



Lok Jagruti Kendra University
University with a Difference

Diploma in Automobile Engineering



Course Code: 025010502

Electric & Hybrid Vehicles

Programme / Branch Name			Diploma in Automobile Engineering			
Course Name	Electric & Hybrid Vehicles				Course Code	025010502
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses
 ESC: Engineering Science Courses
 OEC: Open Elective Courses

BSC: Basic Science Courses
 PCC: Program Core Courses
 PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week					Evaluation Scheme				
L	T	P	Total Teaching Hours	Total Credit	CA	CCE	SEE (TH)	SEE (PR)	Total
4	0	0	4	4	10	40	50	-	100

Legends: L: Lectures T: Tutorial P: Practical
 CA: Continuous Assessment (Attendance + Activity)
 CCE: Continuous & Comprehensive Evaluation
 SEE (Th): Semester End Evaluation (Theory)
 SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisite

- ✓ Physics
- ✓ Automobile Electrical System
- ✓ Basic Automobile Electronics

3. Rationale

The course aims to impart basic skills for understanding and working of various Electric Vehicles and Hybrid Vehicles along with their basic layouts, construction and systems such as Batteries, Motors and other control systems and charging infrastructure too. Along with that real life case studies of successful vehicles already in the market at world level will be studied in order to get real world knowledge too.

4. Objectives

- ✓ Understand the working and types of Electric Vehicles.
- ✓ Understand the working and types of Hybrid Vehicles.
- ✓ Understand the layouts and systems of Electric Vehicles
- ✓ Understand and grasp the deep knowledge about various systems like Batteries, Motors, Control systems, and charging system
- ✓ Understand and grasp the deep knowledge about Charging standards and Infrastructure.
- ✓ Understand and perform real life case study of successful EVs and Hybrid Vehicles.

5. Contents

Unit No.	Unit Name	Topics	Learning Outcome	% Weightage	Hours
1.	Introduction to Electric Vehicles	1.1 EVs and Hybrid Vehicles 1.2 Types of EVs and Hybrid Vehicles 1.3 Costs and Emissions	<ul style="list-style-type: none"> Describe various types of Electric Vehicles and Hybrid Vehicles, their running costs and emissions 	10	04
2.	Electric Vehicle Technology	2.1 Electric Vehicle Layouts. 2.2 Hybrid Vehicle Layouts. 2.3 Different cables and components. 2.4 Other systems <ul style="list-style-type: none"> Heating and air conditioning Brakes Power assisted steering Autonomous vehicle system Park Assist Battery management system 	<ul style="list-style-type: none"> Compare the EVs and Hybrid vehicles. and explain various components and systems of vehicles 	20	09
3.	Batteries	3.1 Basic concept of Battery 3.2 Battery Range, life and recycling. 3.3 Types of batteries: Lead Acid Battery, Lithium-Ion battery, Nickel-Metal Hydride, Lithium Polymer etc. 3.4 Fuel Cells 3.5 Super-Capacitor 3.6 KERS	<ul style="list-style-type: none"> Explain various types of Batteries. Explain concept of Fuel cells and Super Capacitor. Explain what is KERS. 	20	09
4.	Motors and Control System	4.1 Types of Motor and current Trends. 4.2 Construction and Working and functions of Electric Motors: AC and DC Motors 4.3 Motor torque and other specifications 4.4 Control Systems: Power Control, Sensors, Battery	<ul style="list-style-type: none"> Describe different types of Motors and their construction and working Identify motor specifications. Explain various sensors and control systems used in EVs. 	20	09
5.	Charging Systems	5.1 Introduction to Basic Charging system 5.2 Various Charging standards and Infrastructure.	<ul style="list-style-type: none"> Explain Charging standards and Infrastructures. Explain various charging methods. 	30	11

		5.3 Charging Methods and components 5.4 Wireless Power Transfer 5.5 Solar Power charging Case study 5.6 Different EVs Case study: Tesla Roadster, Toyota Mirai, Honda Hybrid vehicles.	<ul style="list-style-type: none"> Study and explain various real life Vehicle's Case study. 		
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Total Hours **42**

6. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	App %	C %	E %	An %
1.	Introduction to Electric vehicles	40	40	20	0	0	0
2.	Electric Vehicle Technologies	35	50	15	0	0	0
3.	Batteries	20	50	30	0	0	0
4.	Motors and Control Systems	30	50	20	0	0	0
5.	Charging Systems	20	50	30	0	0	0

Legends: R: Remembering U: Understanding
 App: Applying C: Creating
 E: Evaluating An: Analyzing

7. Reference Books

- 1) Tom Denton, "Electric and Hybrid Vehicles", Institute of Motor Industry.2016
- 2) James Larminie, J. Lowry, "Electric Vehicle Technology Explained", John Wiley & Sons Ltd. 2003.
- 3) M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
- 4) S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.
- 5) Iqbal Hussein, "Electric and Hybrid Vehicles: Design Fundamentals", CRC Press, 2003.

8. Open Sources (Website, Video, Movie)

- 1) <https://www.youtube.com/c/TheAutomotives>
- 2) <https://theautomobileengineers.blogspot.com/>
- 3) <https://www.youtube.com/c/LearnEngineering>
- 4) <http://auto.howstuffworks.com/>
- 5) <https://nptel.ac.in/course.html>
- 6) <https://Ocw.mit.edu/courses>
- 7) <https://www.eng.mcmaster.ca/mech/content/electric-and-hybrid-vehicles>
- 8) <https://www.youtube.com/playlist?list=PLYqSpQzTE6M9spod-UH7Q69wQ3uRm5thr>