Semester: I/II			
Course Title	Introduction to Electric Vehicle	**CIE Marks**	50
Course Code	BEEETC105/205D	**SEE Marks**	50
Course Type	Theory	**Total Marks**	100
Course Category	ETC	**SEE Duration**	03 hrs
Hours Per Week	3L : 0T : 0P	**SEE Type**	Written
Total Hours	40 hrs	**Credits**	03

Course Learning Objectives
This course will enable the students to
• Understand
• Understand fundamentals of electric vehicle.
• Study the EV architecture and configuration.
• Understand the battery system for EV & EV charging station.
Pre-Requisites
• Energy storage devices, Conventional Vehicle dynamics, Power Electronics, Electric Machine and Sensors

Module-1	**(8 hrs)**
Introduction: EV history, overview of electric vehicles in India, EV advantages, EV market, importance of different transportation development strategies to future oil supply, comparison between conventional vehicle & electric vehicle, EV system, types of electric vehicle. **Self-Study Components:** Conventional Vehicle.	
Module-2	**(8 hrs)**
Motors & Characteristics: Transmission methods (arrangements), Types of motors used in EV, Speed transfer characteristics, torque transfer characteristics, power, and energy requirements. **Self-Study Components:** Construction of basic Motors.	
Module-3	**(8 hrs)**
EV Architectures and Configurations: Architectural structures and configurations, the major EV subsystems – drives, inverters, batteries and energy storage, chargers, sensors and controls, regenerative breaking. **Self-Study Components:** Sensors and controls.	
Module-4	**(8 hrs)**
Storage for EV: Types of batteries, Parameters of battery: voltage rating, Ah rating, cut off Voltage, maximum charge voltage, open circuit voltage, terminal voltage, C-Rating, Specific Energy, Specific Power, selection of battery for EV(energy density, size & weight, terminal voltage, mechanical withstanding, temperature, maintenance, safe). **Self-Study Components**: Types of batteries.	
Module-5	**(8 hrs)**
BMS & Charging stations: Battery management system, controller, SOC, DOD, SOH, Cell Balancing, Cell Safety, types of EV charging schemes, construction, features, impact of EV. **Self-Study Components:** Impact of EV.	

Text Books:	
1.	"Electric Vehicle Technology" by Prof. Suresh Pawar, Notion Press, September 2021.
2.	"Electric & Hybrid Vehicles Design Fundamentals" by Iqbal Husain, CRC PRESS, Boca Raton London New York Washington, D C.
Reference Books:	
1.	"Electric Vehicle Technology Explained" by James Larminie, John Lowry, 2nd Edition, wiley publication ISBN: 978-1-119-94273-3, September 2012.
2.	"Electric Vehicle Engineering by Per Enge", Nick Enge, Stephen Zoepf, McGraw Hill, 1st Edition 21.

Course Outcome Statements: After the successful completion of the course, the student will be able to	
CO1	Explain the EV architecture and compare different types of motors for EV applications
CO2	Explain the BMS and different EV charging scheme.
CO3	Select the suitable inverter and battery system for EV.
CO4	Compare conventional & electric vehicles and analyze the need of EV in transportation industry.
CO5	Prepare a report on impact of EV on automobile industry and society.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	-	-	-	2	-	-	-	-	2
CO2	1	1	-	-	-	-	2	-	-	-	-	2
CO3	2	1	1	1	1	-	2	-	-	-	-	2
CO4	2	1	1	-	-	-	-	-	-	-	-	2
CO5	2	1	1	-	-	-	-	-	-	-	-	2
Avg.	**1.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**2**

3: High, 2: Medium, 1: Low

Suggested Activity Based Assessment (ABA) Methods

- Survey of electric vehicle and their impact on society.
- Impact of Electric vehicle in automobile sector.
- Simulation of electric vehicle.
- Simulation of Batteries.