programs. Many of the MS students intend to continue for the PhD. There is a core curriculum of four courses: advanced thermodynamics, advanced kinetics, and two transport phenomena courses. Beyond these requirements, the students are free to design their course of study. Under the semester system, 30 semester credits (10 of which can be research) are required beyond the baccalaureate for the MS degree, and a total of 90 semester credits (60 of which can be research) are required beyond the baccalaureate for the PhD. Doctoral students must pass a Preliminary Examination generally within the first two years of study. An oral examination on the proposal for their PhD research (Qualifying Exam) is also required.

A wide variety of research areas exist within the department, as mentioned in the section on faculty, but the majority of the graduate students and funding is in five areas: polymers, catalysts and solid state surface science, environmental engineering and surface chemistry, fluidization engineering, and bioengineering. In particular, the polymers (Polymer Materials and Interfaces Laboratory, PMIL) and the catalyst programs have international reputations and, as a result, are very much in demand by prospective graduate students.

THE FUTURE

As mentioned previously, the department is in the process of adding more faculty. We intend to continue strengthening the research effort in the department while maintaining the traditionally strong teaching commitment. Ground will be broken soon for an addition to Randolph Hall. It will include modern facilities for the undergraduate Measurements and Control Laboratory and Unit Operations Laboratory. Initial planning is beginning for a new engineering building which would house the department and its research laboratories. Present space in Randolph Hall would then be turned over to Aerospace and Ocean Engineering and to Mechanical Engineering for a much needed expansion of their facilities.

As the change to the semester system occurs, there will be opportunities for the curriculum to evolve to meet the needs of the changing profession. Changes to the new approved semester curriculum are under consideration which, if implemented, will give the student even greater freedom of choice.

The department looks forward to new facilities, an even stronger faculty interested in research and teaching, a more flexible curriculum, and increased emphasis on the quality of the graduate program. The department is in a position of strength, facing a future that is bright for the faculty, the students, and the profession. □

ChE book reviews

ELEMENTS OF CHEMICAL REACTION ENGINEERING

by H. S. Fogler

Prentice-Hall, Inc., Englewood Cliffs, NJ 07632 (1987) $49.95

Reviewed by
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This is an excellent text for an undergraduate reactor design course. Mole balances and reactor staging are introduced first. Then rate laws, stoichiometry, and isothermal reactor design are discussed. The order of presentation, though somewhat different from other texts, is good. The next chapter, on analysis of rate data, also discusses laboratory reactors. Catalysis and homogeneous kinetics are then presented before nonisothermal reactor design and multiple reactions. The text concludes with two chapters on external diffusion and diffusion in porous catalysts, one on multiphase reactors, and two on residence time distribution and nonideal reactors. The Appendices present common integrals used in reactor design, numerical techniques for integration and differentiation, and a series of guided design problems. Both SI and English units are used in the text. A complete Solutions Manual is available.

The text is well written, the order of presentation and the approach are very good, the notation is clear, the figures and print type are excellent, and the number of errors is small. A number of desirable features separate it from other reactor design texts. The text emphasizes problem solving and reasoning rather than memorization. Thus, at the end of most of the chapters, a few pages are devoted to techniques used in problem solving. This is valuable, though it could be improved upon by showing the application of these techniques to reactor design problems. Important equations are boxed in, and the margins are used to emphasize and summarize important points. Volume changes due to gas-phase mole changes or phase changes are covered more completely than in most texts. A summary of important points is presented at the end of each chapter. Numerical techniques for solving differential equations are presented.

A strong point of the text is the inclusion of numerous example problems and homework problems for real reactions in each chapter. A variety of challenging problems are given, such as those taken from the

Continued on page 41.

is a strong indication that the final equilibrium tangent is **a** rather than **b** or **c** of Figure 4. These comments are only guidelines for Figures 3 and 4—see [6], Figure 5, for a different case involving double pairs of IP. The only rule is that no true equilibrium tangent may cut the Gibbs' curve at any composition.

We are presently working on procedures to extend this algorithum to ternary and higher component systems.

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REVIEW: Reactor Engineering

Continued from page 7.

California Professional Engineers exam. Some involve new technologies (semiconductor processing, biotechnology) and some require numerical solutions. In several chapters excellent problems on critiques of journal articles are given.

A series of accompanying interactive programs for personal computers is available on floppy disks, though they must be purchased separately from the University of Michigan. These are interesting problems that can be used as homework assignments since they provide the student a coded grade. Students find the programs to be both fun and helpful for learning reactor design.

A few aspects of the book could be improved. As done in essentially all reactor design texts, fractional conversion is used as a dependent variable and solutions start with an integrated form of the design equation. A more general approach, which is more easily extended to multiple reactions and complicated reactors, would be to use flow rates and number of moles as dependent variables and start with the differential form of the design equation. The energy balances in Chapter 8 are complicated by using variable heat capacities and symbols for several types of heat capacities. In Chapter 6, the rate of reaction is incorrectly shown as being proportional to the square of the total site concentration on the catalyst surface. Also, as done in many texts, more significant figures are given in the solutions to the example problems than are justified by the data presented.

In summary, this is an excellent undergraduate text for reactor design and it will likely be adopted by a large number of departments. It could also be used as a graduate text if supplemented. □