



# Applied Dynamics: With Applications to Multibody and Mechatronic Systems

By Francis C. Moon

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For almost a decade now, this textbook had been at the forefront in using modern analytical and computational codes and in addressing novel developments. Already used by numerous institutions for their courses, this second edition has been substantially revised, with new sections on biomechanics and micro- and nanotechnology. There is also more coverage of robotics, multibody simulations and celestial mechanics. Numerous examples have been added and problems, partly using MATLAB, have been included.

\* Free solutions manual available for lecturers at [www.wiley-vch.de/supplements/](http://www.wiley-vch.de/supplements/)

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### **Editorial Review**

From the Publisher

This intermediate level text is written for use by an undergraduate senior or first year graduate student in a dynamics course. Provides a modern and thorough examination of dynamics with specific emphasis on physical examples and applications such as: robotics, magnetic bearings, aircraft dynamics, and microelectromagnetic machines. Also includes the development of the method of virtual velocities based on the principle of virtual power.

From the Back Cover

A Modern, Practical Treatment of Dynamics for the Intermediate Reader

Applied Dynamics presents a modern treatment of dynamics not found in any other book. It introduces concepts of multibody dynamics, mechatronic dynamics, and nonlinear dynamics as well as traditional dynamics and examines underlying principles in the context of present-day computational methods. The book offers insight into modern analytical tools such as virtual power and Lagrange's equations through a focus on real-world examples and applications including robotic systems, magnetic bearings, aerospace dynamics, and microelectromagnetic machines (MEMS).

Based on Francis C. Moon's successful Intermediate Dynamics course at Cornell University, Applied Dynamics meets the growing need for an intermediate text that will help students develop practical problem-solving skills. This timely and useful volume:

1 introduces the modern method of virtual power (Kane/Jourdain methods) and traditional methods of Newton-Euler and Lagrange equations

- illustrates applications and phenomena of modern dynamics with numerous examples, graphics, and homework problems

- demonstrates the solution of dynamics problems using modern software tools such as MATLAB and Mathematica

- explains the derivation of equations of motion in electromechanical systems, including MEMS and NEMS devices

- reviews important phenomena associated with the nonlinear equations of rigid body dynamics

- integrates modeling, derivation of equations, and solutions of equations

Applied Dynamics is an ideal text for one-semester courses at the senior undergraduate or first-year graduate level. It is also useful for more advanced students seeking to enhance their understanding of modern software tools or pursue independent investigation.

About the Author

Francis C. Moon is professor of mechanical and aerospace engineering at Cornell University, NY, USA. He has been in the Sibley School of Mechanical and Aerospace Engineering since 1987, having served as its director until 1992. He also served as the Chair of Theoretical and Applied Mechanics for seven years after joining Cornell in 1975. He was Assistant Professor at Princeton University in Aerospace and Mechanical Engineering from 1967-1974.

Professor Moon has worked in a wide spectrum of problems including nonlinear and chaotic vibrations, superconducting bearings, electromagnetic launchers, smart structures, fluid-elastic vibrations, and dynamics of machines. He has written several papers on 19th century kinematic and dynamics of machines and has five patents in magneto-mechanical devices.

Professor Moon has published nearly 140 journal articles as well as 6 books and 3 edited books. He is the

author of Chaotic and Fractal Dynamics and Superconducting Bearings and Levitation, and editor of Dynamics and Chaos in Manufacturing Processes. All titles are available from Wiley. Francis Moon has won the 2007 Lyapunov Award from the American Society of Mechanical Engineers (ASME) in recognition of lifetime contributions to the field of applied nonlinear dynamics.

## **Users Review**

### **From reader reviews:**

#### **Carrie Porter:**

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