



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: BE-Minor/Hons.

Level: UG

Branch: Electric Vehicles

Course / Subject Code : BE06IAA011

Course / Subject Name : Electric & Hybrid Vehicle Systems

<b>w. e. f. Academic Year:</b>	<b>A.Y. 2024-25</b>
<b>Semester:</b>	<b>6th</b>
<b>Category of the Course:</b>	<b>Core Course</b>

<b>Prerequisite:</b>	Basics of Electrical Engineering and Introduction to Electric & Hybrid Vehicles
<b>Rationale:</b>	The course content has been designed to equip learners with the knowledge and skills about various systems equipped in the Electric & Hybrid Vehicles. The course covers various topics such as Batteries of Electric & Hybrid Vehicles, Charging Stations & Regenerative Braking Systems along with Advanced Driver Assistance Systems.

## Course Outcome:

<b>Sr. No.</b>	<b>CO Statement</b>	<b>Topics Mapped</b>	<b>% weightage</b>
CO-1	Understand the chemical composition of batteries, their construction and application.	1	15%
CO-2	Evaluate various types of Batteries used in Electric & Hybrid Vehicles based on their composition, energy density and arrangement.	1	15%
CO-3	Understand the working of Regeneration during braking application and various modes of regeneration.	2	10%
CO-4	Identify various types of Charging Sockets used for charging an Electric and Hybrid vehicle.	3	5%
CO-5	Understand the workings of different types of charging stations. Evaluate the effect of each station on the health of the battery.	3	10%
CO-6	Understand the working of various types of sensors used in ADAS system.	4	15%
CO-7	Describe the operation and function of sensors used in ADAS.	4	20%
CO-8	Perform the recalibration of sensors used in ADAS enabled vehicle.	4	10%

\*Revised Bloom's Taxonomy (RBT)



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### Teaching and Examination Scheme:

Teaching Scheme (Total Course Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
2	0	4	4	100	0	0	0	100

### Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	<b>Battery and Battery Management System</b> Types of batteries, their comparison, applications and causes of failures. Battery Management Systems (BMS), its types and applications.	23	26
2	<b>Regenerative Braking System</b> Conversion of Kinetic Energy to Electrical Energy, Modes of Regeneration, Efficiency and Applications.	22	24
3	<b>Charger and Charging Stations</b> Introduction to different Chargers and Sockets, their classification, and applications. Different types of Charging Stations and their applications.	23	26
4	<b>Advance Driver Assistance System</b> Introduction to ADAS, its sensors, various features in ADAS like ACC, Lane Assist, etc. Application of various sensors in ADAS and connected cars. Recalibration of sensors used in ADAS enabled vehicle.	22	24
Total		90	100

### Suggested Specification table (Theory):

Distribution of Theory Marks (%)					
R Level	U Level	A Level	N Level	E Level	C Level
25	25	20	10	10	5

**Legends:** R: Remembrance; U: Understanding; A: Application, N: Analyze E: Evaluate and C: Create and above Levels (Revised Bloom's Taxonomy)

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