Optional Graduate Degree Emphasis in Computational Science and Engineering

The Departments of Chemical Engineering; Computer Science; Earth Science; Ecology, Evolution and Marine Biology; Electrical and Computer Engineering; Mathematics; and Mechanical Engineering offer an interdisciplinary Master's and Ph.D. degree emphasis in computational science and engineering (CSE). CSE is a rapidly growing multidisciplinary area with connections to the sciences, engineering, mathematics, and computer science. Computer models and simulations have become an important part of the research repertoire, supplementing (and in some cases replacing) experimentation. Going from application area to computational results requires domain expertise, mathematical modeling, numerical analysis, algorithm development, software implementation, program execution, analysis, validation, and visualization of results. CSE addresses these issues.

Although CSE includes elements from computer science, applied mathematics, engineering and science, it focuses on the integration of knowledge and methodologies from all of these disciplines and, as such, is a subject distinct from any of them. All students pursuing an emphasis in CSE must complete the following core course sequence:

- Numerical Methods: (students must take at least three) ECE 210A-B-C-D (cross-listed as ME 210A-B-C-D, Math 206A-B-C-D, CS 211A-B-C-D).
- Parallel Computing: Computer Science 240A-B (students must take at least one).
- Applied Mathematics: Students whose home department is not Mathematics must take either the Math 214A-B or Math 215A-B sequence (run concurrently with Math 119A-B and Math 124A-B respectively), or the ChemEng 230A-B sequence (cross-listed as ME 244A-B). Credit will not be given for more than one of these sequences. Advanced courses may be substituted, with approval, as follows: Math 243 instead of Math 214, and Math 246 instead of Math 215. Students whose home department is Mathematics must take a two course sequence from either Mathematics 243 A-B or Mathematics 246 A-B.

Requirements for the M.S. in one of the above departments (thesis option only) with the CSE emphasis are as follows:

- Complete the requirements for an M.S. in the chosen department.
- Complete the CSE core course sequence.
- Write and defend a master’s thesis in CSE.

The thesis must be written under the supervision of a CSE ladder faculty member from the chosen department. The thesis committee must include a minimum of three permanent ladder faculty members, at least two from the chosen department and one from CSE (may be CSE faculty member from another department).

Students pursuing a Ph.D. with an emphasis in CSE must:

- Complete the requirements for a Ph.D. in the chosen department.
- Complete the CSE core course sequence.
- Write and defend a dissertation in CSE.

The student’s dissertation must be written under the supervision of a CSE ladder faculty member from the chosen department. The doctoral examination committee must include at least one CSE ladder faculty member and at least one ladder faculty member from another department.