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**Elements Of**

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**Engineering**

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**3rd Edition**

**The Leading**

**Integrated**

**Chemical Process**

**Design Guide:**

**With Extensive**

*Page 1/229*

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**Coverage of  
Equipment Design  
and Other Key  
Topics More than  
ever, effective  
design is the  
focal point of  
sound chemical  
engineering.**

**Analysis,  
Synthesis, and  
Design of  
Chemical  
Processes, Fifth**

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**Edition,**  
presents design

**as a creative**

**process that**

**integrates the**

**big-picture and**

**small details,**

**and knows which**

**to stress when**

**and why.**

**Realistic from**

**start to finish,**

**it moves readers**

**beyond classroom**

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**exercises into  
open-ended, real-  
world problem  
solving. The  
authors  
introduce up-to-  
date, integrated  
techniques  
ranging from  
finance to  
operations, and  
new plant design  
to existing  
process**

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**optimization.**

The fifth

edition includes

updated safety

and ethics

resources and

economic factors

indices, as well

as an extensive,

new section

focused on

process

equipment design

and performance,

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covering  
equipment design  
for common unit  
operations, such  
as fluid flow,  
heat transfer,  
separations,  
reactors, and  
more. Conceptual  
ization and  
analysis:  
process  
diagrams,  
configurations,

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Education

**batch  
processing,  
product design,  
and analyzing  
existing  
processes  
Economic  
analysis:  
estimating fixed  
capital  
investment and  
manufacturing  
costs, measuring  
process**

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profitability,  
and more

Synthesis and  
optimization:

process

simulation,

thermodynamic

models,

separation

operations, heat

integration,

steady-state and

dynamic process

simulators, and



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process

Reaction  
regulation

Chemical Engineering 3rd

edition  
Equipment design

and performance:

a full section

of expanded and

revamped

coverage of

designing

process

equipment and

evaluating the

performance of

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equipment

Advanced steady-

state

simulation:

goals, models,

solution

strategies, and

sensitivity and

optimization

results Dynamic

simulation:

goals,

development,

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solution

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methods,

algorithms, and

solvers Societal

impacts: ethics,

professionalism,

health, safety,

environmental

issues, and

green

engineering

Interpersonal

and

communication

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**skills: working  
in teams,  
communicating  
effectively, and  
writing better  
reports This  
text draws on a  
combined 55  
years of  
innovative  
instruction at  
West Virginia  
University (WVU)  
and the**

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suggested

curricula for

one- and two-

semester design

courses, case

studies,

projects,

equipment cost

data, and

extensive

preliminary

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**design**

**information for  
jump-starting  
more detailed  
analyses.**

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Topics—from the  
Fundamentals to  
the State of the  
Art Now in its  
85th Anniversary**

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Equipp

**Edition, this in**

**dustry-standard**

**resource has**

**equipped**

**generations of**

**engineers and**

**chemists with**

**vital**

**information,**

**data, and**

**insights.**

**Thoroughly**

**revised to**

**reflect the**

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latest

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Engineering Brd

Processes,

Perry's Chemical

Engineers'

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provides

unsurpassed

coverage of

every aspect of

chemical

engineering. You



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will get  
comprehensive  
details on  
chemical  
processes,  
reactor  
modeling,  
biological  
processes,  
biochemical and  
membrane  
separation,  
process and  
chemical plant

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Physical and

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Transfer • Fluid

and Particle

Dynamics

\*Reaction

Kinetics •

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Economics •  
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Transfer  
Operations and  
Equipment •  
Psychrometry,  
Evaporative  
Cooling, and

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**Solids Drying •**

**Distillation •**

**Gas Absorption**

**and Gas-Liquid**

**System Design •**

**Liquid-Liquid**

**Extraction**

**Operations and**

**Equipment •**

**Adsorption and**

**Ion Exchange •**

**Gas-Solid**

**Operations and**

**Equipment •**

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**Liquid-Solid**

**Operations and**

**Equipment •**

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**Operations and**

**Equipment**

**• Chemical**

**Reactors • Bio-**

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**including Air**

**, Wastewater and**

**Solid Waste**

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Utilization\*  
Materials of  
Construction  
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Reaction Enginee  
ring Pearson

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**Educación**

**This is the**

**first book**

**entirely on the**

**topic of**

**Migration of**

**Fine Particles**

**in Porous Media.**

**There are two**

**purposes for the**

**use of this**

**book. First, the**

**book is intended**

**to serve as a**



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Engineering And

Education

**comprehensive  
monograph for  
scientists and  
engineers  
concerned with  
problems of  
erosion,  
pollution and  
plugging due to  
migration of  
fines in porous  
media. Second,  
the book is  
recommended to**

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**be used as a  
reference book  
for courses  
offered at  
senior or  
graduate level  
on the topics of  
flow through  
porous media,  
soil erosion and  
pollution, or  
formation  
damage. The  
migration of**

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**fine particles  
in porous media  
is an  
engineering  
concern in oil  
production, soil  
erosion, ground  
water pollution  
and in the  
operation of  
filter beds. As  
a result, the  
topic has been  
studied by**

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researchers  
working in a  
number of  
disciplines.

These studies in  
different  
disciplines are  
conducted, by  
and large,  
independently  
and hence there  
is some  
repetition and  
perhaps more

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**importantly  
there is a lack  
of uniformity  
and coherence.  
These studies,  
nevertheless,  
complement each  
other. To  
illustrate the  
point, consider  
for example the  
migration of  
fine particles  
induced by**

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Reaction  
forces.  
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in chemical  
reaction  
engineering and  
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easier than ever!  
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through this text,  
they'll find a**

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**comprehensive,  
introductory**

**treatment of 3rd**

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**reactors for single-**

**phase and**

**multiphase**

**systems that**

**exposes them to a**

**broad range of**

**reactors and key**

**design features.**

**They'll gain**

**valuable insight on**

**reaction kinetics in**



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edition

**relation to  
chemical reactor  
design. They will  
also utilize a  
special software  
package that helps  
them quickly solve  
systems of  
algebraic and  
differential  
equations, and  
perform parameter  
estimation, which  
gives them more**

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**time for analysis.**

**Key Features**

**Thorough coverage**

**is provided on the**

**relevant principles**

**of kinetics in order**

**to develop better**

**designs of**

**chemical reactors.**

**E-Z Solve software,**

**on CD-ROM, is**

**included with the**

**text. By utilizing**

**this software,**

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**students can have more time to focus on the development of design models and on the interpretation of calculated results. The software also facilitates exploration and discussion of realistic, industrial design problems.**

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**files,**

**demonstrations,  
and a description  
of the E-Z Solve  
software.**

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Engineers in  
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and Biomedical  
Industries Special**

**Features: ·**

**Emphasis is placed  
throughout on the**

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**development of  
common design  
strategy for all  
systems,  
homogeneous and  
heterogeneous.**

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features new  
topics on  
biochemical  
systems, reactors  
with fluidized  
solids, gas/liquid  
reactors, and more**

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**on non ideal flow.  
The book explains  
why certain  
assumptions are  
made, why an  
alternative  
approach is not  
used, and to  
indicate the  
limitations of the  
treatment when  
applied to real  
situations About  
The Book:**

**Chemical reaction engineering is concerned with the exploitation of chemical reactions on a commercial scale. Its goal is the successful design and operation of chemical reactors. This text emphasizes qualitative**



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**arguments, simple design methods, graphical procedures, and frequent comparison of capabilities of the major reactor types. Simple ideas are treated first, and are then extended to the more complex. The Definitive,**

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**Separation Process**

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**with a Thorough**

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**accessible guide**

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mass transfer.**

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concept through  
detailed, realistic  
examples using  
real data-including  
up-to-date  
simulation practice  
and new  
spreadsheet-based**

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**each of today's  
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**column, and batch**

**distillation; exact**

**calculations and**

**shortcut methods**

**for**

**multicomponent**

**distillation; staged**

**and packed column**

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stripping; and

more. In this 3rd

edition, he also

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design methods for  
liquid-liquid

extraction. This

edition contains

the most detailed  
coverage available

of membrane

separations and of

sorption

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**separations  
(adsorption,  
chromatography,  
and ion exchange).**

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techniques and  
references  
throughout,  
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contains more than  
300 new homework  
problems, each**

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simulation

examples and

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problems, based

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easily adaptable to

any simulator

Extensive new

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transfer and  
diffusion, including**

**both Fickian and**

**Maxwell-Stefan**

**approaches**

**Detailed**

**discussions of**

**liquid-liquid**

**extraction,**

**including McCabe-**

**Thiele, triangle**

**and computer**

**simulation**



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**d to prepare students for advanced work in**

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**of membrane**

**separations,**

**including gas**

**permeation,**

**reverse osmosis,**

**ultrafiltration,**

**pervaporation, and**

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**conservation in**

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problems in

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diffusion, mass

transfer, and

membrane

separation

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and concisely

covers the

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models of reaction  
engineering and  
then applies them  
to real-world  
reactor design. The  
book emphasizes  
that the  
foundation of  
reaction  
engineering  
requires the use of  
kinetics and  
transport**

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**knowledge to  
explain and  
analyze reactor  
behaviors. The  
authors use readily  
understandable  
language to cover  
the subject,  
leaving readers  
with a  
comprehensive  
guide on how to  
understand,  
analyze, and make**

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**decisions related to improving chemical reactions and chemical reactor design. Worked examples, and over 20 exercises at the end of each chapter, provide opportunities for readers to practice solving problems related to the**

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the book.**

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integrates

**chemical kinetics,  
reaction**

**engineering, and**

**reactor analysis to**

**provide the**

**foundation for**

**optimizing**

**reactions and**

**reactor design**

**Compares and**

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types of ideal  
reactors, then  
applies reaction  
engineering  
principles to real  
reactor design  
Covers advanced  
topics, like  
microreactors,  
reactive  
distillation,  
membrane  
reactors, and fuel**



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**cells, providing the  
reader with a  
broader  
appreciation of the  
applications of  
reaction  
engineering  
principles and  
methods**

**Problem Solving in  
Chemical and  
Biochemical  
Engineering with  
POLYMATH, Excel,**

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Scott Fogler(3rd  
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Engineering for

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Sustainability and

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book to provide a  
practical working  
guide to

understanding  
process intensification  
(PI) and developing  
successful PI  
solutions and  
applications in  
chemical process,  
civil, environmental,  
energy,  
pharmaceutical,

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biological, and  
biochemical systems.

Process

intensification is a  
chemical and process  
design approach that  
leads to substantially  
smaller, cleaner,  
safer, and more  
energy efficient  
process technology. It  
improves process  
flexibility, product  
quality, speed to

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market and inherent safety, with a reduced environmental footprint. This book represents a valuable resource for engineers working with leading-edge process technologies, and those involved research and development of chemical, process, environmental,

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technology

Written by a highly

regarded author with

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academic experience,



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energy, with sections

on carbon capture

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a result of increasing

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necessary to design a  
chemical reactor for  
any application,  
including chemical  
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modeling.

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The Encyclopaedia

Britannica

This book reminds  
students in junior,  
senior and graduate  
level courses in  
physics, chemistry  
and engineering of

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the math they may have forgotten (or learned imperfectly) that is needed to succeed in science courses. The focus is on math actually used in physics, chemistry, and engineering, and the approach to mathematics begins with 12 examples of

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increasing  
complexity,  
designed to hone  
the student's ability  
to think in  
mathematical terms  
and to apply  
quantitative  
methods to  
scientific problems.

Detailed

illustrations and

links to reference

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further

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algebra and

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techniques

developed during

the author's 40

years of teaching

experience New

practice problems

and exercises to

enhance

comprehension

Coverage of fairly

advanced topics,

including vector and

matrix algebra,



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partial differential  
equations, special  
functions and

complex variables

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undergraduate or

first-year graduate

course, this text

introduces the

quantitative

treatment of

chemical reaction

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real-world vignettes involving commercial applications, a feature widely praised by reviewers and teachers. 2003 edition.

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coverage of the  
principles of  
chemical reaction  
engineering with an  
unsurpassed focus  
on critical thinking  
and creative  
problem solving,  
employing open-

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ended questions  
and stressing the  
Socratic method.

Clear and organized,  
it integrates text,  
visuals, and  
computer  
simulations to help  
readers solve even  
the most  
challenging  
problems through  
reasoning, rather

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than by memorizing  
equations."--BOOK  
JACKET.

Chemical reaction  
engineering is  
concerned with the  
exploitation of  
chemical reactions  
on a commercial  
scale. It's goal is the  
successful design  
and operation of  
chemical reactors.

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This text  
emphasizes  
qualitative  
arguments, simple  
design methods,  
graphical  
procedures, and  
frequent  
comparison of  
capabilities of the  
major reactor types.  
Simple ideas are  
treated first, and are

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then extended to  
the more complex.  
A Modern Approach  
to Chemical  
Reaction  
Engineering with  
Different Case  
Histories and  
Exercises  
Elements of  
Chemical Reaction  
Engineering  
Strategies for



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Solving

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the strengths of

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material and

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students.

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applications to  
the avoidance of  
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**explosion**

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their dynamic  
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reactor design.  
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books that  
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and mass transfer;  
second semester  
covers separation  
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operations). The title  
of this Fourth  
Edition has been  
changed from  
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Processes and Unit  
Operations to  
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Separation Process

Principles (Includes

Unit Operations).

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because the term

Unit Operations has

been largely

superseded by the

term Separation

Processes which

better reflects the

present modern

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nomenclature being used. The main objectives and the format of the Fourth Edition remain the same. The sections on momentum transfer have been greatly expanded, especially in the sections on fluidized beds, flow meters, mixing, and non-

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Newtonian fluids.

Material has been added to the

chapter on mass

transfer. The

chapters on

absorption,

distillation, and

liquid-liquid

extraction have also

been enlarged.

More new material

has been added to



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membrane theory.

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focuses on using  
process simulators  
to design separation

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processes and prepares readers for professional practice. Completely rewritten to enhance clarity, this fourth edition provides engineers with a strong understanding of the field. With the help of an additional co-author, the text

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presents new information on bioseparations throughout the chapters. A new chapter on mechanical separations covers settling, filtration and centrifugation including mechanical separations in

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biotechnology and cell lysis. Boxes help highlight fundamental equations.

Numerous new examples and exercises are integrated throughout as well.

The book presents in a clear and concise manner the

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fundamentals of  
chemical reaction  
engineering. The  
structure of the book  
allows the student to  
solve reaction  
engineering  
problems through  
reasoning rather  
than through  
memorization and  
recall of numerous  
equations,

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restrictions, and conditions under which each equation applies. The fourth edition contains more industrial chemistry with real reactors and real engineering and extends the wide range of applications to which chemical

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reaction engineering  
principles can be  
applied (i.e., cobra  
bites, medications,  
ecological  
engineering)

Filling a  
longstanding gap for  
graduate courses in  
the field, Chemical  
Reaction  
Engineering:  
Beyond the



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Fundamentals covers basic concepts as well as complexities of chemical reaction engineering, including novel techniques for process intensification. The book is divided into three parts:

Fundamentals

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Revisited, Building

on Fundamentals,

and Beyond

A Dictionary of Arts,

Sciences, Literature

and General

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Migrations of Fines

in Porous Media

Separation Process

Engineering

Chemical Reactor

Analysis and Design

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An Introduction to

Chemical

Engineering Kinetics

& Reactor Design

A Comprehensive

Reference for

Electrochemical

Engineering Theory and

Application From

chemical and electronics

manufacturing, to hybrid

vehicles, energy storage,

and beyond,

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electrochemical  
engineering touches  
many industries—any  
many lives—every day.  
As energy conservation  
becomes of central  
importance, so too does  
the science that helps us  
reduce consumption,  
reduce waste, and lessen  
our impact on the planet.  
Electrochemical  
Engineering provides a  
reference for scientists

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and engineers working  
with electrochemical  
processes, and a rigorous,  
thorough text for  
graduate students and  
upper-division  
undergraduates. Merging  
theoretical concepts with  
widespread application,  
this book is designed to  
provide critical  
knowledge in a real-  
world context. Beginning  
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principles underpinning the field, the discussion moves into industrial and manufacturing processes that blend central ideas to provide an advanced understanding while explaining observable results. Fully-worked illustrations simplify complex processes, and end-of chapter questions help reinforce essential knowledge. With in-

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depth coverage of both  
the practical and  
theoretical, this book is  
both a thorough  
introduction to and a  
useful reference for the  
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yet grounded in  
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Electrochemical  
Engineering: Introduces  
basic principles from the  
standpoint of practical  
application Explores the

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with discussion on

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characteristics,

mechanisms, and system

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design and mechanics of

hybrid and electric

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start-stop hybrids, and  
fuel cell systems

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electrodeposition, redox-  
flow batteries,

electrolysis, regenerative  
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semiconductors, and  
other applications of

electrochemical

engineering principles

Overlapping chemical  
engineering, chemistry,  
material science,

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mechanical engineering,

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This textbook is targetted to undergraduate students in chemical engineering, chemical technology, and biochemical engineering for courses in mass transfer, separation

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principles of mass

transfer, both diffusional  
and convective have been  
comprehensively

discussed. The

application of these  
principles to separation  
processes is explained.

The more common  
separation processes used  
in the chemical industries

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are individually described in separate chapters. The book also provides a good understanding of the construction, the operating principles, and the selection criteria of separation equipment. Recent developments in equipment have been included as far as possible. The procedure of equipment design and sizing has been illustrated

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by simple examples. An overview of different applications and aspects of membrane separation has also been provided.

‘ Humidification and water cooling ’ , necessary in every process indus-try, is also described. Finally, elementary principles of ‘ unsteady state diffusion ’ and mass transfer accompanied by



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A large number of solved  
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of the theory are included. • Many end-chapter exercises. • Chapter-wise multiple choice questions. • An Instructors manual for the teachers.

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reactors and processes are discussed.

Furthermore, options that can drastically influence reaction processes, e.g. choice of catalysts,



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