

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme	Diploma Engineering				Branch	Automobile Engineering			
Semester	VI				Version	1.0.0.0			
Effective from Academic Year		2020-21			Effective for the batch Admitted in			July 2018	
Subject code	1AU2606		Subject Name		ADVANCE POWERTRAIN TECHNOLOG				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

Course Learning Outcomes:
The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:
CO1. Describe about working principle of electric vehicles.
CO2. Explain the construction and working principle of various motors used in electric vehicles.
CO 3. Understand about working principle of electronics and sensor less control in electric vehicles.
CO 4 Describe the different types and working principle of hybrid vehicles.
CO 5 Illustrate the various types and working principle of fuel cells.

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
UNIT – 1 Alternate Fuels	1.1 Need for Alternate fuels, 1.2 Desirable Characteristics of good Alternate Fuel Liquid and Gaseous fuels for SI and CI Engines, Kerosene, LPG, Alcohols, Bio-fuels, Natural gas, Hydrogen and use of these fuels in Engines.	1a. Explain different alternative fuels used in automobile recent days. 1b. Describe how they work in existing engine. 1c. Benefits of this fuels in recent trend.	12	9
UNIT – 2 Introduction to Electric Vehicles	2.1 Electric Vehicle – Need - Types – Cost and Emissions – End of life. 2.2 Electric Vehicle Technology – layouts, cables, components, Controls. 2.3 Batteries – overview and its types. 2.4 Battery plug-in and life. 2.5 Ultra-capacitor, Charging – Methods and Standards. Alternate charging sources – Wireless & Solar.	2a. Explain about electric vehicles, need and types. 2b. Identify various electric vehicle technologies and layouts 2c. Use of batteries and other electric device used for it.	12	9
UNIT – 3 Electric Vehicle Motors:	3.1 Motors (DC, Induction, BLDC) – Types, Principle, Construction, Control. 3.2 Electric Drive Trains (EDT) – Series HEDT (Electrical Coupling) – Power	3a. Various motor used to drive the electric vehicles. 3b. Understand electric drive trains. 3c. To understand Basic	12	9

	Rating Design, Peak Power Source (PPS); 3.3 Parallel HEDT (Mechanical Coupling) Torque Coupling and Speed Coupling. 3.4 Switched Reluctance Motors (SRM) Drives – Basic structure, Drive Converter, Design.	calculation and use of motors also various design criterion.		
UNIT – 4 Hybrid vehicle:	4.1 Hybrid Electric vehicles – Classification – Micro, Mild, Full, Plug-in, EV. 4.2 Layout and Architecture – Series, Parallel and Series-Parallel Hybrid, Propulsion systems and components. 4.3 Regenerative Braking, Economy, Vibration and Noise reduction. 4.4 Hybrid Electric Vehicles System – Analysis and its Types, Controls.	4a Classify hybrid vehicles and various hybrid technologies. 4b Study layout and architecture of hybrid vehicles. 4c To study various hybrid vehicle system analysis and controls.	12	9
UNIT – 5 Fuel Cells for Electric vehicles	5.1 Fuel cell – Introduction, Technologies & Types, Obstacles. Operation principles, Potential and I-V curve, Fuel and Oxidation Consumption, Fuel cell Characteristics – Efficiency, Durability, Specific power, Factors affecting, Power design of fuel Cell Vehicle and freeze capacity. 5.2 Lifetime cost of Fuel cell Vehicle – System, Components, maintenance.	5a Understand fuel cell technologies, efficiency etc. 5b Understanding about cost and maintenance.	12	09
		Total	60	45

List of Practical		
No.	Unit	Name of Practical
1	I	Study of various components of electric car.
2	II	Demonstration of wiring layout of electric vehicle.
3	II	V/f control of three-phase induction motor.
4	III	Speed control of BLDC motor in two wheeler.
5	III	Speed control of SRM motor in three wheeler.
6	IV	Application of DC series motor in an electric vehicle.
7	IV	Sensor & Actuators in an Electric Vehicle.

List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Hybrid Electric Vehicle System Modelling and Control.	Wei Liu, General Motors, USA.	John Wiley & Sons, Inc., 2017.
2	Hybrid Electric Vehicles	Teresa Donateo	ExLi4EvA, 2017
3	Electric and Hybrid Vehicles Power Sources, Models, Sustainability	Infrastructure and the Market Gianfranco Pistoia Consultant	Elsevier Publications, 2017
4	Hybrid, Electric & Fuel-Cell Vehicles	Jack Erjavec, Delmar	Cengage Learning
5	Electric and Hybrid Vehicles	Tom Denton	Taylor & Francis, 2018