

## ChE book reviews

### AN INTRODUCTION TO CHEMICAL ENGINEERING KINETICS IN A REACTOR DESIGN

By Charles G. Hill, Jr.

John Wiley and Sons, 1977

Reviewed by Kenneth J. Himmelstein  
University of Kansas

This text is intended to be an introductory text to Chemical Reactor Kinetics and Reactor Design. It covers in detail the thermodynamic and kinetic considerations that enter into the reactor design process.

The major subjects which need to be included in such a text are done well, including the use of concepts in reactor and chemical kinetics, basic development of reactor design, as well as covering such topics as non-ideal flow, thermodynamic considerations, and optimization techniques.

The book combines some of the best features of its most recent predecessors in reaction engineering textbooks. The development of the key concepts of the book are considered in greater detail and based on a more "first principles" approach than previous texts. Yet, it avoids the very abstract  $A \rightarrow B$  approach by combining the detailed derivations and presentations with concrete examples which are based on data from real situations. This combined approach allows the author to present more deeply those concepts which the student should take from any introductory course to be applied in future years, while at the same time allowing the student to feel that he is studying real chemical engineering as opposed to some abstract classroom exercise. The attention to detail in this book is outstanding and gives the student a significant feel for problems associated with design of chemical reactors. This text is richly illustrated and documented, well referenced, and provides appropriate thermochemical data.

The major problem with the book is its organization. The first seven chapters (forty percent of the book) are devoted to chemical kinetics, while the last eight chapters are largely devoted to design of chemical reactors. Thus, there is marked division between analysis and synthesis. The student is not introduced to the concept of a reactor except very briefly until the book has used approximately 250 pages. This is undesirable in that the art of synthesis is best appreciated when the science the student learns is immediately applied practically. For instance, some of the basic

concepts of heterogenous catalysis covered in the section on chemical kinetics are not used until much later. The student loses the chance to employ the details presented by the authors and must go back and review or relearn the material. There is an additional problem of organization in that the determination of reaction rate expressions is covered in the third chapter while the basic concepts of chemical kinetics (the molecular interpretations of kinetic phenomena) is not covered until the fourth. Thus, the student is left to guess at rate expression forms without any knowledge of why those forms are appropriate.

Finally, as a concluding chapter to the book, the author includes two illustrated problems of extended length and detail in reactor design. These extended problems are extremely valuable and offer significant improvement over the previous texts, in that it certainly considers the widely varying considerations that one must include in a complete reactor design.

In conclusion this book is a well detailed, somewhat deeply developed, treatment of chemical kinetics and reactor design to be used as an introductory text. It does its job well except for organizational problems. It is excellent an basis for a one or two semester course in chemical reactor engineering. □

### INTRODUCTION TO OPTIMIZATION THEORY

By B. S. Gottfried and J. Weisman

Prentice-Hall, 1973

Reviewed by Thomas F. Edgar  
University of Texas at Austin

This book is written as a formal exposition of optimization theory. As such, it does not appear to be suitable for the first exposure to the subject of optimization, either for an undergraduate student or a practicing engineer. Although this text probably could be used in a graduate course in optimization, the subject matter is more heavily slanted towards the operations researcher than towards the chemical engineer.

*Introduction to Optimization Theory* does not present a point of view which differs significantly from that available in existing texts. There are very few new insights or approaches used in the authors' development of optimization theory or algorithms. Therefore the selection of this textbook over others will rest upon how well it matches the specific topics to be covered and the depth of coverage of a given course.

The chapters cover necessary and sufficient