



# Fundamentals of Machine Elements, Third Edition

*By Steven R. Schmid, Bernard J. Hamrock, Bo. O. Jacobson*

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**Fundamentals of Machine Elements, Third Edition** By Steven R. Schmid, Bernard J. Hamrock, Bo. O. Jacobson

**Fundamentals of Machine Elements, Third Edition** offers an in-depth understanding of both the theory and application of machine elements. Design synthesis is carefully balanced with design analysis, an approach developed through the use of case studies, worked examples, and chapter problems that address all levels of learning taxonomies. Machine design is also linked to manufacturing processes, an element missing in many textbooks.

The third edition signifies a major revision from the second edition. The contents have been greatly expanded and organized to benefit students of all levels in design synthesis and analysis approaches.

What's New in This Edition:

- Balances synthesis and analysis with strong coverage of modern design theory
- Links coverage of mechanics and materials directly to earlier courses, with expansion to advanced topics in a straightforward manner
- Aids students of all levels, and includes tie-in to engineering practice through the use of case studies that highlight practical uses of machine elements
- Contains questions, qualitative problems, quantitative problems, and synthesis, design, and projects to address all levels of learning taxonomies
- Includes a solutions manual, book website, and classroom presentations in full color, as well as an innovative "tear sheet" manual that allows instructors to present example problems in lectures in a time-saving manner
- Expands contents considerably, Topics: the importance of the heat affected zone in welding; design synthesis of spur, bevel, and worm gears; selection of multiple types of rolling element bearings (including deep groove, angular contact, toroidal, needle, and cylindrical and tapered roller) using a standard unified approach; consideration of advanced welding approaches such as brazing, friction welding and spot welding; expansion of fatigue coverage including the use of the staircase method to obtain endurance limit; and design of couplings, snap rings, wave and gas springs, and hydrostatic bearings
- Provides case studies that demonstrate the real-world application of machine elements. For example, the use of rolling element bearings in windmills,

powder metal gears, welds in blisks, and roller coaster brake designs are all new case studies in this edition that represent modern applications of these machine elements.

Fundamentals of Machine Elements, Third Edition can be used as a reference by practicing engineers or as a textbook for a third- or fourth-year engineering course/module. It is intended for students who have studied basic engineering sciences, including physics, engineering mechanics, and materials and manufacturing processes.

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## **Editorial Review**

### **Review**

***"Design is essential in the modern economy, and this book does a superb job in explaining both design analysis and design synthesis. Schmid, Hamrock and Jacobson are well-known experts in the field, and it shows from this concise and well-written book."***

?Prof. Bharat Bhushan, Ohio Eminent Scholar and The Howard D. Winbigler Professor, Director, Nanoprobe Laboratory for Bio- & Nanotechnology and Biomimetics (NLB<sup>2</sup>), Ohio State University, Columbus, USA

***"I have been working as a bearing engineer for nearly two decades, and have come across many different machine design and application problems associated with the rolling element bearing. Most of the time, design problems can be handled quickly if the engineer has a good fundamental understanding of how a machine element works, but this information is unfortunately missing from most conventional treatments of the subject matter. This book gives the reader enough of a fundamental background to understand the machine elements and design the overall system, and it is highly recommended."***

—Mike Kotzalas, The Timken Company, Boca Raton, Florida, USA

***"This book is a must for every mechanical engineering student for use as a textbook, and should be in every engineer's library as a reference book. I wish it was available 30 years ago!"***

—Jim Adams, Director, Technical Services, Metal Powder Industries Federation, Princeton, New Jersey, USA

***"For many years a leading automobile company sponsored Berkeley research on the "Composite Transmission Error Prediction for Automatic Transmissions." I only wish this excellent book was available at that time to bring our software engineers 'up to speed' on gear fundamentals, manufacturing, and gear design synthesis, as well as other machine elements."***

—Paul Wright, Professor of Mechanical Engineering, University of California, Berkeley, USA

### **About the Author**

Steven R. Schmid is a Professor at the University of Notre Dame, where he has taught manufacturing and design since 1993. Prior to teaching, Dr. Schmid was employed at Triodyne, Inc, performing machine design failure investigations. Among his awards are the ASME Foundation Swanson Fellowship in 2012, the ASME Newkirj Award, and the SME Parsons Awards, and he is a Fellow of the American Society of Mechanical Engineers.

Bernard J. Hamrock joined the staff of The Ohio State University as a professor of mechanical engineering in 1985 and is now professor emeritus. Prior to that he spent 18 years as a research consultant in the Tribology Branch of the NASA Lewis Research Center in Cleveland, Ohio. He received his Ph.D. and Doctor of Engineering degrees from the University of Leeds, England. His awards include the NASA Exceptional Achievement Medal in 1984, the 1998 Jacob Wallenberg Award given by The Royal Swedish Academy of Engineering Sciences, and the 2000 Mayo D. Hersey Award from the American Society of Mechanical Engineers.

**Bo O. Jacobson** received his Ph.D. and D.Sc. degrees from Lund University in Sweden. From 1973 until 1987, he was professor of machine elements at Luleå Technology University in Sweden. In 1987 he joined SKF Engineering & Research Centre in the Netherlands, while retaining a professorship at Chalmers University from 1987 to 1991, and Luleå Technical University from 1992 to 1997. In 1997 he was appointed professor of machine elements at Lund University. Professor Jacobson has written ten compendia used at Swedish universities, six covering different machine elements and four covering the basic course and the advanced course in tribology.

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#### **Alicia Hendrickson:**

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