



**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**  
**ACADEMIC YEAR 2021-2022(EVEN)**  
**INTERNAL FACULTY SEMINAR REPORT**

Department of EEE in association with IEEE has organized Internal Seminar on “DC-DC Converter Topologies for Electric vehicles and fast charging stations: state of the Art and future trends” on 31.3.2022. The main objective of the seminar is to provide basic research areas of different DC-DC Converter topologies for Electric vehicles.

**Venue: Smart Class room**

**Resource Person (Internal):**

Mr.R.Sundaramoorthi, Assistant Professor/EEE

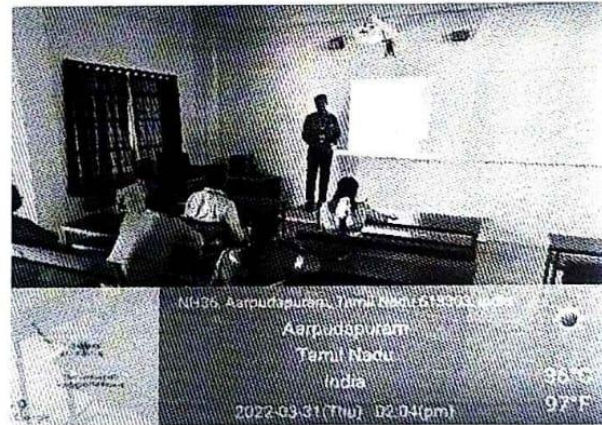
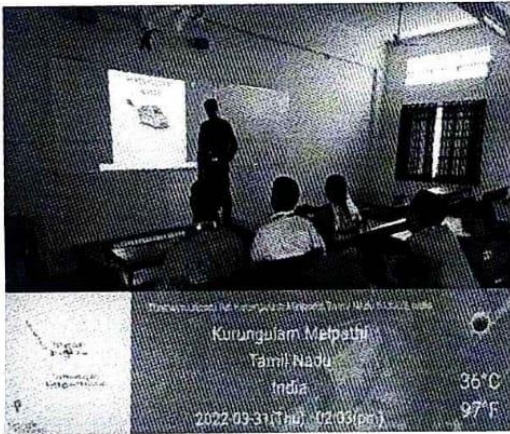
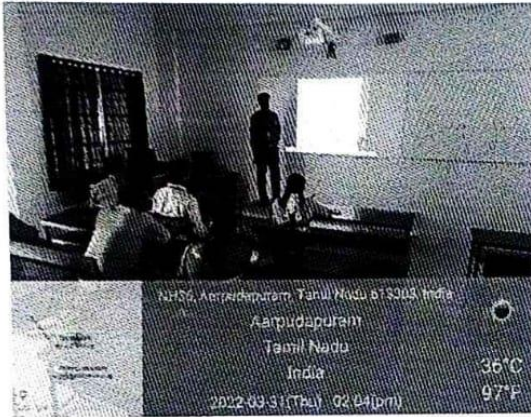
**Ref: IEEE Transactions on Transportation and Electrification**

Mr.R.Sundaramoorthi,AP/EEE welcomed all the faculty members of EEE department. During his session, he started with basic Introduction about converter topologies and the importance of Electric and Hybrid Electric vehicles. He pointed out that, the large number of automobiles in use around the world has caused and continues to cause serious problems of environment and human life. Air pollution, global warming, and the rapid depletion of the earth's petroleum resources are now serious problems. Electric Vehicles (EVs), Hybrid Electric Vehicles (HEVs) and Fuel Cell Electric Vehicles (FCEVs) have been typically proposed to replace conventional vehicles in the near future.. Energy storage or supply devices vary their output voltage with load or state of charge and the high voltage of the DC-link create major challenges for vehicle designers when integrating energy storage / supply devices with a traction drive. He addressed the current research area about DC-DC converters can be used to interface the elements in the electric power train by boosting or chopping the voltage levels. Due to the automotive constraints, the power converter structure has to be reliable, lightweight, small volume, with high efficiency, low electromagnetic interference and low current/voltage ripple. He also explained about comparative study on three DC/DC converters topologies (Conventional step-up dc-dc converter, interleaved 4-channels step-up dc-dc converter with independent inductors and Full-Bridge step-up dc-dc converter) are carried out.

The modeling and the control of each topology are presented. Simulations of 30KW DC/DC converter are carried out for each topology. This study takes into account the weight, volume, current and voltage ripples, Electromagnetic Interference (EMI) and the efficiency of each converter topology. He briefed about the knowledge on different configurations of DC-DC Converters. He broadly given the ideas of Electric vehicle Battery Management Systems function such as (a) Provide battery safety and longevity, a must-have for Li-ion (b) Reveal state of function in the form of state of charge(SoC) and state of Health (SoH) (c) Prompt caution and service. He also explained different types of battery, importance and functions of Hybrid Electric vehicle. In addition, he also described charging stations importance and implementation. He has given broad idea of different features and specifications of BMS.

He briefed that, the different configurations of EV power supply show that at least one DC/DC converter is necessary to interface the FC, the Battery or the Super capacitors module to the DC-link. In electric engineering, a DC to DC converter is a category of power converters and it is an electric circuit which converts a source of direct current (DC) from one voltage level to another, by storing the input energy temporarily and then releasing that energy. In addition that, he explained about bi-directional converter can move power in either direction, which is useful in applications requiring regenerative braking and the amount of power flow between the input and the output can be controlled by adjusting the duty cycle (ratio of on/off time of the switch). He broadly explained about transformer-based converters may provide isolation between the input and the output and listed main drawbacks of switching converters include complexity, electronic noise and high cost for some topologies. He introduced about research areas on Electric vehicles such as cell balancing techniques, State of charge methods, State of Health and wireless charging techniques. He has briefed about the different techniques of estimating state of charge, state of health mechanisms and applications. He mentioned detailed explanation about all the methods of balancing techniques safe operating Area of different types of cells .Finally he pointed out what are the current research areas in battery Electric vehicles and Battery Management systems.

## SNAPSHOTS



Mr.R.Sundaramoorthi AP/EEE delivering lecture during internal faculty Seminar

### OUTCOME:

- Faculty will able to highlight basic research areas on DC-DC Converter and Hybrid Electric vehicles.
- Able to understand the different types of Battery Management Functions and methods to observe applications in this field.
- Learn how to model DC -DC Converter with simulink tool boxes.

*R. Sundaramoorthi*  
FACULTY INCHARGE 4/4/2022

*A. Arumugam*  
HOD/EEE 4/4/22

*J. Ananthi*  
04/4/2022  
PRINCIPAL