

Electric and Hybrid Vehicles Design Fundamentals

SECOND EDITION



Iqbal Husain



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Electric And Hybrid Vehicles Design Fundamentals Second Edition

Mehrdad Ehsani,Yimin Gao,Ali Emadi



Electric And Hybrid Vehicles Design Fundamentals Second Edition:

Electric and Hybrid Vehicles Iqbal Husain, 2011-06-27 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 automobiles 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

Electric and Hybrid Vehicles Iqbal Husain, 2021-02-22 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

Electric and Hybrid Vehicles: Design Fundamentals Dr. Viswaprakash Babu, Saidulu Valampatla, Banothu Raju, Dr. Debabrata Das, 2025-02-14 Electric and Hybrid Vehicles Design Fundamentals introduction to the principles design considerations and engineering aspects of electric and hybrid vehicles Key topics such as powertrain architectures energy storage systems motor technologies and control strategies the offers insights into modern advancements and challenges in sustainable transportation It efficiency optimization environmental impact and future trends in vehicle electrification Designed for students researchers and engineers this serves as a foundational resource for understanding the evolving landscape of electric and hybrid vehicle technologies

Electric Vehicles Seref Soyly, 2011-09-12 In this book modeling and simulation of electric vehicles and their components have been emphasized chapter by chapter with valuable contribution of many researchers who work on both technical and regulatory sides of the field Mathematical models for electrical vehicles and their components were introduced and merged together to make this book a guide for industry academia and policy makers

Energy Efficiency Improvement of Geotechnical Systems Genadiy Pivnyak, Oleksandr Beshta, Mykhaylo Alekseyev, 2013-11-19 This book covers innovative technologies and approaches for improvement of technical and economic parameters of functional geotechnical systems The focus is on mathematical modelling of objects and processes as well as the development of techniques and their control algorithms The book comprises schemata of practical tasks solving related to min

Comprehensive Dictionary of Electrical Engineering Philip A. Laplante, 2018-10-03 Succinct yet comprehensive coverage of the most important terms acronyms and definitions made the first edition of the Comprehensive Dictionary of Electrical Engineering a bestseller Recent advances in many disciplines of this rapidly growing field have made necessary a new edition of this must have reference This authoritative lexicon includes more than 1500 additional terms now supplying more than 11 000 total terms gathered by a stellar international panel of the world s leading experts compiled from CRC s immensely popular and highly respected handbooks and accompanied by more than 120 tables and illustrations New areas to this edition include Process Control and Instrumentation Embedded Sensors and Systems Biomedical Engineering Hybrid Vehicles Mechatronics Data Storage GIS Includes new terms reflecting the rapid growth in Computer Electronics Image Processing Nanotechnology Fuel Cells Phillip Laplante has again succeeded in producing an invaluable up to date reference for the entire field of electrical engineering covering device electronics and applied electrical microwave control power and digital systems engineering in addition to the new areas listed above Whether you are a practicing or student electrical engineer or a professional from another field in need of complete and

updated information you need look no further than the Comprehensive Dictionary of Electrical Engineering Second Edition

CRC Handbook of Engineering Tables Richard C. Dorf, 2003-11-24 The most important tables from every engineering discipline in one volume collected from the best most authoritative references in the business it is now more than wishful thinking The CRC Handbook of Engineering Tables makes it a reality The most frequently consulted tables and figures from CRC's acclaimed engineering handbooks are gathered together

Modern Electric, Hybrid Electric, and Fuel Cell Vehicles Mehrdad Ehsani, Yimin Gao, Ali Emadi, 2017-12-19 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

Advanced Electric Drive Vehicles Ali Emadi, 2014-10-02 Electrification is an evolving paradigm shift in the transportation industry toward more efficient higher performance safer smarter and more reliable vehicles There is in fact a clear trend to move from internal combustion engines ICEs to more integrated electrified powertrains Providing a detailed overview of this growing area *Advanced Electric Drive Vehicles* begins with an introduction to the automotive industry an explanation of the need for electrification and a presentation of the fundamentals of conventional vehicles and ICEs It then proceeds to address the major components of electrified vehicles i.e. power electronic converters electric machines electric motor controllers and energy storage systems This comprehensive work Covers more electric vehicles MEVs hybrid electric vehicles HEVs plug in hybrid electric vehicles PHEVs range extended electric vehicles REEVs and all electric vehicles EVs including battery electric

vehicles BEVs and fuel cell vehicles FCVs Describes the electrification technologies applied to nonpropulsion loads such as power steering and air conditioning systems Discusses hybrid battery ultra capacitor energy storage systems as well as 48 V electrification and belt driven starter generator systems Considers vehicle to grid V2G interface and electrical infrastructure issues energy management and optimization in advanced electric drive vehicles Contains numerous illustrations practical examples case studies and challenging questions and problems throughout to ensure a solid understanding of key concepts and applications Advanced Electric Drive Vehicles makes an ideal textbook for senior level undergraduate or graduate engineering courses and a user friendly reference for researchers engineers managers and other professionals interested in transportation electrification

Control Applications of Vehicle Dynamics Jingsheng Yu,Vladimir Vantsevich,2021-12-24 This book presents essential knowledge of car vehicle dynamics and control theory with NI LabVIEW software product application resulting in a practical yet highly technical guide for designing advanced vehicle dynamics and vehicle system controllers Presenting a clear overview of fundamental vehicle dynamics and vehicle system mathematical models the book covers linear and non linear design of model based controls such as wheel slip control vehicle speed control path following control vehicle stability and rollover control stabilization of vehicle trailer system Specific applications to autonomous vehicles are described among the methods It details the practical applications of Kalman Bucy filtering and the observer design for sensor signal estimation alongside lateral vehicle dynamics and vehicle rollover dynamics The book also discusses high level controllers alongside a clear explanation of basic control principles for regenerative braking in both electric and hybrid vehicles and wheel torque vectoring systems Concrete LabVIEW simulation examples of how the models and controls are used in representative applications along with software algorithms and LabVIEW block diagrams are illustrated It will be of interest to engineering students automotive engineering students and automotive engineers and researchers

Principles of Sustainable Energy Systems, Second Edition Frank Kreith,Susan Krumdieck,2013-08-19 Completely revised and updated Principles of Sustainable Energy Systems Second Edition presents broad based coverage of sustainable energy sources and systems The book is designed as a text for undergraduate seniors and first year graduate students It focuses on renewable energy technologies but also treats current trends such as the expanding use of natural gas from fracking and development of nuclear power It covers the economics of sustainable energy both from a traditional monetary as well as from an energy return on energy invested EROI perspective The book provides complete and up to date coverage of all renewable technologies including solar and wind power biological processes such as anaerobic digestion and geothermal energy The new edition also examines social issues such as food water population global warming and public policies of engineering concern It discusses energy transition the process by which renewable energy forms can effectively be introduced into existing energy systems to replace fossil fuels See What s New in the Second Edition Extended treatment of the energy and social issues related to sustainable energy Analytic models of all energy systems in the current and future economy

Thoroughly updated chapters on biomass wind transportation and all types of solar power Treatment of energy return on energy invested EROI as a tool for understanding the sustainability of different types of resource conversion and efficiency projects Introduction of the System Advisor Model SAM software program available from National Renewable Energy Lab NREL with examples and homework problems Coverage of current issues in transition engineering providing analytic tools that can reduce the risk of unsustainable fossil resource use Updates to all chapters on renewable energy technology engineering in particular the chapters dealing with transportation passive design energy storage ocean energy and bioconversion Written by Frank Kreith and Susan Krumdieck this updated version of a successful textbook takes a balanced approach that looks not only at sustainable energy sources but also provides examples of energy storage industrial process heat and modern transportation The authors take an analytical systems approach to energy engineering rather than the more general and descriptive approach usually found in textbooks on this topic

Electric and Hybrid Vehicles Amir Khajepour, M. Saber Fallah, Avesta Goodarzi, 2014-03-05 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

Electric Vehicles for Smart Cities Evanthia A. Nanaki, 2020-10-07 Electric Vehicles for Smart Cities Trends Challenges and Opportunities uniquely examines different approaches to electric vehicle deployment in the context of smart cities It provides a holistic picture of electromobility within urban areas offering an integrated approach to city transportation systems by considering the energy systems latest vehicle technologies and transport infrastructure Electric Vehicles for Smart Cities addresses the interaction between grid infrastructure vehicles costs and benefits and operational reliability within an integrated framework The book examines the role electric vehicles play in the social and political aspects of climate change mitigation as well as a renewable energy based economy It explains how electric vehicles and their system requirements work including recharging techniques and

infrastructures and discusses alternative market deployment approaches Includes case studies from cities around the world including Amsterdam London Oslo Barcelona Los Angeles New York Silicon Valley Los Angeles Beijing Shanghai Tianjin Tokyo and Goto Islands Traces the developments innovations advantages and disadvantages in the electric car industry Provides learning aids such as discussion questions and text boxes *Optimal Control of Hybrid Vehicles* Bram de Jager, Thijs van Keulen, John Kessels, 2013-04-05 *Optimal Control of Hybrid Vehicles* provides a description of power train control for hybrid vehicles The background environmental motivation and control challenges associated with hybrid vehicles are introduced The text includes mathematical models for all relevant components in the hybrid power train The power split problem in hybrid power trains is formally described and several numerical solutions detailed including dynamic programming and a novel solution for state constrained optimal control problems based on the maximum principle Real time implementable strategies that can approximate the optimal solution closely are dealt with in depth Several approaches are discussed and compared including a state of the art strategy which is adaptive for vehicle conditions like velocity and mass Three case studies are included in the book a control strategy for a micro hybrid power train experimental results obtained with a real time strategy implemented in a hybrid electric truck and an analysis of the optimal component sizes for a hybrid power train *Optimal Control of Hybrid Vehicles* will appeal to academic researchers and graduate students interested in hybrid vehicle control or in the applications of optimal control Practitioners working in the design of control systems for the automotive industry will also find the ideas propounded in this book of interest **Solutions Manual for Electric and Hybrid Vehicles Design Fundamentals** Husain Iqbal, 2003-08 *Fundamentals of Materials for Energy and Environmental Sustainability* David S. Ginley, David Cahen, 2011-11-30 How will we meet rising energy demands What are our options Are there viable long term solutions for the future Learn the fundamental physical chemical and materials science at the heart of renewable non renewable energy sources future transportation systems energy efficiency and energy storage Whether you are a student taking an energy course or a newcomer to the field this textbook will help you understand critical relationships between the environment energy and sustainability Leading experts provide comprehensive coverage of each topic bringing together diverse subject matter by integrating theory with engaging insights Each chapter includes helpful features to aid understanding including a historical overview to provide context suggested further reading and questions for discussion Every subject is beautifully illustrated and brought to life with full color images and color coded sections for easy browsing making this a complete educational package *Fundamentals of Materials for Energy and Environmental Sustainability* will enable today's scientists and educate future generations [The Engineering Handbook](#) Richard C Dorf, 2018-10-03 First published in 1995 *The Engineering Handbook* quickly became the definitive engineering reference Although it remains a bestseller the many advances realized in traditional engineering fields along with the emergence and rapid growth of fields such as biomedical engineering computer engineering and nanotechnology mean that the time has

come to bring this standard setting reference up to date New in the Second Edition 19 completely new chapters addressing important topics in bioinstrumentation control systems nanotechnology image and signal processing electronics environmental systems structural systems 131 chapters fully revised and updated Expanded lists of engineering associations and societies The Engineering Handbook Second Edition is designed to enlighten experts in areas outside their own specialties to refresh the knowledge of mature practitioners and to educate engineering novices Whether you work in industry government or academia this is simply the best most useful engineering reference you can have in your personal office or institutional library

Modern Electric, Hybrid Electric, and Fuel Cell Vehicles Mehrdad Ehsani, Yimin Gao, Ali Emadi, 2017-12-19 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

Human-Centered Design and User Experience Tareq Ahram and Christianne Falcão, 2023-12-04 Proceedings of the AHFE International Conference on Human Factors in Design Engineering and Computing AHFE 2023 Hawaii Edition Honolulu Hawaii USA 4 6 December 2023

Hybrid Electric Vehicles Chris Mi, M. Abul Masrur, 2017-11-29 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

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