Environmental Engineering and Management Journal *June 2014, Vol.13, No. 6, 1549-1550*
http://omicron.ch.tuiasi.ro/EEMJ/

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Book Review

CONTROL OF BIOLOGICAL AND DRUG-DELIVERY SYSTEMS FOR CHEMICAL, BIOMEDICAL AND PHARMACEUTICAL ENGINEERING

Laurent Simon

John Wiley & Sons, Inc., Hoboken, New Jersey
ISBN: 978-0-470-90323-0, 2013, XVI+366 pages

The book, *Control of Biological and Drug-Delivery Systems for Chemical, Biomedical, and Pharmaceutical Engineering*, deals with multidisciplinary knowledge of process dynamics and basic control theory for analysing various processes met in chemical, biomedical and pharmaceutical engineering. The control of biological and drug-delivery systems is highly important to develop bio-based products meant for a long and healthy life to billions of people worldwide.

This book is the first of its kind to present specific concepts taught at the undergraduate level, especially for chemical and biomedical engineering students. Nevertheless, its focus on drug-delivery systems and various topics in the biological sciences is expected to be of interest for specialists in pharmaceutical engineering and systems biology. For instance, readers will learn how stability criteria can be applied to achieve new insights into the regulation of biological pathways and lung mechanics. Also, they can learn how the concept of a time constant can be employed to obtain the dynamics of diffusive processes.

The author, Laurent Simon, PhD, is Associated Professor of Chemical Engineering and Associate Director of the Pharmaceutical Engineering Program at New Jersey Institute of Technology. His research and teaching interests focus on modelling, analysis, and control of drug delivery systems. Dr. Laurent Simon has received the Excellence in Teaching Award, Master Teacher Designation, and Newark College of Engineering Saul K. Fenster Innovation in Engineering Education Award.

In very clear language, Dr. Laurent Simon outlines the role of process dynamics and control in a number of disciplines and introduces mathematical modeling based on the physical knowledge of a given system. The book is structured on 16 different chapters. The author does a great job describing the techniques developed to linearize process models, and introducing the concept of deviation variables. Laplace transforms of several functions and ordinary and partial differential equations are computed and techniques of inverting Laplace transforms are provided. Also, partial fraction expansion and the residue theorem are applied to solve differential equations.

A fundamental approach for controller analysis and design, the derivation of transfer functions from input-output models is also discussed. Strategies to derive reduced-order models are presented and control methodologies are developed. Frequency response analyses are studied and various ways to draw Bode and Nyquist are described. The fundamentals of cascade and feed-forward control designs are covered. A technique for determining the relaxation time for lumped- and distributed-parameter systems is explained.

Finally, the book describes how to estimate the time needed to reach a steady-state value based on

Laplace transforms. Each chapter has an up-to-date well documented list of references.

Written by a leading expert and educator in the field, the book is rich in illustrations so that the information provided is easily comprehensible. He gives many examples of possible applications so that the reader can grasp the actual use of the theory. Thus, readers get detailed examples from the biological sciences and novel drug technologies, 160 solved problems, and demonstrations of how Matlab and Mathematica can be used to solve complex drug delivery problems.

In conclusion I highly recommend this book to specialists in chemical and biomedical engineering, working in industry or universities, to under or postgraduate students, to PhD students and to all those interested in topics concerning pharmaceutical engineering, process control, and systems biology.

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