A PROPOSAL FOR A NEW EE CURRICULUM

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- Permanent Visitor: Charles Zukowski
Outline

• Reasons for change
• Considerations in new curriculum design
• Proposed changes
• Typical templates
• Work still to be done
• Time table for implementation
Reasons for Change

• Present curriculum has too large a core, makes it impossible to start early in certain subject areas, and allows students to graduate without depth.
Considerations in the Design of the New Curriculum
1. The core, as a whole, should:

• Provide fundamental tools.

• Expose students to the breadth of EE.

• Serve as a springboard.
2. Need for depth in one area

- Familiarization with process of digging into a discipline in depth.

- Opportunity for students to pursue their own passion.

- Job opportunities.
3. Need for breadth

• Innovation requires more and more an interdisciplinary approach.

• Exposure to other fields helps one’s creativity in his/her own field.

• Exposure to other fields reduces the chance of obsolescence.
4. Advantages of starting EE early

• Motivates students.

• Allows for just-in-time exposure to math and physics, and motivates their study.

• Gives students more time to explore before choosing a depth area.
Advantages of starting EE early, cont’d

• Allows time to take classes in chosen depth area.

• Allows for spreading non-technical requirements more evenly.
Early start in *all* depth areas

*All* students should be able to take courses in *any* of the depth areas in their *first* year in EE:

- Columbia students as sophomores;
- Transfer students as juniors.
Summary of objectives

• Provide strong core

• Introduce depth

• Ensure breadth

• Early start in all depth areas
Proposed Changes
• Eliminate the following course requirements (and add 2 tech electives):
  
  – Signals and Systems II
  
  – Thermodynamics
  
  – Linear Algebra
• Ask for the following changes, in coordination with the rest of the School (the Math dept. is receptive):

  – Incorporate complex numbers and basics of linear algebra and ODEs into Calculus II

  – Replace ODE course by “Linear Algebra and Differential Equations” course, and possibly have it taken before Calculus III.
• Make the following changes to Signals and Systems I (3202):
  
  – Remove its circuits prerequisite
  
  – Redesign it to include an introduction to discrete-time concepts
  
  – Move it to the fall.
• Add to the core a choice between:

  – Introduction to Communication Systems

  – Introduction to Network Engineering.
• Institute a *depth* requirement:

  – At least two technical electives in one area, in addition to those in the core;

  – At least one of those electives must have as a prerequisite another course in the same area, or a related course in the core.
• Institute a *breadth* requirement:

– At least two technical electives outside the depth area, in addition to those in the core;

– One or both of these electives can be from other departments.
A proposal also under consideration:

- Replace the Chemistry requirement by:

  “Chemistry/Biology. Choose one course from:
  - CHEM C1403 or higher
  - BIOL W2001 or higher”
Typical templates
Sample template: 
Early-starting students

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>Spring</td>
<td>Fall</td>
<td>Spring</td>
</tr>
<tr>
<td>Programming</td>
<td>Chemistry /Biology</td>
<td>Probability</td>
<td>Digital Systems</td>
<td>Sem. Dev. &amp; Lab**</td>
</tr>
<tr>
<td>Gateway Lab</td>
<td>Intro to EE</td>
<td>Circuits</td>
<td>Electrons</td>
<td>Data Structures</td>
</tr>
</tbody>
</table>

Note: Labs also exist in conjunction with Circuits, Signals and Systems, Digital Systems, and Electronics.

12/18/2002  
Y.T., New EE Curric. Presentation
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<td>Spring</td>
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</tr>
<tr>
<td>Calculus I</td>
<td>Calculus II</td>
<td>Calculus III</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>Physics I</td>
<td>Physics II</td>
<td>Signals &amp; Systems</td>
<td>Communications*</td>
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<td>Tech. Elective</td>
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Example: Illustrating flexibility for students oriented toward signals, systems or communications. Similar flexibility exists for other focus areas.
## Sample template: Late-starting & transfer students

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Work still to be done

• Get more comments from students, faculty, industry, etc.
• Coordinate with School’s “First Two Years” committee.
• Talk to the Math department.
• Create new courses/revise courses affected.
Work still to be done, cont’d

• Formulate depth requirements for each area.
• Post sample templates.
• Get approvals.
• Improve advising to prospective transfer students.
• Announce.
Proposed time table

- Finish discussions with “First Two Years” committee and the Math department: 2/28/03

- Finish course revision and submission to COI: 3/31/03

- Formulate depth requirements & post sample templates: 4/15/03

- Announce: 5/1/03