The New CompE Curriculum Explained

Since Fall 2012, it has been clear that the CompE Curriculum is being revised. The proposed program has been approved by the University Senate and will be effective starting Fall 2014 for the incoming freshman class. The new CompE curriculum can essentially be broken into two parts: new introductory CompE courses, and revised requirements for technical electives.

The New Computer Engineering Sequence

Previously, all ECE students were required to take ECE 190 (Intro to Computing Systems), ECE 290 (Computer Engineering I), and ECE 385 (Digital Systems Laboratory). The new sequence - ECE 120 (formerly known as ECE 198 JL), ECE 220 (formerly known as ECE 198 KL), and ECE 385 (formerly known as ECE 298) - replaces the current sequence. Students must still take ECE 110 (Introduction to Electrical and Computer Engineering). ECE 190 has been discontinued and ECE 290 will be taught for the last time in the Spring 2014 semester.

Many students wonder what the difference is between the old and new curriculum. Computer Engineering was first introduced in ECE 110 with a bit of digital logic. ECE 190 assumed some familiarity with digital logic, so it was able to breeze through some high-level explanations of the LC-3 architecture in the first few weeks before they got down to the main topic of the course - programming (in both LC-3 and in C); the course took a fundamentally bottom-up approach to programming - students learned how computers worked at a low level and how to do low-level programming in LC-3, and later in the semester the class taught high-level programming via C (which by today’s standards, isn't that high-level). ECE 290 circles back to digital logic, going through all the techniques to design combinational circuits and sequential circuits, and, in the last portion of the course, goes over the microarchitecture of the LC-3 in detail - by the end of 290, students know everything they need to design a computer from logic gates. ECE 385 is a lab course where students finally implement digital logic circuits that they learned how to design in ECE 290; the class spends about half the semester with breadboards and the other half in VHDL with circuits being run on FPGAs.

The new curriculum changes up a handful of things from the old one. ECE 120 corresponds more closely to ECE 290 than to ECE 190. The class spends most of its time on digital logic, but towards the end gets into the beginning of ECE 190's material, explaining how the LC-3 works and getting the students started on LC-3 assembly. One of the advantages of this is that ECE 120 assumes that students have no background in digital logic; thus this class can be taken before or concurrently with ECE 110, unlike ECE 190. ECE 220 focuses on teaching students how to program, picking up where ECE 120 leaves off and teaches basic C programming and simple data structures. ECE 220 ends by extending students’ knowledge of C to basic C++ concepts and object oriented programming. This is a new addition to the ECE 190 material that matches with an upcoming change in CS 225 (Data Structures), which will assume students have C++ experience. ECE 220 is designed so that students can proceed directly to ECE 391 (Computer Systems Engineering), but many will benefit from additional programming experience. Both of these courses were developed by Professor Lumetta, who is also the course director for ECE 391.

Content-wise ECE 298 replaces ECE 385 but the course will still be known as ECE 385. The course includes more complex breadboard labs than ECE 120, but there are fewer than the former iteration of ECE 385. The new ECE 385 focuses on SystemVerilog and development for FPGAs, while also being worth 3 credit hours (as opposed to 2 hours) to reflect the required work in the class.

It is clear from the new curriculum that the ECE department has renewed its commitment to a bottom-up introduction to programming. It appears that the main goals of the new curriculum are to break the dependence of the CompE courses on ECE 110 and to give an easier introduction to programming than ECE 190 currently does. We expect to see some changes in the ECE 110 coverage of digital logic to reduce the overlapping material with ECE 120, which would also be accompanied by a reduction from 4 credit hours to 3 for ECE 110. Part of the vision here is that freshmen would have flexibility between taking ECE 198 JL and ECE 110 sometime in their first year, and by the end of sophomore year easily be done with ECE 220 and ECE 385 and/or ECE 391, and thus have better prospects for hardware-related internships.

One of the main goals of the new CompE curriculum is to allow students to have more flexibility in what classes they choose. In the past, computer architecture was the main area of interest CompE students followed, but this has changed and become more varied among students. These changes aim to match up the CompE curriculum to the EE curriculum with fewer required classes (or choosing from a required list) and more freedom in following fields of interest. Computer architecture is still an option for students, but it isn't the end goal of the curriculum. The hope is that this will create a more versatile and open CompE degree while still keeping the rigor of the current curriculum.

The former introductory sequence of ECE 190 and ECE 290 is no longer available for registration. Any students who have taken ECE 190 but have not yet taken ECE 290 should talk to an advisor in order to find the best course of action.

Curriculum Changes

In Fall 2013, one section of ECE 313 (Probability and Engineering Applications) focused on problems in Computer Engineering. It was taught with different homework and exam problems, but students learned the same concepts. We expect this special section or something similar to be offered in future semesters. Students may choose any section to meet the graduation requirement, but CompE majors may find the problems more interesting and applicable in the CompE section.

As mentioned above, the revised CompE curriculum will take effect for incoming freshmen in Fall 2014. However, the department is planning to allow a petition process for CompE students with fewer than 96 credit hours to switch to this new curriculum.

The approved curriculum changes are:

- ECE 198JL will become ECE 120; ECE 198KL will become ECE 220; ECE 385 will be updated with the content from the ECE 298 curriculum.
- 28 credit hours of technical electives, including the EE foundation requirement, the design elective, and the advanced computing core.
- Computer Engineering will have a “1 of 6” EE foundation requirement. The current list of classes:
  - ECE 310 - Digital Signal Processing
  - ECE 329 - Fields and Waves


All Computer Engineers will be required to take CS 374, the replacement course for CS 373 and CS 473 that is being developed by the Computer Science department. CS 374 is a rigorous algorithms course that combines topics from CS 373 and CS 473.

Computer Engineers will choose among the design elective classes: ECE 411 - Computer Organization and Design, ECE 445 - Senior Design, ECE 496, and ECE 499. The ECE 445 hardware requirement will most likely be relaxed for Computer Engineers, in hopes that "hybrid" projects incorporating both hardware and software portions (done by EE and CompE student, respectively) would be pursued. This would also mean that the course professors for ECE 445 would be expanded to 3 or 4 professors, with the new additions being in CompE-focused areas.

Computer Engineers will be required to take 3 courses from the Advanced Computing Core, which includes:

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<tr>
<th>ECE 408</th>
<th>ECE 411</th>
<th>ECE 412</th>
<th>ECE 422 (CS 461)</th>
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<tr>
<td>ECE 428 (CS 425)</td>
<td>ECE 438 (CS 438)</td>
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<td>ECE 448 (CS 440)</td>
<td>ECE 462</td>
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<td>ECE 470 (AE 482, ME 445)</td>
<td>ECE 478</td>
<td>ECE 484</td>
<td>ECE 491 (CS 450, MATH 450, CSE 401)</td>
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CS 357 (MATH 357) CS 411 CS 412 CS 413 CS 414
CS 418 (CSE 427) CS 421 CS 424 CS 426 CS 431
CS 446 CS CS 475 476

The department will not impose the new curriculum requirements on existing students, but many students have expressed interest. Students will be able to petition to change to the new curriculum, but those who have 96+ credit hours at the time the curriculum becomes official may not choose the new curriculum. As a result, current students should still plan to take ECE 329, ECE 340, and ECE 411.