LESSON PLAN

A)

PROGRAMME: DIPLOMA ENGINEERING	**COURSE: AUTOMOBILE ENGINEERING**
TEACHER NAME: ARJUN BEHURA	**SEMESTER : 6TH**
SUBJECT NAME:ELECTRIC& HYBRID VEHICLE and EMISSION CONTROL	**THEORY NO: 04**
COURSE AREA/ DOMAIN :	**CONTACT HOURS:**
CORRESPONDING LAB PRACTICAL NO(IF ANY):	**LAB COURSE NAME:**

B) Course Outcomes:

At the end of the course, the students will be able to*:*

1. Have brief idea on vehicle development
2. Understand the basic operation of battery electric vehicles.
3. Understand the basic operation of fuel cell electric vehicles.
4. Understand the concepts of hybrid electric vehicles.
5. Have knowledge on modern vehicle emission control technologies.

C) Text Books:

Sl.No.	Prescribed Books	Author
01	STATISTICAL ELECTRIC & HYBRID VEHICLES	A.K. BABU
02	ELECTRIC & HYBRID VEHICLES – DESIGN FUNDAMENTALS	IQBAL HUSSAIN

D) Course Plan*:*

Planning				
Week No.	**Lecture No.**	**Chapter No.**	**Article(s) from the Syllabus**	**Topics to be taught (Brief Description of the title from the Prescribed Book)**

01	**1** **2** **3** **4**	**01**	**1.1** **1.2** **1.3** **1.4** **1.5** **1.6**	Introduction Need for electric vehicle Problems of electric vehicles – (range and batteries, charging, lack of performance, purchase price, safety and reliability) Advantage of electric vehicle Disadvantage of electric vehicle Major component of electric vehicle – (motor, battery, charger, controller, DC converter, energy management system)
02	**5** **6** **7** **8**	**02**	**2.1** **2.2** **2.3** **2.4** **2.5** **2.6** **2.7**	Battery electric vehicle(BEV)-(advantage, disadvantage, application) Hybrid Electric Vehicle (HEV)- (advantage, disadvantage, application) Plug-In Hybrid Electric vehicle(PHEV) – (advantage, disadvantage, application) Energy sources (battery, ultra capacitors, flywheels ,fuel cells) Requirements of EVs energy sources Battery – requirement of EV batteries, selection of battery, deep cycle battery Types of battery for EVS (lead-acid battery, lithium-ion battery)and their advantages and disadvantages Ultra capacitor and its working principle Flywheel and its advantage and disadvantage
03	**9** **10** **11** **12**	**03**	**3.1** **3.2**	Electric motor Requirements of EV motor Brushed DC motor Brushless DC motor Switched reluctance motor AC induction motor Indian electric vehicle (4 wheeler, 3 wheeler, 2 wheeler)
04	**13** **14** **15** **16**	**04**	**4.1** **4.2** **4.3** **4.4** **4.5** **4.6** **4.7**	Hybrid electric vehicle(HEV) Advantage and disadvantage of HEV Components of HEV Working of hybrid vehicle Hybridization (micro hybrid, mild hybrid, full hybrid) Fuel cell electric vehicle (FCEV) working principle, advantages and disadvantages
05	**17** **18** **19**	**05**	**5.1** **5.2** **5.3**	Advanced Engine Design Variable Valve Timing Turbo charging Systems

	20		**5.4** **5.5**	Catalytic Converters The Two-Way Catalyst The Three-Way Catalyst Diesel Oxidation Catalyst (DOC) Selective Catalytic Reduction (SCR) Nitrogen–Oxide (NOx) Adsorber Catalyst The Diesel Particulate Filter (DPF) Exhaust Gas Recirculation (EGR) Crankcase Emission Control System

Faculty HOD Academic Convener Principal