ELECTRICAL ENGINEERING AND POWER SYSTEMS

OVERALL COURSE OBJECTIVES: The purpose of these courses is to equip learners with the knowledge and skills needed to apply and integrate concepts and technologies towards the planning, designing, and implementing efficient electric vehicle systems, Raspberry Pi projects, and complex power systems. It stresses the importance of sustainability and strategic management in power systems, enabling learners to contribute meaningfully to environmental sustainability, technological advancement, and reliability of these systems.

LEARNING OUTCOMES: On successful completion of the course the students shall be able to:

1. Design, simulation, and implementation of custom circuit boards for Raspberry Pi projects along with proficient understanding of sensor integration, calibration, and data post-processing.
2. Detailed understanding of operational mechanisms of batteries in electric vehicles, their role in promoting sustainable mobility, accompanied by ability to evaluate all aspects of electric vehicle systems, including propulsion and charging technologies.
3. The ability to plan and develop efficient and effective electric vehicle charging infrastructure systems and comprehensive understanding of EV battery technology including capacity, charging practices, and performance optimization.
4. Proficiency in the design, implementation and management safety protocols, power system protection schemes and switchgears that complies with industry standards and withstands the test of complex technological advancements.
5. Mastery over transmission line design and modeling, and ability to analyze performance, leverage MATLAB for practical applications along with implementing environmentally responsible practices.
6. Aptitude in designing and implementing power distribution processes, providing strong foundations for understanding and operating automation systems like SCADA and awareness of the safety measures in the power systems industry.

Power System: Generation, Transmission and Protection	Advanced Study of Protection Schemes and Switchgear
	Basics of Electrical Protection System
	Design of Transmission Line: Modelling and Performance
	Electrical Power Generation - An Industrial Outlook
	Electric Industry Operations and Markets
Power Distribution & Automation	Electrical Power Distribution
	MV Substation - An industrial approach (PART-A)
	MV Substation - An industrial approach (PART-B)

	Safety in the Utility Industry
Renewable Power Systems	Electric Power Systems
	Renewable Power and Electricity Systems
	Solar Energy and Electrical System Design
	Solar Energy Systems Overview
Powering your Home Projects with Raspberry Pi	Beginning Custom Projects with Raspberry Pi
	Communications and High-Speed Signals with Raspberry Pi
	Designing Hardware for Raspberry Pi Projects
	Using Sensors With Your Raspberry Pi
Electric Vehicles	Batteries and Electric Vehicles
	Behind the Scenes: Exploring EV Core Systems
	Bridging the Gap: EV Grid Integration & V2G Systems
	Creating EV Charging Hubs: Innovative Design
	Demystifying EV Batteries: Tech & Management
	Electric Vehicles and Mobility
	EV Evolution: Comprehensive Introduction to EVs
	Mastering EV Cooling: Advanced Thermal Management
	Maximizing Miles: Enhancing EV Range & Efficiency
	Plug Into The Future - EV Charging Essentials
	Powering the Drive: Unveiling EV Electronics
	Safety First: EV Maintenance & Best Practices
	The Road to Autonomy: Exploring EV Technologies

COURSE CONTENT:

Module 1: Advanced Study of Protection Schemes and Switchgear [16 Hours]

This course concentrates and details about Transmission line protection, Generator protection, Transformer protection & Bus bar protection. This course extends numerical protection along with switchgear details.

Sub-Topics
Chapter : Transmission Lines Protection

Chapter : Generator Protection
Chapter : Transformer and reactor protection
Chapter : Bus Bars Protection, Load Shedding and Frequency Relaying
Chapter : Numerical Protection
Chapter : Switchgear Theory
Chapter : Practical Switchgear

Formative Assessments:
7 graded quizzes.

Module 2: Basics of Electrical Protection System [12 Hours]

This course centers around power system protection and switchgear, which are fundamental to ensuring reliable electrical power systems. Inadequate protection systems can result in major power failures, posing significant societal and economic impacts. The course covers the increasingly complex aspects of power system protection due to advances in protection and communication technology and the rise of renewable energy sources. It offers an updated view on the role of protective relays, provides practical examples, and bridges the gap between theory and real-life engineering applications. The course covers electrical protection schemes, numerical relay and algorithm, and optical instrument transformers, offering learners clear insights into these areas.

Sub-Topics
Chapter : Overview of Protective Relays
Chapter : Instrumentation Transformers
Chapter : Overcurrent Protection Relays
Chapter : Differential relays and system grounding protective relaying
Chapter : Motor protection

Formative Assessments:
5 graded quizzes.

Module 3: Design of Transmission Line: Modelling and Performance [16 Hours]

This course provides an extensive examination of transmission line design, modeling, and performance evaluation. It equips participants with both theoretical knowledge and practical skills necessary in the transmission line engineering field. It enables learners to master transmission line parameters, accurately evaluate performance, investigate corona discharge and related phenomena, and gain proficiency in MATLAB for practical application. The course is characterized by hands-on MATLAB demonstrations, real-world case studies, and a strong focus on environmental impact assessments. It requires a basic electrical engineering background, including knowledge of circuit analysis, electromagnetism, and mathematical modeling, with familiarity with MATLAB or similar programming languages beneficial for completing hands-on exercises.

Sub-Topics
Chapter : Transmission Line Parameters
Chapter : Modelling And Performance Of Ac Transmission Lines -Part-I
Chapter : Modelling And Performance Of Ac Transmission Lines -Part-Ii

Formative Assessments:
5 graded quizzes.

Module 4: Electrical Power Generation - An Industrial Outlook [11 Hours]

This course explains the complete Power Generation, extensively detailing about the various electrical equipment along with the process of power generation.

Sub-Topics
Chapter : An Introduction to Power Sector Scenario - Generation, Transmission & Distribution of Power
Chapter : Overview of Electrical Generator and its Auxiliary Systems
Chapter : Overview of Electrical System for Power plant
Chapter : Power Plant Control System

Formative Assessments:
4 graded quizzes.

Module 5: Electric Industry Operations and Markets [8 Hours]

This two-week course provides an in-depth insight into the Electric Industry. The first week focuses on the core activities of the industry, discussing the generation, transmission, and distribution of electricity. You will learn about the immediate feedback mechanism in electricity consumption and how it impacts transmission and generation. The second week shifts gear to electric markets. You will learn about cost components, various market structures, pricing of electricity, and how different factors are transforming the industry. By the end of this course, you'll be equipped with skills to describe and interpret the main features, operations, and regulations of the Electric Industry.

Sub-Topics
Chapter : Electric Industry Operations
Chapter : Electricity Industry Markets

Formative Assessments:
8 graded quizzes and 1 Peer review assignment.

Module 6: Electrical Power Distribution [12 Hours]

This application-oriented course explores multiple aspects of power distribution and equipment up to 33kV, with a focus on both indoor and outdoor environments. It adopts a cross-disciplinary approach to ensure comprehension of site execution, testing, and commissioning. Emphasizing safety at each step, the course incorporates cutting-edge trends like SCADA & automation, broadening the conceptual knowledge base. It prepares learners to excel as Construction Engineers, Planning Engineers, and Commissioning Engineers. This course offers insights into electrical distribution methods, types of loads, greenfield construction of overhead lines, distribution line components, concepts of auto reclosers and sectionalizers, and in-depth knowledge of SCADA.

Sub-Topics
Chapter : Types & Methods of Distribution
Chapter : Types of loads & Distribution of Power
Chapter : Green Field Construction of OH Lines

Chapter : Distribution Line - Components
Chapter : Auto reclosers/Sectionalisers
Chapter : OH Distribution Line Components
Chapter : SCADA in detail

Formative Assessments:
6 graded quizzes.

Module 7: MV Substation - An industrial approach (PART-A) [15 Hours]

This bespoke certificate course on MV Substation Engineering, curated by Subject Matter Experts at L&T, pragmatically guides learners through industry practices for substation engineering and equipment selection in line with Indian & International Standards. It also includes a comprehensive overview of electrical safety rules, operating procedures, and maintenance practices. The course is designed to aid learners in excelling as Electrical Design Engineers and Construction and Planning Engineers. It offers insights into substation types and components, configuration based on different scenarios, transformer types and installation, LV and MV switchgear and their components, basics of protection systems, and station AC/DC auxiliary power systems.

Sub-Topics
Chapter : Substation Overview
Chapter : Basic Design Parameters, Single Line Diagram
Chapter : Transformers
Chapter : LV & MV Switchgear
Chapter : Control System Components & Control Schemes
Chapter : Station ACDC Aux Power System, DC Systems & DG Set

Formative Assessments:
6 graded quizzes.

Module 8: MV Substation - An industrial approach (PART-B) [15 Hours]

Crafted by Subject Matter Experts at L&T, this bespoke certificate course on MV Substation Engineering gives learners a practical understanding of substation engineering. It covers industry practices, selection of substation equipment in accordance with Indian & International standards, electrical safety rules, and safe operating procedures, along with an overview of maintenance practices. The course prepares learners to excel as Electrical Design Engineers and Construction and Planning Engineers. It provides insights into cable construction and termination, cable routing, earthing and lightning protection, civil and mechanical aspects of substation design, and substation maintenance and safety.

Sub-Topics
Chapter : Cable Types & Construction, Selection & Sizing, Termination & Accessories
Chapter : Surge Arrester, Lighting & Small Power Equipment
Chapter : Outdoor SS Layout Engineering
Chapter : Cable Routing & EKD
Chapter : Earthing & Lightning Protection
Chapter : MV Substation – Civil Design and Construction

Chapter : Fire Protection Systems and HVAC for Substations, Maintenance of MV SS and Safety Rules and SOP

Formative Assessments:
6 graded quizzes.

Module 9: Safety in the Utility Industry [11 Hours]

This course arms you with basic utility industry safety knowledge. You will be educated about personal protective equipment, fire safety, hazardous materials and their symbols. You will gain insights to recognize the importance of a safe work environment. This course is for individuals considering a career in the energy field (who have a high school diploma, at minimum, and basic knowledge of mathematics), and existing energy sector employees with less than three years of experience who have not completed similar training and would benefit from a course of foundational industry concepts. The course is a combination of online lectures, videos, readings and discussions. This is the third course in the Energy Production, Distribution & Safety specialization that explores various facets of the power sector, and features a culminating project involving creation of a roadmap to achieve a self-established, energy-related professional goal.

Sub-Topics
Chapter : The Basics
Chapter : Hazards & Response
Chapter : Preparing for Hazards in the Workplace
Chapter : Safety Administration & Management

Formative Assessments:
4 graded quizzes.

Module 10: Electric Power Systems [12 Hours]

This course familiarizes you with standards and policies of the electric utility industry, and provides you with basic vocabulary used in the business. It introduces the electric power system, from generation of the electricity all the way to the wall plug. You will learn about the segments of the system, and common components like power cables and transformers.
This course is for individuals considering a career in the energy field (who have a high school diploma, at minimum, and basic knowledge of mathematics), and existing energy sector employees with less than three years of experience who have not completed similar training and would benefit from a course of foundational industry concepts.
This is the first course in the Energy Production, Distribution & Safety specialization that explores various facets of the power sector, and features a culminating project involving creation of a roadmap to achieve a self-established, energy-related professional goal.

Sub-Topics
Chapter : Basic Electricity
Chapter : Generation, Transmission, & Distribution
Chapter : System Design & Switching
Chapter : Renewable Energy & Smart Grid Technologies

Formative Assessments:
4 graded quizzes.

Module 11: Renewable Power and Electricity Systems [13 Hours]

The energy revolution is underway. Renewable energy is growing at an astounding pace - notably in electricity. Wind turbines and solar photovoltaic (PV) systems account for most new power plants built worldwide, and are essential to building a low-carbon and sustainable energy future. As a result, there are countless new opportunities in renewable electricity.
This course provides a solid grounding in the basics of renewable electricity. We'll start with how electricity is measured, how electricity systems operate, and how renewable technologies like wind turbines and solar PV work. We'll then cover technical and market fundamentals: how and why renewables are driving change in electricity systems worldwide, how electricity systems are changing to accommodate all these new renewables, and what that all means for those seeking to understand and participate in the global transformation of electricity systems. This global transformation is just beginning; with knowledge gained from this course you'll be ready to jump on board.

Sub-Topics
Chapter : Introduction and Renewable Power Basics
Chapter : Grid Operations and Grid Integration
Chapter : Storage and Demand Flexibility
Chapter : Power Structure Industry and ISOs
Chapter : Course Summary and Review

Formative Assessments:
5 graded quizzes.

Module 12: Solar Energy and Electrical System Design [17 Hours]
This course supplies learners with the insights necessary for properly planning, and therefore successfully installing, a photovoltaic (PV) system per design specifications. It directs learners through the important steps of initial site inspection and evaluating appropriate locations for PV systems, and features unique elements of residential, small, industrial and utility-scale solar applications. The course probes key design concerns – including load, efficiency, and mechanical and electrical design – as well as aesthetics and tools for planning. Learners experiment with calculations needed to design a PV system, exercising newly gained knowledge about site selection, layout, code compliance, system components, and wire sizing. This course is targeted for engineers who have interest in entering the solar power sectors. It is also appropriate for HVAC installers, architects and building code inspectors. Learners should have a basic grasp of electrical engineering, physics and mathematical concepts. Those who are unfamiliar with how PV works, the elements of a PV system, and/or solar power ROI should take the first course of the specialization, Solar Energy Systems Overview. Material includes online lectures, videos, demos, hands-on exercises, project work, readings and discussions. This is the second course in the Solar PV for Engineers, Architects and Code Inspectors specialization.

Sub-Topics
Chapter : PV Design Basics
Chapter : PV Design Considerations
Chapter : Electrical System Design
Chapter : Recommendation Options
Chapter : System Design Project: Theory to Practice

Formative Assessments:
5 graded quizzes.

Module 13: Solar Energy Systems Overview [9 Hours]

By the end of this course, learners will have acquired a broad understanding of the history and mechanics behind converting light into electricity, commonly known as photovoltaics (PV). They are empowered to recognize and describe elements of a PV system, enabling them to: compare the most common types of solar cells, sketch a solar PV system, and analyze differences between rooftop and ground mounting configurations. The course explores economic considerations, touching on solar PV costs for residential and commercial use, incentives, and contrasts solar power with fossil fuel and nuclear plants. This course is ideal for anyone interested in entering the solar power sector, whether fresh to the workforce or switching industries. The curriculum is especially useful for engineers, HVAC installers, architects, and building code inspectors. Material includes online lectures, videos, demos, project work, readings and discussions. This is the first course in the Solar PV for Engineers, Architects and Code Inspectors specialization.

Sub-Topics
Chapter : Acknowledgement
Chapter : Solar Power
Chapter : The Nature of PV
Chapter : Solar Power ROI
Chapter : PV System Analysis Project: Theory to Practice

Formative Assessments:
4 graded quizzes.

Module 14: Beginning Custom Projects with Raspberry Pi [14 Hours]

This course leverages Raspberry Pi 4, allowing you to develop a comprehensive network-connected project accessible via smartphone. Through exploring components like sensors and motors, it lays a foundation for creativity in your projects. It treats Raspberry Pi as an "embedded system", preparing you for Internet of Things (IoT) devices, home automation, and robotics projects. The course is newbie-friendly with sections on Python programming, Linux essentials, and basic electronics for willing learners. It is divided into four modules covering Raspberry Pi installation and configuration, network access, control over external sensors and motors, and web interface access to the device. This introductory course leads onto three more courses, each further enhancing your skills and project complexity. Start building and take your projects to the next level.

Sub-Topics
Chapter : Installing, Configuring, and Connecting to Your Raspberry Pi Over the Network
Chapter : Controlling Your Raspberry Pi Over the Network
Chapter : Using Sensors and Motors
Chapter : Let's Make Our Own IoT Project

Formative Assessments:
7 graded quizzes.

Module 15: Communications and High-Speed Signals with Raspberry Pi [13 Hours]

The course focuses on the hardware physical layer and communication aspects of a project,

specifically revolving around high-speed signals. It not only teaches how to troubleshoot these signals when issues arise, but also how to design projects to ensure they perform effectively from the outset. Key topics covered include common signal protocols, physics of high-frequency signals, understanding digital waveform distortion due to unintentional filtering in circuits, and crucial rules of thumb for designing high-speed circuits. This knowledge and these skills provide learners with a holistic understanding of signal estimation, rise time, and different approaches to both troubleshooting and new design development.

Sub-Topics
Chapter : Communications Protocols
Chapter : Real-World Signal Impairements
Chapter : Designing for High-Speed Signals
Chapter : Five Rules of Thumb

Formative Assessments:
4 graded quizzes.

Module 16: Designing Hardware for Raspberry Pi Projects [10 Hours]

This course emphasizes the application of knowledge and experience gained in prior courses. Specifically, it covers four key areas including circuit simulation, schematic entry, PCB layout, and 3D CAD modeling, utilizing free and open-source software to ensure universal access. By the end, learners should be comfortably able to design their own printed circuit board and corresponding custom fitments. The modules intricately cover transient response and filter frequency-domain response simulation, schematic entry technicalities, physical conversion of schematic into a PCB design, and the co-design of electrical and mechanical systems. The integration of these areas allows for totally customized project development.

Sub-Topics
Chapter : Circuit Simulation
Chapter : Drafting Schematics
Chapter : Designing Printed Circuit Boards
Chapter : Co-Designing PCBs and Mechanical Parts

Formative Assessments:
4 graded quizzes.

Module 17: Using Sensors With Your Raspberry Pi [8 Hours]

This course on integrating sensors with your Raspberry Pi is course 3 of a Coursera Specialization and can be taken separately or as part of the specialization. Although some material and explanations from the prior two courses are used, this course largely assumes no prior experience with sensors or data processing other than ideas about your own projects and an interest in building projects with sensors.
This course focuses on core concepts and techniques in designing and integrating any sensor, rather than overly specific examples to copy. This method allows you to use these concepts in your projects to build highly customized sensors for your applications.
Some of the ideas covered include calibrating sensors and the trade-offs between different

mathematical methods of storing and applying calibration curves to your sensors. We also discuss accuracy, precision, and how to understand uncertainty in your measurements. We study methods of interfacing analog sensors with your Raspberry Pi (or other platform) with amplifiers and the theory and technique involved in reducing noise with spectral filters. Lastly, we borrow from the fields of data science, statistics, and digital signal processing, to post-process our data in Python.

Sub-Topics
Chapter : Designing Sensors
Chapter : Calibration Methods
Chapter : Interface Circuits
Chapter : Introduction to Signal Processing

Formative Assessments:
4 graded quizzes.

Module 18: Batteries and Electric Vehicles [9 Hours]

This course will focus on aspects of battery performance in zero emission vehicles, EV charger networks and second life applications of EV batteries, and standards and regulatory requirements.

Sub-Topics
Chapter : Course Introduction
Chapter : Batteries in Various Application Modes
Chapter : Performance and Reliability of EV Batteries, Range Anxiety
Chapter : Futuristic EV Batteries
Chapter : Second Life and Recycling of EV Batteries

Formative Assessments:
4 graded quizzes and 1 peer-review assignment.

Module 19: Behind the Scenes: Exploring EV Core Systems [2 Hours]

This comprehensive course offers a broad perspective on the components, propulsion systems, batteries, charging technologies, performance features, and influential factors in the world of Electric Vehicles (EVs). This essential course delves deep into the EV technology, covering fundamentals of EV components, various propulsion systems, types of batteries, charging technologies, and performance indicators. Upon completion, learners will be proficiently identifying and evaluating all aspects of electric vehicle systems. This course appeals to anyone interested in EV systems, with a basic STEM knowledge recommended for understanding certain technical terms. It equips learners with the knowledge to comprehend and potentially contribute to the evolving landscape of electric vehicle systems.

Sub-Topics
Chapter : Behind the Scenes: Exploring EV Core Systems

Formative Assessments:
1 graded assignment.

Module 20: Bridging the Gap: EV Grid Integration & V2G Systems [2 Hours]

Electric Vehicle (EV) Grid Integration and Vehicle-to-Grid (V2G) Systems is an essential course that discusses the critical intersection of electric vehicles and the electrical grid. As the EV market continues to grow, being aware of how these vehicles can interact with and benefit the grid becomes increasingly crucial.

Sub-Topics
Chapter : Bridging The Gap - EV Grid Integration & V2G Systems

Formative Assessments:
1 graded assignment.

Module 21: Creating EV Charging Hubs: Innovative Design [2 Hours]

The course is a comprehensive exploration into the crucial elements of effective EV charging infrastructure design and implementation. In the face of the global transition towards sustainable transport, this course brushes up on the importance of well-thought-out charging infrastructure, which includes its planning, execution, and assimilation with the electric grid. The curriculum encompasses an in-depth discussion on smart charging technologies and emerging trends like wireless charging infrastructure. On completion, learners will be proficient in identifying and evaluating efficient EV infrastructure designs which are user-centric, regulatory compliant, and contribute to sustainable transportation growth. It is primarily designed for electric vehicle industry professionals, city planners, urban developers, and individuals passionate about sustainable transportation solutions. Prior completion of an electric vehicle charging infrastructure design course is recommended.

Sub-Topics
Chapter : Creating EV Charging Hubs – Innovative Design

Formative Assessments:
1 graded assignment.

Module 22: Demystifying EV Batteries: Tech & Management [2 Hours]

In a world transitioning to sustainable transportation, understanding Electric Vehicle (EV) battery technology is paramount. This course is your gateway to uncovering the technology behind electric vehicle batteries, making you an informed and empowered part of the electric mobility revolution. This is a foundational course that will cover a range of concepts and applications related to Electric Vehicle (EV) Batteries, such as chemistry, capacity, energy, power, and cycle life. We will review Battery Management systems, including metrics and intelligent management techniques. The learners will also acquire knowledge related to performance optimization, charging and discharging methods, infrastructure, and factors affecting battery health.
Upon completing this course, you will be able to get a strong foundation on the fundamentals of battery technology used in electric vehicles. This will enable you to review battery technology projects and their application in the real world. You will gain know-how in optimal battery charging and discharging practices for efficiency and longevity. These skills will empower learners to make informed decisions, maximize the performance and lifespan of electric vehicle batteries, and contribute to the sustainable use of electric vehicles.
This program is designed for anyone who is interested in battery technology used for electric vehicle

applications. This includes engineers working in product development to faculty and students from academia. Learners should ideally be aware of the basic structure and architecture of an electric vehicle. It is also recommended for the learner to be aware of basic physics and chemistry to understand the technical terms covered in the course.

Sub-Topics
Chapter : Demystifying EV Batteries: Tech & Management

Formative Assessments:
1 graded assignment.

Module 23: Electric Vehicles and Mobility [20 Hours]
The course aims to facilitate nuanced understanding of electric vehicle dynamics, allowing you to find answers to key global questions concerning environmental impacts, infrastructure investments, and global accessibility. This course amalgamates insights from engineering science, sociology, environmental science, political science, economics, and management to enable learners to evaluate and implement electric vehicle usage effectively. This English version MOOC is offered by Groupe Renault and ParisTech, with lecture videos in French but the presentation and subtitles in English. Drawing on the longstanding partnership between the two on sustainable mobility, this course evolves from a previously offered Master course, led by ParisTech and its affiliate schools.

Sub-Topics
Chapter : Welcome
Chapter :Understand Mobility and its evolutions
Week 1 Assessment
Chapter : Electric Mobility and Environmental Impact Reduction
Week 2 Assessment
Chapter : Economic Analysis
Week 3 Assessment
Chapter : Electric Mobility and Infrastructures: Technical and Economic Dimensions
Week 3 Assessment
Chapter : Electric Mobility Today
Week 4 Assessment
Chapter : Prospective: The Road to Electrification
Week 5 Assessment
Chapter : Electric Mobility, Connected Mobility, Autonomous Mobility
Chapter : Electric Mobility for All: Utopia or Obviousness
Week 6 Assessment
Chapter : Conclusion

Formative Assessments:
6 graded quizzes.

Module 24: EV Evolution: Comprehensive Introduction to EVs [2 Hours]

As global efforts to curb climate change elevate, electric mobility emerges as a significant initiative to reduce the transportation sector's carbon footprint. This course offers foundational knowledge on Electric Vehicle (EV) technology, starting with the need and environmental impacts of EVs to their

role in promoting sustainable mobility. The curriculum explores the history, evolution, and various types of electric vehicles, their key components, powertrain layouts, and major functions. It concludes with discussions around challenges, opportunities, and emerging trends within the EV industry. On completion, learners would gain a strong understanding of electric vehicle technology fundamentals, preparing them for deeper exploration into the world of EVs. This course appeals to a broad spectrum of audience, including engineers, academicians, students, and anyone interested in EV technology. Although accessible to all, some basic knowledge of physics and chemistry would be helpful in understanding technical terms.

Sub-Topics
Chapter : EV Evolution: Comprehensive Introduction to EVs

Formative Assessments:
1 graded assignment.

Module 25: Mastering EV Cooling: Advanced Thermal Management [2 Hours]

The course equips learners with the essentials of managing thermal conditions in growing electric vehicle (EV) industry. Covering optimal thermal control system strategies, advanced thermal management technologies, along with maintenance and troubleshooting, the course provides practical insights into the development of efficient thermal management systems. Designed for beginners and professionals alike, you don't need special prior knowledge, but familiarity with automotive systems could be beneficial. On completion, learners will confidently identify and evaluate thermal aspects of EVs and comprehend the basic layout diagram of an EV thermal management system.

Sub-Topics
Chapter : Mastering EV Cooling - Advanced Thermal Management

Formative Assessments:
1 graded assignment.

Module 26: Maximizing Miles: Enhancing EV Range & Efficiency [2 Hours]

The course offers a detailed overview of factors influencing the range and efficiency of electric vehicles (EVs), increasingly popular in today's dynamic automotive landscape. The course covers elements such as vehicle weight, aerodynamics, tire selection, advanced technologies like lightweight materials, low rolling resistance tires, and advanced battery management systems. It also addresses the need for an expanded charging infrastructure to enable global electric mobility adoption. Designed for anyone interested in electric vehicle efficiency, it is beneficial for learners to have basic knowledge of EV components. On completion, learners will be informed enough to optimize EV usage, improve their driving habits, and effectively contribute to EV projects.

Sub-Topics
Chapter : Maximizing Miles - Enhancing EV Range & Efficiency

Formative Assessments:
1 graded assignment.

Module 27: Plug Into The Future - EV Charging Essentials [2 Hours]

In the evolving era of electric mobility, the course offers critical insights into EV charging systems. The participants will learn about the importance of charging infrastructure, various charging types and technologies, and planning and deployment considerations. This beginner-friendly course requires no prerequisites and invites all interested in EV charging infrastructure. It is designed for EV enthusiasts, automotive industry decision-makers, urban planners, and those engaged in the energy sector. By completion, learners will be adept at identifying and evaluating EV charging infrastructure processes and concepts, contributing significantly to planning utilities, installation, and operations.

Sub-Topics
Chapter : Plug Into The Future - EV Charging Essentials

Formative Assessments:
1 graded assignment.

Module 28: Powering the Drive: Unveiling EV Electronics [2 Hours]

Welcome to the comprehensive video course on "Electric Vehicle Power Electronics", which explains the pivotal role of power electronics in the electric vehicle (EV) ecosystem. The course consists of four key lessons, covering fundamentals of power electronics, various power electronics topologies used in EVs like pulse-width modulation (PWM), H-bridge, and multilevel converters. It also explores control strategies and algorithms and discusses the synergy between motor drive systems and energy management techniques. The course is designed for individuals with a basic understanding of electrical engineering or power electronics, and an interest in EVs and sustainable transportation would be beneficial but not a prerequisite. Upon completion, you will gain a holistic understanding of power electronics in EVs, enabling you to apply this knowledge effectively.

Sub-Topics
Chapter : Powering the Drive: Unveiling EV Electronics

Formative Assessments:
1 graded assignment.

Module 29: Safety First: EV Maintenance & Best Practices [2 Hours]

The course is designed to navigate the shift towards sustainable transportation by providing essential knowledge of EV care and safety practices. The course comprises four key lessons: "Electric Vehicle Safety Practices," "Electric Vehicle Maintenance Fundamentals," "Electric Vehicle Charging Infrastructure Maintenance," and "Troubleshooting and Diagnostics." Each lesson offers actionable skills and knowledge, equipping learners to implement safety practices, perform routine maintenance, comprehend charging infrastructure, and diagnose common issues. Upon completion, learners will confidently maintain electric vehicles, ensuring both safety and optimal performance. This program targets those seeking to learn about EV maintenance, including professionals in the service, maintenance, and automotive aftermarket industry. It is recommended for participants to have prior knowledge of basic automobile service, maintenance, and basic EV components.

Sub-Topics

Chapter : Safety First: EV Maintenance & Best Practices

Formative Assessments:
1 graded assignment.

Module 30: The Road to Autonomy: Exploring EV Technologies [2 Hours]

The course offers a forward-looking exploration into the realm of autonomous electric vehicles (AEVs). This dynamic course closely examines electric propulsion and autonomous driving and their impact on the automotive industry. The course starts with the foundations of AEVs, tracing their evolution and importance in enhancing safety and reducing emissions, particularly in urban environments. It then delves into the core of AEV technology including sensor systems, perception algorithms, and decision-making processes. Finally, the course addresses safety concerns, exploring regulatory frameworks ensuring passenger and pedestrian safety. This course is designed for EV enthusiasts, and it is recommended to have completed a basic course on electric vehicle technology before embarking on this journey.

Sub-Topics
Chapter : The Road to Autonomy: Exploring Electric Vehicle Technologies

Formative Assessments:
1 graded assignment.

ASSESSMENT:

For summative assessments, Coursera will provide question banks for which exams can be conducted on the Coursera platform or the faculty will create their own assessments.

Note: If a Course or Specialization becomes unavailable prior to the end of the Term, Coursera may replace such Course or Specialization with a reasonable alternative Course or Specialization.