BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE
(An Autonomous Institution)
Amalapuram–533201,Dr. B.R.Ambedkar Konaseema DT,Andhra Pradesh.
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
(Accredited by NBA)

III Year II Semester Course Code: 23EE6E03	FUNDAMENTALS OF ELECTRIC VEHICLES (OPEN ELECTIVE-II)	L	T	P	C
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Pre-requisite:

Basic knowledge in Physics, Chemistry and Basics of Electrical and Electronics.

Course Objectives:

- To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
- To understand various power converters used in electric vehicles.
- To be familiar all the different types of motors suitable for electric vehicles.
- To know various architecture of hybrid electric vehicles.
- To have knowledge on latest developments in batteries and other storage systems.

Course Outcomes:

After the completion of the course the student should be able to:

CO1: Illustrate the use and advantages of different types of electric vehicles. CO2: Use suitable power converters for EV application.

CO3: Select suitable electric motor for EV power train. CO4: Design HEV configuration for a specific application.

CO5: Analyse various storage systems and battery management system for EVs.

UNIT – I

Introduction

Fundamentals of vehicles – Vehicle model – Calculation road load and tractive force – Components of conventional vehicles – Drawbacks of conventional vehicles – Need for electric vehicles– Advantages and applications of Electric Vehicles – History of Electric Vehicles – EV Market in India and outside India – Types of Electric Vehicles.

UNIT – II

Components of Electric Vehicles

Main components of Electric Vehicles – Electric Traction MotorandController – Power Converters – Rectifiers used in EVs – Bidirectional DC–DC Converters – Voltage Source Inverters – PWM inverters used in EVs.

UNIT – III

Motors for Electric Vehicles

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Characteristics of traction drive – requirements of electric machines for EVs – Comparison of Different motors for Electric and Hybrid Vehicles – Induction Motors – Synchronous Motors – Permanent Magnetic Synchronous Motors – Brushless DC Motors – Switched Reluctance Motors (Construction details and working only).

UNIT – IV

Hybrid Electric Vehicles

Evolution of Hybrid Electric Vehicles – Advantages and Applications of Hybrid Electric Vehicles – Architecture of HEVs – Series and Parallel HEVs – Complex HEVs – Range extended HEVs – Examples – Merits and Demerits.

UNIT – V

Energy Sources for Electric Vehicles

Batteries– Types of Batteries – Lithium-ion – Nickel-metal hydride – Lead-acid – Comparison of Batteries – Battery Charging – Fast Charging –Battery Management System – Ultra capacitors – Flywheels – Compressed air energy storage (CAES)– Fuel Cell – it's working.

Text Books

1. Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2021.
2. Tom Denton, Hayley Pells - Electric and hybrid vehicles, Third Edition, 2024

Reference Books:

1. Kumar - L. Ashok - and S. Albert Alexander. Power Converters for Electric Vehicles. CRC Press - 2020.
2. Chau - Kwok Tong. Electric vehicle machines and drives: design - analysis and application. John Wiley & Sons - 2015.
3. Berg - Helena. Batteries for electric vehicles: materials and electrochemistry. Cambridge university press - 2015.

Online Learning Resources:

1. MOOC at https://www.edx.org/learn/electric-cars
2. https://archive.nptel.ac.in/courses/108/106/108106170