31ST EUROPEAN SYMPOSIUM ON
COMPUTER AIDED PROCESS
ENGINEERING

PART A
31ST EUROPEAN SYMPOSIUM ON COMPUTER AIDED PROCESS ENGINEERING

PART A

Edited by

Metin Türkay
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Rafiqul Gani
PSE for SPEED
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Preface

This book contains papers presented at the 31st European Symposium of Computer Aided Process Engineering (ESCAPE-31), held in Istanbul, Turkey, from June 6-9, 2021. The ECSAPE series started in 1992 at Elsinore, Denmark, on a strong foundation of 23 events of the European Federation of Chemical Engineers (EFCE) Working Party on Computer Aided Process Engineering (CAPE). The most recent symposia were organised in Eindhoven, The Netherlands 2019 (ESCAPE-29), and Milano, Italy 2020 (ESCAPE-30).

The ESCAPE series serves as a forum to bring together scientists, researchers, managers, engineers, and students from academia and industry, who are interested in CAPE and Process Systems Engineering (PSE). The scientific aim of the symposium is to present and review the latest developments in CAPE and/or PSE. This research area bridges fundamental chemical and biological sciences with various aspects of process and product engineering. The objective of ESCAPE-31 is to promote the use of a systems approach, highlighting the traditional CAPE-PSE topics as well as the emerging CAPE-PSE topics of current interest and future significance.

The main theme for ESCAPE-31 is on the methodical approaches in process systems engineering with emphasis on circular engineering economy, and sustainable product and/or process development. The papers at ESCAPE-31 are arranged in terms of the following themes: Process-product synthesis, design and integration; Methods, models and computational tools for PSE; Process control and operations; CAPE/PSE in energy/water/food nexus and sustainability; Process operations and supply chains; PSE in biological systems and processes; Education in CAPE/PSE & knowledge transfer.

A total of 320 contributed 6-pages papers are included in this book. All the papers have been reviewed and we thank the members of the international scientific committee for their evaluations, comments and recommendations. It was a very difficult task since we started with more than 452 submitted abstracts. The selection process involved review of abstracts, review of manuscripts and final selection of the revised manuscript.

We hope that this book will serve as a valuable reference document to the scientific and industrial community and that it will contribute to the progress in computer aided process and product engineering.

Metin Turkay
Rafiqul Gani
9 March 2021
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PART B
31\textsuperscript{ST} EUROPEAN SYMPOSIUM ON
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