A review of the book "Optimal control" by Richard Vinter, Modern Birkhaeuser Classics, Boston, MA, 2010.

This is a reprint of a book already reviewed in [Zbl 0952.49001]. The author is a renowned expert in optimal control, a mathematically-oriented branch of systems control engineering whose roots can be found in the calculus of variations of the 17th century. Optimal control gained momentum in the 1960s during the cold war, with the development of the aerospace industry. Engineers in space agencies worldwide are now making extensive and systematic use of optimal control theory to design space vehicle trajectories and missions.

The book is strongly mathematically oriented and the author's focus is mostly on modern tools developed since the 1970s, namely nonsmooth variational analysis and differential inclusions. These techniques are extensively and rigorously introduced, sometimes very technically, and at the price of readability for control engineers, in this reviewer's opinion. Many illustrative examples are however scattered throughout the text to ease the reading. Each chapter starts with a very accessible and informative introduction that settles the scene and puts the technical material in context. Similarly, each chapter winds up with well-written notes, historical remarks and pointers to more than 150 bibliographic entries. The introductory chapter, a 60-page overview of optimal control, is remarkable. This illuminating chapter starts with the early historical developments of the calculus of variations in the late 17th century, and gradually motivates and explains the development of modern mathematical tools (e.g. subdifferential calculus, viscosity solutions of Hamilton-Jacobi partial differential equations) in the last quarter of the 20th century.

In this reviewer's opinion, the opening chapter of this book can be considered as a major contribution to the modern optimal control literature. Together with the more advanced technical material of the other chapters, it turns this book into a valuable and by now classical source for systems control engineers and applied mathematicians.

Didier Henrion, Toulouse, May 2011.