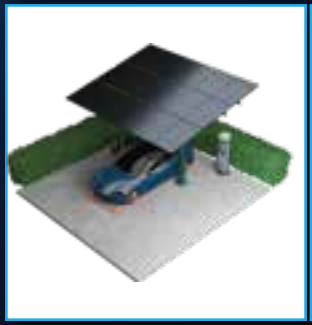
CENTRE OF EXCELLENCE

E-Mobility Research and Skill Development



In Association With

Supported By

Certification Partner

About Centre of Excellence

Excellence is a term which means the quality of being outstanding or extremely good. Achieving excellence is never easy to do. Excellence is a quality that people really appreciate, because it's so hard to find.

The vision of preparing a workforce of skilled professional and providing excellence to them is one of the Aim that ISIE INDIA is working at. ISIE INDIA is India's Biggest E-Mobility Research & Development and Skill Based Education Platform. In a short span of 8 years, we have already engaged with more than 2.5 lacs Engineering Students, Faculties and Professionals. To continue the legacy of skilling and providing excellence, ISIE INDIA comes up with a platform which will be epicentre of Technologies and Sustainable Development of Green Mobility and Electric Vehicle. ISIE INDIA named that hub as "Centre of Excellence for Research Innovation & Incubation."

In line with National Electric Mobility Mission and Thrust of Government of India on Electric Mobility, rapid growth in the Electric Mobility is evident in India. As a part of the National Electric Mobility Mission Plan 2020 (NEMMP 2020), the Department of Heavy Industries, Government of India formulated a scheme namely Faster Adoption and Manufacturing of Hybrid & Electric vehicles in India [FAME-India], wherein it is intended to support the hybrid /electric vehicle market development and its manufacturing ecosystem to achieve self-sustenance at the end of the stipulated period.

Centre of Excellence (COE) is a unique facility by ISIE INDIA which can be used as a source to train and upskill students and faculties It consists of various experimental, research, prototyping & testing equipment for EV Technology in EV Design, Battery Design & Testing & Charging Technologies. ISIE INDIA is working as a bridge between Industry & Academia and having 8 years of excellence by various innovative initiatives for Industry, Academia and Government centred around E-Mobility.

The Centre of Excellence for EVs will create an ecosystem for sustainable mobility solution. It's a unique facility by ISIEINDIA in association with Industry & Academia for Research, Innovation, Skill development and Incubation. COE will provide the interface to work on different aspect of EV/HEV. This will provide more visibility to learning and approach towards the research activities. COE established by ISIE INDIA at various university will be connected through a digital platform to exchange & share their knowledge and research.

Objective

- COE will create an Ecosystem for Research, Innovation, Skill Development, Entrepreneurship for Green Mobility.
- Creating a strong association of expertise with verity of experiences and facilities for Research and Innovation to exchange knowledge, ideas, solutions to Industry and Academia.
- Conduct technical programme such as training, workshops, internships, seminars, conferences, expert talks, schools and FDPs in relevant areas.
- Implement NEP (National Education Policy) and filling the gap between Industry and Academia.
- COE will provide best world class practices for Design, Research & Prototyping.

Benefits of Centre of Excellence

- Provision to Quality Education with Industry Oriented Skills.
- Association with Wide Network of Industry Experts. Project based Learning for Electric Vehicle Engineering.
- Consistency in Research, Innovation and Industry Oriented Skills for Sustainable Mobility.
- Association with Various Angel Investor, Venture Capitalist to create many young entrepreneurs for Atam Nirbhar Bharat.
- COE will establish strong association with Industries to fulfil gap between Industry & Academia.
- Multi-disciplinary for core engineering branches i.e., ME, Automobile, Electrical, Mechatronics etc.
- It will establish intent & attention and prepare for core engineering branches.
- Create career opportunities, business and entrepreneurs for core branches & multi-disciplinary students.

ASSOCIATED PARTNERS

MG Motors India and ISIEINDIA joined hands to upskill Electric Vehicle Centre of Excellence for Mobility Research and Skill Development (Electric Vehicle Engineering). MG Motors and ISIE INDIA will skill engineering under graduates through specialization in EV/HEV, and various training programs for electric vehicle technology and provide Industry exposure under our COE for Electric Vehicles. MGMI and ISIEINDIA will leverage their domain knowledge in automotive space and help in designing specific courses on futuristic technologies to be run through "ISIE- Centre of Excellence for Mobility, Research and Skill Development."

ARK Info solution Pvt Ltd. (Elite Partner of ANSYS Inc.) & ISIEINDIA join hands to establish COE and EV Centric Labs for E-Mobility Research for Skill Enhancement in which ISIE INDIA & Ansys will establish COE and providing various training programs based on EV Technology, EV Modelling and Simulation.

Automotive Skill Development Council (ASDC) is the Certification Partner for various courses QPs and nonQPs. ASDC being a skilling body under Govt. of India, the certificate is globally valid.

Society of Manufacturers of Electric Vehicles (SMEV) and ISIE INDIA comes together to provide Internship and Placement opportunities in various Electric Vehicle oriented industries. SMEV is associated with 80+ EV industries which will be providing various career opportunities in EV Industries.

CENTRE OF EXCELLENCE LAUNCHED BY

Prof. (Dr.) Anil D. Sahasrabudhe

Chairman, AICTE

Dr. Sahasrabudhe in the launch ceremony mentioned that this centre of excellence is unique opportunity for the students who are willing to work in the field of electric vehicles.

According to him the theoretical concepts backed by the practical approach is need of the hour. He appreciated the ISIEINDIA (a leading platform in e-mobility sector) for providing opportunity to the enthusiastic youth of the country.

Mr. Nikunj Sanghi

Chairman, Automtotive Skill Development Council (ASDC)

Congratulating ISIE and the auto industry like MG Motors, SMEV, ARK and ANSYS for signing MOU. ASDC will act as the bridge between the academia and the industry. Thanking ISIE for creating such platform and taking such huge step where such initiative will take place.

Mr. Yash Yadav

Chief Corporate Affairs Officer, MG Motors India

We MG Motors India are also one of the fastest start-up autonomous industry and as a noticeably young organization, ISIE is running skill development programs for youth, ISIE trains people with high skills development.

Mr. Sohinder Gill

Global CEO, Hero Electric

Today there should be a platform, which creates a distinction within the students' knowledge and Skill-based education to value-adding to the EV.

He mentioned about the battery technology that a few people know about cells, thermal management. We need to do something in the field of battery efficiency on which most of the organizations are struggling.

Mr. Dhianu Das

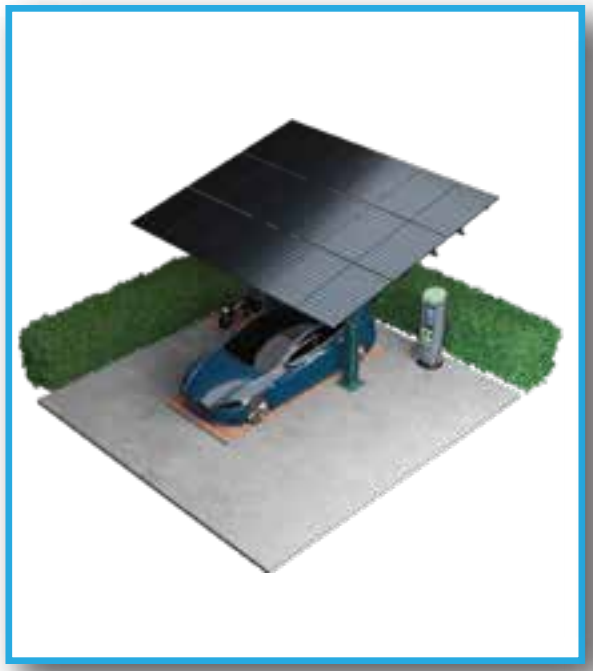
Co-Founder, Agility Venture Partners

Mr. Dhianu Das thanked ISIE for bringing such a center of excellence in EV and said that the trend of EV was going down before 2020, but it has picked up really well with the infusion of latest technologies. Showing his support for ISIE, he addresses that way academics should provide short-term courses to students in the electric vehicles.

Mr. Shital Kumar Joshi

Technical Director, ANSYS Inc.

Electrification is an area that has been our focus, IC engines matured over 100 years now EV cars are expected to be matured and announced within 10 years with the same reliability because of having a lot of technology in EVs.



Charging Infrastructure and Research Lab

Battery Prototyping and Testing Lab

EV/HEV Powertrain Research Lab

OVERVIEW: CENTRE OF EXCELLENCE

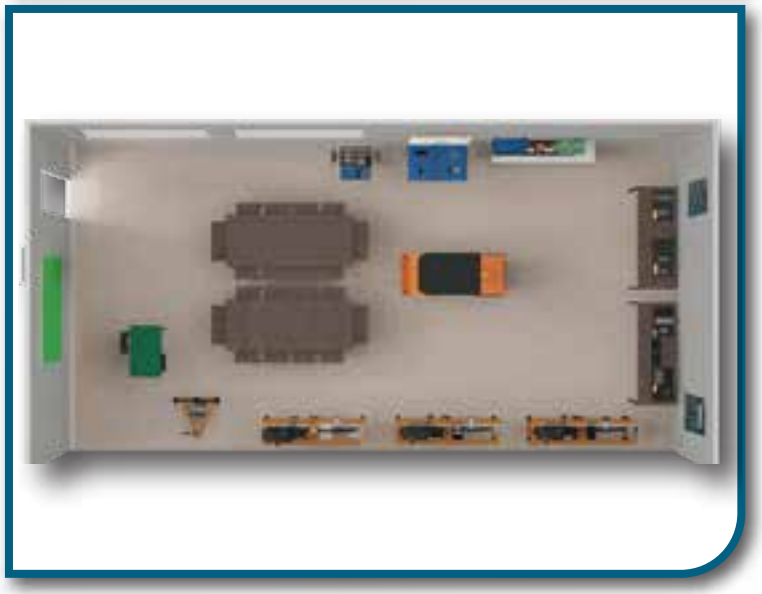
Centre of Excellence (COE) is a unique facility which is having 20+ setup and workbenches on which 100+ experiments and research work can be performed. These setups and workbenches are divided in 3 Labs.
Each lab is specially designed to perform hands on experiments, research and prototyping & testing work. Labs are enabled with Mock & Working Apparatus which can be easily understood and actuated. Some of the workbenches includes Motor Cut Sections, EV Drivetrain, HEV Drivetrains, Battery Testing Machines etc.

Why 3 Labs?

- The rule of three suggests that things grouped into threes are more appealing and easier to remember.
- It's a principle captured neatly in the Latin phrase "omne trium perfectum: everything that comes in threes is perfect, or, every set of three is complete."
- The rule of three takes advantage of our inherent nature to produce work that are simple, appealing and effective. Whatever our work or task aims, it can sprinkle a little stardust on our efforts and increase our chances of success.

EV/HEV Powertrain Research Lab

The powertrain is the heart of the vehicle, and responsible to deliver the power to the wheels. This lab consists of equipment's and setup to help the students and faculties gain better grasp over the motor technology, hybrid vehicle and fuel cell technology. They will be able to design, prototype, test and, optimize the powertrain setups.



EV Drivetrain Experimental Setup

EV drivetrain Experimental Setup is one of the main setups which will demonstrate the construction and working of an Electric Drivetrain. The setup is designed in such a way so that number of experiments can be performed on it as this setup will consist of major components of an Electric Vehicle.

Component List

- BLDC Motor
- Controller
- 48V Battery
- Throttle
- Wire Harness (LV/HV)
- Digital Display Board
- Static Loading Mechanism
- Ammeter and Voltmeter
- Control Panel
- Safety Switch

Experiment List

- Study of construction & working of an EV Drivetrain
- Study of performance parameters of an EV Drivetrain.
- Experiments on power flow, losses & safety of EV drive train.
- Experiment on calculating Range, performance & efficiency of Electric Vehicle.

EV Machines

EV machines or electric machines setup is one of the main setups which is used for demonstration of various Motors and Controllers. The setup comprises of cut sections of different motors and controllers which will make it easy to understand the construction parameters of those EV Machines.

Component List

- Cut Section of BLDC Motor
- Cut Section of Induction Motor
- Cut Section of Hub Motor
- Cut Section of sine wave Controller
- Cut Section of square Wave Controller

Experiment List

- Analysis of design parameters of different motors.
- Experiment on motor architecture & working of different motors.
- Study & research on effect of winding slot design & its performance analysis.
- Study & research on effect of placement of magnet in motor & its performance analysis on voltage, current & speed manipulation.
- Study & research on effect of materials used for casing design of motor & its performance analysis.
- Study & research on analysis of performance parameters of a controller.

HEV Drivetrain Experimental Setup

HEV Drivetrain or Hybrid Drivetrain experimental setup is of the unique kind of setups designed by ISIE INDIA. It is designed in such a way that it will provide you a feel of an actual vehicle. It consists of an Engine and a Motor connected altogether as same as in Hybrid Electric Vehicle. Ease of operation and understanding are two unique advantages of the setup.

Component List

- IC Engine with ECU
- Gear drive with Clutch
- BLDC Motor
- Drive Control
- Battery Charge Display Meter
- 48V Battery
- Foot Throttle (Motor and Engine)
- Battery Charger
- Dynamo
- Ammeter
- Voltmeter
- Protection Shield

Experiment List

- Demonstration of Hybrid Drive train and its types
- Construction and Working of Hybrid Drivetrain.
- Experiment to calculate torque and power of a Combined Hybrid Drivetrain.
- Experiment to calculate the efficiency of the setup.
- Experiment on power flow, power losses & safety of motor.
- Experiment on power flow, power losses & safety of engine.
- Experiment on power flow, power losses & safety of motor and engine both.

EV Mock Layout Workbench

EV Mock Layout is a demonstrative setup of an Electric Vehicle which comprises of exploded view of the components included in an Electric Vehicle. The workbench plays an important role in explaining the arrangement of setup and working principle of an EV.

Component List

- Circuit Diagram of the Mock Layout
- Head Lights
- Brake Lights
- Indicator and its actuator
- 48 V Battery
- BLDC Motor
- Tachometer
- Foot throttle
- Electric Drive

Experiment List

- Demonstration of architecture of an electrical sub system EV.
- Overview of various electrical subsystem of an EV.
- Construction and working of an electric vehicle electrical system.
- Illustration of power flow of an electrical system of a vehicle.
- Experiment on calculating the power loss in actuating the electrical system of a vehicle.

Conversion Kit 2 -Wheeler and 3- Wheeler

Conversion Kits for 2&3 Wheel vehicles are used to convert a conventional vehicle to an Electric Vehicle. The kit consist of all the components that are required for the conversion. It can be used to perform number of experiments and also be used to run a converted vehicle on electric power.

Component List

- BLDC Motor
- Controller
- Wire Harness
- Hand Throttle
- Converter
- Mechanical/ Electrical Drive

Experiment List

- Demonstration & study of prototyping process
- Experiment on retrofitting and prototyping of 2W/3W vehicles.
- Calculate the performance parameters of retrofitted vehicle.
- Compare the performance of conventional and retrofitted vehicle.

Motor Test Bench Dynamometer

Conversion Kits for 2&3 Wheel vehicles are used to convert a conventional vehicle to an Electric Vehicle. The consist of all the components that are required for the conversion. It can be used to perform number of experiments and also be used to run a converted vehicle on electric power.

Component List

- Motor Test Bench Dynamometer
- In-house developed Motor
- Desktop with Testing Interface
- Control Panel

Experiment List

- Overview and study of construction of a Motor Testbench Dynamometer.
- Demonstration of working of a Motor Testbench Dynamometer.
- Illustration of determining motor performance parameters using Motor Test Bench Dynamometer.
- Testing of Induction motor performance using a Dynamometer.
- Testing of BLDC motor performance using a Dynamometer.
- Optimization and analysis through graphs and results at various RPM, load, amperage, voltage, etc.

Battery Prototyping and Testing Lab

Battery for an electric vehicle is one of the crucial and most expensive components. The participants in this lab will be able to perform various mechanical and electrical tests for the battery/ cell, along with the battery pack design and cell sorting. Study about the BMS functionality and design and create the safety circuit for balanced charge and discharge characteristics.

BMS Tester

BMS Tester or Battery Management System Tester is a device which is used to analyse the health of a battery. This equipment is specially used for lithium battery protection board performance testing, multi-functional protection board testing system, mainly used to detect whether the functional indicators of power battery protection board are within the parameters range.

Specification

Overcharge Protection Voltage	0 - 5V
Over discharge Protection Voltage	0 - 5V
Overcharge Protection Current	0 - 150A
Over discharge Protection Current	0 - 120A
Overcharge Protection Delay	0 - 8 ms

Optional	1 - 16 S Combination

Experiment List

- Overview of BMS tester and its construction
- Demonstration of BMS tester working and operations
- Experiment on test of power battery protection board of protective board manufacturer and power battery manufacturer.
- Experiment on testing of battery for overcharge protection voltage, overcharge recovery voltage, over discharge protection voltage, over discharge recovery voltage, over discharge current protection.
- Experiment on testing of battery for charging current protection, balanced open voltage, balanced real-time current, total self-consuming current of protection board, single self-consuming current.

Cell Capacity Tester

Cell Capacity tester machine is an apparatus which is used to test and analyse the capacity of the cells. Cells which are developed in-house can be tested on this apparatus.

Specification

Type of Cell	Cylindrical
Capacity	5V 3A - 108 A
Supply	AC 380V(+-)5% 50 Hz (3 phase)
Fixture	4 Wires

Experiment List

- Experiment on cell charging and discharging
- Demonstration of cell capacity tester working and operations
- Experiment on calculation of current and voltage of a cell and balancing
- Experiment on calculating the charge and discharge time of a cell
- Experiment on cell selection for battery pack.

Spot Welding Machine

Spot Welding Machine usually connect metal plates to the contact points of the battery. This method has been used for many decades and is still very common today.

Component List

Input Voltage	380V | 50 Hz | 2.2 kW
Cell Type	18650 | 26650 | 32700
Nickel Strip	0.08 - 0.025 mm
Size	900 x 800 x 1320 mm

Experiment List

- Overview of Spot Welding and its construction.
- Demonstration of Spot welding working and operations.
- Experiment on performing welding operation on cells.
- Experiment on testing the welded joint strength and efficiency.
- Experiment on key safety and precaution for spot welding

Battery Ageing Machine
(Additional Option)

This equipment is specially used for Circle Life Testing and quality control in the production or experiment of Lithium-Ion batteries, lead acid batteries, cadmium-nickel batteries, nickel-hydrogen batteries and other batteries.

Component List

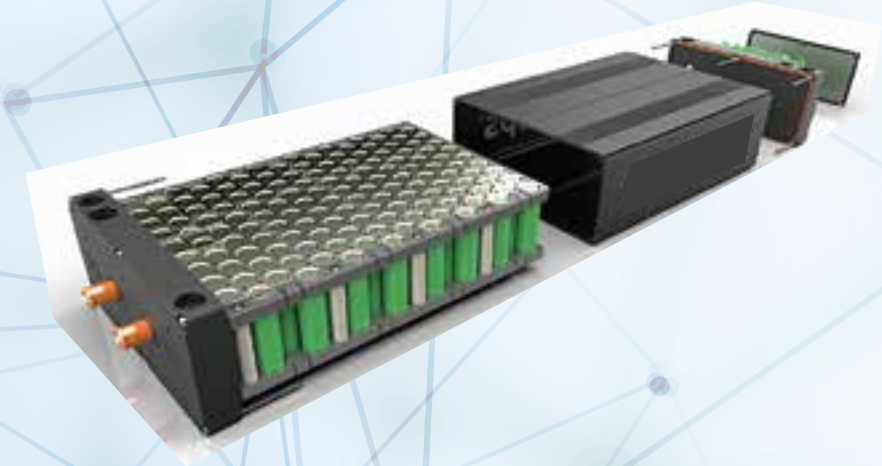
Voltage Range	0 - 100 V
Charge Current	0 - 100 A (4C)
Discharge	0 - 100 A
Time	1 - 9999 h/ step
Database	MySQL Database

Communication Mode	TP/ IP
Data Output	Excel, txt, chart

Experiment List

- Overview of Battery Ageing Machine and its construction.
- Demonstration of Battery Ageing Machine working and operations.
- Experiment of Charge characteristic test.
- Experiment of battery charge retention test.
- Experiment of battery charge and discharge efficiency test.
- Experiment of battery overcharge, over discharge rate endurance test.

Battery Prototyping Workbench



Battery Prototyping Workbench is going to one of the most important workbenches in Battery Prototyping & Testing Lab. It is having various setups and components on which hands-on experiments can be performed to have a better understanding about battery construction and working.

Component List

- Battery Cut Section
- Raw Material for Battery
- Battery Management System
- Cup and Holder type battery prototyping system

Experiment List

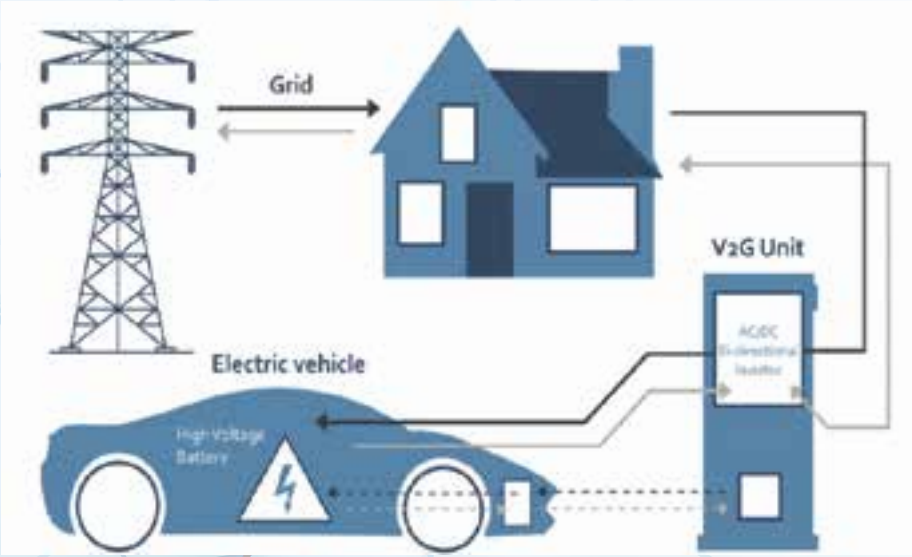
- Demonstration of Battery and its types
- Demonstration of Battery Management System and its types
- Experiment on construction & working of a battery management system
- Experiment on developing In-house battery using cup and holder.
- Experiment on calculating performance parameters of battery.
- Experiment on integration of BMS with Battery.
- Experiment on battery harness and safety.

Charging Infrastructure Lab

Charging being the major concern in electric vehicle, this lab consists of DC and AC chargers, with integrated circuits for V2G charging. This state-of-the-art facility consists of the overall charging infrastructure model, for 2-wheeler and 4-wheeler.

V2G Mock Setup

V2G or Vehicle to Grid Infrastructure Setup involves drawing unused power from the car into the smart grid. V2G, which is also known as vehicle-grid integration (VGI).



Component List

- V2G Mock Setup
- Power flow 3D sketch of V2G technology

Experiment List

- Overview of V2G technology and its construction.
- Demonstration of Power flow in V2G mock setup.
- Experiment on architecture & working of V2G technology.
- Experiment on architecture & working of V2X technology.
- Experiment on architecture & working of V2I technology.

Solar Powered Charging Station

A solar powered charging station is designed so that devices can be charged outdoors and in an environmentally friendly way. This system converts solar energy to electricity and stores it in a battery bank. It is also called as Off- Grid Charging Station

Component List

- Solar Panels
- Energy Storage System - 48V
- Convertor
- Wire Harness
- Panel Frames/ on wheel/ on column - MS
- DC Charger
- Off Grid PCU

Experiment List

- Overview of Solar Powered Charging Station and its construction
- Demonstration of Power flow in Solar Powered Charging Station.
- Experiment on Architecture & working of a Solar Charging Station.
- Experiment on study of Off Grid Charging Technology.
- Experiment on developing a mock setup of On-grid charging station.
- Experiment on architecture and working of a Solar panel enabled Charging Station.
- Research& analysis of power flow, power losses & safety in a solar powered charging station.

On-Grid Charging Station

The charging station consists of a converter connecting grid to a DC bus where EVs get connected through battery chargers. An energy management strategy based on optimal power flow is also proposed by integrating a solar PV generation system with charging station to alleviate the impact of fast charging on the grid.

Component List

- On-Grid Charging Station
- Power distribution layout

Experiment List

- Overview of on grid technology and its construction.
- Demonstration of Power flow in On-Grid Charging Technology.
- Experiment on developing a mock setup of on-grid charging station.
- Experiment on determining charging time of an Electric Vehicle.

Utilization of Centre of Excellence

Specialization Program in Electric Vehicle Engineering

Certification Program

Training Program under NSQF

Research for Sustainable Mobility

Entrepreneurship

Specialization Program in Electric Vehicle Engineering®

B.Tech ME Specilization in EV Engineering®
B.Tech ECE Specilization in EV Engineering®
B.Tech EEE Specilization in EV Engineering®

These specialization in Electric Vehicle Engineering® is an exclusive program by ISIEINDIA, in association with MG Motors, ASDC and SMEV. We are giving flexibility to academia to incorporate wide range of subject and practical related to electric vehicle technology in their curriculum that will fill the gap between the industry and academia.

3 Semester Program

For ME/Auto/Mechatronics/EE/EEE/ECE

Semester	Course Title
4th/ 5th Semester	Fundamentals of EV/HEV EV Design and Architecture EV Fundamental Practical Lab
6th/ 7th Semester	Powertrain, Energy Storage & BMS Charging Infrastructure for EV/HEV Powertrain and Energy Storage Lab
8th Semester	Internship in SMEV Associates/Live Projects

For CSE/IT

Semester	Course Title
4th/ 5th Semester	Fundamentals of EV/HEV Data Science & AI Application to Automotive Industry Practical Lab
6th/ 7th Semester	EV Embedded System & ADAS EV Automotive Software Development Practical Lab
8th Semester	Internship in SMEV Associates/Live Projects

Collaborative B.Tech

Semester	Course Title
1st Sem	Fundamentals of EV & HEV EV/HEV Fundamental Lab
2nd Sem	Modelling of EV/HEV EV/HEV Modelling Lab
3rd Sem	Automotive Safety Automotive Safety Lab
4th Sem	EV/HEV Power train EV/HEV Power train Lab
5th Sem	Energy Storage and Battery Management System Energy Storage and Battery Management System Lab
6th Sem	Charging Infrastructure for EV/ HEV EV Charging Practical Lab
7th Sem	EV/HEV Homologation EV/HEV Homologation Lab
8th Sem	Internship will be Provides in SMEV Associates Industries

Certification Program

Certification by ASDC

The above facility can be used to organize certification Program by ISIEINDIA with certification of ASDC. These programs can be 3, 5, 7, 10 and 15 Days Skill Development Program / Faculty Development Program / Proficiency Improvement Program. It will gather the participation from Students, faculties and working professionals.

Short Term Training & Internship Program

(Open for all)

Certified Diploma

(Graduate and Post Graduate)

PG Diploma Program

(Graduates, Undergraduates and Professionals)

Subject Domain List

- EV/HEV Powertrain
- Battery Pack Design and Prototyping
- BMS and BTMS
- Charging Infrastructure
- Motor Design and Prototyping
- Electric Drive and Controllers
- ADAS and AutoSar
- Smart and Connected Vehicle
- Homologation and Testing

Training Program under NSQF

COE can be used to deliver the Qualification Pack (QP's) approved under NSDC, especially in electric vehicle segments. Some of the QP's are already approved by NSDC and some are in discussion for the approval. COE can be used to deliver NSQF from Level 1 to 8.

- PSS/Q2503 - Electric Vehicle Charging Station Technician
- ASC/Q1424 - Electric Vehicle Service Lead Technician
- ASC/Q3605 - Electric Vehicle Assembly Technician
- ASC/Q3606 - Electric Vehicle Assembly Operator
- ASC/Q8406 - Electric Vehicle Test Engineer

Research for Sustainable Mobility

The barriers preventing the widespread of electric vehicle is not only in terms of public acceptance, but also the lack of technology in terms of public demand. People around the globe are looking to buy the electric vehicles, but they are more concerned about range and charge time. This centre of excellence can provide you with the state of the art equipment and trained faculties for guidance.

EV Powertrain

Electric Drive and Controllers

Energy Storage

(Battery, BMS and BTMS)

EV Charging

(Wireless Charging, Level 2 and Level 3 charging, charger safety)

Green Transport

(Fuel cell, Hydrogen fuel)

Intelligent Transport

(Autonomous Vehicle, semi autonomous connected vehicle)

Entrepreneurship

Electric Vehicle industry is a niche industry and there has been many startups in this domain, coming up with the product of their own. Out of these their has been ones like Ather Energy, Hero Electric, Ampere, Revolt Motors, MG Motors India, etc, who has already given tough competition to the big players of the industry. Similarly, we are looking to encourage the youth of this country to come forward and provide them a platform where they can meet with investors and fulfil their dreams.

Aim

- Facilitate and motivate young engineers for entrepreneurship in green mobilty.
- Analyzing, Prototype and Testing.
- Mentorship & Networking
- Angel Investors and Seed Funding

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