ISIEINDIA

Post Graduation Program in

POWERTRAIN AND INTEGRATION

Get the whole picture

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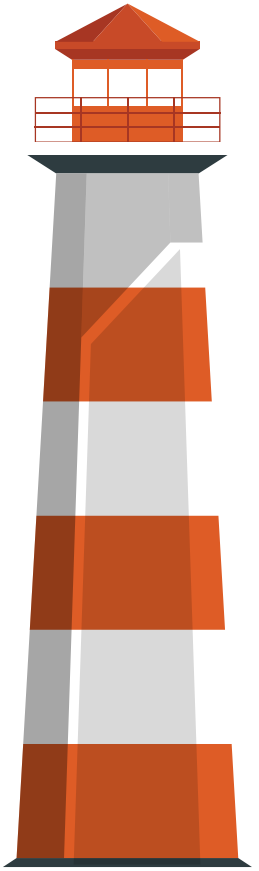
About ISIEINDIA

With more than 1 Million+ learners in 20+ countries, ISIEINDIA, is a leading global edtech company for professional and higher education offering industry-relevant programs in blended and purely online modes across technology domains. Our Programs are Industry oriented to enhance the technical skill sets and to create a sustainable career path for learners.



Our Mission

Enabling career success in the Automotive Industry

As India's largest professionals and engineering students learning company and a global footprint in 20+ countries, we're on a mission to make professionals around the globe proficient and future-ready.

Our Vision

A world with skilled automotive ecosystem

To create sustainable training platform leading to provide an opportunity to the every member of automotive workforce.

250+
City Learner Base

Why ISIEINDIA

300%
Highest Salary Hike

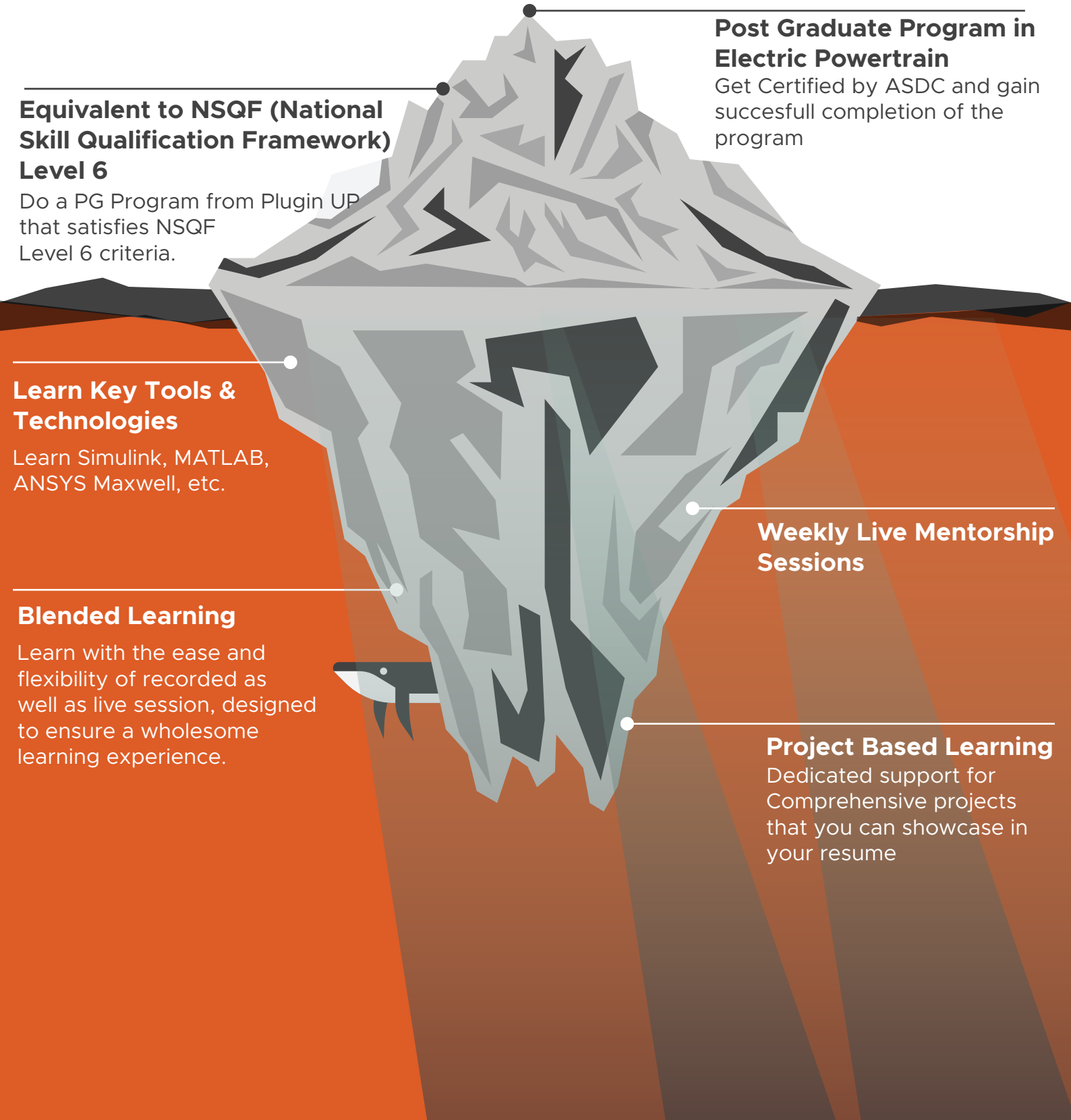
60%
Average Salary Hike

300+
Hiring Partners

1+ Million
Learners

350+
Industry Experts

Program Highlights



Post Graduate Program in Electric Powertrain
Get Certified by ASDC and gain succesfull completion of the program

Equivalent to NSQF (National Skill Qualification Framework) Level 6
Do a PG Program from Plugin UP that satisfies NSQF Level 6 criteria.

Learn Key Tools & Technologies
Learn Simulink, MATLAB, ANSYS Maxwell, etc.

Weekly Live Mentorship Sessions

Blended Learning
Learn with the ease and flexibility of recorded as well as live session, designed to ensure a wholesome learning experience.

Project Based Learning
Dedicated support for Comprehensive projects that you can showcase in your resume

Faculty and Industry Experts

G Leela Mohan Rao
Associate Software Engineer
accenture

Boris Fabris
Automotive Design Consultant

Priya Parameswarappa
Buisness System Manager
SIEMENS

Manish Kumar
Assistant Manager, R&D
TVS

Rahul Bollini
R&D Consultant for Li-Ion Battery
ISIE INDIA

Ketan Kumar Jangra
Assistant Manager
JBM Group

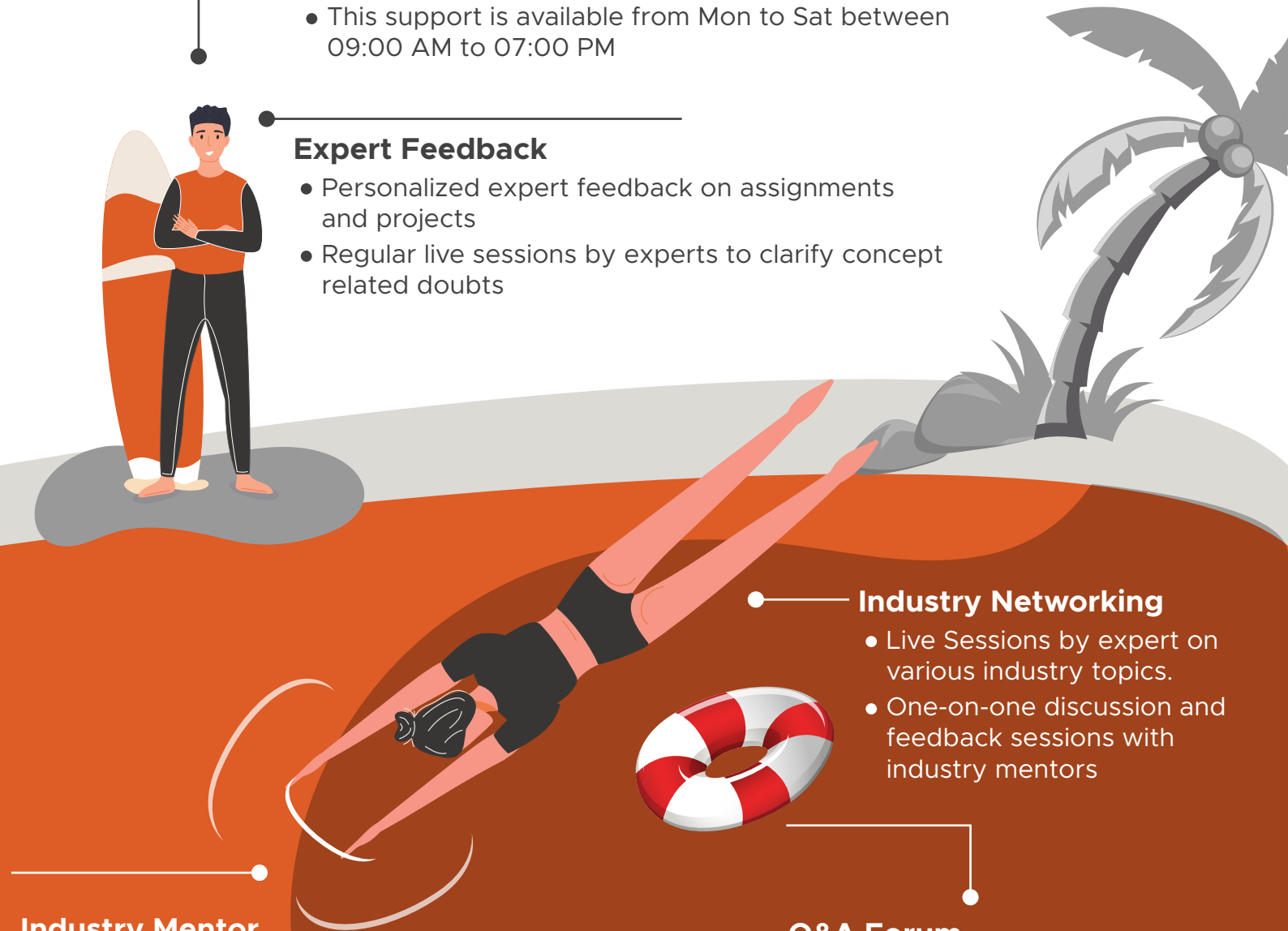
ISIEINDIA Learning Experience

Student Support Team

- We have a dedicated Learner Support Team for handling your queries via email or callback request.
- This support is available from Mon to Sat between 09:00 AM to 07:00 PM

Expert Feedback

- Personalized expert feedback on assignments and projects
- Regular live sessions by experts to clarify concept related doubts



Industry Networking

- Live Sessions by expert on various industry topics.
- One-on-one discussion and feedback sessions with industry mentors

Industry Mentor

- Receive unparalleled guidance from industry mentors, teaching assistants and graders
- Receive one-on-one feedback on submissions and personalised feeback on improvements

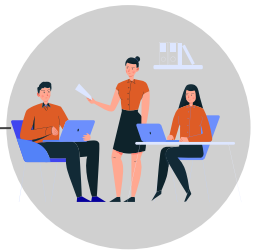
Q&A Forum

- Timely doubt clearing sessions by industry experts and peers
- 100% expert-verified responses to ensure quality learning

Learning Path

Course Orientation
0 Week

Learn 6 Specializations
1 Week to 36 Weeks

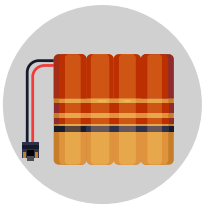


4 Major Projects
33 Week to 37 Week

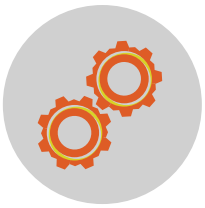
Placement Drive
37 Weeks to 44 Weeks

Electric Machine Design
4 Units, 6 Weeks

Battery Pack Design
4 Units, 6 Weeks



BMS and BTMS
4 Units, 6 Weeks



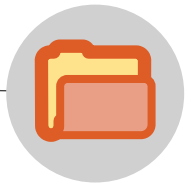
Controls Methods
4 Units, 6 Weeks

EV Charging
4 Units, 6 Weeks

Homologation & Testing
4 Units, 6 Weeks

27 Assignment
Every week to analyse the performance

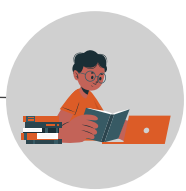
16 Case Study
To analyse the learning performance



4 Mini Projects
To get the significant, immediate result of learning

Live Sessions
Monthly Live Sessions with Industry Experts

6 Assessments
Every month to analyse the performance



Online Classes
120+ Hours of Online Learning

Post Graduation Program in Powertrain and Integration

COURSE CURRICULUM

MODULE 1 : ELECTRIC MACHINE DESIGN & INDUSTRY PROSPECTS

UNIT 1. ABOUT EV INDUSTRY AND MARKET STUDY

1. Coming of EV in 19th Century
2. Golden Era of EV
3. Coming of New Era in EV
4. EV Market and Sales
5. Components; Trends and Growth
6. HEV Architecture – Parallel Hybrid
7. Series Hybrid
8. Series Parallel
9. Fuel Cell EV
10. Selection on Motors, their Size and Types
11. Transmissions
12. Hub Motor
13. Battery Performance Index : Battery
14. Expert Lecture (Live)

UNIT 2. ELECTRIC VEHICLE POWERTRAIN SELECTION

1. Vehicle Coordinate System
2. Powertrain Equation
3. Drag Equation
4. Drag Coefficient
5. Drag Calculation
6. Tire Construction and Specification
7. Wheel Rolling without Slipping
8. Wheel Dynamics ROLL vs SLIP vs SKID
9. Contact Patch
10. Hysteresis Loss
11. Tyre Parameters
12. 2W – Calculating Parameters
13. Power Calculation
14. Torque Calculation
15. Gearbox Selection
16. Motor Characteristics
17. Expert Lecture (Live)

UNIT 3. MOTOR AND CONTROLLER

1. Vehicle Coordinate System
2. Basic Understanding of Motor
3. SRM Motor
4. Introduction of BLDC Motor
5. Control Principles
6. Motor for EV
7. Regenerative Braking

8. Motor Control
9. Motor Control Quadrant
10. Asynchronous vs Synchronous Motor
11. Expert Lecture (Live)

UNIT 4. MOTOR MODELLING AND DESIGN

1. Introduction
2. Motor Geometry
3. Add Winding and Material
4. Simulating E Magnetics
5. Expert Lecture (Live)

MODULE 2 : LITHIUM ION CELL AND BATTERY PACK DESIGN

UNIT 1. INTRODUCTION TO LITHIUM-ION CELLS

1. Working principle of a Lithium-Ion Cell
2. History of Lithium-Ion Cells
3. Various chemistries of Lithium-Ion Cells
4. Various form factors of Lithium-Ion Cells
5. NMC Cells and its Applications
6. LFP Cells and its Applications
7. Components of a Lithium-Ion Cell
8. Fabrication process of a Lithium-Ion Cell
9. SEI Layer Formation

UNIT 2. CHARACTERISTICS OF A LITHIUM ION CELL

1. What is a cell capacity and its units?
2. How to measure the cell capacity?
3. Popular cell capacities used in India
4. Definition of nominal voltage and values for popular cell chemistries
5. Definition of upper cut-off voltage and values for popular cell chemistries.
6. Definition of lower cut-off voltage and values for popular cell chemistries.
7. Open circuit voltage (OCV) and its importance in cell sorting.
8. Definition of cell internal resistance
9. Understanding its values
10. How to measure cell internal resistance?
11. Importance of cell internal resistance in cell sorting.
12. Definition of state of charge
13. Importance of state of charge during cell sorting
14. Definition of state of health
15. Capacity fade property of a Lithium-ion cell
16. How to measure state of health?
17. Gravimetric energy density and its calculation
18. Volumetric energy density and its calculation

UNIT 3. LITHIUM ION CELL OPERATION

1. Storage for up to 3 months, 3-6 months and above 6 months
2. Temperature range during charging for NMC and LFP
3. Temperature range during discharging for NMC and LFP
4. What is a C rating?
5. Standard continuous charge current
6. Maximum continuous charge current
7. Standard continuous discharge current
8. Maximum continuous discharge current
9. Peak current
10. Definition of cycle life
11. Factors affecting cycle life
12. Major components of a battery pack
13. Expert Lecture (Live)

UNIT 4. INTODUCTION TO BATTERY PACK

1. Packaging components and its importance
2. Series and parallel arrangement of cells
3. Connecting a BMS to the battery pack
4. Master-slave BMS and its connection
5. Types of connectors
6. Selecting the right Lithium-ion cell
7. Selecting the right BMS
8. Types of bonding materials and selecting the right thickness
9. Selecting the right rating of connectors
10. Expert Lecture (Live)

UNIT 5. INTODUCTION TO BATTERY PACK

1. Energy auditing the end application
2. Discharge capacity testing
3. Depth of discharge (DoD) testing
4. Vibration test
5. Mechanical drop test
6. Ingress protection rating testing
7. External short circuit protection
8. Over-charge protection
9. Over-discharge protection
10. Over-temperature protection
11. Expert Lecture (Live)

UNIT 6. BATTERY PACK DESIGN

1. Process of making a battery pack with illustration
2. Ideal design techniques : Welding types & its usage, BMS parameters, Thermal management
3. Expert Lecture (Live)

MODULE 3 : BMS AND BTMS

UNIT 1. INTRODUCTION TO BMS

1. Definition of a BMS
2. Monitoring
3. Predefined operating conditions
4. Mandate from cell manufacturers
5. Create a safe environment for batteries
6. Hardware BMS
7. Smart BMS
8. Overvoltage cut-off
9. Undervoltage cut-off
10. Continuous current
11. Over current detection
12. Temperature cut-off
13. Why communication is important?
14. Analysing the data
15. Types of communication protocols
16. State of charge (SoC)
17. Depth of discharge (DoD)
18. State of health (SoH)
19. State of power (SoP)
20. Energy delivered since last charge
21. Number of charge-discharge cycles
22. Total energy delivered since first use
23. Total operating time since first use
24. Expert Lecture (Live)

UNIT 2. BMS IN LITHIUM ION BATTERY

1. Active and passive components in a BMS
2. Explanation of BMS architecture design
3. How to connect the BMS in a battery pack
4. How to connect the BMS to the individual cells for balancing
5. For NMC Battery pack applications
6. For LFP Battery pack applications
7. What is balancing?
8. How does the BMS do the balancing?
9. Passive balancing
10. Active balancing
11. Expert Lecture (Live)

UNIT 3. BMS FAILURE ON FIELD, TESTING

1. Common reasons for failure
2. How to avoid failures
3. Indian manufacturers
4. Foreign manufacturers
5. BMS passes the test
6. BMS fails the test and reasons behind it
7. Expert Lecture (Live)

UNIT 4. INTRODUCTION TO BTMS AND ITS TYPES

1. Definition
2. Thermal Management of batteries
3. Prevents thermal runaway of batteries

4. Active BTMS
5. Passive BTMS
6. Air cooling
7. Expert Lecture (Live)

UNIT 5. BTMS IN LITHIUM ION BATTERIES

1. Liquid cooling
2. Phase changing materials (PCM)
3. BTMS in existing Indian EVs
4. Future of BTMS
5. R&D scope in BTMS
6. Expert Lecture (Live)

MODULE 4 : CONTROL METHODS

UNIT 1. FUNDAMENTAL OF POWER ELECTRONICS AND DRIVES

1. Basics of Power Electronics
2. AC-DC converters
3. DC-DC Converters
4. DC-AC Converters
5. Expert Lecture (Live)

UNIT 2. INDUCTION MOTOR DRIVES

1. Induction Motor Drive
2. Operation of induction motor with unbalance voltage and Single phasing
3. Analysis of Induction Motor Fed from Non Sinusoidal Supply
4. Starting Methods of Induction Motor
5. Braking in Induction Motors
6. Speed control in Induction Motors
7. Variable Frequency control method of Induction Motor Drive
8. Slip Power Recovery Methods
9. Static Kramer Drive
10. VSI Fed Induction Motor
11. Introduction to CSI fed Induction Motor and its operation.
12. Expert Lecture (Live)

UNIT 3. BRUSHLESS DC MOTOR DRIVE

1. Synchronous Motors
2. BLDC Motors
3. Control Strategy in BLDC Motor
4. Servo Applications
5. BLDC Motor Drives
6. Expert Lecture (Live)

UNIT 4. PMSM DRIVES & SWITCHED RELUCTANCE MOTOR DRIVE

1. PMSM Motors
2. Servo Drive employing Sinusoidal PMAC Motor Fed From Current regulated VSI
3. Switched Reluctance Motor
4. Converter circuits in SRM
5. Modes of operation in SRM
6. Expert Lecture (Live)

MODULE 5 : EV CHARGING

UNIT 1. INTRODUCTION TO EV CHARGING

1. Introduction to EVSE
2. Safety of EVSE Infra
3. Sites & Maps
4. Related Technology
5. EV Charging Connector – SAE
6. IEC62196 Connector
7. SAEJ1172
8. Introduction to Bharat AC
9. CHAdeMO Connector
10. Communication Protocol
11. Charging Methods and Algorithm
12. Expert Lecture (Live)

UNIT 2. CHARGING PROTOCOL AND MODES

1. OSI Introduction
2. Layered Architecture 01
3. Layered Architecture 02
4. OCPP and CSMS Introduction
5. Benefits of OCPP
6. SOAP and JSON
7. Functions of OCPP
8. Charger Technologies
9. Intro to Power Electronics Devices
10. Switch Configurations
11. Turn Off Mechanism and Harmonics
12. AC Charging Levels
13. Intro to Charging Levels and Modes
14. DC Charging Levels
15. Charging Modes
16. Charging Modes Case Study
17. Charging Levels and Modes
18. Expert Lecture (Live)

UNIT 3. CHARGING TYPE

1. Fast Charging Intro
2. Fast Charger Safety
3. DC Charging – Region wise spread
4. DC Connectors
5. Tesla Supercharger
6. Tesla Supercharger Billing and Connectors
7. Mega Chargers
8. Expert Lecture (Live)

UNIT 4. CHARGING TECHNOLOGIES

1. Introduction to Smart Grid
2. Definitions 01
3. Definitions 02
4. Smart Grid
5. V2G Technology
6. Application of V2G
7. Unidirectional V2G
8. Bidirectional V2G and Efficiency
9. SAE and ISO-IEC Std
10. Signaling Circuit
11. Expert Lecture (Live)

MODULE 4 : HOMOLOGATION AND TESTING

UNIT 1. INTRODUCTION TO REGULATIONS

1. Vehicle Categories
2. BOV vs EV
3. CMVR 1989 and AIS Committee
4. FVSS
5. EEC/ECE
6. Whole Vehicle Type Approval
7. Homologation for Export
8. Type of Test Tracks
9. Hardware in Loop (HIL)
10. Driving Cycle
11. Expert Lecture (Live)

UNIT 2. STATIC TESTS

1. CMVR Physical Verification
2. Tire Depth
3. Vehicle Weight
4. Horn Installation
5. Rear View Mirror
6. Tell Tales Test
7. External Projection
8. Wheel Guard
9. Foot Control Arrangements
10. Angle and Dimensions Measurement
11. Requirement of Temporary Cabin
12. Expert Lecture (Live)

UNIT 3. DYNAMIC TESTS

1. Vehicle Preparations
2. Pass-by-Noise
3. Gradeability
4. Instruments Calibration
5. Turning Circle Test
6. Steering Effort
7. Cooling Performance
8. Brake Test
9. Range Test
10. Energy Consumption Test
11. Maximum Speed
12. Acceleration Test
13. Expert Lecture (Live)

UNIT 4. VEHICLE COMPONENT TESTING & HYBRID VEHICLE RETROFITMENT AND CHARGING

1. Component Testing – Horn Test
2. Safety Glass Test
3. Windscreen Test
4. Rear View Mirror Test
5. Hinges and Latches Test
6. Demist and Defrost Test
7. Field of Vision Test
8. Powertrain Component Test – Motor Power
9. Max 30 minutes power
10. Battery Safety Criteria
11. EMI-EMC
12. Hybrid Vehicle Test – M and N Category
13. Hybrid Retro fitment Kit
14. Electric Kit for Conversion
15. Charging System– AC Charging
16. DC Charging
17. Expert Lecture (Live)

PROJECTS

PROJECT 1 : BLDC MOTOR DESIGN

By using Motor-Cad Software Design Tools, Design & submit 2D Axial & Radial Motor with Specific Stator, Rotor, Winding Pattern , Winding Material Parameters. And Draw Torque , Back Emf, current losses , BH Steel Curves for the same

PROJECT 2 : CAD MODELING OF DIFFERENT BATTERY PACKS

Designing battery packs with different cell compositions and suggesting different CAD models for each cell chemistry. Calculation of number of cells in a battery pack.

PROJECT 3 : PERFORMANCE ESTIMATION OF BATTERY PACK UNDER DIFFERENT DRIVE CYCLE

Designing the battery pack in MATLAB Simulink and performing simulation for thermal and Different Drive cycles. Estimating the performance and battery life cycle.

PROJECT 4 : DESIGN THE CONTROLLER OF A BLDC MOTOR

Suggest the MATLAB model of a 3 phase BLDC motor and evaluate the performance under different load conditions. Components used while modeling must follow industrial standards and should be available for manufacturing purposes.

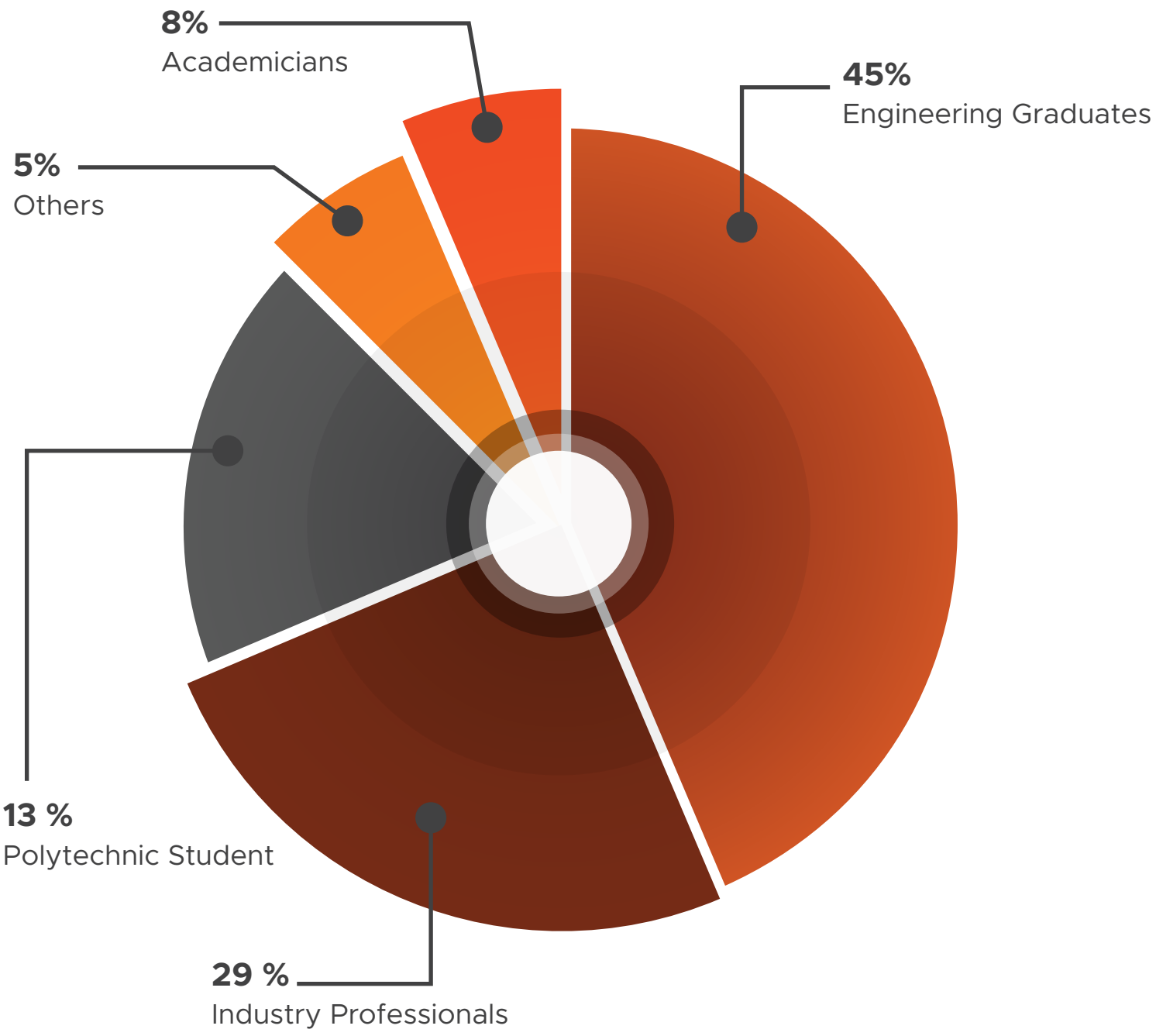
PROJECT 6 : 2-W TESTING BY ARAI

Students will make able to make real time project report on ARAI Testing of 2W EV. Complete process of EV Testing and their expected outcomes.

Note: The curriculum and projects are subject to change as per the industry experts.

Meet the Class

OUR LEARNER'S COMES FROM



Career Support

Interview Preperation

Pre-recorded content on topics such as

- Problem solving approach
- Approaching guesstimates
- Domain specific interview question bank and much more

Profile Builder

An easy to use Resume, Linedin and Cover Letter prepration tool.

- Resume Score
- Realtime recommendations to improve
- Match your resume to the JD and check fitment
- Linkedin Profile Review

Industry Readiness Assesments

Industry oriented tests which are pre--pared and validated by domain esperts.

- Detailed reports
- Industry readiness score
- Identifying strengths and helping aid in self-improvement plan for key skills

Personalised Industry Session

90-minute sessions over the weekend by leading industry experts

- Session categories: Career, Technical and Communication
- Doubt resolution
- Develop proof of concept and apply theoretical concepts in real world
- Assess skill levels
- Peer Networking
- Classroom element
- Business communication sessions and much more

Career Mentorship Sessions

Get personalised career advice through 1-1 sessions with industry experts

- Goal setting for better employment results
- Industry Readiness Assessment report discussion

1+ Million
Learners

INR 11 LPA
Highest Salary Package

300%
Highest Salary Hike

60%
Average Salary Hike

Our Alumni's Work's at

Plugin Up has a network of over 250+ companies who look to recruit graduates from our programs. Some of these well-known companies include.

HERO ELECTRIC The smart move | BOSCH | ASHOK LEYLAND | LARSEN & TOUBRO | ETO The Good Move

ATHER | amazon.com | Ansys | Mahindra | Cummins

KPMG | इंडियनऑयल IndianOil | MG | MICHELIN | NISSAN

Program Details and
Admission Process

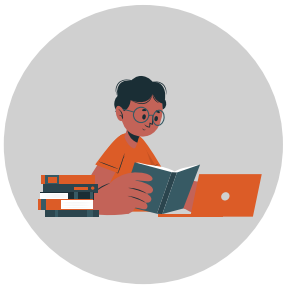
PROGRAM DURATION AND FORMAT
09 Months | Online | Live + Recorded

PROGRAM FEES
Starting at INR 11,111/month* or INR 99,999/-

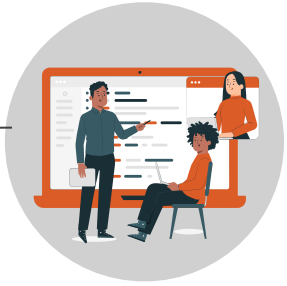
ELIGIBILITY
Minimum 1 Year of Experience

PROGRAM START DATE
Please refer to the website for program start dates.

MONTHLY COMMITMENT (31-34 hours/month)



20-22 HOURS
Asynchronous learning time



7-8 HOURS
Assignments and projects

4 Live Session
Once in a week

FOR FURTHER INFORMATION CONTACT
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COMPANY INFORMATION
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