Approved in 44th BoA Meeting (24-11-2021)

Course number : ET 501
Course Name : Power Electronic Applications in Electric Transportation
Credit Distribution : 3-0-0-3
Intended for : PG
Prerequisite : Power Electronics/Consent of the instructor
Mutual Exclusion : None

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1. **Preamble:** This course is designed to build up an in-depth understanding among the PG students about the power electronics for electric vehicle applications. The major goal of this course is to familiarize the students with the operation and working principles of the power electronics converters for electric vehicle (EV) applications. This course will provide analysis and design of power electronics converter topologies in EV applications. This course is also helpful for UG students interested in doing projects in this field.

2. **Course Modules with quantitative lecture hours:**

Module 1: Introduction to hybrid and electric vehicles (3 hours)

- Electrification concepts
- HEV architectures and classifications
- Technological trends
- Electric drivetrains

Module 2: Introduction to Power Electronics (7 hours)

- Basic power electronics concepts
- Overview of power semiconductor devices
- Various converters for EVs

Module 3: Power electronics Converters (12 hours)

- DC-DC converters
- AC-DC converters
- DC-AC converters

Module 4: Battery Connected Systems (6 hours)

- Battery pack
- Battery management system
- Thermal management system
- Body control unit

Module 5: Charging Infrastructure for EVs (6 hours)

- On-board charging
- Fast charging
- Battery-swapping station
- DC-microgrid based charging station

Module 6: Modelling and Simulation (8 hours)

- System design considerations
- Rating and sizing of electric drivetrain components
- Complete system modelling
- Simulation of the complete system

Laboratory/practical/tutorial Modules:

A laboratory course is proposed separately to support this course.

3. Text books:

1. A. Emadi, M. Ehsani and J. M. Miller, Vehicular Electric Power Systems: Land Sea Air and Space Vehicles, New York:Marcel Dekker, 2003.
2. J. Larminie and J. Lowry, Electric Vehicle Technology Explained, New York:Wiley, 2003.

4. References:

1. Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics, Applications and Design," John Wiley & Sons, 2003.
2. M.H. Rashid, "Power Electronics: Circuits, Devices and Application" Pearson Education, Fourth edition,2017•
3. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles" 1st Edition, Springer, 2003.
4. B. K. Bose, "Modern Power Electronics and AC Drives" Pearson Education India; Edition 1, 2015

5. Similarity with the existing courses:
(Similarity content is declared as per the number of lecture hours on similar topics)

S. No.		Course Code	Similarity Content	Approx. % of Content
1.		EE309		10

6. Justification of new course proposal if cumulative similarity content is >30%: