

Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering)

By Dean Karnopp

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Anyone who has experience with a car, bicycle, motorcycle, or train knows that the dynamic behavior of different types of vehicles and even different vehicles of the same class varies significantly. For example, stability (or instability) is one of the most intriguing and mysterious aspects of vehicle dynamics. Why do some motorcycles sometimes exhibit a wobble of the front wheel when ridden "no hands" or a dangerous weaving motion at high speed? Why does a trailer suddenly begin to oscillate over several traffic lanes just because its load distribution is different from the usual? Other questions also arise: How do humans control an inherently unstable vehicle such as a bicycle and how could a vehicle be designed or modified with an automatic control system to improve its dynamic properties?

Using mainly linear vehicle dynamic models as well as discussion of nonlinear limiting effects, **Vehicle Dynamics, Stability, and Control, Second Edition** answers these questions and more. It illustrates the application of techniques from kinematics, rigid body dynamics, system dynamics, automatic control, stability theory, and aerodynamics to the study of the dynamic behavior of a number of vehicle types. In addition, it presents specialized topics dealing specifically with vehicle dynamics such as the force generation by pneumatic tires, railway wheels, and wings.

The idea that vehicles can exhibit dangerous behavior for no obvious reason is in itself fascinating. Particularly obvious in racing situations or in speed record attempts, dynamic problems are also ubiquitous in everyday life and are often the cause of serious accidents. Using relatively simple mathematical models, the book offers a satisfying introduction to the dynamics, stability, and control of vehicles.

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Editorial Review

Review

As with Prof. Karnopp's other books, a wide range of topics are presented in **Vehicle Dynamics, Stability, and Control**. If one enjoys Prof. Karnopp's other textbooks, as I do, then this textbook is another wonderful adventure through a complicated and interesting technical subject. ?Robert M. Sexton, Virginia Commonwealth University

I will consider adopting this book for my vehicle dynamics course. The modeling is a step above the book currently used and should improve the students' understanding of the subject matter. The material on active control of vehicles is a good addition.

?Jack E. Helms, Louisiana State University

The material is written in a very direct way. Reading it goes on smoothly to the end without trouble. And when you have finished, you happily have understood a very complicated issue. ... I do think Prof. Karnopp is one of the very best professors in Mechanical Engineering living today. The book can be recommended both to beginners and to experienced scientists or engineers. Beginners will take advantage from the very easy way the complicated topics are presented and made easy to grasp. Experienced scientists can get further insight into basic phenomena presented with unsurpassed inspiring style. ?G. Mastinu, Politecnico di Milano

The book includes a rich compilation of examples of the application of basic methods of stability analysis to vehicle dynamics behavior, both attractive to the lecturer and students. It brings two subjects ? stability of motion and vehicle dynamics, which are often lectured separately ? together and reveals the benefit of an integrative view. ... The book offers a very attractive introduction to the analysis of stability of motion from a comprehensive vehicle dynamics point of view. Examples include automobiles, aircrafts, railway vehicles, vehicle dynamics control etc., which give engineering students an easy understanding of the application of mathematical methods to illustrative problems on the dynamic behaviour of vehicles. Basic models on the external force generation at tires, railway wheels, or wings are presented as well and allow for a more comprehensive understanding of vehicle dynamics.

?Manfred Plöchl, Vienna University of Technology

The chapters provide good and wide basic knowledge in the field of vehicle stability. The book is focused on analogies between several technical fields, which – in my mind – gives a good understanding of the physical effects behind. It is easy to read and to understand, since it uses simple words and refers to daily-life-examples. As explicitly mentioned by the author, it is not aimed at explaining the physics deeply. The focus is giving an overview and providing a fundamental and solid base of knowledge. In my opinion, this is achieved successfully. I would recommend this book to students or engineers who are interested in getting a good overview with respect to vehicle stability and in understanding how various physical effects are connected with each other.

?Dr. Andreas Wagner, Manager Vehicle Attributes of Chassis Concepts, Audi, Ingolstadt, Germany

Praise for the First Edition:

...a comprehensive analysis of the vibration characteristic parameter which defines stability. The author widely use[s] mathematical reasoning to establish the optimum ways to improve vehicle stability. ... The

book is a valuable reference ... it is very useful for professors, researchers, and students interested in the vehicle stability field. ?Prof. Dan Dascalescu, Ph.D.

The monograph will be useful for students and engineers specializing in the related fields. ?*Zentralblatt MATH*

Users Review

From reader reviews:

Barbie Brookins:

The feeling that you get from Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) will be the more deep you rooting the information that hide inside the words the more you get thinking about reading it. It doesn't mean that this book is hard to recognise but Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) giving you enjoyment feeling of reading. The article author conveys their point in specific way that can be understood by simply anyone who read that because the author of this book is well-known enough. This particular book also makes your vocabulary increase well. That makes it easy to understand then can go together with you, both in printed or e-book style are available. We recommend you for having this kind of Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) instantly.

James Reed:

Reading can called imagination hangout, why? Because if you find yourself reading a book especially book entitled Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) the mind will drift away trough every dimension, wandering in each and every aspect that maybe unknown for but surely will end up your mind friends. Imaging each word written in a e-book then become one type conclusion and explanation which maybe you never get prior to. The Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) giving you a different experience more than blown away the mind but also giving you useful facts for your better life within this era. So now let us teach you the relaxing pattern the following is your body and mind are going to be pleased when you are finished reading it, like winning a game. Do you want to try this extraordinary wasting spare time activity?

Anne Braden:

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Alexander Pridmore:

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