either  
Structures, Geotechnical, Transportation, Construction or  
Environmental. Each area of Concentration has specific elective  
course requirements.

# ACCEND

- ACCEND is an accelerated BS/MS program.
  - Available in many engineering programs
  - Engineering/MBA also available.
  - Entrance requirements higher than for BS program.
- Students must have 30 free hours in the senior year to take the 30 required graduate hours.
  - Can enter with AP/AS credit
  - Can take courses in the summer between Freshman and Sophomore year
  - Skip 1<sup>st</sup> co-op.
- Students co-op in research labs for their 4<sup>th</sup> and 5<sup>th</sup> co-ops.
- Stay one extra summer at the end to finish the thesis.
- BS/MS degree completed in 5 years + 1 quarter.
- A custom curriculum is designed for each student.

# Freshman Engineering Program (FEP)

- For two types of students:
  - Undecided about a major
  - Students who meet a certain minimum requirement, but don't meet a Specific Departmental requirement.
- Students take a “generic” freshman curriculum.
  - Take a general Introduction to Engineering course or a Department specific introduction course.
- At the end of Freshman year can transfer to a program if:
  - $\text{GPA} > 2.0$
  - Room in program

# Retention/Attrition

- Officially, retention rate is about 65%.
- This number is not quite accurate.
  - The number is based on number of enrolled freshmen vs. number of graduating seniors for a given class.
  - Students transfer in and out. Thus, the 65% who graduate are not necessarily the same students who started as Freshmen.
- No hard data, but probably 50% of Freshmen quit/transfer.

# Why Student Transfer/Quit

- The largest reason is poor grades.
  - In most cases, it is an inability to adjust to college life.
    - Social activities
    - Drugs/alcohol
    - Poor study/work habits
    - Outside work demands
    - Improper HS preparation
    - Personal problems
    - Rarely is it a case of a student who “isn’t smart enough”.

# Why Students Transfer/Quit

- Don't want to be Engineers
  - Parental pressure to “get a real job”.
  - Didn't really understand what engineering is.
  - Expectations of parents, teachers, peers, councilors (“You're good in math, you should be an Engineer!”)
- Decide to stay in Engineering
  - Change majors
  - Change schools
    - Homesick
    - Boyfriend/girlfriend issues
    - Don't like UC
    - Financial pressures

# Academic Standards

- Students basically have 2 quarters to attain an acceptable level of performance (GPA > 2).
  - Three GPAs, Department, College and University.  
All must be > 2.0
- Students cannot fail to complete the same course twice (Grades of F, W, or some equivalent).

# Academic Standards

- Students who fall too far behind:
  - May be demoted (adds co-op quarters)
  - May be forced to skip co-ops to make up work.
- Students who have poor records:
  - Warning
  - Probation
  - Suspension
  - Dismissal

# Co-operative Education

- Started at the University of Cincinnati in 1906.
- Started in Engineering by Dean Herman Schneider.
- Originally, students alternated work and school in two week increments.
- Currently, student alternate work and school by quarter.
- Two sections. One co-ops Fall/Spring and one co-ops Winter/Summer.

# Co-operative Education

- Founded at the University of Cincinnati by Dean Herman Schneider in 1906
- First Co-op Class had 27 students in 13 companies
- Second year over 400 inquiries from prospective students
- First Co-op Program in Business in 1919
- First Mandatory Co-op Program in the USA in 1920 in College of Engineering
- First Women Admitted to Co-op in 1920
- UC Co-op program split into 3 colleges in 1946
- Currently UC has approximately 4,000 students co-oping annually
- Nationwide there are approximately 600 co-op programs with 241,000 students participating

# Co-operative Education

- Student start with 4 quarters of school. Three quarters freshman year the first quarter sophomore year.
- Some students start co-oping in Winter quarter. The rest start in spring.
- Once a student starts to co-op, they MUST continue to alternate work and school until senior year.
  - Co-op quarters may be waived to allow a student to catch up as long as a student co-ops at least 4 quarters.
  - Demoted students add 2 co-ops per year of demotion.
- All students co-op the summer before senior year.
- Senior year is the normal 3 quarter year.

# Co-operative Education

- Jobs vary based on
  - Discipline
  - Experience
- Students earn \$1700 - \$2500/month.
  - Responsible for own expenses
  - Remain students for purposes of using University facilities, insurance, etc.
- Students co-op all over the United States
- International co-op
  - Germany
  - Japan
  - Latin America

# Co-operative Education

|      |        |        |        |
|------|--------|--------|--------|
| Fall | Winter | Spring | Summer |
|------|--------|--------|--------|

|          |       |       |       |      |
|----------|-------|-------|-------|------|
| Freshman | Class | Class | Class | Free |
|----------|-------|-------|-------|------|

|           |       |       |       |       |           |
|-----------|-------|-------|-------|-------|-----------|
| Sophomore | Class | Class | Co-op | Class | Section 2 |
|           | Class | Co-op | Class | Co-op | Section 1 |

|            |       |       |       |       |           |
|------------|-------|-------|-------|-------|-----------|
| Pre-junior | Co-op | Class | Co-op | Class | Section 2 |
|            | Class | Co-op | Class | Co-op | Section 1 |

|        |       |       |       |       |           |
|--------|-------|-------|-------|-------|-----------|
| Junior | Co-op | Class | Co-op | Co-op | Section 2 |
|        | Class | Co-op | Class | Co-op | Section 1 |

|        |       |       |       |  |
|--------|-------|-------|-------|--|
| Senior | Class | Class | Class |  |
|--------|-------|-------|-------|--|