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**Smart Charging of Electric and Plug-in Hybrid Vehicles Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, Third Edition Hybrid Electric Vehicle Design and Control: Intelligent Omnidirectional Hybrids The Electric Car *Electric and Hybrid Vehicles* The Guide to Electric, Hybrid & Fuel-Efficient Cars Multiphase Hybrid Electric Machines Hybrid, Electric, and Fuel-Cell Vehicles Hybrid Electric Vehicle Technology Lightweight Electric/Hybrid Vehicle Design Advanced Hybrid and Electric Vehicles Hybrid**

**Electric Vehicle Design and Control: Intelligent Omnidirectional Hybrids Overviews and Viewpoints *Hybrid Electric Power Train Engineering and Technology: Modeling, Control, and Simulation* Electric and Plug-in Hybrid Vehicle Networks *Energy Efficient Non-Road Hybrid Electric Vehicles Hybrid Electric Vehicle System Modeling and Control* Why **Plug-In Hybrid Electric Vehicles Are The Best Type Of Vehicles, Why Natural Gas Vehicles Do Not Warrant The Cost, Why Electric Cars Do Not Warrant The Cost, And The Ample Problems With Buying An****

**Electric Vehicle Electric Vehicles and the Future of Energy Efficient Transportation Electric & Hybrid Vehicles Electric and Hybrid-Electric Vehicles**

This book chronicles recent advances in electric and hybrid-electric vehicles and looks ahead to the future potential of these vehicles. Featuring SAE technical papers -- plus articles from Automotive Engineering International magazine -- from 1997-2001, *Electric and Hybrid Electric Vehicles* provides coverage of topics such as: Lithium-Ion Batteries Regenerative Braking Fuel Economy

Transmissions Fuel Cell Technology Hydrogen-Fueled Engines And many more Electric and hybrid-electric activities at companies such as Nissan, Mercedes-Benz, Ford, Dodge, and Toyota are also covered. The electric vehicle market has been gradually gaining prominence in the world due to the rise in pollution levels caused by traditional IC engine-based vehicles. The advantages of electric vehicles are multi-pronged in terms of cost, energy efficiency, and environmental impact. The running and maintenance cost are considerably less than traditional models. The

harmful exhaust emissions are reduced, besides the greenhouse gas emissions, when the electric vehicle is supplied from a renewable energy source. However, apart from some Western nations, many developing and underdeveloped countries have yet to take up this initiative. This lack of enthusiasm has been primarily attributed to the capital investment required for charging infrastructure and the slow transition of energy generation from the fossil fuel to the renewable energy format. Currently, there are very few charging stations, and the construction of the

same needs to be ramped up to supplement the growth of electric vehicles. Grid integration issues also crop up when the electric vehicle is used to either do supply addition to or draw power from the grid. These problems need to be fixed at all the levels to enhance the future of energy efficient transportation. Electric Vehicles and the Future of Energy Efficient Transportation explores the growth and adoption of electric vehicles for the purpose of sustainable transportation and presents a critical analysis in terms of the economics, technology, and environmental perspectives of

electric vehicles. The chapters cover the benefits and limitations of electric vehicles, techno-economic feasibility of the technologies being developed, and the impact this has on society. Specific points of discussion include electric vehicle architecture, wireless power transfer, battery management, and renewable resources. This book is of interest for individuals in the automotive sector and allied industries, policymakers, practitioners, engineers, technicians, researchers, academicians, and students looking for updated information on the

technology, economics, policy, and environmental aspects of electric vehicles. 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. This book provides an insight into the design, modeling, control, and application of multiphase hybrid permanent magnet machines for electrified powertrains in

electric and hybrid electric vehicles. The authors present an overview of electric and hybrid electric vehicles, hybrid electric machine topologies, hybrid permanent magnet (HPM) machine design, multiphase hybrid machines, operation of multiphase generators in series hybrid electric vehicles (SHEV), and machine hardware build-up and testing. Readers will gain an understanding of multiphase machine configuration, their design, control, and recent applications, along with the benefits they provide, and learn general design steps, prototyping, and hardware build-up processes of

multiphase electric machines. *Multiphase Hybrid Electric Machines: Applications for Electrified Powertrains* will be a valuable reference for undergraduate and graduate students, researchers, and practicing engineers, working on electric/hybrid electric vehicles, as well as electric machine applications in renewable energy systems specifically wind turbines, HVAC systems, robotics, and aerospace industry. *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. 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. A Step-by-Step Guide to Building a Plug-In Hybrid Electric

Vehicle from the Ground Up Written by clean energy guru and electric vehicle expert Seth Leitman, this hands-on guide gives you the latest technical information and easy-to-follow instructions for building a plug-in hybrid electric vehicle (PHEV). "Written by Seth Leitman, longtime green vehicle/sustainability expert and author of "Build Your Own Electric Vehicle," this 275-page book provides an overview of the technology and the issues in doing a conversion, and it works well as a different way in to the open source material that can be found at [v.org or the easier-to-remember <http://www.priusplus.org>." -- CalCars.org Build Your Own Plug-In Hybrid Electric Vehicle puts you in the driver's seat when it comes to hitting the road in a reliable, economical, and environmentally friendly ride. Inside, you'll find complete details on the hybrid powertrain and all the required components, including the motor, battery, and chassis. The book covers the plug-in hybrids currently on the market as well as hybrid conversion companies, conversion kits, and related resources. Pictures, diagrams, charts, and graphs](http://www.eaa-phe</a></p></div><div data-bbox=)

illustrate each step along the way. With this how-to guide on hand, you'll be behind the wheel of your own plug-in hybrid electric automobile in no time! Build Your Own Plug-In Hybrid Electric Vehicle covers: Energy savings and environmental benefits PHEV background Drivetrain components and design Chassis selection DC and AC motor types Batteries and chargers The conversion process Licensing and insurance Safety, maintenance, troubleshooting, and warranties Clubs and associations Additional resources 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. 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. 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: 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 worlds leading industry and research experts Executive summaries of specific case studies Information on basic research and application approaches This book is a printed edition of the Special Issue "Emerging Technologies for Electric and Hybrid Vehicles" that was published in

energies This essay sheds light on why plug-in hybrid electric vehicles are the best type of vehicles and elucidates why natural gas vehicles do not warrant the cost. Moreover, why electric cars do not warrant the cost is delineated and the ample problems with buying an electric vehicle are explicated in this essay. Furthermore, the criteria for how to determine if buying a car is worth the investment is demystified and how to earn substantial money online so that you can afford to finance your plug-in hybrid electric vehicle purchase is expounded upon in this essay. While it

may seem far fetched, plug-in hybrid electric vehicles are the utmost best type of vehicles available for sale on the car market in the digital era. Succinctly stated, plug-in hybrid electric vehicles are the utmost best type of vehicles since they can operate off electric power or gasoline, unlike other types of vehicles. "The reason that hybrid vehicles are more efficient than conventional gasoline-only vehicles is because they have the ability to 'reclaim' energy that was once wasted, for example, the energy used when braking" ("Plug In Hybrid," 2012). Regenerative

braking for instance allows plug-in hybrid electric vehicles to partially recharge their battery pack. Regenerative braking can be exhibited enroute and helps prolong the vehicle's driving duration before the plug-in hybrid electric vehicle becomes rendered inoperable. In stark contrast to a typical hybrid vehicle, the plug-in hybrid electric vehicle has the highly pragmatic ability to be recharged "by connecting it to a wall outlet in your home or elsewhere" ("Plug In Hybrid," 2012). More customers are beginning to take heed of the possibility of procuring a plug-in hybrid electric

vehicles. It is far more affordable it is to operate a car off of wattage as opposed to gasoline. Customers can even convert their existing hybrid vehicles into plug-in hybrid electric vehicles. This process involves going to an auto body shop so that vehicular modifications can allow their hybrid vehicle to be able to be recharged when connected into "a wall outlet in your home or elsewhere" ("Plug In Hybrid," 2012). In order for a hybrid vehicle to become a plug-in hybrid electric vehicle, an auto mechanic will need to "add extra batteries into the vehicle in order to improve the

hybrid's electrical holding capacity and will also need to add a 'jack' ("Plug In Hybrid," 2012) so that it can connect "to the power grid" ("Plug In Hybrid," 2012). Even though converting a hybrid vehicle into a plug-in hybrid electric vehicle can be very costly, it is an expenditure worth paying if you profusely utilize your vehicle. Plug-in hybrid electric vehicles offer a host of benefits to vehicle owners. "The extra battery capacity of the plug-in hybrid is the key to reaping the benefits of the plug-in hybrid electric vehicle configuration. On a conventional hybrid car, that kind of extra capacity is out

of reach since the hybrid vehicle never fully charges except on long freeway trips. By adding the plug in jack with the extra battery, the plug-in hybrid electric vehicle has the ability to use its extra capacity by running on all-electric mode for an extended range of 30 miles or more. That means that instead of depleting expensive gasoline, the car uses electrical energy which is much cheaper. Since most trips are less than 30 miles, that means the vehicle can operate in-town without ever using a drop of gasoline" ("Plug In Hybrid," 2012). Plug-in hybrid electric vehicles discharge minimal tailpipe

emissions relative to conventional gasoline powered vehicles. This means that they help reduce mankind's carbon footprint and decelerate the rate of climate change due to a reduction of carbon dioxide emissions in the atmosphere. Furthermore, by owning a plug-in hybrid electric vehicle you are less dependent on needing gasoline to fuel your vehicle than most vehicle owners. Fortunately, a plug-in hybrid vehicles can operate off of electricity. 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) "This book is an introduction to automotive technology, with

specific reference to battery electric, hybrid electric, and fuel cell electric vehicles. It could serve electrical engineers who need to know more about automobiles or automotive engineers who need to know about electrical propulsion systems. For example, this reviewer, who is a specialist in electric machinery, could use this book to better understand the automobiles for which the reviewer is designing electric drive motors. An automotive engineer, on the other hand, might use it to better understand the nature of motors and electric storage systems for application in automobiles, trucks

or motorcycles. The early chapters of the book are accessible to technically literate people who need to know something about cars. While the first chapter is historical in nature, the second chapter is a good introduction to automobiles, including dynamics of propulsion and braking. The third chapter discusses, in some detail, spark ignition and compression ignition (Diesel) engines. The fourth chapter discusses the nature of transmission systems." —James Kirtley, Massachusetts Institute of Technology, USA "The third edition covers extensive topics in modern

electric, hybrid electric, and fuel cell vehicles, in which the profound knowledge, mathematical modeling, simulations, and control are clearly presented. Featured with design of various vehicle drivetrains, as well as a multi-objective optimization software, it is an estimable work to meet the needs of automotive industry.” —Haiyan Henry Zhang, Purdue University, USA “The extensive combined experience of the authors have produced an extensive volume covering a broad range but detailed topics on the principles, design and architectures of

Modern Electric, Hybrid Electric, and Fuel Cell Vehicles in a well-structured, clear and concise manner. The volume offers a complete overview of technologies, their selection, integration & control, as well as an interesting Technical Overview of the Toyota Prius. The technical chapters are complemented with example problems and user guides to assist the reader in practical calculations through the use of common scientific computing packages. It will be of interest mainly to research postgraduates working in this eld as well as established academic

researchers, industrial R&D engineers and allied professionals.” —Christopher Donaghy-Sparg, Durham University, United Kingdom The book deals with the fundamentals, theoretical bases, and design methodologies of conventional internal combustion engine (ICE) vehicles, electric vehicles (EVs), hybrid electric vehicles (HEVs), and fuel cell vehicles (FCVs). The design methodology is described in mathematical terms, step-by-step, and the topics are approached from the overall drive train system, not just individual components.



Furthermore, in explaining the design methodology of each drive train, design examples are presented with simulation results. All the chapters have been updated, and two new chapters on Mild Hybrids and Optimal Sizing and Dimensioning and Control are also included • Chapters updated throughout the text. • New homework problems, solutions, and examples. • Includes two new chapters. • Features accompanying MATLABM software. 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 and hybrid vehicles have been globally identified to be the most environmental friendly road transportation. Energy Systems for Electric and Hybrid Vehicles provides comprehensive coverage of the three main energy system technologies of these vehicles - energy sources, battery charging and vehicle-to-grid systems. Electric vehicles are changing transportation dramatically and this unique book merges the many disciplines that contribute research to make EV

possible, so the reader is informed about all the underlying science and technologies driving the change. An emission-free mobility system is the only way to save the world from the greenhouse effect and other ecological issues. This belief has led to a tremendous growth in the demand for electric vehicles (EV) and hybrid electric vehicles (HEV), which are predicted to have a promising future based on the goals fixed by the European Commission's Horizon 2020 program. This book brings together the research that has been carried out in the EV/HEV sector and the leading role of advanced

optimization techniques with artificial intelligence (AI). This is achieved by compiling the findings of various studies in the electrical, electronics, computer, and mechanical domains for the EV/HEV system. In addition to acting as a hub for information on these research findings, the book also addresses the challenges in the EV/HEV sector and provides proven solutions that involve the most promising AI techniques. Since the commercialization of EVs/HEVs still remains a challenge in industries in terms of performance and

cost, these are the two tradeoffs which need to be researched in order to arrive at an optimal solution. Therefore, this book focuses on the convergence of various technologies involved in EVs/HEVs. Since all countries will gradually shift from conventional internal combustion (IC) engine-based vehicles to EVs/HEVs in the near future, it also serves as a useful reliable resource for multidisciplinary researchers and industry teams. Hybridization is an increasingly popular paradigm in the auto industry, but one that is not fully understood by car

manufacturers. In general, hybrid electric vehicles (HEV) are designed without regard to the mechanics of the power train, which is developed similarly to its counterparts in internal combustion engines. Hybrid Electric Power Train Engineering and Technology: Modeling, Control, and Simulation provides readers with an academic investigation into HEV power train design using mathematical modeling and simulation of various hybrid electric motors and control systems. This book explores the construction of the most energy efficient power trains, which is of importance to

designers, manufacturers, and students of mechanical engineering. This book is part of the Research Essentials collection. This SpringerBrief deals with the control and optimization problem in hybrid electric vehicles. Given that there are two (or more) energy sources (i.e., battery and fuel) in hybrid vehicles, it shows the reader how to implement an energy-management strategy that decides how much of the vehicle's power is provided by each source instant by instant. Hybrid Electric Vehicles: •introduces methods for modeling energy flow in hybrid

electric vehicles; •presents a standard mathematical formulation of the optimal control problem; •discusses different optimization and control strategies for energy management, integrating the most recent research results; and •carries out an overall comparison of the different control strategies presented. Chapter by chapter, a case study is thoroughly developed, providing illustrative numerical examples that show the basic principles applied to real-world situations. The brief is intended as a straightforward tool for learning quickly about state-of-the-

art energy-management strategies. It is particularly well-suited to the needs of graduate students and engineers already familiar with the basics of hybrid vehicles but who wish to learn more about their control strategies. 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 This contributed volume contains the results of the research program “Agreement for Hybrid and Electric Vehicles”, developed in the framework of the Energy Technology

Network of the International Energy Agency. The topical focus lies on technology options for the system optimization of hybrid and electric vehicle components and drive train configurations which enhance the energy efficiency of the vehicle. The approach to the topic is genuinely interdisciplinary, covering insights from fields. The target audience primarily comprises researchers and industry experts in the field of automotive engineering, but the book may also be beneficial for graduate students. 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 Climate change, urban air quality, and dependency on

crude oil are important societal challenges. In the transportation sector especially, clean and energy efficient technologies must be developed. Electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs) have gained a growing interest in the vehicle industry. Nowadays, the commercialization of EVs and PHEVs has been possible in different applications (i.e., light duty, medium duty, and heavy duty vehicles) thanks to the advances in energy storage systems, power electronics converters (including DC/DC converters, DC/AC inverters, and

battery charging systems), electric machines, and energy efficient power flow control strategies. This book is based on the Special Issue of the journal Applied Sciences on "Plug-In Hybrid Electric Vehicles (PHEVs)". This collection of research articles includes topics such as novel propulsion systems, emerging power electronics and their control algorithms, emerging electric machines and control techniques, energy storage systems, including BMS, and efficient energy management strategies for hybrid propulsion, vehicle-to-grid (V2G), vehicle-to-home (V2H), grid-to-vehicle (G2V)

technologies, and wireless power transfer (WPT) systems. Considerable work has gone into electric car and battery development in the last ten years, with the prospect of substantial improvements in range and performance in battery cars as well as in hybrids and those using fuel cells. This book covers the development of electric cars, from their early days, to new hybrid models in production. Most of the coverage is focused on the very latest technological issues faced by automotive engineers working on electric cars, as well as the key business factors

vital for the successful transfer of electric cars into the mass market. Electric and hybrid vehicles are now the present, not the future. This straightforward and highly illustrated full colour textbook is endorsed by the Institute of the Motor Industry, and introduces the subject for further education and undergraduate students as well as technicians. This new edition includes a new section on diagnostics and completely updated case studies. It covers the different types of electric vehicle, costs and emissions, and the charging infrastructure, before moving on to explain how hybrid

and electric vehicles work. A chapter on electrical technology introduces learners to subjects such as batteries, control systems and charging which are then covered in more detail within their own chapters. The book also covers the maintenance and repair procedures of these vehicles, including fault finding, servicing, repair and first-responder information. Clear diagrams, photos and flow charts outline the charging infrastructure, how EV technology works, and how to repair and maintain hybrid and electric vehicles. Optional IMI online

eLearning materials enable students to study the subject further and test their knowledge. It is particularly suitable for students studying towards IMI Level 2 Award in Hybrid Electric Vehicle Operation and Maintenance, IMI Level 3 Award in Hybrid Electric Vehicle Repair and Replacement, IMI Accreditation, C&G and other EV/Hybrid courses. Passionate about sustainable development? Introducing the world's first guide to electric cars! In the first edition of what promises to be the new bestseller in the world of cars, our authors explain the latest on electric vehicles. Speaking to

amateurs and more seasoned enthusiasts alike, our two experts answer all your questions: how do you recharge and service an electric vehicle? Are electric cars built for North American winters? Can you even drive on electricity every day of the week? Do you really save money when you go electric? Do electric vehicles have the speed you need? Would a hydrogen car be a wiser choice? Are the batteries in electric cars harmful to the environment—are they dangerous like the oil companies say? Does the government chip in when you buy an electric vehicle? Jacques Duval and Daniel Breton have

tested over 70 different models that are on the market now or will be in a matter of months. They get down to the nitty-gritty with in-depth commentary from page one. Learn all there is to know about tech features, pricing, energy consumption stats, greenhouse gas emissions and pollutants. Just fifteen years ago, electric cars were a novelty—now, they're becoming increasingly central to the automobile industry. Soon, the entire world will turn to this eco-friendly mode of transportation! This illustrated history chronicles electric and hybrid cars from the late 19th century to today's fuel cell and plug-in

automobiles. It describes the politics, technology, marketing strategies, and environmental issues that have impacted electric and hybrid cars' research and development. The important marketing shift from a "woman's car" to "going green" is discussed. Milestone projects and technologies such as early batteries, hydrogen and bio-mass fuel cells, the upsurge of hybrid vehicles, and the various regulations and market forces that have shaped the industry are also covered. The topics of interest in this book include significant challenges in the BMS design of

EV/HEV. The equivalent models developed for several types of integrated Li-ion batteries consider the environmental temperature and ageing effects. Different current profiles for testing the robustness of the Kalman filter type estimators of the battery state of charge are used in this book. Additionally, the BMS can integrate a real-time model-based sensor Fault Detection and Isolation (FDI) scheme for a Li-ion cell undergoing degradation, which uses the recursive least squares (RLS) method to estimate the equivalent circuit model (ECM) parameters. This book will fully meet the demands



of a large community of readers and specialists working in the field due to its attractiveness and scientific content with a great openness to the side of practical applicability. This covers various interesting aspects, especially related to the characterization of commercial batteries, diagnosis and optimization of their performance, experimental testing and statistical analysis, thermal modelling, and implementation of the most suitable Kalman filter type estimators of high accuracy to estimate the state of charge This volume of "Encyclopedia of Sustainability Science and

Technology, Second Edition," covers the electrification of vehicles, which is key to a sustainable future of transportation in both light-duty and heavy-duty vehicle sectors to address global concerns of climate change, air pollutant emissions, energy efficiency and energy security. Vehicle electrification includes several existing and emerging technologies and powertrain architectures such as conventional hybrid electric vehicles (HEVs), plug-in hybrids with various electric driving range, short- and long-range battery electric vehicles, as well as hydrogen fuel cell electric

vehicles (FCEVs). Electrification will be key to connected autonomous vehicles, which are perceived to improve mobility, increase safety, reduce energy consumption and infrastructure costs, improve productivity, decrease traffic congestion and increase customer satisfaction. While electrification of vehicle technologies is relatively mature, technology improvement and economies of scale are needed to compete against incumbent technologies and to realize their benefits in the marketplace. Significant infrastructure development is

needed in the case of hydrogen fuel cell vehicles and to a lesser extent for plug-in electric vehicles. Vehicle efficiency improvement is sought through a combination of several approaches, including weight reduction, engine downsizing, increased engine compression ratio with high octane fuels, and the use of compression ignition engines with low octane fuels. Liquid hydrocarbon fuels are needed in applications where high storage energy density is required such as long-haul class-8 combination heavy-duty trucks. Shared mobility is another emerging concept that enables access to

transportation services on an as-needed basis. This approach can enhance accessibility to transportation, decrease number of vehicles on the road, reduce energy use and impact on the environment, reduce cost of transportation and the need for parking, and reduce transportation time between origin and destination. In all, the reader will receive a comprehensive introduction to electric vehicles and technology trends, including energy storage, in light-, medium-, and heavy-duty sectors, as well as the infrastructure development that will be required to realize these

benefits for society. 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. The why, what and how of the electric vehicle powertrain Empowers engineering professionals and students with the knowledge and skills required to engineer electric vehicle powertrain architectures, energy storage systems, power electronics converters and electric drives. The modern electric powertrain is relatively new for the automotive industry, and engineers are challenged with designing affordable, efficient

and high-performance electric powertrains as the industry undergoes a technological evolution. Co-authored by two electric vehicle (EV) engineers with decades of experience designing and putting into production all of the powertrain technologies presented, this book provides readers with the hands-on knowledge, skills and expertise they need to rise to that challenge. This four-part practical guide provides a comprehensive review of battery, hybrid and fuel cell EV systems and the associated energy sources, power electronics,

machines, and drives. The first part of the book begins with a historical overview of electromobility and the related environmental impacts motivating the development of the electric powertrain. Vehicular requirements for electromechanical propulsion are then presented. Battery electric vehicles (BEV), fuel cell electric vehicles (FCEV), and conventional and hybrid electric vehicles (HEV) are then described, contrasted and compared for vehicle propulsion. The second part of the book features in-depth analysis of the electric powertrain traction machines, with a

particular focus on the induction machine and the surface- and interior-permanent magnet ac machines. The brushed dc machine is also considered due to its ease of operation and understanding, and its historical place, especially as the traction machine on NASA's Mars rovers. The third part of the book features the theory and applications for the propulsion, charging, accessory, and auxiliary power electronics converters. Chapters are presented on isolated and non-isolated dc-dc converters, traction inverters, and battery charging. The fourth part

presents the introductory and applied electromagnetism required as a foundation throughout the book. • Introduces and holistically integrates the key EV powertrain technologies. • Provides a comprehensive overview of existing and emerging automotive solutions. • Provides experience-based expertise for vehicular and powertrain system and sub-system level study, design, and optimization. • Presents many examples of powertrain technologies from leading manufacturers. • Discusses the dc traction machines

of the Mars rovers, the ultimate EVs from NASA. • Investigates the environmental motivating factors and impacts of electromobility. • Presents a structured university teaching stream from introductory undergraduate to postgraduate. • Includes real-world problems and assignments of use to design engineers, researchers, and students alike. • Features a companion website with numerous references, problems, solutions, and practical assignments. • Includes introductory material throughout the book for the general scientific

reader. • Contains essential reading for government regulators and policy makers. Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles is an important professional resource for practitioners and researchers in the battery, hybrid, and fuel cell EV transportation industry. The book is a structured holistic textbook for the teaching of the fundamental theories and applications of energy sources, power electronics, and electric machines and drives to engineering undergraduate and postgraduate

students. Textbook Structure and Suggested Teaching Curriculum This is primarily an engineering textbook covering the automotive powertrain, energy storage and energy conversion, power electronics, and electrical machines. A significant additional focus is placed on the engineering design, the energy for transportation, and the related environmental impacts. This textbook is an educational tool for practicing engineers and others, such as transportation policy planners and regulators. The modern automobile is used as the vehicle upon which

to base the theory and applications, which makes the book a useful educational reference for our industry colleagues, from chemists to engineers. This material is also written to be of interest to the general reader, who may have little or no interest in the power electronics and machines. Introductory science, mathematics, and an inquiring mind suffice for some chapters. The general reader can read the introduction to each of the chapters and move to the next as soon as the material gets too advanced for him or her. Part I Vehicles and Energy Sources Chapter 1

Electromobility and the Environment Chapter 2 Vehicle Dynamics Chapter 3 Batteries Chapter 4 Fuel Cells Chapter 5 Conventional and Hybrid Powertrains Part II Electrical Machines Chapter 6 Introduction to Traction Machines Chapter 7 The Brushed DC Machine Chapter 8 Induction Machines Chapter 9 Surface-permanent-magnet AC Machines Chapter 10: Interior-permanent-magnet AC Machines Part III Power Electronics Chapter 11 DC-DC Converters Chapter 12 Isolated DC-DC Converters Chapter 13 Traction Drives and Three-phase Inverters Chapter 14 Battery Charging Chapter

15 Control of the Electric Drive Part IV Basics Chapter 16 Introduction to Electromagnetism, Ferromagnetism, and Electromechanical Energy Conversion The first third of the book (Chapters 1 to 6), plus parts of Chapters 14 and 16, can be taught to the general science or engineering student in the second or third year. It covers the introductory automotive material using basic concepts from mechanical, electrical, environmental, and electrochemical engineering. Chapter 14 on electrical charging and Chapter 16 on electromagnetism can also be used as a general

introduction to electrical engineering. The basics of electromagnetism, ferromagnetism and electromechanical energy conversion (Chapter 16) and dc machines (Chapter 7) can be taught to second year (sophomore) engineering students who have completed introductory electrical circuits and physics. The third year (junior) students typically have covered ac circuit analysis, and so they can cover ac machines, such as the induction machine (Chapter 8) and the surface permanent-magnet ac machine (Chapter 9). As the students typically have studied

control theory, they can investigate the control of the speed and torque loops of the motor drive (Chapter 15). Power electronics, featuring non-isolated buck and boost converters (Chapter 11), can also be introduced in the third year. The final-year (senior) students can then go on to cover the more advanced technologies of the interior-permanent-magnet ac machine (Chapter 10). Isolated power converters (Chapter 12), such as the full-bridge and resonant converters, inverters (Chapter 13), and power-factor-corrected battery chargers (Chapter 14), are covered in the

power electronics section. This material can also be covered at the introductory postgraduate level. Various homework, simulation, and research exercises are presented throughout the textbook. The reader is encouraged to attempt these exercises as part of the learning experience. Instructors are encouraged to contact the author, John Hayes, direct to discuss course content or structure. Introduction. System design and implementation. Four - wheel independent steering control. Battery management system. Energy

management system. Conclusions. This book outlines issues related to massive integration of electric and plug-in hybrid electric vehicles into power grids. Electricity is becoming the preferred energy vector for the next new generation of road vehicles. It is widely acknowledged that road vehicles based on full electric or hybrid drives can mitigate problems related to fossil fuel dependence. This book explains the emerging and understanding of storage systems for electric and plug-in hybrid vehicles. The recharging stations for these types of vehicles might represent a great advantage for the

electric grid by facilitating integration of renewable and distributed energy production. This book presents a broad review from analyzing current literature to on-going research projects about the new power technologies related to the various charging architectures for electric and plug-in hybrid vehicles. Specifically focusing on DC fast charging operations, as well as, grid-connected power converters and the full range of energy storage systems. These key components are analyzed for distributed generation and charging system integration into



micro-grids. The authors demonstrate that these storage systems represent effective interfaces for the control and management of renewable and sustainable distributed energy resources. New standards and applications are emerging from micro-grid pilot projects around the world and case studies demonstrate the convenience and feasibility of distributed energy management. The material in this unique volume discusses potential avenues for further research toward achieving more reliable, more secure and cleaner energy. 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. This book analyzes the main problems in the real-time control of parallel hybrid electric powertrains in non-road applications that work in continuous high dynamic operation. It also provides practical insights into maximizing the energy efficiency and drivability of

such powertrains. It introduces an energy-management control structure, which considers all the physical powertrain constraints and uses novel methodologies to predict the future load requirements to optimize the controller output in terms of the entire work cycle of a non-road vehicle. The load prediction includes a methodology for short-term loads as well as cycle detection methodology for an entire load cycle. In this way, the energy efficiency can be maximized, and fuel consumption and exhaust emissions simultaneously reduced. Readers

gain deep insights into the topics that need to be considered in designing an energy and battery management system for non-road vehicles. It also becomes clear that only a combination of management systems can significantly increase the performance of a controller. HYBRID, ELECTRIC AND FUEL-CELL VEHICLES, Second Edition, covers the cutting-edge technology and technology that are revolutionizing today's automotive industry. Author Jack Erjavec combines in-depth industry expertise with an engaging, reader-friendly style, providing extensive detail on

new and upcoming electric vehicles, including hybrids in production today and the fuel cell vehicles of tomorrow. Expansive coverage ranges from basic theory related to vehicle construction, electricity, batteries, and motors, to the political and social impact of these high-profile vehicles. In addition to up-to-date, highly accurate technical information on vehicles available today—including service procedures and safe shop practices—the text provides an informed look into the future with material on vehicles currently under development. Important Notice:

Media content referenced within the product description or the product text may not be available in the ebook version. The book deals with the fundamentals, theoretical bases, and design methodologies of conventional internal combustion engine (ICE) vehicles, electric vehicles (Evs), hybrid electric vehicles (HEVs), and fuel cell vehicles (FCVs). The design methodology is described in mathematical terms, step-by-step, and the topics are approached from the overall drive train system, not just individual components. Furthermore, in explaining the

design methodology of each drive train, design examples are presented with simulation results. All the chapters have been updated, and two new chapters on Mild Hybrids and Optimal Sizing and Dimensioning and Control are included. The book deals with the fundamentals, theoretical bases, and design methodologies of conventional internal combustion engine (ICE) vehicles, electric vehicles (Evs), hybrid electric vehicles (HEVs), and fuel cell vehicles (FCVs). The design methodology is described in mathematical terms, step-by-step, and the topics are

approached from the overall drive train system, not just individual components. Furthermore, in explaining the design methodology of each drive train, design examples are presented with simulation results. All the chapters have been updated, and two new chapters on Mild Hybrids and Optimal Sizing and Dimensioning and Control are included. This concise book has been designed for easy reading and to meet the critical skill requirements of students in the branches of Automobile Engineering and Mechanical Engineering and Mechanical Engineering. The

contents are presented in 22 lucid chapters. The book deals with the fundamentals, electric vehicles (EVs), hybrid electric vehicles (HEVs), and fuel cell vehicles (FCVs). It comprehensively presents vehicle performance, configuration, and control strategy for different electric and hybrid electric vehicles. This course book is intended for use as a Textbook and as a primary Reference book by colleges and technical universities offering core and elective subjects like Electric and Hybrid Vehicles and New Generation Vehicles.

- [Hybrid](#)

- [Electric Vehicles Management Systems Of Electric And Hybrid Electric Vehicles](#)
- [Electric And Hybrid Vehicles](#)
- [Hybrid Electric Vehicles](#)
- [Electric And Hybrid Vehicles](#)
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