

PREFACE TO SECOND EDITION

This second edition reinforces the intent of the first—the retention of Analytical Mechanics as a central focus of graduate physics education. In recent years, there has been a tendency to eliminate the traditional Analytical Mechanics course from the graduate curriculum, replacing it by perhaps a week in a quantum mechanics course. One purpose of this book is to reverse this trend, to ensure that physics graduates learn their subject at the depth needed to advance beyond current thinking.

Several additions in the second edition allow a more flexible use of the text. Part I contains new chapters on "Central Force Motion" (Chapter 11) and "Scattering" (Chapter 12) and has added introductory material on time-independent canonical transformations and generating functions to the chapter "Introduction to Hamiltonian Mechanics" (Chapter 4).

In Part II, several sections of the chapter on "Hamilton–Jacobi Theory" (Chapter 21) have been rewritten, and a chapter on "Angle-Action Variables" (Chapter 22) has been added, which includes its application to the "old" quantum theory.

The mathematical appendices in Part III have been retained and material on the algebra of finite sums has been added.

With these additions Part I is now a self-contained introductory analytical mechanics course. The instructor can then choose specific topics from the advanced material in Part II to suit the needs of particular student groups. After the short preparatory Chapters 13, 14, and 15 of Part II, the course can take either a relativity track with Chapters 16, 17, and 18, or an advanced classical and quantum track with Chapters 19, 20, 21, and 22.

With its emphasis on a thorough understanding of the classical underpinnings of modern physics, the book is intended to enable future generations of physics students to question our current theories, even well-established ones.

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