Preface

Nowadays, the finite element method (FEM) has become the main instrument to simulate manufacturing processes. It constitutes a complex process involving a variety of physical phenomena, such as plastic deformation, frictional contact, thermo-mechanical coupling, burr formation mechanisms, etc. Experimental approaches to study manufacturing processes are important but they can be replaced by FEM analysis with the advantage of saving the time and money required to undertake experimental procedures in the laboratory. However the experimental validation of FEM analysis in manufacturing processes is also very important. Recently, combinations of FEM analysis and artificial intelligence techniques for modeling and optimization manufacturing processes have been used with great success.

The purpose of this book is to present a collection of examples illustrating the state-of-the-art and research developments in FEM analysis for manufacturing processes. Chapter 1 presents a concept of authentication of the FEM in metal cutting. Chapter 2 contains FEM analysis of high-speed machining (HSM) with coated tools. Chapter 3 covers experimental and numerical modeling of tube end-forming processes. Chapter 4 contains information on FEM analysis in rolling processes. Chapter 5 is dedicated to FEM analysis

of the ball-burnishing surface treatment. Finally, in Chapter 6, combinations of the FEM and artificial intelligence techniques for modeling and optimizing manufacturing operations are presented.

This book is suitable for use as a textbook for a final undergraduate engineering course or to elucidate the use of the FEM in manufacturing processes at the postgraduate level. This book can also serve as a useful reference for academics, manufacturing and computational sciences researchers, mechanical, manufacturing, industrial and materials engineers, professionals in manufacturing processes, and related industries. This book will be of scientific interest to many important centers of research, laboratories, and universities throughout the world. Therefore, it is hoped that this book will encourage and enthuse others to undertake research in this field of science and technology.

As the Editor, I am grateful to ISTE for this opportunity and for their professional support. Finally, I would like to thank all the chapter authors for their contributions to this book.

J. Paulo DAVIM
University of Aveiro, PORTUGAL

December 2010