

Preface

The book *Rail Vehicle Dynamics* was developed from a course book for the class *Rail Vehicle Dynamics* at the Technical University (TU) Berlin. Klaus Knothe has been responsible for the class for almost 25 years, 20 of these years together with Prof. Robert Gasch. Therefore, Chaps. 4–7 are strongly influenced by Prof. Gasch. Sebastian Stichel was a Ph.D. student for five years at the *Department of Aeronautics and Astronautics* and during that time, substantially revised the course literature. Today, he is a professor of rail vehicle dynamics at the Royal Institute of Technology (KTH), in Stockholm. Further results from numerous research projects and Ph.D. theses are included. A German version of the book was published in 2003.

The reason for writing a textbook on rail vehicle dynamics was that a comprehensive book on the topic did not exist, either in German or English. In the two excellent books on *Fahrzeugdynamik (Vehicle Dynamics)* [1] and on *Systemdynamik und Regelung von Fahrzeugen (System Dynamics and Control of Vehicles)* [2], rail vehicle dynamics specifically could not be described extensively. In English, there is the book of Garg and Dukkipati [3], but it is somewhat dated now. The same applies to the book of Kovalev [4], as well as to the brochure of Krugmann [5] or the still very valuable book from Hanneforth [6]. An anthology with Klaus Knothe as one of the authors [7] deals with a number of aspects, but it does not provide a general introduction. Since this book was published in German in 2003, a number of very interesting books on the topic have appeared, e.g., the book *Fundamentals of Rail Vehicle Dynamics* by Wickens [8] and *Handbook on Railway Vehicle Dynamics*, edited by Iwnicki [9]. From Australia, the book *Design and Simulation of Rail Vehicles* by Spyriagin and Cole et al. [10] has been published. These books also partly fill gaps but still have a somewhat different focus than our book. Books from the nineteenth century [11] or the first half of the twentieth century [12, 13] cannot fill the gap either. Therefore, it was considered worthwhile to fill the vacancy with this book. The situation is somewhat different in track dynamics (Gleisdynamik) [14] and bridge dynamics (Brückendynamik) [15].

The text book has the character of an introduction. This means that the most important aspects are described in detail, while further questions are touched

on only briefly. The approach is therefore almost inductive, i.e., basic theories are given when needed. This has been successfully applied in our class on rail vehicle dynamics, in which master's students in vehicle engineering and machine technology are in many cases confronted for the first time with equations of motion and their solution.

With that said, we should mention the main audience for this book. It was written for university students in engineering sciences who want to learn more about rail vehicle dynamics and perhaps also to find an entrance into methods of dealing with other dynamic problems in technical systems. It is also intended for engineers in the rail vehicle industry, railway operators, infrastructure owners, and authorities who want to deepen their knowledge of the topic.

Without help, we would not have been able to write this book. Firstly, we would like to mention Prof. Gasch again, whose lecture notes of the first part of the class *Rail Vehicle Dynamics* were the basis for Chaps. 4–7. Regarding the Ph.D. students who participated in the lectures only, Dr.-Ing. Arnold Groß-Thebing and Dr.-Ing. Burchard Ripke are mentioned here. Dr.-Ing. Walter Kik followed the development of the lecture notes with great interest and offered many suggestions. He also helped with both words and deeds in the final phase of the writing of the manuscript, especially with calculation examples. The authors would like to thank Dr.-Ing. André Theiler for help with Chap. 3. Those who contributed within their research projects are mentioned in the respective sections in the book. We would also like to thank Prof. Evert Andersson and Prof. Mats Berg. Sebastian Stichel is giving a class on rail vehicle dynamics together with them at KTH. Parts from the lecture notes are included in Chaps. 7 and 14. Special thanks also to Roger Enblom, who proofread these two chapters and gave valuable input.

The drawings were made by Mrs. Christine Koll in her reliable manner. We owe her enormous thanks. Special thanks also to the staff at Springer for their patience with the authors.

Last but not least, the authors wish to thank their wives, who exhibited considerable patience during the writing of the manuscript.

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