

Preface

Modern power electronics has evolved into a new era of electrical energy processing. In this context, power electronic controlled systems have become indispensable to the proper operation of power systems. Control systems theory and signal processing have become, in the last decades, vectors of research and technological innovation in the field of power electronics. Following this trend, this textbook applies control systems theory to the field of power electronics and is intended to be a reference for students and professionals working in the power systems field. It provides the reader with the tools for obtaining various models and control structures for a wide range of switching converters (with both DC and AC stages). The subject covers not only linear control techniques that use the ubiquitous proportional–integral controller, devised as early as the 1980s, but also more modern nonlinear continuous or variable-structure control.

The textbook *Power Electronic Converters Modeling and Control: With Case Studies* originates from the course “Modeling and control of power electronic structures”, taught by Professor Seddik Bacha to bachelor engineers and masters in electrical engineering at Grenoble Institute of Technology and Joseph Fourier University in France since 1994. Its content has been enriched by topics and case studies issued from research work and theses developed at Grenoble Electrical Engineering Laboratory in France in switching converters and renewable energy conversion control. Its writing has begun following the encouragements of Professor Jean-Paul Hautier, former General Administrator of École Nationale Supérieure des Arts et Métiers in France.

Like its main topics, the presentation style of this textbook places it at the intersection of power electronics, control systems and signal processing, partially covering some industrial electronics areas. The spirit of the writing assumes that students possess basic knowledge within the aforementioned disciplines. Within the book, each problem is approached in both theoretical and practical fashion, employing illustrative examples. Case studies issue from close-to-real-world problems and are treated in a most complete way. Simulations and comments therein are placed so as to allow insight into what concerns switching converter–control structure closed-loop operation.

Effort has been made to synthesize information from a quite well-developed domain possessing a rich bibliography, merge key terms, achieve the case studies and to unify visions, notations and styles to obtain a presentation both power engineers and control engineers can comprehend.

The discourse of this book was heavily influenced by the experience Dr. Iulian Munteanu and Dr. Antoneta Iuliana Bratcu had as students and co-workers of Professor Emil Ceangă from Dunărea de Jos University of Galați in Romania. We appreciate his helpful suggestions, which have inspired the pedagogical presentation of many control approaches within this book.

We thank Professor Leopoldo García Franquelo from University of Sevilla in Spain for evaluating our work and endorsing this textbook. We also thank Professor Jean-Pierre Rognon from Grenoble Institute of Technology in France for his helpful comments and suggestions, which improved the quality of this text.

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