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# Electric And Hybrid Vehicles Design Fundamentals Second Edition

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Modern Electric, Hybrid Electric, and Fuel Cell Vehicles

Electric & Hybrid Vehicles

Electric and Hybrid Vehicles

Advanced Hybrid and Electric Vehicles

Overviews and Viewpoints

Propulsion Systems for Hybrid Vehicles

Hybrid Electric Vehicle System Modeling and Control

Hybrid Electric Vehicle Design and Control: Intelligent Omnidirectional Hybrids

Lightweight Electric/Hybrid Vehicle Design

Introduction to Hybrid Vehicle System Modeling and Control

Lightweight Electric/Hybrid Vehicle Design

Hybrid-Powered Vehicles

Hybrid Electric Vehicles

Electric and Hybrid Vehicles

Batteries

Electric Vehicle Design

Overviews and Viewpoints

Hybrid Electric Vehicle Design and Control: Intelligent Omnidirectional Hybrids

Hybrid Electric Vehicles

Electric and Hybrid Vehicles

The Electric Car

Electric Powertrain

Modeling for Hybrid and Electric Vehicles Using Simscape

Electric and Hybrid Vehicles

Modern Electric, Hybrid Electric, and Fuel Cell Vehicles

Fuel Cell Hybrid EVs

Hybrid Electric Power Train Engineering and Technology: Modeling, Control, and Simulation

Smart Electric and Hybrid Vehicles

Modern Electric, Hybrid Electric, and Fuel Cell Vehicles

Electric and Plug-in Hybrid Vehicle Networks

Electric and Plug-In Hybrid Vehicles

Hybrid Electric Vehicles

Electric Vehicle Machines and Drives

Electric and Hybrid Vehicles

Electric Vehicle Technology Explained  
Electric and Hybrid Vehicles  
Electric and Hybrid Vehicles  
Smart Electric and Hybrid Vehicles  
Electric and Hybrid Vehicles  
Hybrid Electric Vehicle Technology

*Electric And Hybrid  
Vehicles Design  
Fundamentals Second  
Edition*

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**CLARKE HEZEKIAH**

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*Modern Electric, Hybrid Electric, and Fuel  
Cell Vehicles* CRC Press

This book explores the behavior of networks of electric and hybrid vehicles. The topics that are covered include: energy management issues for aggregates of plug-in vehicles; the design of sharing systems to support

electro-mobility; context awareness in the operation of electric and hybrid vehicles, and the role that this plays in a Smart City context; and tools to test and design massively large-scale networks of such vehicles. The book also introduces new and interesting control problems that are becoming prevalent in the EV-PHEV's context, as well as identifying some open questions. A particular focus of the book is on the opportunities afforded by networked actuation possibilities in electric and hybrid

vehicles, and the role that such actuation may play in air-quality and emissions management.

### **Electric & Hybrid Vehicles** SAE International

Air pollution, global warming, and the steady decrease in petroleum resources continue to stimulate interest in the development of safe, clean, and highly efficient transportation. Building on the foundation of the bestselling first edition, *Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, Second Edition* updates and expands its detailed coverage of the vehicle technologies that offer the most promising solutions to these issues affecting the automotive industry. Proven as a useful in-depth resource and comprehensive reference for modern

automotive systems engineers, students, and researchers, this book speaks from the perspective of the overall drive train system and not just its individual components. New to the second edition: A case study appendix that breaks down the Toyota Prius hybrid system  
Corrections and updates of the material in the first edition  
Three new chapters on drive train design methodology and control principles  
A completely rewritten chapter on Fundamentals of Regenerative Braking  
Employing sufficient mathematical rigor, the authors comprehensively cover vehicle performance characteristics, EV and HEV configurations, control strategies, modeling, and simulations for modern vehicles. They also cover topics including: Drive train architecture

analysis and design methodologies  
Internal Combustion Engine (ICE)-based  
drive trains Electric propulsion systems  
Energy storage systems Regenerative  
braking Fuel cell applications in vehicles  
Hybrid-electric drive train design The  
first edition of this book gave practicing  
engineers and students a systematic  
reference to fully understand the  
essentials of this new technology. This  
edition introduces newer topics and  
offers deeper treatments than those  
included in the first. Revised many times  
over many years, it will greatly aid  
engineers, students, researchers, and  
other professionals who are working in  
automotive-related industries, as well as  
those in government and academia.  
**Electric and Hybrid Vehicles** CRC  
Press

The latest developments in the field of  
hybrid electric vehicles Hybrid Electric  
Vehicles provides an introduction to  
hybrid vehicles, which include purely  
electric, hybrid electric, hybrid hydraulic,  
fuel cell vehicles, plug-in hybrid electric,  
and off-road hybrid vehicular systems. It  
focuses on the power and propulsion  
systems for these vehicles, including  
issues related to power and energy  
management. Other topics covered  
include hybrid vs. pure electric, HEV  
system architecture (including plug-in &  
charging control and hydraulic), off-road  
and other industrial utility vehicles,  
safety and EMC, storage technologies,  
vehicular power and energy  
management, diagnostics and  
prognostics, and electromechanical  
vibration issues. Hybrid Electric Vehicles,

Second Edition is a comprehensively updated new edition with four new chapters covering recent advances in hybrid vehicle technology. New areas covered include battery modelling, charger design, and wireless charging. Substantial details have also been included on the architecture of hybrid excavators in the chapter related to special hybrid vehicles. Also included is a chapter providing an overview of hybrid vehicle technology, which offers a perspective on the current debate on sustainability and the environmental impact of hybrid and electric vehicle technology. Completely updated with new chapters Covers recent developments, breakthroughs, and technologies, including new drive topologies Explains HEV fundamentals

and applications Offers a holistic perspective on vehicle electrification Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, Second Edition is a great resource for researchers and practitioners in the automotive industry, as well as for graduate students in automotive engineering.

*Advanced Hybrid and Electric Vehicles*  
CRC Press

"In this book recent developments, future outlook, advanced and analytical modeling techniques of smart electric and hybrid vehicles are explained with examples backed by experimental and numerical data. It also discusses the integration of newer developments like digital twin, artificial intelligence, Nature inspired algorithms, Internet of Things,

role of Industry 4.0 in advancements in vehicle engineering. It compiles overall aspects of advancements in smart electric and hybrid vehicles by bringing the latest research and development by comprehensive range of mathematical, numerical and simulation modeling, and management techniques to strengthen the engineering science and technological developments for future. This book: This book focuses on contemporary aspects of smart electric and hybrid vehicles techniques for new means and models for green environment. Discusses the role of artificial intelligence, machine learning, and machine vision tools in smart electric and hybrid vehicles. Presents design and analysis of charging stations and their sustainability roadmap for

smart electric vehicles. Highlights the cyber and functional security of intelligent and hybrid vehicles. Explains diagnostics, prognostics, reliability, and durability issues in smart electric and hybrid vehicles. Covers Internet of things-based battery and charging management approach and effect of voltage drop in charging capacity of smart electric vehicles. It is primarily written for senior undergraduate, graduate students, and academic researchers in the fields of electrical engineering, electronics and communication engineering, computer engineering, and automotive engineering"--

Overviews and Viewpoints John Wiley & Sons

Lightweight Electric/Hybrid Vehicle

Design covers the particular automotive design approach required for hybrid/electrical drive vehicles. There is currently huge investment world-wide in electric vehicle propulsion, driven by concern for pollution control and depleting oil resources. The radically different design demands of these new vehicles requires a completely new approach that is covered comprehensively in this book. The book explores the rather dramatic departures in structural configuration necessary for purpose-designed electric vehicle including weight removal in the mechanical systems. It also provides a comprehensive review of the design process in the electric hybrid drive and energy storage systems. Ideal for automotive engineering students and

professionals **Lightweight Electric/Hybrid Vehicle Design** provides a complete introduction to this important new sector of the industry. Comprehensive coverage of all design aspects of electric/hybrid cars in a single volume Packed with case studies and applications In-depth treatment written in a text book style (rather than a theoretical specialist text style)

**Propulsion Systems for Hybrid Vehicles** CRC Press

An advanced level introductory book covering fundamental aspects, design and dynamics of electric and hybrid electric vehicles There is significant demand for an understanding of the fundamentals, technologies, and design of electric and hybrid electric vehicles and their components from researchers,



engineers, and graduate students. Although there is a good body of work in the literature, there is still a great need for electric and hybrid vehicle teaching materials. *Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach* is based on the authors' current research in vehicle systems and will include chapters on vehicle propulsion systems, the fundamentals of vehicle dynamics, EV and HEV technologies, chassis systems, steering control systems, and state, parameter and force estimations. The book is highly illustrated, and examples will be given throughout the book based on real applications and challenges in the automotive industry. Designed to help a new generation of engineers needing to master the principles of and

further advances in hybrid vehicle technology. Includes examples of real applications and challenges in the automotive industry with problems and solutions. Takes a mechatronics approach to the study of electric and hybrid electric vehicles, appealing to mechanical and electrical engineering interests. Responds to the increase in demand of universities offering courses in newer electric vehicle technologies. [Hybrid Electric Vehicle System Modeling and Control](#) Springer. Fully updated throughout, *Electric Vehicle Technology, Second Edition*, is a complete guide to the principles, design and applications of electric vehicle technology. Including all the latest advances, it presents clear and comprehensive coverage of the major

aspects of electric vehicle development and offers an engineering-based evaluation of electric motor scooters, cars, buses and trains. This new edition includes: important new chapters on types of electric vehicles, including pickup and linear motors, overall efficiencies and energy consumption, and power generation, particularly for zero carbon emissions expanded chapters updating the latest types of EV, types of batteries, battery technology and other rechargeable devices, fuel cells, hydrogen supply, controllers, EV modeling, ancillary system design, and EV and the environment brand new practical examples and case studies illustrating how electric vehicles can be used to substantially reduce carbon emissions and cut down reliance on

fossil fuels futuristic concept models, electric and high-speed trains and developments in magnetic levitation and linear motors an examination of EV efficiencies, energy consumption and sustainable power generation. MATLAB® examples can be found on the companion website [www.wiley.com/go/electricvehicle2e](http://www.wiley.com/go/electricvehicle2e) Explaining the underpinning science and technology, this book is essential for practicing electrical, automotive, power, control and instrumentation engineers working in EV research and development. It is also a valuable reference for academics and students in automotive, mechanical, power and electrical engineering.

**Hybrid Electric Vehicle Design and Control: Intelligent Omnidirectional**

**Hybrids** SAE International

Air quality is deteriorating, the globe is warming, and petroleum resources are decreasing. The most promising solutions for the future involve the development of effective and efficient drive train technologies. This comprehensive volume meets this challenge and opportunity by integrating the wealth of disparate information found in scattered papers.

*Lightweight Electric/Hybrid Vehicle Design*

John Wiley & Sons

Build state-of-the-art intelligent omnidirectional HEVs Engineer high-performance, low-emission automobiles by overcoming traditional obstacles and efficiently harnessing energy from multiple sources. Hybrid Electric Vehicle Design and Control features complete

coverage of all electrical, mechanical, and software components. Find out how to develop fast-charging battery systems, efficiently manage power, implement independent steering and force control, and enhance driving stability and controllability. This comprehensive guide offers detailed modeling, testing, and tuning techniques and provides an overview of emerging developments in hybrid technologies. Coverage includes: 4WIS and 4WID hardware and software Hybrid vehicle design structures Zero-radius turning and lateral parking Steer-by-wire and extended steering Behavior-based and zero-radius steering Traction force distribution and stability Battery, energy, and power management systems Cell equalization and fast-charging control

MPC, load forecasting, and neural network classification Best performance techniques

**Introduction to Hybrid Vehicle System Modeling and Control** CRC Press

Hybrid Electric Vehicle Technology provides foundational information about vehicles that use more than one propulsion technology to power a drive system. This textbook is filled with technical illustrations and concise descriptions of the different configurations and vehicle platforms, the operation of various systems and the technologies involved, and the maintenance of hybrid electric vehicles. Safety precautions required used when working around high-voltage vehicle systems, especially in emergencies, are

highlighted.

*Lightweight Electric/Hybrid Vehicle Design* John Wiley & Sons

A timely comprehensive reference consolidates the research and development of electric vehicle machines and drives for electric and hybrid propulsions • Focuses on electric vehicle machines and drives • Covers the major technologies in the area including fundamental concepts and applications • Emphasis the design criteria, performance analyses and application examples or potentials of various motor drives and machine systems • Accompanying website includes the simulation models and outcomes as supplementary material

**Hybrid-Powered Vehicles** SAE International

Thoroughly updated to encompass the significant technological advances since the publication of the first edition, *Electric and Hybrid Vehicles: Design Fundamentals, Second Edition* presents the design fundamentals, component sizing, and systems interactions of alternative vehicles. This new edition of a widely praised, bestselling textbook maintains the comprehensive, systems-level perspective of electric and hybrid vehicles while covering the hybrid architectures and components of the vehicle in much greater detail. The author emphasizes technical details, mathematical relationships, and design guidelines throughout the text. New to the Second Edition New chapters on sizing and design guidelines for various hybrid architectures, control strategies

for hybrid vehicles, powertrain component cooling systems, and in-vehicle communication methods New sections on modeling of energy storage components, tire-road force mechanics, compressed air-storage, DC/DC converters, emission control systems, electromechanical brakes, and vehicle fuel economy Reorganization of power electronics, electric machines, and motor drives sections Enhanced sections on mechanical components that now include more technical descriptions and example problems An emphasis on the integration of mechanical and electrical components, taking into account the interdisciplinary nature of automotive engineering As an advisor to the University of Akron's team in the Challenge X: Crossover to Sustainable

Mobility, Dr. Husain knows first-hand how to teach students both the fundamentals and cutting-edge technologies of the next generation of automotives. This text shows students how electrical and mechanical engineers must work together to complete an alternative vehicle system. It empowers them to carry on state-of-the-art research and development in automotive engineering in order to meet today's needs of clean, efficient, and sustainable vehicles.

Hybrid Electric Vehicles CRC Press

With production and planning for new electric vehicles gaining momentum worldwide, this book - the first in a series of five volumes on this subject - provides engineers and researchers with perspectives on the most current and

innovative developments regarding electric and hybrid-electric vehicle technology, design considerations, and components. This book features 12 SAE technical papers, published from 2008 through 2010, that provide an overview of research on topics such as: The CO<sub>2</sub> benefits of electrification The effects of aggressive driving behavior Heat recovery in hybrid vehicles The impact of drive cycles on PHEV component requirements Energy management strategies using game theory and other approaches

**Electric and Hybrid Vehicles** CRC Press

Hybrid Powered Vehicles, 2nd Edition builds on the original edition's exploration of hybrid components, system engineering, design constraints,

challenges, and opportunities of hybrid vehicles. Since the first edition was published in 2003, hybrid vehicles have seen major technical developments and have gained significant market share. This book provides the reader with a thorough yet accessible understanding of the latest hybrid technology developments, along with keen insight into the market forces shaping the technology and a look at what lies ahead. Author John German reviews the development history of hybrid vehicles and the current state of hybrid technology, including battery types and chemistries. He also highlights the cycles of fuel availability, fuel economy, and concern for environmental issues, and profiles government efforts to spur development of more efficient vehicles.

Future enhancements, including more sophisticated hybrid control strategies and integrating additional electrical components to improve efficiency, are also featured. Cost reduction, being a major barrier to mass market adoption, is also discussed. Finally, future sales and market forecasts are offered, including the belief that hybrid sales will rapidly increase after approximately 2020 and will capture about 75% of the market by about 2030. Topics include: Transitional Technology or Ultimate Solution Design Components Design Constraints Plug-In Hybrid Design Hybrid System Optimization Customer Acceptance Future Development Future Conventional Hybrid and PHEV Markets *Batteries* SAE International Automobiles have played an important

role in the shaping of the human civilization for over a century and continue to play a crucial role today. The design, construction, and performance of automobiles have evolved over the years. For many years, there has been a strong shift toward electrification of automobiles. It started with the by-wire systems where more efficient electro-mechanical subsystems started replacing purely mechanical devices, e.g., anti-lock brakes, drive-by-wire, and cruise control. Over the last decade, driven by a strong push for fuel efficiency, pollution reduction, and environmental stewardship, electric and hybrid electric vehicles have become quite popular. In fact, almost all the automobile manufacturers have adopted strategies and launched vehicle models

that are electric and/or hybrid. With this shift in technology, employers have growing needs for new talent in areas such as energy storage and battery technology, power electronics, electric motor drives, embedded control systems, and integration of multi-disciplinary systems. To support these needs, universities are adjusting their programs to train students in these new areas of expertise. For electric and hybrid technology to deliver superior performance and efficiency, all subsystems have to work seamlessly and in unison every time and all the time. To ensure this level of precision and reliability, modeling and simulation play crucial roles during the design and development cycle of electric and hybrid vehicles. Simscape, a Matlab/Simulink



toolbox for modeling physical systems, is an ideally suited platform for developing and deploying models for systems and sub-systems that are critical for hybrid and electric vehicles. This text will focus on guiding the reader in the development of models for all critical areas of hybrid and electric vehicles. There are numerous texts on electric and hybrid vehicles in the market right now. A majority of these texts focus on the relevant technology and the physics and engineering of their operation. In contrast, this text focuses on the application of some of the theories in developing models of physical systems that are at the core of hybrid and electric vehicles. Simscape is the tool of choice for the development of these models. Relevant background and appropriate

theory are referenced and summarized in the context of model development with significantly more emphasis on the model development procedure and obtaining usable and accurate results.

### **Electric Vehicle Design** Elsevier

A thoroughly revised third edition of this widely praised, bestselling textbook presents a comprehensive systems-level perspective of electric and hybrid vehicles with emphasis on technical aspects, mathematical relationships and basic design guidelines. The emerging technologies of electric vehicles require the dedication of current and future engineers, so the target audience for the book is the young professionals and students in engineering eager to learn about the area. The book is concise and clear, its mathematics are kept to a

necessary minimum and it contains a well-balanced set of contents of the complex technology. Engineers of multiple disciplines can either get a broader overview or explore in depth a particular aspect of electric or hybrid vehicles. Additions in the third edition include simulation-based design analysis of electric and hybrid vehicles and their powertrain components, particularly that of traction inverters, electric machines and motor drives. The technology trends to incorporate wide bandgap power electronics and reduced rare-earth permanent magnet electric machines in the powertrain components have been highlighted. Charging stations are a critical component for the electric vehicle infrastructure, and hence, a chapter on vehicle interactions with the

power grid has been added. Autonomous driving is another emerging technology, and a chapter is included describing the autonomous driving system architecture and the hardware and software needs for such systems. The platform has been set in this book for system-level simulations to develop models using various softwares used in academia and industry, such as MATLAB®/Simulink, PLECS, PSIM, Motor-CAD and Altair Flux. Examples and simulation results are provided in this edition using these software tools. The third edition is a timely revision and contribution to the field of electric vehicles that has reached recently notable markets in a more and more environmentally sensitive world. Overviews and Viewpoints CRC Press  
Electric and Hybrid Vehicles: Power

Sources, Models, Sustainability, Infrastructure and the Market reviews the performance, cost, safety, and sustainability of battery systems for hybrid electric vehicles (HEVs) and electric vehicles (EVs), including nickel-metal hydride batteries and Li-ion batteries. Throughout this book, especially in the first chapters, alternative vehicles with different power trains are compared in terms of lifetime cost, fuel consumption, and environmental impact. The emissions of greenhouse gases are particularly dealt with. The improvement of the battery, or fuel cell, performance and governmental incentives will play a fundamental role in determining how far and how substantial alternative vehicles will penetrate into the market. An adequate recharging

infrastructure is of paramount importance for the diffusion of vehicles powered by batteries and fuel cells, as it may contribute to overcome the so-called range anxiety." Thus, proposed battery charging techniques are summarized and hydrogen refueling stations are described. The final chapter reviews the state of the art of the current models of hybrid and electric vehicles along with the powertrain solutions adopted by the major automakers. Contributions from the world's leading industry and research experts Executive summaries of specific case studies Information on basic research and application approaches

**Hybrid Electric Vehicle Design and Control: Intelligent Omnidirectional Hybrids** John Wiley & Sons

This new edition includes approximately 30% new materials covering the following information that has been added to this important work: extends the contents on Li-ion batteries detailing the positive and negative electrodes and characteristics and other components including binder, electrolyte, separator and foils, and the structure of Li-ion battery cell. Nickel-cadmium batteries are deleted. adds a new section presenting the modelling of multi-mode electrically variable transmission, which gradually became the main structure of the hybrid power-train during the last 5 years. newly added chapter on noise and vibration of hybrid vehicles introduces the basics of vibration and noise issues associated with power-train, driveline and vehicle vibrations, and addresses

control solutions to reduce the noise and vibration levels. Chapter 10 (chapter 9 of the first edition) is extended by presenting EPA and UN newly required test drive schedules and test procedures for hybrid electric mileage calculation for window sticker considerations. In addition to the above major changes in this second edition, adaptive charging sustaining point determination method is presented to have a plug-in hybrid electric vehicle with optimum performance.

Hybrid Electric Vehicles John Wiley & Sons

In this book, recent developments, the future outlook, and advanced and analytical modeling techniques of smart electric and hybrid vehicles are explained with examples backed by

experimental and numerical data. It also discusses the integration of newer developments like digital twin, artificial intelligence, nature-inspired algorithms, Internet of Things, and the role of Industry 4.0 in advancements in vehicle engineering. It compiles overall aspects of advancements in smart electric and hybrid vehicles by bringing the latest research and development by comprehensive range of mathematical, numerical, and simulation modeling, and management techniques to strengthen the engineering science and technological developments for the future. Features:

- This book focuses on contemporary aspects of smart electric and hybrid vehicles techniques for new means and models for green environment.
- Discusses the role of

artificial intelligence, machine learning, and machine vision tools in smart electric and hybrid vehicles.

- Presents design and analysis of charging stations and their sustainability roadmap for smart electric vehicles.
- Highlights the cyber and functional security of intelligent and hybrid vehicles.
- Explains diagnostics, prognostics, reliability, and durability issues in smart electric and hybrid vehicles.
- Covers the Internet of Things-based battery and charging management approach and effect of voltage drop in charging capacity of smart electric vehicles. It is primarily written for senior undergraduates, graduate students, and academic researchers in the fields of electrical engineering, electronics and communication engineering, computer

engineering, and automotive engineering.

Electric and Hybrid Vehicles KHANNA PUBLISHING HOUSE

With production and planning for new electric vehicles gaining momentum worldwide, this book – the first in a series of five volumes on this subject – provides engineers and researchers with perspectives on the most current and innovative developments regarding electric and hybrid-electric vehicle

technology, design considerations, and components. This book features 12 SAE technical papers, published from 2008 through 2010, that provide an overview of research on topics such as: The CO2 benefits of electrification The effects of aggressive driving behavior Heat recovery in hybrid vehicles The impact of drive cycles on PHEV component requirements Energy management strategies using game theory and other approaches