

22MEHO102		THERMAL MANAGEMENT OF ELECTRIC VEHICLE BATTERY SYSTEMS				
		CATEGORY	L	T	P	C
		PE	3	0	0	3
COURSE OBJECTIVES						
1	To know Thermal Management of Electric Vehicle Battery Systems					
2	To recognize the applications of PC Min Thermal Management					
3	To investigate the Thermal behaviors in Electric Vehicle Battery Systems through Simulation and Experimental					
4	To calculate the Energy and Exergy Analyses of Battery TMSs					
5	To obtain solutions for case Studies on Thermal Management Solutions of Electric batteries					
UNIT I INTRODUCTION						
Introduction, Current Battery Technologies: Lead Acid Batteries, Nickel Cadmium Batteries, Nickel Metal Hydride Batteries, Lithium-Ion Batteries, Battery Environmental Impact, Battery Management Systems, Safety Management/ Fault Diagnosis/ Thermal Management.			9	0	0	9
UNIT II PHASE CHANGE MATERIALS FOR THERMAL MANAGEMENT SYSTEMS						
Basic Properties and Types of PCMs, Organic PCMs, Inorganic PCMs, Measurement of Thermal Properties of PCMs, Heat Transfer Enhancements, Environmental Impact of Phase Change Materials, Applications of PCMs.			9	0	0	9
UNIT III SIMULATION AND EXPERIMENTAL INVESTIGATION OF BATTERY TMS						
Numerical Model Development for Cell and Submodules, Cell and Module Level Experimentation Set Up and Procedure, Vehicle Level Experimentation Set Up and Procedure, Illustrative, Simulation and Experimentations on the liquid battery TMS using PCMs			9	0	0	9
UNIT IV ENERGY AND EXERGY ANALYSES OF BATTERY TMS						
TMS Comparison, Modeling of Major TMS Components, Energy and Exergy Analyses, Illustrative Example: Liquid Battery Thermal Management Systems			9	0	0	9
UNIT V CASE STUDIES ON THERMAL MANAGEMENT SOLUTIONS OF ELECTRIC BATTERIES						
Case Study 1: Experimental and Theoretical Investigation of Temperature Distributions in a Prismatic Lithium- Ion Battery.			9	0	0	9
CaseStudy2:Thermal Management Solutions for Electric Vehicle Lithium- Ion Batteries based on Vehicle Charge and Discharge Cycles						
TOTAL(45L) : 45 PERIODS						
REFERENCE BOOKS:						
1	Ibrahim Dinçer, Halil S. Hamut, Nader Javani, Thermal Management of Electric Vehicle BatterySystems,C,2017					
2	Halil S. Hamut, Nader Javani, Ibrahim Dinçer, Thermal Management of Electric Vehicle BatterySystems,Wiley,2016					
3	Weixiang Shen, Rui Xiong, Advanced Battery Management Technologies for Electric Vehicles, John Wileyandsons, First edition 2019					
4	Chitra A., Sanjeevikumar Padmanaban, Jens Bo Holm-Nielsen, Artificial Intelligent Techniques for Electric and Hybrid Electric Vehicles, John Wiley and sons, First edition 2020					
5	Bruno Scrosati, Jurgen Garche, Werner Tillmetz, Advances in Battery Technologies for Electric Vehicles, Woodhead Publishing, 2015					

COURSE OUTCOMES: Upon completion of this course, the students will be able to:		Bloom Taxonomy Mapped
CO1	Describe and analyze the techniques of Thermal Management of Electric Vehicle Battery Systems	Analyze
CO2	Describe and classify various applications of PCM in Thermal Management	Understand
CO3	Investigate the Thermal behaviors in Electric Vehicle Battery Systems through Simulation and Experimental	Analyze
CO4	Calculate the Energy and Exergy Analyses of Battery TMSs	Analyze
CO5	Identify the solutions for case Studies on Thermal Management Solutions of Electric batteries	Analyze

COURSE ARTICULATION MATRIX

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	0	0	2	0	1	0	0	0	0	0	1	0	0
CO2	3	2	1	0	1	0	1	0	0	0	1	0	2	0	0
CO3	3	2	2	3	1	0	1	0	0	0	1	0	2	0	0
CO4	3	2	1	2	1	1	0	0	0	0	1	0	2	0	0
CO5	3	3	0	0	1	2	1	1	1	1	1	0	2	0	0
Avg	2.8	2.2	0.8	1	1.2	0.6	0.8	0.2	0.01	0.01	0.04	0.0	1.8	0.0	0.0
3/2/1 – indicates strength of correlation (3 – high, 2- medium, 1- low)															