



# **Electric and Hybrid Vehicles**

**Principles, Design and Technology**

# Electric and Hybrid Vehicles: Principles, Design and Technology

Mary Murphy



# Table of Contents

<b>Preface</b>	<b>vii</b>
<b>Chapter 1 Introduction to Electric Vehicles</b>	<b>1</b>
a. Electric Car	50
b. Electric Bikes	50
c. Electric Bus	55
<b>Chapter 2 Hybrid Electric Vehicles</b>	<b>62</b>
a. Hybrid Vehicles	62
b. Hybrid Electric Vehicle	74
c. Hybrid Electric Truck	94
d. Hybrid Electric Bus	95
<b>Chapter 3 Fuel Cell Electric Vehicles</b>	<b>100</b>
a. Fuel Cell Vehicle	119
b. Fuel Cell Forklift	127
c. Fuel Cell Electric Bus	131
<b>Chapter 4 Electric Vehicle Technologies</b>	<b>133</b>
a. Electric Vehicle Battery	133
b. Charge Control	149
c. Directive Warning Sounds	157
d. Open Charge Point Protocol	164
e. Regenerative Braking	179
f. Traction Motor	182
g. Electric Traction Systems	186
h. Motor Controller	211
<b>Chapter 5 Electric Vehicle Charging Devices and Systems</b>	<b>215</b>
a. Charging Station	215
b. Magna-Charge System	219
c. Connectors	221
d. Rapid Chargers	222
e. Fast Chargers	224
f. Slow Chargers	226
g. Combined Charging System	227
h. Wireless Charging	230
i. EnergyBus Connectors	234

## Permissions

## Index

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# Preface

An electric vehicle is a vehicle that uses a single or multiple electric or traction motors for propulsion. It may be powered by electricity derived from off-vehicle sources, or from a self-contained system of solar panels, battery or an electric generator. A hybrid electric vehicle (HEV) is a kind of hybrid vehicle, which integrates an electric propulsion system with an internal combustion engine. There are different types of HEV, of which the hybrid electric car is the most common form. Depending on the way in which power is delivered to the drivetrain, HEV can be classified into parallel hybrids, series hybrids and power-split hybrids. They can also be classified into mild and full hybrids depending on the degree of hybridization. Modern HEVs use innovative technologies such as regenerative brakes, motor-generators and start-stop systems, besides others. This book unfolds the innovative aspects of electric and hybrid vehicles. Most of the topics introduced in this book cover the principles, design and technology of HEV. As this field is emerging at a rapid pace, the contents of this book will help the readers understand the modern concepts and trends in this field.

A foreword of all Chapters of the book is provided below:

**Chapter 1**, Electric vehicle are vehicles that use traction motors or electric motors for propulsion. Such vehicles may be powered by an inbuilt battery or through a collector system with electricity derived from off-vehicle sources. This chapter provides an introduction to electric vehicles and provides an overview of different electric vehicles such as electric car, electric bike and electric bus; **Chapter 2**, Hybrid vehicles use more than one distinct power types. These can be two-wheeled and cycle-type vehicles or heavy vehicles. The aim of this chapter is to provide an understanding of hybrid electric vehicles, such as hybrid electric vehicle, plug-in hybrid electric vehicle, hybrid electric truck and hybrid electric bus, besides others; **Chapter 3**, A fuel cell electric vehicle is a kind of electric vehicle that uses a fuel cell in combination with a battery or a supercapacitor for powering its electric motor. The topics elaborated in this chapter on fuel cell, fuel cell vehicle, fuel cell forklift and fuel cell electric bus will help in providing a better perspective about the different types of fuel cell electric vehicles and their functioning; **Chapter 4**, Electric vehicles are powered using one or more electric motors. It may contain solar panels, a battery or an electric generator for converting fuel into electricity. This chapter provides a close examination of electric vehicle technologies and includes vital topics like electric vehicle battery, charge control, electric motor, traction motor, electric traction system, motor controller, etc. for a comprehensive understanding of the subject; **Chapter 5**, An electric vehicle charging station is an infrastructure that supplies electric power for recharging electric vehicles, such as plug-in hybrids, electric cars, etc. This chapter has been carefully written to provide an easy understanding of the varied aspects of electric vehicle charging devices and systems, with a compilation of significant topics such as charging station, connectors, rapid chargers, fast chargers, slow chargers, wireless charging, EnergyBus connectors, etc.

I would like to thank the entire editorial team who made sincere efforts for this book and my family who supported me in my efforts of working on this book. I take this opportunity to thank all those who have been a guiding force throughout my life.

**Mary Murphy**