

**GUJARAT TECHNOLOGICAL UNIVERSITY**Syllabus for Bachelor of Vocation (B.Voc), 4th Semester

Branch: Automobile Servicing

Subject Name: Electrical & Hybrid Vehicles – II

Subject Code: 1140104

With effective
from academic
year 2018-19

Teaching Scheme			Credits	Examination Marks				Total Marks
L	P	OJT		Theory		Tutorial/ Practical		
			University exams (ESE)	Progressive Assessment (PA)	External Practical /viva Exam(ESE)	Internal evaluation Practical /viva Exam(PA)		
3	-	-	3	50	-	-	-	50

Course Content:

Unit No.	Content	Hrs
1	Hybrid Architecture and Power Plant Specifications: Series configuration locomotive drives- series parallel switching- load tracking architecture. Pre-transmission parallel and combined configurations Mild hybrid- power assist- dual mode- power split- power split with shift- Continuously Variable transmission (CVT)- wheel motors. Grade and cruise targets- launching and boosting- braking and energy recuperation- drive cycle implications.	10
2	Sizing the Drive System and Energy Storage Technology: Matching electric drive and ICE; sizing the propulsion motor; sizing power electronics. Battery basics; lead acid battery; different types of batteries; battery parameters	08
3	Fuel Cells: Fuel cell characteristics- fuel cell types – alkaline fuel cell- proton exchange Membrane; direct methanol fuel cell- phosphoric acid fuel cell- molten carbonate fuel cell- solid oxide fuel cell- hydrogen storage systems- reformers- fuel cell EV- super and ultra-capacitors- PEM fuel cell vehicles.	08
4	Energy Storage: Battery based energy storage: Battery basics, Lead acid (Pb-Acid) battery, Nickel-Cadmium (NiCd) battery, Nickel-Metal-Hydride (NiMH) battery, Lithium-ion (Li-ion) battery, Lithium-polymer (Li-poly) battery, Ultra capacitors.	08
5	Nonelectric Hybrid Systems: Short term storage systems flywheel accumulators. Continuously variable transmissions hydraulic accumulators hydraulic pumps/motors- pneumatic hybrid engine systems operation modes.	08
Total Hours:		42

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
5	15	15	10	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate and above Levels (Bloom's Taxonomy)

Reference Books:

1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House