provide a broad overview of the basic models and ideas of statistical physics.

The new edition contains additional as well as revised material. In Chapter 2, Jaynes's treatment of probability as a form of logic is used to judge rational expectations and to introduce his maximum entropy principle. In addition, there is a discussion on distributions of extreme values. Chapter 3 now includes a section on the Caldeira–Leggett model, which allows a generalized Langevin equation to be derived from deterministic Newtonian mechanics. There is also a section on first passage times for unbounded diffusions as an example of the effectiveness of renewal equation techniques and a discussion on extreme excursions of Brownian motions. In addition, the section on Nelson's stochastic mechanics has been extended to provide a detailed discussion on the tunneling effect. Much of the material on credit risk analysis in Chapter 5 was made obsolete by the financial crisis in 2008 and has been appropriately modified. A major new development is the treatment of nonstationarity of financial time series, with additional discussion of extreme events in such series. Finally, the treatment of microscopic modeling approaches has been extended to include agent-based modeling techniques, which allows correlation of agent behavior and microscopic degrees of freedom to be incorporated in the discussions. There are six appendices that expand on background mathematical material.

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Nonlinear Time Scale Systems in Standard and Nonstandard Forms: Analysis and Control. *By Anshu Narang-Siddarth and John Valasek*. SIAM, Philadelphia, 2014. $94.00. xvi+219 pp., hardcover. ISBN 978-1-611973-33-4.

Singular perturbation methods in control have provided a very successful application of many asymptotic techniques, involving applied mathematicians and engineers. The early work was summarized in Kokotovic, Khalil, and O'Reilly [1], now reprinted as a SIAM Classic. This new book has developed from the recent thesis research of Professor Narang-Siddarth at Texas A&M University, where Professor Valasek was her advisor. It is less specifically oriented toward aerospace applications than Ramnath [2] and indeed, it begins with a presentation of multiple time scale phenomena quite generally before considering design aspects and stabilizing controls.

The standard problem consists of the initial value problem for the coupled slow-fast vector system

$$\dot{x} = f(t, x, z, u),$$
$$\epsilon\dot{z} = g(t, x, z, u),$$

with a small positive parameter ϵ. Its limiting outer solution away from a thin initial layer results when we can solve the limiting algebraic constraint for

$$z = h(t, x, u),$$

resulting in a reduced-order control problem. These authors call the problem nonstandard when they can't solve for z in this way. They naturally seek ways to transform the given problem to a standard one. The control aspect makes the problem interesting, and computed solutions for aerospace and other examples provide a check on any intuitive design choices made.

Not surprisingly, inner and outer (or slow and fast) problems arise, and one naturally seeks the composite control as the sum of slow and fast parts. Stability hypotheses naturally involve Liapunov functions, and extensions with a hierarchy of several small parameters multiplying derivatives occur. There's a nice overview of classical results, including an emphasis on a role of the slow manifold. Most significant and novel, however, is the treatment of nonstandard examples. This is very worthy of further development, regarding both theory and practice. The authors deserve our thanks for their successful and provocative developments.

REFERENCES

[1] P. Kokotovic, H. K. Khalil, and J. O'Reilly, *Singular Perturbation Methods in Control: Analysis and Design*, Academic Press, London, 1986.

[2] R. V. Ramnath, *Multiple Scales Theory and Aerospace Applications*, AIAA Education Series, Reston, VA, 2010.

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Ordinary Differential Equations, from Calculus to Dynamical Systems. *By Virginia W. Noonburg.* The Mathematical Association of America, Washington, D.C., 2014. $60.00. xiv+315 pp., hardcover. ISBN 978-1-93951-204-8.

This book has the traditional outline of a first course in ODEs: Introduction, first-order equations, second-order equations, linear systems, geometry of autonomous systems, and Laplace transforms. Overall, there are lots of pictures of solutions. Students are encouraged to use computer algebra and numerical methods. Examples (and projects) coming from easy-to-comprehend applications are common, and complicated solution techniques aren't avoided when needed. Readers, in keeping up, will learn a lot that will be useful elsewhere.

There's particularly good coverage of beats and resonance, phase plane pictures, the matrix exponential (and its simplicity compared to corresponding eigenvalue/eigenvector representations), bifurcation, limit cycles, and the Laplace transform (which many authors make so simple that it provides no added value).

The writing is clear, the problems are good, and the material is well motivated and largely self-contained. Some previous acquaintance with linear algebra would, however, be helpful.

In summary, this new book is highly recommended for students anxious to discover new techniques.

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Differential Equations and Linear Algebra. *By Gilbert Strang.* Wellesley-Cambridge Press, Wellesley, MA, 2014. $86.00. x+502 pp., hardcover. ISBN 978-0-9802327-9-0.

There's no doubt that Gilbert Strang is a master teacher and an enthusiastic evangelist for his perceptive vision of where applied math should be headed. After a half century and ten editions of Boyce and DiPrima, there's a pile of reasons (and ways) to change the typical first course in differential equations. One good idea is to combine that course with one on linear algebra, which occurred quite some time ago to Kreider, Kuller, Ostberg, and Perkins and to Hirsch and Smale, among others. Now, however, we have MATLAB and Maple, the singular value decomposition, and the fast Fourier transform! Some experimentation with technology and computing uncovers the practical importance of differential equations. Students tend to learn the method of Frobenius and about specific special functions later, perhaps encountering them in a course in engineering, biology, or finance. They ultimately also learn that nonlinearity must be faced. This is hinted at by the book's attractive cover illustration (by two artistic SIAM staff members), which relates pictures of the Lorenz attractor from a Portuguese grad student.

As you'd expect, the emphasis here is linear differential equations with constant coefficients. Honestly, there aren't many variable coefficient ODEs that we can handle analytically, though it is certainly fun to solve one. Numerical methods for initial value problems are, admittedly, very successful and the resulting portraits provide immediate understanding of solution behavior. Moreover, the powerful underlying A^TA philosophy employed carries over to using eigenvalues and eigenvectors to solve boundary value problems for Laplace's equation and other partial differential equations, analytically and via finite differences. Most sophomores would not have realized this without Strang's insistence. Using Fourier series and Fourier and Laplace transforms brings the focus successfully back to the classical syllabus. Meanwhile, however, one has figured out many matrix decompositions, how to use delta and transfer functions, and has understood critical ideas like stability and stiffness. The exercises, which include challenge problems, look interesting, and extensive backup resources from MIT websites are available.

As with Strang's linear algebra books, now in their fourth edition, this text is