SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Automobile Engineering		LP: AE18602
B.E/~~B.Tech/M.E/M.Tech~~ : **Automobile Engineering** Regulation: **2018**		Rev. No: 00
PG Specialisation	: **NA**	Date: 11.01.2021
Sub. Code / Sub. Name	: **AE18602 - Hybrid and Electric Vehicles**	
Unit	: I	

Unit Syllabus: INTRODUCTION TO NEED FOR ALTERNATIVE SYSTEM

History of electric and hybrid vehicles. Need of electric and hybrid vehicles – comparative study of diesel, petrol, electric and hybrid vehicles, Limitations of electric vehicles, Specification of different electric and hybrid vehicles.

Objective: To make the students to know and understand the constructional and working details about Hybrid and Electric Vehicles.

Session No *	Topics to be covered	Ref	Teaching Aids
1	History of electric vehicles	1,3	PPT
2	History of hybrid vehicles	1,3	PPT
3	Need of electric and hybrid vehicles	1,3	PPT
4	Comparative study of diesel, petrol, electric and hybrid vehicles	1,3	PPT
5	Comparative study of diesel, petrol, electric and hybrid vehicles	1,3	PPT
6	Comparative study of diesel, petrol, electric and hybrid vehicles	1,3	PPT
7	Limitations of electric vehicles.	1,2	PPT
8	Specification of different electric vehicles.	1,2	PPT
9	Specification of different hybrid vehicles.	1,2	PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

Sub. Code / Sub. Name: **AE18602 - Hybrid and Electric Vehicles**

Unit : **II**

Unit Syllabus: ENERGY STORAGE DEVICES AND FUEL CELLS

Electromechanical batteries, types of batteries – lead acid batteries, nickel based batteries, lithium based batteries, electrochemical reactions, thermodynamic voltage, specific energy, specific power, energy efficiency and ultra-capacitors.
Fuel Cell- fuel cell characteristics, fuel cell types - hydrogen fuel cell, connecting cell in series, water management in the Proton-Exchange Membrane (PEM) fuel cell and its thermal management.

Objective: To introduce various configuration of Hybrid and Electric Vehicles.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Electromechanical batteries, types of batteries – lead acid batteries,	1,2	PPT
11	Nickel based batteries	1,2	PPT
12	Lithium based batteries	1,3	PPT
13	Electrochemical reactions, thermodynamic voltage	1,4	PPT
14	Specific energy, specific power, energy efficiency	1,3	PPT
15	Ultra-capacitors	1,3	PPT
16	Fuel Cell- fuel cell characteristics, fuel cell types	1,4	PPT
17	Hydrogen fuel cell, connecting cell in series	1,4	PPT
18	water management in the Proton-Exchange Membrane (PEM) fuel cell and its thermal management	1,4	PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub. Code / Sub. Name: **AE18602 - Hybrid and Electric Vehicles**

Unit : **III**

Unit Syllabus: ELECTRIC VEHICLES

Electric vehicle (EV) layout, performance of EVs, traction motor characteristics, tractive effort, transmission requirements, vehicle performance, energy consumption, advantage and limitations, specifications, system components, electronic control system, safety and challenges in EVs.

Objective: To impart the knowledge about energy storage devices.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Electric vehicle (EV) layout	1,3	PPT
20	Performance of EVs	1,3	PPT
21	Traction motor characteristics, tractive effort	1,3	PPT
22	Vehicle performance, energy consumption	1,3	PPT
23	Advantage and limitations	1,3	PPT
24	Specifications	1,4	PPT
25	System components	1,4	PPT
26	Electronic control system	1,4	PPT
27	Safety and challenges in EVs	1,4	PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub. Code / Sub. Name: **AE18602 - Hybrid and Electric Vehicles**

Unit : **IV**

Unit Syllabus: HYBRID VEHICLES

Concepts of hybrid electric drive train, types, architecture of series and parallel hybrid electric drive train, merits and demerits, hybrid electric drive train design, mild and full hybrids, Plug-in Hybrid Electric Vehicles (PHEV) and range extended Hybrid Electric Vehicles (HEV).

Objective: To impart knowledge on electrical drives for automobiles.

Session No *	Topics to be covered	Ref	Teaching Aids
28	Concepts of hybrid electric drive train	1,3	PPT
29	Types of hybrid electric drive train	1,3	PPT
30	Architecture of series hybrid electric drive train	1,3	PPT
31	Architecture of parallel hybrid electric drive train	1,3	PPT
32	Merits and demerits	1,3	PPT
33	Hybrid electric drive train design	1,3	PPT
34	Mild and full hybrids	2,4	PPT
35	Plug-in Hybrid Electric Vehicles (PHEV)	2,4	PPT
36	Range extended Hybrid Electric Vehicles (HEV)	2,4	PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub. Code / Sub. Name: **AE18602 - Hybrid and Electric Vehicles**

Unit : **V**

Unit Syllabus: PROPULSION MOTORS AND CONTROLLERS

Types of electric motors – working principle of Alternate Current (AC) and Direct Current (DC) motors, Characteristic of shunt, series and compound, types of DC motors - permanent magnet and separately exited DC motors, AC single phase and 3-phase motor, inverters, DC and AC motor speed controllers.

Objective: To introduce various electronic controllers for Hybrid and Electric Vehicles.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Types of electric motors – working principle of Alternate Current (AC) motors	1,2	PPT
38	Working principle of Direct Current (DC) motors	1,2	PPT
39	Characteristic of shunt, series and compound	1,2	PPT
40	Types of DC motors - permanent magnet exited DC motors	1,3	PPT
41	Separately exited DC motors	1,3	PPT
42	AC single phase motor	1,3	PPT
43	AC 3-phase motor	1,3	PPT
44	Inverters	1,3	PPT
45	DC and AC motor speed controllers	1,3	PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub Code / Sub Name: **AE18602 - Hybrid and Electric Vehicles**

REFERENCES:

1. Kambiz Ebrahimi Mehrdad Ehsani, Yimin Gao, Stefano Longo, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles", Third edition, CRC Press, 2019.
2. Tom Denton, "Electric and Hybrid Vehicles", 1st edition, Routledge Publishers, 2017.
3. Iqbal Husain, "Electric and Hybrid Vehicles Design Fundamentals", CRC Press, 2005.
4. Ronald K. Jurgen, "Electric and Hybrid-Electric Vehicles: Engines and Powertrains", SAE International, 2015.
5. Ron HodKinson, "Light Weight Electric/ Hybrid Vehicle Design", Butterworth Heinemann Publication, 2005.

	Prepared by	Approved by
Signature		
Name	**Mr. K. PAUL DURAI**	**Dr. J. VENKATESAN**
Designation	Assistant Professor	HoD/AUT
Date	11.01.2021	11.01.2021
Remarks *:	Same Lesson plan is followed for the academic year 2021-22 01/03/22	01/03/2022
Remarks *:	Same Lesson plan is followed for the academic year 2022-23 11/01/23	11/01/2023

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

Same Lesson plan is followed for the academic year 2023-24

02/01/24 02/01/2024