



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering Power Electronics

Subject Code: 3722920

SUBJECT NAME: Electric and Battery Operated Vehicles

Semester II

Type of course: Engineering Science (ELECTRICAL)

Prerequisite: NA

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Fundamental of Electric Vehicles Electric Vehicle Types: Hybrid, Plug-in Hybrid and Fully Electric Vehicles, Applications of EV: Two wheelers, Three wheelers, Four wheelers, Buses & Special Purpose Vehicles Like Walkway, Segway, Transportation, Bulk Transport, Industrial Inner Transport, Task Vehicles Basics of Electric Power Train Advantages & Limitations of EV	6	15%
2	Vehicle Dynamics Mechanical Design Aspects, force, strength, speed, centre of gravity, vehicle mathematical modelling.	6	15%
3	Electric Motor for EV Selection parameter of Electric Motor for EV, Type, Size & Performance Comparison of DC Motor, Induction Motor, BLDC, SRM & PMSM	8	20%
4	Design of Electronics: Converters & Controller Controller design for DC Motor & BLDC, Controller Type, Selection, Performance Analysis Advance Energy Storage (Ultracapacitor) Electric Vehicle Data Acquisition, Sensors and Control Systems	12	30%
5	Battery & Charging System Lead Acid Battery, Li-ion battery & battery management system, Battery Chargers AC Chargers & DC Fast Charging system, DC Fast Charging Protocols like GB/T, ChedeMo, CSS.	8	20%

Reference Books:

1. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, *Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design*, CRC Press, 2005



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2. Iqbal Husain, *Electric and Hybrid Vehicles: Design Fundamentals*, CRC Press, 2003
3. Sheldon S. Williamson, *Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles*, Springer, 2013.
4. C.C. Chan and K.T. Chau, *Modern Electric Vehicle Technology*, OXFORD University Press, 2001.
5. Chris Mi, M. Abul Masrur, David Wenzhong Gao, *Hybrid Electric Vehicles Principles And Applications With Practical Perspectives*, Wiley Publication, 2011.

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand working of Electric Vehicles and recent trends	22
CO-2	Analyze different power converter topology used for electric vehicle application	30
CO-3	Develop the electric propulsion unit and its control for application of electric vehicles	30
CO-4	Understand working Hybrid Vehicle	20

List of Experiments:

Lab experiments shall target the modeling of various power electronic converters for electric and hybrid electric vehicles. Experiments related to design of required filters and their effect on transfer function and response also can be included.

List of Open Source Software/learning website:

- E-materials available at the website of NPTEL- <http://nptel.ac.in/>
- MATLAB (Trial version): Software is useful for simulation and analysis of electrical systems