



iHUB DivyaSampark



Department of Science & Technology
Government of India



EXECUTIVE POST GRADUATE CERTIFICATE PROGRAM IN ELECTRIC VEHICLE DESIGN

Acquire cutting-edge skills to make a successful career in electric vehicle design and manufacturing.



10 Million
Learners



1:1 Personalized
Mentorship



55% Average
Salary Hike

Executive Post Graduate Certificate Program in Electric Vehicle Design

The Executive Post Graduate Program in Electric Vehicles by iHUB DivyaSampark, IIT Roorkee and Intellipaat is designed to help you master the concepts of electric vehicle design and technology. You will learn about the fundamentals of electric vehicles, batteries, electric vehicle subsystems, charging infrastructure, and much more in this course.



Department of Science & Technology
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Hottest Job of 21st Century



50Mn Job Postings

EV industry may create 50 mn indirect jobs by 2030



Skill Development

Electric Vehicle Professionals are equipped with various relevant skill, fetching lucrative job offers



Growing Analytics Industry

The electric vehicle market is projected to grow at a CAGR of 24.3%



Future-oriented Career

Electric Vehicle sector is a budding field; a head start will prove to be beneficial



Popular Degree

You must possess a Bachelors Degree with relevant skills to work in this domain



High Demand

The EV ecosystem needs more than 100,000 Skilled Professionals

Our Credentials



10 Million+

Aspiring Students



1,000+

Industry-expert Instructors



400+

Hiring Partners



500+

Corporates Upskilled



55%

Average Salary Hike



155+

Countries' Learners

About Program

This executive post graduate course, developed by the faculty at IIT Roorkee, aims to bring you up to speed as well as deepen your understanding of electric vehicle design and other related concepts. The purpose of this course is to develop the next generation of EV designers who will advance the field of vehicle design.



Learning Format

Online Bootcamp



12 Months

Live Classes



Career Services

by Intellipaat



Executive PG

Certification

Key Highlights

- ✓ 50+ Live sessions over a period of 12 months
- ✓ 24*7 Support by Intellipaat
- ✓ No cost EMI available
- ✓ Career Services by Intellipaat
- ✓ Soft Skills Essential Training
- ✓ Free Career Counselling by Intellipaat
- ✓ 1:1 Mock Interview
- ✓ Exclusively Curated Projects
- ✓ One-on-One interaction with mentors
- ✓ Learn from IIT faculty & Industry Experts
- ✓ Designed for working professionals and freshers
- ✓ Dedicated Learning Management Team
- ✓ 2 Days campus immersion at IIT Roorkee
- ✓ Resume Preparation and LinkedIn Profile Review

Program Pedagogy



Instructor-led Training

Get trained by top industry experts



Hackathons

Get a sense of how real projects are built



Dedicated Learning Management Team

To help you with your learning needs



Peer Networking and Group Learning

Improve your professional network and learn from peers



Self-paced videos

Learn at your own pace with world-class content



Gamified Learning

Get involved in group activities to solve real-world problems



Projects and Exercises

Get real-world experience through projects



1:1 Personalized Learning

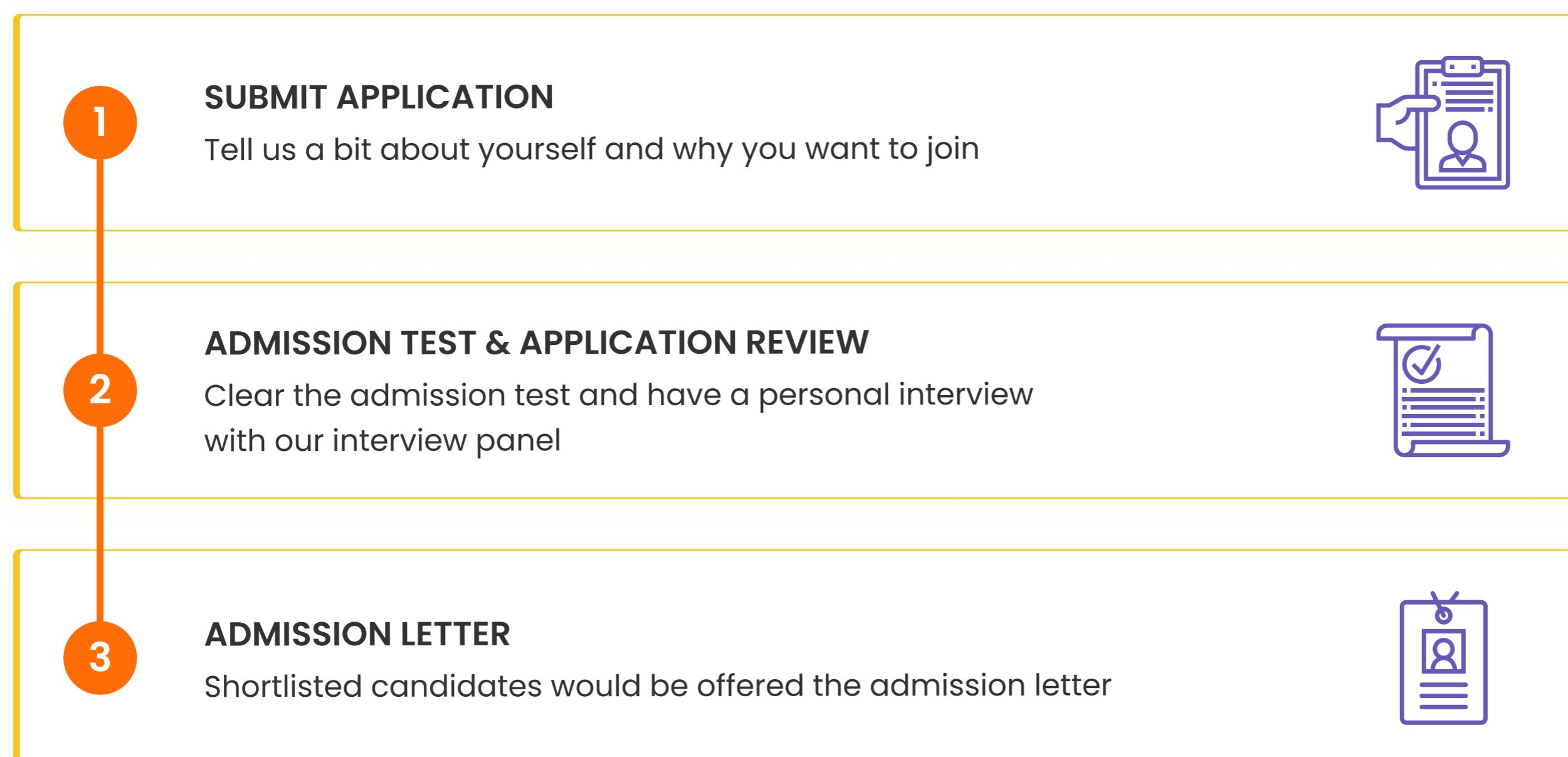
Hands-on exercises, project work, quizzes, and capstone projects

Who Can **Apply for the Course?**

- ✓ Freshers and Engineering Graduates
- ✓ Mechanical and Automotive Engineers
- ✓ Systems and Network Professionals
- ✓ Electrical Engineers
- ✓ Computer Science Engineers
- ✓ Non-IT professionals aiming to venture into a novel field

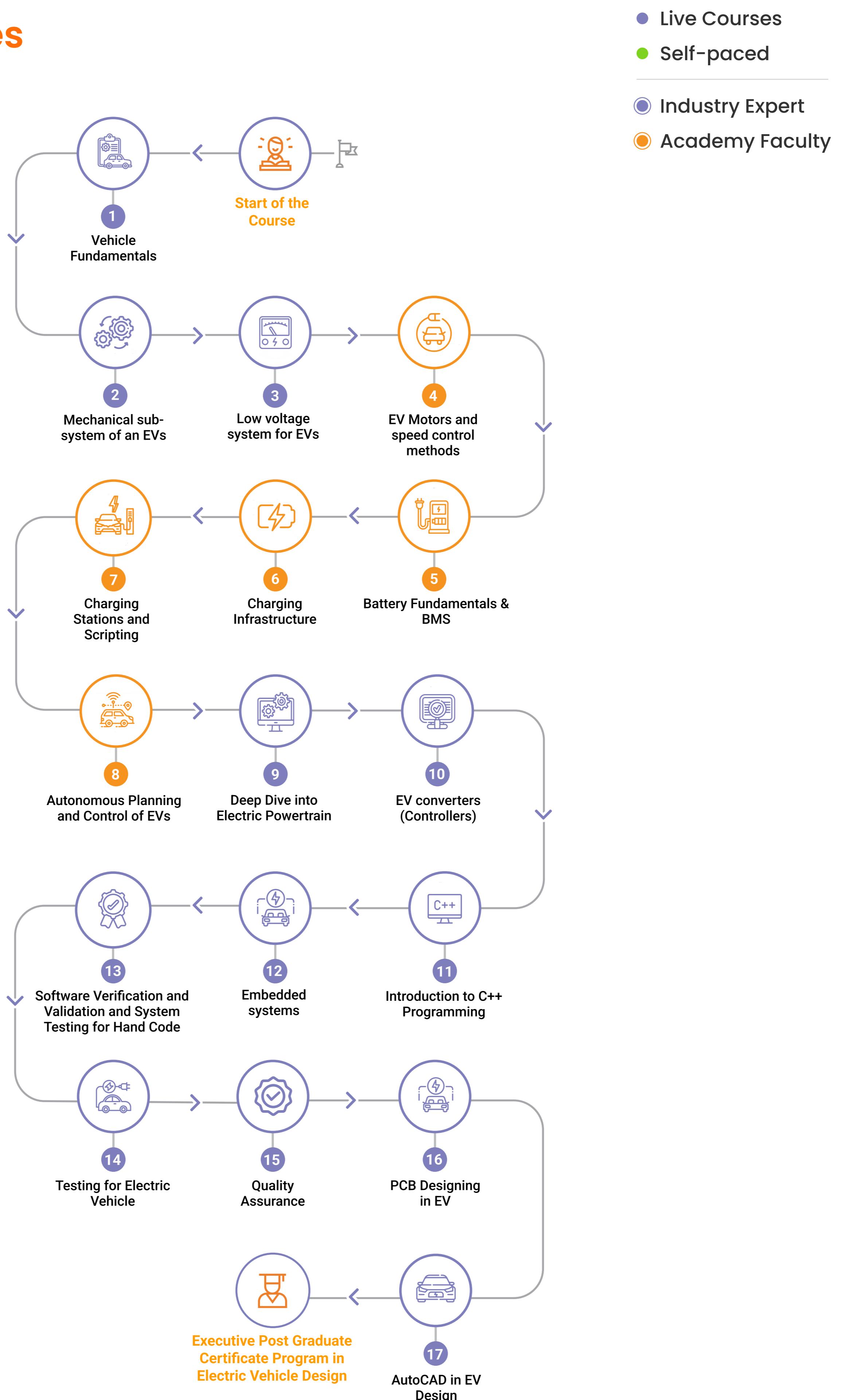
Application **Process**

The application process consists of three simple steps. Candidates have to submit their application. An offer of admission will be made to the selected candidates, and their application will be accepted upon the payment of the admission fee.



Learning Path

Live Courses



Program Curriculum

```
modifier_ob.select=1  
bpy.context.scene.objects.active = modifier_ob  
print("Selected" + str(modifier_ob)) # modifier ob  
modifier_ob.select = 0  
#bpy.ops.object.select_all(action='DESELECT')  
#bpy.ops.object.select_all(action='SELECT')
```

Module 1

Vehicle Fundamentals

- Basics of Electro mobility [Pure EV, Hybrid, Plug-In Hybrid]
- EV and IC engine- pros, cons
- EV powertrain architecture
- Vehicle Performance

Module 2

Mechanical sub-system of an EVs

- Steering system and dynamics
- Suspension system and dynamics
- Thermal management
- Gear and transmission Systems
- Braking systems
- Chassis design
- Turbulence
- Design against vibration
- Wheel and tyre dynamics

Module 3

Low voltage system for EVs

- Sensor interfaces
- Electronics for EV testing
- Infotainment system
- Vehicle to vehicle communication system
- Electronic Control unit
- Publishing Odometry data from sensors
- Odometry Modelling
- Role of odometry in path planning of autonomous vehicles

Module 4

EV Motors and speed control methods

- Motor ratings
- EV/HEV motor requirement
- Types of Motors: IM, PMSM, SyRM, PMBLDC, SRM
- Torque and speed control: IM, PMSM, SyRM
- Torque and speed control: SRM, PMBLDC
- Motor drives and converters used in EVs
- Lab exercises (2 hrs)

Module 5

Battery Fundamentals & BMS

- Battery modeling advantages and Disadvantages
- Characteristics of battery cell
- Battery sizing
- Introduction and objective of BMS
- Charging and discharging control
- Understanding of SOC, Cell balancing
- BMS topologies
- SoC estimation
- Protection and battery management system logic Development

Module 6

Charging Infrastructure

- Battery Charging methods
- EV supply equipment (EVSE), EV battery chargers components
- Charging infrastructure challenges
- Classification based on charging levels (region-wise), modes, plug types
- Standards related to: connectors, communication protocols, supply equipment
- Converters used in EV chargers
- Communication protocol/procedures for BHARAT DC001
- Communication protocol/procedures for CCS2 charger
- Lab exercises (3 hrs)

Module 7

Charging Stations and Scripting

- Charging station components
- Topologies and strategies used in fast chargers
- Renewable integration
- Solid state transformer
- DC/DC Converter Modelling and Simulation
- AC/DC Converter Modelling and Simulation
- Design and simulation of AC and DC charge controller
- Lab exercises (3 hrs)

Module 8

Autonomous Planning and Control of EVs

- Autonomous Vehicle Kinematics and Constraints
- Control to reference position and pose.
- Control of autonomous vehicle using kinematics
- Lateral Vehicle Dynamics

Program Curriculum

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```

- Steering Control for Automated Lane Keeping
- Cruise Control in Autonomous Vehicles
- Perception in autonomous vehicles
- Layers of Motion Planning for autonomous vehicles
- Motion Planning Primitives and Planning Scenarios
- Path planning methods
- Collision avoidance
- Co-operative control-based planning
- Lab exercises (2 hrs)

Module 9

Deep Dive into Electric Powertrain

- What is a powertrain in a vehicle?
- Basic ICE powertrain
- Types of electric powertrains
- Pure Electric
- Hybrid Electric
- Level of hybridization in EVs
- Micro
- Medium
- Full
- Plugin Hybrid
- Hybrid Powertrain architecture
- Series
- Parallel
- Series-Parallel
- Drive cycles

Module 10

EV converters (Controllers)

- Basics of power electronics
- Basic power converter topologies
- Types of converters (AC-DC, DC-AC, AC-AC, DC-DC)
- Inverter circuit
- Chopper circuit
- Buck-Boost converter
- Modeling of basic converter circuit using MATLAB

Module 11

Introduction to C++ Programming

Module 12

Embedded systems

- Embedded C Essentials
- Software and Technologies Used

Module 13

Software Verification and Validation and System Testing for Hand Code

Module 14

Testing for Electric Vehicle

- Testing – Penetration Testing, Thermal Testing, Non-Destructive Testing.

Module 15

Quality Assurance

Module 16

PCB Designing in EV

- Overview of PCB Design in EVs
- Basic PCB Design Principles
- Introduction to PCB Design Software
- PCB Design for EV Components
- Schematic Capture for EV Systems
- Layout and Routing Techniques
- Power Integrity and Signal Integrity
- High-Speed Design Considerations
- Thermal Management in EV PCBs

Module 16

AutoCAD in EV Design

- Overview of AutoCAD in EV Design
- Basic AutoCAD Commands for EV Design
- Creating EV Components in AutoCAD
- Integrating AutoCAD with EV Systems
- Schematic Design in AutoCAD
- Importing and Exporting EV Designs
- Advanced AutoCAD Features for EV Modeling
- Case Study: Modeling an EV Component in AutoCAD
- Integration with Simulation Tools

Program Curriculum

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```

Job Readiness

- Job Search Strategy
- Resume Building
- Linkedin Profile Creation
- Interview Preparation Sessions by Industry Experts
- Mock Interviews
- Placement opportunities with 400+ hiring partners upon clearing the Placement Readiness Test.

Skills to Master

- | | | | |
|------------------------|--------------------------|---------------------------|--------------------------|
| • Vehicle Fundamentals | • Battery Technology | • Battery Sizing | • Battery Management |
| • MATLAB Simulink | • Mechanical sub-systems | • Charging Infrastructure | System (BMS) Development |
| • Low-voltage Systems | • Testing of EVs | | |

Course Projects

Projects cover the following industries:



Retail



Social Media



Supply Chain



Entrepreneurship



E-commerce



Banking



Healthcare



Insurance

Beginner

Range Simulation

Using MATLAB creates an EV range simulation for estimating the range of the EV considering the fundamentals of vehicle dynamics, mechanical subsystems of EV, etc.

Beginner

Motor Simulation

Linear controller design for electric machine system using MATLAB Simulink, and Space vector modeling of induction machine and vector control using MATLAB Simulink

Beginner

Battery Pack Simulation

Simulate the battery pack using simulink and access the battery optimization and performance w.r.t the various input parameters.

Intermediate

Battery Management System Design

Implement a battery management system using MATLAB for assessing charge using Soc algorithm and other algorithms for battery operations.

Intermediate

Charging Infrastructure Design

Single-phase AC-DC converter simulation for 3.3kW On-board charger using MATLAB Simulink and Isolated DC-DC converter simulation for 3.3kW On-board charger using MATLAB Simulink.

Advance

EV Testing

Perform penetration, thermal, and Non-destructive testing to evaluate operating range and other significant metrics for the electric vehicle in a simulation.

Course Advisors / Faculty



Dr. Srinivas Singirikonda

Specialist Transportation Business Unit at TATA Elxsi

Dr. Sreenivas, TATA Elxi's Specialist, excels in R&D, development and testing. His research boosts battery modeling and energy systems, published internationally, showcasing his passion for practical research.



Ravi Kumar

Project management at JLR

Ravi, skilled in Manufacturing, Quality, and autos, drives future tech and net-zero emissions. He manages Jaguar Land Rover's legacy ECUs and Tata Elxi's fuel cell R&D, focusing on hydrogen cells & electrolyzers.



Avinash Kishore

Program Manager at TCS

Avinash, TCS Program Manager, excels in 22+ years of EV leadership, power electronics, and product development. Expert in inverters, with deep EV regulation insight. Published 10+ papers, holds 3 electronics invention records.



Himanshu Tyagi

Senior Manager at Tata Motors

Himanshu, Tata Motors' Senior Manager, with 6+ years, specializes in aftersales and content development for cars, tractors, and commercial vehicles, displaying a passion for on-road and off-road automobiles.



Manish Anand

CEO at iHUB IIT Roorkee

Manish Anand is an IIT Kanpur alumnus with an MBA in Technology and innovation management from Korea Advanced Institute of Science and Technology (KAIST), Seoul. He currently heads iHUB, a Technology Innovation Hub hosted at IIT Roorkee.



Dr. Sudeb Das Gupta

Professor at IIT Roorkee

Dr. Sudeb Dasgupta is currently working as Professor at IIT Roorkee. He has completed his PhD from Banaras Hindu University in Electronics Engineering and has more than 20 years of teaching experience.



Dr. Premalata Jena

Associate Professor at IIT Roorkee

Dr. Premalata Jena is currently working as an associate professor at IIT Roorkee. She completed her Ph.D. from IIT Kharagpur and has more than 10 years of teaching experience.

Intellipaat Career Services



500+
Webinars



600+
Job Shares



400+
Hiring Partners



55%
Avg. Salary Hike*

What Makes Us **Tick**



Career-oriented Sessions

Attend 25+ career-oriented sessions by industry mentors and plan your career trajectory



Profile Building

Craft a electric vehicle design and analysis resume and LinkedIn profile and make an impression on top employers



Mock Interview Preparation

Prepare with mock interviews including most asked questions by top employers



1:1 Mentoring Sessions

Get 1:1 guidance at every step in your career transition to electric vehicle design and analysis



Placement Assistance

Placement opportunities are provided once the learner is moved to the placement pool upon clearing Placement Readiness Test (PRT)**



Dedicated Job Portal Access

Get exclusive access to 200 job postings per month on Intellipaat's job portal



Job Fairs

Job fairs are conducted regularly to introduce learners to major organizations



Hackathons

Work in teams and get exclusive access to hackathons

Program Partners



About Intellipaat

Intellipaat is one of the leading online training providers with more than 10 million learners in over 155 countries. We are on a mission to democratize education as we believe that everyone has the right to quality education.

We create courses in collaboration with top universities and MNCs for employability like EICT IIT Roorkee, EICT IIT Guwahati, IITM Pravartak, IIM Ranchi, IIT Jammu, IU, LSBU, University of Essex, University of Liverpool, IBM, Microsoft, etc.

Our courses are delivered by SMEs & our pedagogy enables quick learning of difficult topics. 24/7 technical support & career services help learners to jump-start their careers.



About iHUB DivyaSampark, IIT Roorkee

iHUB DivyaSampark, IIT Roorkee aims to enable an innovative ecosystem in new-age technologies like AI, ML, Drones, Robots, and data analytics (often called CPS technologies). It aims to do this by promoting and enhancing core competencies, capacity building, and manpower training to provide solutions for national strategic sectors and become a significant contributor to Digital India.

Achievements – IIT Roorkee:

- Ranked 7th 'Overall' and 6th in 'Engineering' in India as declared by NIRF 2022
- Ranked 175th in the world for 'Engineering and Technology' by QS World University Rankings 2023
- Ranked as the 369th best institute in the world by QS World University Rankings 2023
- Ranked as the 114th best institute in Asia by QS World University Rankings 2023

Upon the completion of this program, you will:

- Certification from iHUB DivyaSampark, IIT Roorkee



10 Million Learners & 500+ Corporates across 155+ countries
upskilling on Intellipaat Platform



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