Learning Outcomes Data
for the
Senate Committee on
Instructional Program Priorities

Program: Certificate in Mixed-Signal Integrated Circuit Design

Department: Electrical & Electronic Engineering (EEE)

Faculty member completing template: Preetham B. Kumar

Date: 02/01/2012
1. Please describe your program’s learning-outcomes trajectory since 2006-07: Has there been a transformation of organizational culture regarding the establishment of learning outcomes and the capacity to assess progress toward their achievement? If so, during which academic year would you say the transformation became noticeable? What lies ahead; what is the next likely step in developing a learning-outcomes organizational culture within the program?

   Since the Digital and Microelectronic areas are two of the heavily populated areas of the EEE graduate program, as evinced from the comprehensive exam profile (given in the previous section), it was suggested to introduce a Certificate in Mixed-Signal Integrated Circuit Design.

   **Details of Certificate program**

   Units required: 16
   The certificate in mixed-signal integrated circuit (IC) design will recognize the commitment and accomplishments of graduate students studying in this area, and provide potential employers with evidence of the skills students have developed. Graduate students studying mixed-signal integrated circuit design will become knowledgeable and proficient in the different skills this demanding field requires. This requires studying multiple subjects such as amplifier design, device physics and matching, analog layout techniques, and key mixed-signal building blocks. In addition, students will learn the methods and tools used to design and layout ICs.

   *Courses in parentheses are prerequisites.
   A. Required Lower Division Courses (13 units)*
   (3) EEE 230 Analog and Mixed Signal Integrated Circuit Design (EEE 109 or instructor permission)
   (3) EEE 231 Advanced Analog and Mixed Signal Integrated Circuit Design (EEE 230 or instructor permission)
   (3) EEE 232 Key Mixed-Signal Integrated Circuit Building Blocks (EEE 230 or instructor permission)
   (1) EEE 235 Mixed-Signal IC Design Laboratory (EEE 230 or instructor permission))
   (3) EEE 236 Advanced Semiconductor Devices
   **B. Required Electives (3 units)**
   (3) select one from the following:
   EEE 110 Advanced Analog Integrated Circuits (EEE 109 or instructor permission)
   EEE 234 Digital Integrated Circuit Design (EEE 230 or instructor permission)
   EEE 238 Advanced VLSI Design-For-Test I (CPE 151 and CPE 166)
   EEE 239 Advanced VLSI Design-For-Test II (EEE 238)

   *No assessment review has been made so far on this Certificate in Mixed-Signal Integrated Circuit Design, which is offered as a special program within the Department of Electrical & Electronic Engineering.*

2. Please list in prioritized order (or indicate no prioritization regarding) up to four desired learning outcomes (“takeaways” concerning such elements of curriculum as perspectives, specific content knowledge, skill sets, confidence levels) for students completing the program. For each
stated outcome, please provide the reason that it was designated as desired by the faculty associated with the program.

Certificate goals

- Facilitate the study of multiple subjects such as amplifier design, device physics and matching, analog layout techniques, and key mixed-signal circuit blocks.
- Teach students the methods and tools used to design and layout ICs.
- To be fully embedded within the Master’s Degree program offered by the Department of Electrical & Electronic Engineering
- Provide potential employers with evidence of the skills students have developed

3. For undergraduate programs only, in what ways are the set of desired learning outcomes described above aligned with the University’s Baccalaureate Learning Goals? Please be as specific as possible.

This is not applicable for the EEE graduate program.

4. For each desired outcome indicated in item 2 above, please:
   a) Describe the method(s) by which its ongoing pursuit is monitored and measured.

   There has been no assessment cycle as yet for this Certificate program, but it will be assessed in 2012 year.

   The proposed mechanisms of assessment are:
   
   ➢ **Direct measurements**, which involves course-based assessment
   ➢ **Indirect measurements**, such as student and industry surveys

   b) Include a description of the sample of students (e.g., random sample of transfer students declaring the major; graduating seniors) from whom data were/will be collected and the frequency and schedule with which the data in question were/will be collected.

   **Proposed Student Sample**

   The data will be collected from EEE graduate students, with primary specialization in the Microelectronic Design, which is one of the core areas of the EEE graduate program.

   c) Describe and append a sample (or samples) of the “instrument” (e.g., survey or test), “artifact” (e.g., writing sample and evaluative protocol, performance review sheet), or other device used to assess the status of the learning outcomes desired by the program.

   **Proposed assessment mechanisms**

   ➢ **Course based assessment**
The course based assessment will select typical courses from the core and elective list required for the Certificate completion.

- **Sample survey of students completing the certificate program**

  This survey will obtain feedback from students completing the certificate program, on their impressions on the program, and scope for improvement.

d) Explain how the program faculty analyzed and evaluated (will analyze and evaluate) the data to reach conclusions about each desired student learning outcome.

The proposed mechanisms of assessment of the certificate program are:

- **Course based assessment**
- **Sample survey of students completing the certificate program**

5. Regarding each outcome and method discussed in items 2 and 4 above, please provide examples of how findings from the learning outcomes process have been utilized to address decisions to revise or maintain elements of the curriculum (including decisions to alter the program’s desired outcomes). If such decision-making has not yet occurred, please describe the plan by which it will occur.

  **This is a future proposed action in 2012, based on the results of the course based assessment, and sample survey of students completing the certificate program.**

6. Has the program systematically sought data from alumni to measure the longer-term effects of accomplishment of the program’s learning outcomes? If so, please describe the approach to this information-gathering and the ways in which the information will be applied to the program’s curriculum. If such activity has not yet occurred, please describe the plan by which it will occur.

  **This is a future proposed action in 2012, based field visits to companies in the Microelectronic Design area, such as Intel and AMD (Advanced Micro Devices).**

7. Does the program pursue learning outcomes identified by an accrediting or other professional discipline-related organization as important? Does the set of outcomes pursued by your program exceed those identified as important by your accrediting or other professional discipline-related organization?

  **This is not applicable for the graduate program, since the professional ABET accreditation is applicable for the undergraduate program only.**
8. Finally, what additional information would you like to share with the Senate Committee on Instructional Program Priorities regarding the program’s desired learning outcomes and assessment of their accomplishment?

The first assessment cycle was completed in January 2011, and the EEE graduate program was fully approved until the next review cycle. We are working on the suggestions of the reviewer in an effort to improve the assessment and review process.