

Preface

Nowadays, Mechanical Engineering is currently defined as a discipline “*which involves the application of principles of physics, design, manufacturing and maintenance of mechanical systems.*” Among others, fundamental subjects of classical mechanical engineering include: kinematics and dynamics, materials and manufacturing processes, thermodynamics and heat transfer, fluid mechanics, automation and control, applied mechanics and design, etc. With a special emphasis, this book also covers some modern subjects of mechanical engineering such as nanomechanics and nanotechnology, mechatronics and robotics, computational mechanics, alternative energies, sustainability, as well as aspects related with mechanical engineering education. It look to cover original contributions that advance understanding of both the fundamentals of mechanical engineering and its application to the solution of problems in modern industry.

The main aim of this book is to present a collection of examples illustrating research, development, and education in modern mechanical engineering. [Chapter 1](#) of the book provides sustainability in mechanical engineering discipline. [Chapter 2](#) is dedicated to application of solar distillation systems with phase change material storage. [Chapter 3](#) describes magneto-rheological fluid technology. [Chapter 4](#) contains information on tribological behaviour of rare-earth lubricating oils. [Chapter 5](#) is dedicated to structural dynamics and viscoelastic passive damping treatments. [Chapter 6](#) describes thermo mechanical modeling of multiphase steels (classical and modern engineering analysis). [Chapter 7](#) provides optimal real-time management automated production lines. [Chapter 8](#) deals with modeling optimization of mechanical systems and processes. [Chapter 9](#) contains information on implementing STEP-NC (exploring possibilities for the future advanced manufacturing) and [Chap. 10](#) is dedicated of optimum CNC free-form surface machining through design of experiments in CAM software. [Chapter 11](#) describes modeling of micromachining and [Chap. 12](#) is dedicated of micromilling. [Chapter 13](#) provides digital image processing in machining. [Chapter 14](#) describes formability and simulative tests in modern sheet metal forming education. Finally, [Chap. 15](#) is dedicated to multimedia resources in engineering education.

With a great usefulness, this book can be used as a research book for final undergraduate engineering course or as a topic on mechanical engineering at the postgraduate level. It also can serve book can serve as a useful reference for academics, researchers, mechanical, manufacturing, industrial and materials

engineers, professionals in mechanical engineering and related industries. The interest of scientific in this book is evident for many important research centers, laboratories, and universities as well as industry. Therefore, it is hoped this book will inspire and fill with enthusiasm others to undertake research in modern mechanical engineering.

The Editor acknowledges Springer for this opportunity and for its enthusiastic and professional support. Finally, I would like to thank to all the chapter authors for their availability for this work.

Aveiro, Portugal, October 2013

J. Paulo Davim

Modern Mechanical Engineering
Research, Development and Education
Davim, J.P. (Ed.)
2014, VIII, 466 p. 360 illus., Hardcover
ISBN: 978-3-642-45175-1