A New Course on Introduction to Chemical Process Modeling

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This course provides an overview of the chemical engineering curriculum and develops facility with using modern computational software for numerical problem solving. Faculty instructors for the junior-senior courses in the curriculum have identified the key modeling concepts that they would like students entering their courses to be exposed to early in their education in our department. We selected 10-12 key topics from this list and structure the course around one key concept per week. The lectures introduce these concepts and the students immediately begin to apply them in smaller discussion sections. We introduce computational tools motivated by these key concepts. By the end of this course, the students have a set of tools that have been selected by the faculty in the latter courses as most useful to them as instructors.

Computing technology is an essential component of this course. The college has invested in classrooms with laptop projection capability and wireless internet connections. Many engineering undergraduates bring their own laptops to campus. The department loans the additional laptops so every student can bring a laptop to class. The course requires intensive problem solving in small groups to educate the students in how to use advanced computational tools for engineering decision making in complex situations. We have used undergraduates who have mastered the course in previous semesters as the leaders for the smaller discussion sections. The professor in charge of the course also covers one discussion section on a rotating basis.

Given the following features: (i) the course provides an integrative introduction to the CBE curriculum, (ii) the course instructors select the concepts and computational tools presented, and (iii) the senior students lead discussion sections with the junior students, we hope to foster a learning community in the department in which using technology to solve complex engineering problems becomes an integral part of our students' educational experience. The course URL (http://cbe255.che.wisc.edu/) gives details on the modules developed, which are listed below:

1. Programming and programming languages
2. Stoichiometry of chemical reactions
3. Diffusion and heat transfer
4. Process systems steady-state modeling and design
5. Chemical kinetics in well-mixed reactors
6. Staged separations
7. Estimating parameters from data