



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

By Dean Karnopp



## Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) By Dean Karnopp

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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**Bibliography**

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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:**

#### **Arthur Sanchez:**

The book Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) make you feel enjoy for your spare time. You may use to make your capable more increase. Book can to get your best friend when you getting anxiety or having big problem with the subject. If you can make reading a book Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) to get your habit, you can get much more advantages, like add your own capable, increase your knowledge about many or all subjects. You can know everything if you like open and read a guide Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering). Kinds of book are several. It means that, science reserve or encyclopedia or other people. So , how do you think about this e-book?

#### **Gail Brasfield:**

The particular book Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) will bring that you the new experience of reading the book. The author style to explain the idea is very unique. In the event you try to find new book you just read, this book very ideal to you. The book Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) is much recommended to you to learn. You can also get the e-book through the official web site, so you can quicker to read the book.

#### **Ella Oxley:**

Precisely why? Because this Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering) is an unordinary book that the inside of the guide waiting for you to snap the item but latter it will shock you with the secret the idea inside. Reading this book close to it was fantastic author who else write the book in such wonderful way makes the content inside easier to understand, entertaining technique but still convey the meaning entirely. So , it is good for you because of not hesitating having this ever again or you going to regret it. This phenomenal book will give you a lot of positive aspects than the other book possess such as help improving your expertise and your critical thinking approach. So , still want to hold off having that book? If I were you I will go to the reserve store hurriedly.

#### **Alejandro Colon:**

Playing with family inside a park, coming to see the sea world or hanging out with pals is thing that usually you might have done when you have spare time, and then why you don't try matter that really opposite from

that. Just one activity that make you not sense tired but still relaxing, trilling like on roller coaster you have been ride on and with addition info. Even you love Vehicle Dynamics, Stability, and Control, Second Edition (Mechanical Engineering), you may enjoy both. It is fine combination right, you still want to miss it? What kind of hangout type is it? Oh seriously its mind hangout fellas. What? Still don't obtain it, oh come on its known as reading friends.

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