**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 Sudha 29/03/24

Dated: 29/03/24

**Indian Institute of Technology, Kanpur**

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6. **Proposing Instructor:** Dr. Amarendra Edpuganti
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9. **Course outline**

I. **Basics of electric mobility**: 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.

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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 ( Each lecture has 1.25 hours duration)**

| Topics | Number of lectures |
|---|---|
| 1. Basics of Electric mobility | 8 |
| Introduction | 1 |
| Hybrid electric vehicles | 3 |
| Plug-in and battery electric vehicles | 2 |
| Vehicle fundamentals | 2 |
| 2. Energy storage system | 10 |
| Cell fundamentals and parameters | 2 |
| Battery Modelling | 4 |
| Charging algorithms | 2 |
| Battery management systems (BMS) | 2 |
| 3. Battery charging systems | 6 |
| On-board chargers | 2 |
| Off-board chargers | 2 |
| V2X Technologies | 2 |
| 4. Motors for electric mobility | 2 |
| | 26 |

**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: 20/12/2024 Proposer: Amarendra Edpuganti

DPGC Convener : _____

The course is approved / not approved

Sudhe

Chairman, SPGC

Dated: 27/03/25

**PGDesk-IITK-DOAA**

**From:** spgc <spgc@iitk.ac.in>
**Sent:** 17 February 2025 09:44
**To:** Pgdesk
**Cc:** dpgc_see@iitk.ac.in
**Subject:** Fwd: Proposal for Revision in Electric Vehicles course SEE627
**Attachments:** SEE 627_ course modification.pdf

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

**Categories:** Blue Category

@Pgdesk: for next SPGC meeting please.

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Regards,

Sudhanshu
Chairperson, SPGC

-------- Original Message --------

**Subject:**Proposal for Revision in Electric Vehicles course SEE627
**Date:**2025-02-14 18:14
**From:**dpgc_see <dpgc_see@iitk.ac.in>
**To:**Spgc <spgc@iitk.ac.in>
**Copy:**Amarendra Edpuganti <amarendrae@iitk.ac.in>, Raghvendra Kumar <raghvenk@iitk.ac.in>, Ashishg <ashishg@iitk.ac.in>

Dear Chairman, SPGC,

Kindly approve the attached course, which was shared in acadstaff (see below). We have not received any further comments/inputs for the same.

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Regards
DPGC Convenor (SEE Dept)
---
Dr. PRABODH BAJPAI, Fellow IE(I), SMIEEE
Professor,
Department of Sustainable Energy Engineering
I.I.T. Kanpur-208016, U.P., India
Homepage- https://home.iitk.ac.in/~pbajpai/
Phone:+91-512-679-2327(Off.) 8826(Resi.)
Alternate email:bajpai.prabodh@gmail.com

On 2025-02-09 19:25, Amarendra Edpuganti wrote:

Dear Prabodh,

There are no further comments received. Please proceed for the next steps.

Best Regards

Amarendra

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**From:** acadstaff <acadstaff-bounces@lists.iitk.ac.in> **On Behalf Of** Amarendra Edpuganti
**Sent:** 27 December 2024 20:00
**To:** 'kallol' <kallol@iitk.ac.in>
**Cc:** 'Ashishg' <ashishg@iitk.ac.in>; 'dpgc_see' <dpgc_see@iitk.ac.in>; 'Acadstaff' <acadstaff@lists.iitk.ac.in>
**Subject:** Re: [acadstaff] Proposal for Revision in Electric Vehicles course SEE627

Dear Prof Kallol,

Please find attached the updated course proposal with detailed lecture wise break-up.

Best Regards

Amarendra

---

**From:** kallol <kallol@iitk.ac.in>
**Sent:** 23 December 2024 11:05
**To:** dpgc_see <dpgc_see@iitk.ac.in>
**Cc:** Amarendrae <amarendrae@iitk.ac.in>; Ashishg <ashishg@iitk.ac.in>
**Subject:** Re: [acadstaff] Proposal for Revision in Electric Vehicles course SEE627

Dear Professor Bajpai,

The course is surely be good. I have following suggestion. The lecture wise break up can be expanded. I am sure that there could be several exciting sub-sections in each of the sections. Otherwise, it will be challenging for the student to understand the content. For example, Introduction is of 10 lectures, Energy storage system is of 15 lectures and battery charging is of 10 lectures.

I hope that the proposer might want to discuss with some of the experienced faculty members in the department.

Best regards,

Kallol

---

Kallol Mondal

Professor
Department of Materials Science and Engineering
Indian Institute of Technology Kanpur
Kanpur, Uttar Pradesh, India 208016

On 2024-12-20 21:32, dpgc_see wrote:

Dear colleagues,

The Proposal for Course Modification of Electric Vehicles course SEE627 is available at the following link:
https://iitk.ac.in/doaa/data/NewCourses/Revised-Course-proposal-SEE627-Electric-Mobility.pdf

If you have any comments, you may email them directly to Prof. Amarendrae <amarendrae@iitk.ac.in>
with CC to dpgc_see@iitk.ac.in by Jan. 11, 2025.

---

Regards
DPGC Convenor (SEE Dept)
---
Dr. PRABODH BAJPAI, Fellow IE(I), SMIEEE
Professor,
Department of Sustainable Energy Engineering
I.I.T. Kanpur-208016, U.P., India
Homepage- https://home.iitk.ac.in/~pbajpai/
Phone:+91-512-679-2327(Off.) 8826(Resi.)
Alternate email:bajpai.prabodh@gmail.com

On 2024-12-20 21:31, dpgc_see wrote:

Dear colleagues,

The Proposal for Course Modification of Electric Vehicles course SEE627 is available at the following link:
https://iitk.ac.in/doaa/data/NewCourses/Revised-Course-proposal-SEE627-Electric-Mobility.pdf

If you have any comments, you may email them directly to Prof. Amarendrae <amarendrae@iitk.ac.in>
with CC to dpgc see@iitk.ac.in by Jan. 11, 2025.

---

Regards
DPGC Convenor (SEE Dept)
---
Dr. PRABODH BAJPAI, Fellow IE(I), SMIEEE
Professor,
Department of Sustainable Energy Engineering
I.I.T. Kanpur-208016, U.P., India
Homepage- https://home.iitk.ac.in/~pbajpai/
Phone:+91-512-679-2327(Off.) 8826(Resi.)
Alternate email:bajpai.prabodh@gmail.com

On 2024-12-20 15:38, courses wrote:

Dear Sir,

The revised course proposal is available now at the following link:

https://iitk.ac.in/doaa/data/NewCourses/Revised-Course-proposal-SEE627-Electric-Mobility.pdf

Our repository link is as follows:

https://www.iitk.ac.in/doaa/new-course-approval-repository

In case of any query, please feel free to contact us.

With best regards,

OARS Team

On 2024-12-20 09:29, dpgc_see wrote:

Kindly upload the attached Proposal for Course Modification of Electrical Vehicles course SEE627 and share the link.

Revision in the content is significantly more than 20%.

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Regards
DPGC Convenor (SEE Dept)
---
Dr. PRABODH BAJPAI, Fellow IE(I), SMIEEE
Professor,
Department of Sustainable Energy Engineering
I.I.T. Kanpur-208016, U.P., India
Homepage- https://home.iitk.ac.in/~pbajpai/
Phone:+91-512-679-2327(Off.) 8826(Resi.)
Alternate email:bajpai.prabodh@gmail.com

--------- Original Message --------

**Subject:**RE: Revision in Electric Vehicles course in the core basket
**Date:**2024-12-16 17:01
**From:**"Amarendra Edpuganti" <amarendrae@iitk.ac.in>
**To:**"'dpgc_see'" <dpgc_see@iitk.ac.in>
**Copy:**"'Head_see'" <head_see@iitk.ac.in>, "'Raghvendra Kumar'" <raghvenk@iitk.ac.in>

Dear Prabodh,

Please find attached the updated course content. I named the course as Electric mobility.

Best Regards

Amarendra

In the FM It was decided to add SEE-627: Electric Vehicles in Semester I in the core basket. and It was also suggested to rename the Electric Vehicles course to make it more broad and generic like Electric mobility, Energy system for electric vehicles.

You should send the revised course proposal at earliest for the same by Dec. 25. Also keep in mind the necessary content revision as a core basket course.

Regards
DPGC Convenor (SEE Dept)
---
Dr. PRABODH BAJPAI, Fellow IE(I), SMIEEE
Professor,

Department of Sustainable Energy Engineering
I.I.T. Kanpur-208016, U.P., India
Homepage- https://home.iitk.ac.in/~pbajpai/
Phone:+91-512-679-2327(Off.) 8826(Resi.)
Alternate email:bajpai.prabodh@gmail.com

**INDIAN INSTITUTE OF TECHNOLOGY KANPUR**
**POSTGRADUATE OFFICE**

No. A(P)/IITK/course approval/
March 25, 2025

The Convener, DPGC
Departments of **DOMS/MTH/SEE**
IIT Kanpur

I am directed to communicate the concurrence of the SPGC (2024-25) in its 6th meeting held on 27/02/2025 for the approval of new/modification PG course proposal. After detailed discussion the following courses were approved.

| Course No | Title | Credits | Instructor | SPGC Decision |
|---|---|---|---|---|
| DMS613 | Introduction to Mathematical Finance | 3-0-0-0-[9] | Dr. Sourav Majumdar | Approved |
| MBA644 | Cyber Security and Privacy for Managers | 3-0-0-1-[10] | Dr. Sourya Joyee De | Approved |
| MBA788M | Monte Carlo Methods in Finance | 3-0-0-1-[5] | Dr. Sourav Majumdar | Approved |
| MBA789M | Management Sciences | 3-0-0-1-[5] | Dr. Harshal Rajan Mulay | Approved |
| MBA790M | Private Equity, Venture Capital and other Alternative Assets | 3-0-0-1-[5] | Dr. Harshal Rajan Mulay | Approved |
| MTH619 | Representation theory of quivers | 3-0-0-0-[9] | Dr. Amit Kuber | Approved |
| SEE627 | Electric Mobility [Modification] | 3-0-0-2-[11] | Dr. Amarendra Edpuganti | Approved |

Joint/Assistant Registrar
Academic Affairs

**CC**: OARS (DOAA Office) For necessary action

**MINUTES**
**FOR THE 6th MEETING OF THE SENATE POSTGRADUATE COMMITTEE (2024-25) HELD**
**ON February 27, 2025 (Thursday) AT 11:00 AM**
**CONFERENCE ROOM (208), ACADEMIC AFFAIRS BUILDING**

**Members Present:** Prof(s): D. Chaitanya Kumar Rao on behalf P M Mohite (AE), Suresh Kumar (BSBE), Basker Sundararaju (CHM), Ark Verma (CGS), Gourabananda Pahar (CE), Soumik Das on behalf of Dipin S Pillai (CHE), J Ramkumar (DES), Sukumar Vellakkal (ECO), Imon Mondal (EE), Animesh Mandal (ES), Rajarshi Sengupta (HSS), Subhankar Mukherjee (DoMS), Anikesh Pal (ME), Sudhanshu S Singh (MSE), Pritam Chakraborty (MSP), Sudhanshu Shekhar (MATH), Sagar Chakrabarty (PHY), Kunal P Mooley (SPASE), Prabodh Bajpai (SEE)

**Members Absent:** Prof(s), Piyush Rai (CSE), Pankaj Wahi (NET), Sapam Ranjita Chanu (PSE)

**Senate Nominee :** Prof. Abheejeet Mohapatra

**Student representatives:** Saurabh Sona Lahamate (231250121

## (A) Ratification of minutes of 5th SPGC meeting held on January 24, 2025

No comments were received. Minutes is confirmed

## (B) Item requiring SPGC Approval

### a) New course approval

| Course No | Title | Credits | Instructor | SPGC Decision |
|---|---|---|---|---|
| DMS613 | Introduction to Mathematical Finance | 3-0-0-0-[9] | Dr. Sourav Majumdar | Approved |
| MBA644 | Cyber Security and Privacy for Managers | 3-0-0-1-[10] | Dr. Sourya Joyee De | Approved |
| MBA788M | Monte Carlo Methods in Finance | 3-0-0-1-[5] | Dr. Sourav Majumdar | Approved |
| MBA789M | Management Sciences | 3-0-0-1-[5] | Dr. Harshal Rajan Mulay | Approved |
| MBA790M | Private Equity, Venture Capital and other Alternative Assets | 3-0-0-1-[5] | Dr. Harshal Rajan Mulay | Approved |
| MTH619 | Representation theory of quivers | 3-0-0-0-[9] | Dr. Amit Kuber | Approved |
| SEE627 | Electric Mobility [Modification] | 3-0-0-2-[11] | Dr. Amarendra Edpuganti | Approved |

### b) Termination under 5.7

| S. No | Roll No | Name | Dept. | Prog. | Supervisor & DPGC Recommendation | SPGC Decision |
|---|---|---|---|---|---|---|
| 1. | 241250026 | Jatin Chaudhary | DOMS | MBA | Recommended | Approved to be reported to Senate |
| 2. | 241010003 | Adhikari Thakur Prasad Das | AE | MTech | Recommended | Approved to be reported to Senate |

### c) Full Time to Part-Time

| S. No | Roll No | Name | Dept | Prog | Supervisor and DPGC Recommendation | Remark | SPGC Decision |
|---|---|---|---|---|---|---|---|
| 1. | 231040115 | Swati Gupta | EE | MTech | Recommended | CU=78<br>TU=54<br>CPI=9.38<br>NOC - attached | Approved |
| 2. | 231040036 | Bingi Poojari Venkatesh | EE | MTech | Recommended | CU=78<br>TU=54<br>CPI=9.38<br>NOC - attached | Approved |

Sudha