

Program : Diploma in Automobile Engineering	
Course Code : 6059A	Course Title: Electric and Hybrid Vehicles Lab
Semester : 6	Credits: 1.5
Course Category: Program Elective	
Periods per week: 3 (L:0, T:0, P:3)	Periods per semester: 45

Course Objectives:

- To develop basic knowledge of electric and hybrid vehicles.
- To understand the working of electric motors, controllers and batteries.
- To perform servicing of electric and hybrid vehicles

Course Prerequisites:

Topic	Course code	Course name	Semester
Knowledge of Automobile engineering		Basic Automobile Engineering	2

Course Outcomes:

On completion of the course, the student will be able to:

CO n	Description	Duration (Hours)	Cognitive level
CO1	Identify the different configurations of electric and hybrid vehicles.	10	Applying
CO2	Apply the procedures of testing of electric motors used in electric and hybrid vehicles.	10	Applying
CO3	Apply the procedures of charging and testing of batteries used in electric vehicle.	10	Applying
CO4	Make use of servicing procedure on electric and hybrid vehicles.	12	Applying
	Lab Exam	3	

CO – PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3			2	2		
CO2	3			2	2		
CO3	3			2	2	2	2
CO4	3			3	3	2	2

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	Identify the different configurations of electric and hybrid vehicles		
M1.01	Demonstrate the power train layout of electric and hybrid vehicles	4	Understanding
M1.02	Identify the different configurations of electric and hybrid vehicles	4	Applying
M1.03	Develop a comparison chart of petrol, diesel, electric and hybrid vehicles	2	Applying
CO2	Apply the procedures of testing of electric motors used in electric and hybrid vehicles		
M2.01	Apply the procedure of overhauling of dc motor, ac motor, Brushless dc motor, and permanent magnet synchronous motor	4	Applying
M2.02	Apply the procedures of testing of dc motor, ac motor, Brushless dc motor, and permanent magnet synchronous motor	4	Applying
M2.03	Demonstrate the operation of speed control in dc motor	2	Understanding
	Lab Exam – I	1.5	
CO3	Apply the procedures of charging and testing of batteries used in electric vehicles		
M3.01	Demonstrate the operation of Rectifiers, Inverters, DC/DC converters and Power Split devices for Hybrid Vehicles	3	Understanding
M3.02	Apply the procedures of charging techniques of batteries used in electric vehicles	2	Applying
M3.03	Apply the procedures of testing on batteries	3	Applying

M3.04	Demonstrate the operation of regenerative braking	2	Applying
CO4	Make use of servicing procedure on electric and hybrid vehicles		
M4.01	Demonstrate the electric wiring circuit of electric two wheeler	2	Understanding
M4.02	Apply the procedures of servicing of electric two wheeler	3	Applying
M4.03	Demonstrate the electric wiring circuit of electric three wheeler/four wheeler	2	Understanding
M4.04	Apply the procedures of servicing of electric three wheeler/four wheeler	3	Applying
M4.03	Plan the maintenance schedule of electric and hybrid vehicles	2	Applying
	Open ended projects**		Applying
	Lab Exam – II	1.5	

**** Suggested Open Ended Projects**

(Not for End Semester Examination but compulsory to be included in Continuous Internal Evaluation. Students can do open ended experiments as a group of 2-3. There is no duplication in experiments between groups.

1. Convert a petrol engine two wheeler into an electric two wheeler using a hub motor and control units
2. Construct a comparative performance chart of different batteries used in electric vehicles today.

Text / Reference:

T/R	Book Title/Author
T1	Jack Erjavec, Jeff Arias, “Hybrid, Electric and Fuel-cell Vehicles”, Cengage Learning India Pvt Ltd. New Delhi.
R1	C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons.
R2	Vedam Subramanyam, “Electric Drives – Concepts and Applications”, Tata McGraw Hill
R3	M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press.
R4	T. Denton, “Electric and Hybrid Vehicles”, Routledge.
R5	Iqbal Hussein, “Electric and Hybrid Vehicles Design Fundamentals”, CRC Press

Online Resources:

Sl.No	Website Link
1	https://nptel.ac.in/courses/108/103/108103009/
2	https://www.youtube.com/watch?v=3E1SXG7VkQk&list=PLYqSpQzTE6M9spod-UH7Q69wQ3uRm5thr&index=2
3	https://www.youtube.com/watch?v=V004WUdpHeA&list=PL8qPObng38fHB4nPoBOA4l1ujmriiq_1E