Process Dynamics, Modeling, and Control

By B. A. Ogunnaike and W. H. Ray, Oxford University Press, New York, 1994, 1,260 pp., $87.00.

In recent years, a number of undergraduate process dynamics and control textbooks have been published. The trend for these textbooks has been curiously growing in size, almost exponentially, over time. As such, many critics have been quick to pounce on this as a negative trend for the state of control education. The book considered in this review falls into that category, having appeared in 1994 with 1,260 pages. This reviewer, however, finds the text under consideration to have many meritorious traits, not the least of which is the physical magnitude of the textbook.

There are a variety of undergraduate chemical engineering curriculums for process dynamics and control education ranging from the required two-quarters of instruction (such as, RPI), to merely an elective single semester course (such as, Princeton). The most common formulation, however, is a one-semester required offering with the possibility of subsequent enrollment in an (advanced) elective course. Even more varied are the treatments of topics in a typical one-semester required course. Some instructors favor the traditional approach of heavy emphasis on Laplace transforms and the frequency domain, while others prefer the discrete (digital) approach. Some place emphasis on PID synthesis techniques, while others address more advanced model-based approaches.

All of these options are served rather well by the comprehensive treatment of topics in *Process Dynamics, Modeling, and Control.* Various subsections of the textbook address: dynamics; modeling and identification; single-loop design; multivariable control; digital control; and specialized topics. Each of these subjects is treated in-depth with very clear exposition. For example, the MPC chapter (27) is one of the most readable introductory surveys of this important technology. Similarly, the treatment of PID control design is very thorough, including a "catalog" of synthesis formulae, which is not to be found in any of the other available texts. Each of these examples points to the valuable role of such a comprehensive textbook not only during the course, but as a reference *after* the course. More advanced mathematical topics, which are generally considered as a prerequisite for such a course, are conveniently encapsulated in the Appendixes (such as Laplace transforms, complex variables, matrix algebra). The only topical treatment missing in the text is a detailed handling of the interactions between process design and control, such as is handled in the recent texts by Luben and Luyben, or Marlin.

The exercises in the text have a strong applied flavor, no doubt owing to the fact that the first author is based in industry and the second has considerable experience with industrial consulting and research. Although the book falls short in delivering a companion software package (compared to Marlin's text, for example), it does offer a nice selection of exercises that require a computer control simulation package to solve (such as MATLAB/Simulink, SpeedUp, HYSIM, and so on). Furthermore, the exercises consist of practical and realistic engineering problems as opposed to simple mathematical problems.

Francis J. Doyle, III
Chemical Engineering Dept.
University of Delaware
Newark, DE 19716