

**Indian Institute of Technology, Kanpur**  
**Department of Sustainable Energy Engineering**  
Proposal for a Course Modification

1. **Course Number:** SEE627
2. **Course Title:** ~~Electric vehicles~~ **Electric Mobility**
3. **Per Week Lectures:** 3\_(L), Tutorial: \_(T), Laboratory: \_(P), Additional Hours[0-2]: \_\_\_(A)
4. **Duration of Course:** Full Semester
5. **Proposing Department:** SEE

**Other Departments/IDPs which may be interested:** EE

**Other faculty members interested in teaching:** Dr. Prabodh Bajpai and Dr. Suvendu Samanta

6. **Proposing Instructor:** Dr. Amarendra Edpuganti

7. **Course Description:**

Electric mobility includes all types of transportation that is fully or partly driven by electric motors. It has been gradually replacing the conventional transportation due to climate concerns, shortage of oil resources, and energy security. The aim of this course is to teach system level understanding of the electric mobility to benefit students from diverse backgrounds.

8. **Expected learning outcomes**

On completing the course, the student will be able to:

- Understand the basics of electric mobility, and power train configurations
- Learn about different battery storage technologies and charging algorithms
- Learn about different types of chargers for electric mobility
- Learn about different kinds of motors used in electric mobility

9. **Course outline**

- I. **Introduction:** Need for replacing conventional transportation, comparison between electric vehicles (EV) and internal combustion engines (ICEV), types of EVs, vehicle fundamentals, plug-in hybrid electric vehicles (PHEV), Range extended EVs (REEVs), and configurations of EVs.
- II. **Energy storage system:** Electrochemical cell, basics of batteries, types of batteries, battery modeling, charging algorithms, battery management system (BMS), cell balancing techniques, and SOC estimation techniques.
- III. **Battery charging:** Classification of battery chargers, types of onboard chargers, fast charging stations, and v2x technologies.
- IV. **Motors for electric mobility:** Induction motors, Brushless dc motors, permanent magnet synchronous motors, switched reluctance motors, and synchronous reluctance motors.

## 10. Lecture-wise breakup

Topics	Number of lectures
1. Introduction	10
2. Energy storage system	15
3. Battery charging	12
4. Motors for electric mobility	5
	42

## 11. Pre-requisites: Consent of Instructor

### 12. Textbooks:

1. Iqbal Husain, "Electric and Hybrid vehicles", Design Fundamentals, CRC Press, 2021.
2. M. Ehsani, Y. Gao, S. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles", CRC Press LLC, Boca Raton, U.S., 2018. Third Edition



Dated: 19/10/2024

Proposer: Amarendra Edpuganti

DPGC Convener : \_\_\_\_\_

The course is approved / not approved

Chairman, SPGC

Dated: \_\_\_\_\_