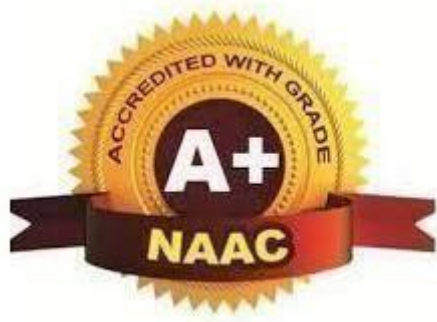




TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute



DEPARTMENT OF ELECTRICAL ENGINEERING

M. Tech. Electric Vehicle Technology

Course Outcomes

Considering

**National Education
Policy 2020**

From

Academic Year 2024-25

Program: M. Tech. Electric Vehicle Technology (EVT)

Course wise Course Outcomes

Semester-II **MEV21201: Battery Management System**

Course Code	Course Outcomes	CL
MEV21201.1	Understand Battery Management Systems and their Fundamentals	2
MEV21201.2	Analyze the functional requirements of BMS such as voltage, temperature, and current sensing, as well as thermal management, protection, and communication systems.	4
MEV21201.3	Evaluate the State of Charge (SOC) and State of Health (SOH) estimation techniques, including model-based and voltage-based methods, and understand the factors affecting battery aging.	5
MEV21201.4	Design and simulate battery models and systems using Equivalent Circuit Models (ECMs) and Physics-Based Models (PBMs) to predict performance in electric vehicles and energy systems.	6
MEV21201.5	Develop effective BMS designs focusing on cell balancing, energy optimization, and safety for enhancing battery life and performance in multi-battery systems.	6

Semester-II	MEV21202: Electric and Hybrid Vehicle	
Course Code	Course Outcomes	CL
MEV21202.1	Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources	3
MEV21202.2	Design and develop basic schemes of electric vehicles and hybrid electric vehicles.	6
MEV21202.3	Choose proper energy storage systems for vehicle applications	3
MEV21202.4	Identify various communication protocols and technologies used in vehicle networks	2
MEV21202.5	Analyze Sizing the drive system in Hybrid and Electric Vehicles.	4

MEV21203: Electrical Vehicle Laboratory - II

	Course Outcomes	CL
MEV21203.1	Interpret the role of battery management system	3
MEV21203.2	Identify the requirements of Battery Management System	3
MEV21203.3	Demonstrate the effect of field weakening in DC motor control.	5
MEV21203.4	Analyze the control of 3 phase induction motor.	3
MEV21203.5	Demonstrate the significance of dead time in PWM generation.	5

	MEV21204: EV Battery Charging System	
	Course Outcomes	CL
MEV21204.1	Comprehensive understanding of Electric Vehicles (EVs), including their history, components, comparison with internal combustion engines in terms of technology.	4
MEV21204.2	Analyze and evaluate the types, design, and operation of electric vehicle chargers.	3
MEV21204.3	Apply knowledge of EV charging systems to select and size fast and slow chargers (AC & DC), choose appropriate EVSE power modules.	3
MEV21204.4	Assess the electrical infrastructure for public EV charging stations, including the selection and sizing of transformers, HT/LT equipment	4
MEV21204.5	Integrate EV chargers with solar power plants by selecting appropriate PV module technologies.	3

	MEV21205: Fuel Cell Technology	
	Course Outcomes	CL
MEV21205.1	Explain types of fuel cells and their applications	4
MEV21205.2	Identify the challenges in hydrogen production and its storage	3
MEV21205.3	Demonstrate the working principle of fuel cells and its process design	3
MEV21205.4	Classify materials for electrodes and testing of different cells	4
MEV21205.5	Demonstrate the processing of fuels for the fuel cell	3

	MEV21206: Advance Battery Technology for Electric Vehicle	
	Course Outcomes	CL
MEV21206.1	Analyze and compare various energy sources for electric vehicle propulsion, understand the electrochemical principles and terminologies.	4
MEV21206.2	Identify and evaluate key electrical and mechanical characteristics of batteries, including capacity, C-rate, impedance, SOC, SOH, and life cycles.	4
MEV21206.3	Apply cell characterization techniques, utilize tools for standard testing, develop battery capacity estimation algorithms.	4
MEV21206.4	Interpret battery packs by understanding the construction of modules, electrical connections, and protection systems at both the cell and pack levels, with practical knowledge.	4
MEV21206.5	Understand the functionality and topology of Battery Management Systems (BMS), including measurement, protection, management.	4

	MEV21207: Plug in Electrical Vehicle	
	Course Outcomes	CL
MEV21207.1	Understand the fundamental concepts and types of Electric Vehicles (EVs) and Plug-in Electric Vehicles (PEVs)	2
MEV21207.2	Analyze the performance metrics and energy sources for Plug-in Electric Vehicles	4
MEV21207.3	Evaluate battery technologies, battery management systems, and their role in PEVs	5
MEV21207.4	Understand the principles of charging infrastructure, power electronics, and charging strategies for PEVs	2
MEV21207.5	Apply motor control techniques and regenerative braking for efficient PEV powertrain operation	3

	MEV21208: Advanced Power Train Engineering	
	Course Outcomes	CL
MEV21208.1	Explain the architecture, design, and working principles of advanced electric vehicle powertrain systems	4
MEV21208.2	Evaluate and optimize electric motor performance for specific EV applications.	4
MEV21208.3	Design power converters and inverters for efficient power flow and control in EV powertrains	4
MEV21208.4	Utilize emerging EV technologies such as regenerative braking, wireless charging, and bidirectional energy transfer	4
MEV21208.5	Apply software tools to model, simulate, and validate powertrain designs and performance.	4

	MEV21209: Advanced Battery Recycling Technology	
	Course Outcomes	CL
MEV21209.1	Analyze various types of energy storage technologies and evaluate their efficiency, scalability, and environmental impact.	4
MEV21209.2	Compare the performance, efficiency, and environmental impacts of conventional battery technologies and emerging battery technologies.	4
MEV21209.3	Analyze recent tenders and battery energy storage projects in India, assessing their scope, objectives, and potential impact on the energy landscape.	4
MEV21209.4	Assess the economic viability of battery recycling in India, considering factors such as investment requirements, job creation, environmental savings, and revenue generation from recovered materials.	5
MEV21209.5	Design a roadmap for enhancing battery recycling regulations in India, proposing policy changes that align with global trends.	6


 HOD
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