



Shri Vile Parle Kelavani Mandal's

**DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING**

(Autonomous College Affiliated to the University of Mumbai)

NAAC Accredited with "A" Grade (CGPA : 3.18)



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# Dwarkadas J. Sanghvi College of Engineering

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## Scheme and detailed Syllabus (DJ19) of Honours Degree Program in Electric Vehicles

*Revision: 1 (2022)*

*With effect from the Academic Year: 2022-2023*



**Proposed scheme for Honours in Electric Vehicles  
 (Academic Year 2022-2023)**

Sr.	Course Code	Course	Teaching Scheme (hrs.)				Continuous Assessment (A) (marks)			Semester End Assessment (B) (marks)					(A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA (A)	Th / Cb	O	P	O & P	Total SEA (B)		
Sem V																
1	DJ19MEHN1C1	Fundamentals of Electric Vehicles	4	--	--	4	25	--	25	75	--	--	--	75	100	4
Sem VI																
2	DJ19MEHN1C2	Electric drives and controls	4	--	--	4	25	--	25	75	--	--	--	75	100	4
3	DJ19MEHN1L1	Electric Vehicle Laboratory 1		2		1		25	25	--	--	--	25	25	50	1
Sem VII																
4	DJ19MEHN1C3	Energy source management	4	--	--	4	25	--	25	75	--	--	--	75	100	4
5	DJ19MEHN1L2	Electric Vehicle Laboratory 2	--	2	--	1	--	25	25	--	--	--	25	25	50	1
Sem VIII																
6	DJ19MEHN1C4	Electric Vehicle System Design	4	--	--	4	25	--	25	75	--	--	--	75	100	4
		Total	16	4	0	18	100	25	125	300	0	0	25	325	500	18



## Honors in Electric Vehicles

Semester: V

Program: Mechanical Engineering

Course: Fundamentals of Electric Vehicles (DJ19MEHN1C1)

### Pre-requisite:

1. Basic of electronics and electrical engineering
2. Fundamentals of physics and engineering mechanics

### Objectives:

1. To study different automotive components and subsystems
2. To explore the transition of automotive domain from Internal Combustion Engine to electric vehicles

**Outcomes:** On completion of the course, the learner will be able to:

- 1 To explain the basic of Electric vehicles and its major parts.
2. To define the functionality and working principles of different types of Automotive Powertrains
3. To illustrate the working of various automotive transmission systems
4. To explain vehicle fundamentals of various subsystem.
5. To illustrate the working of motors and conversions.
6. To identify and illustrate the various hybrid electric powertrains and their different modes of operations

Electric Vehicles (DJ19MEHN1C1)		
Unit	Description	Duration
1	<b>Electric Vehicles</b> History, Basics of Electric Vehicles ,Components of Electric Vehicle, General Layout of EV, EV classification : Battery Electric Vehicles (BEVs), Fuel-Cell Electric Vehicles (FCEVs) Comparison with Internal Combustion Engine: Technology, Advantages & Disadvantages of EV, National Policy for adoption of EVs, Overview of Tesla car.	10
2	<b>Vehicle Mechanics</b> History of Vehicle Development, General Configuration of Automobile, Body and Chassis Fundamentals: General Packaging, Types of Structural System, Backbone Construction; Body and Chassis Materials. Automotive Powertrain Mechanical, Suspensions system, Steering System, NVH, Control System Integration and Implementation. Front-Wheel Drive (FWD) Powertrains, Rear-Wheel Drive Powertrains (RWD), Multi-Wheel Drive Powertrains (AWD and 4WD).	10
3	<b>Transmission Systems</b> Transmission gears, Manual Transmission (MT), Automatic Transmission (AT), Automated Manual Transmissions (AMT) and Continuously Variable Transmissions (CVT); Manual Transmissions Powertrain Layout and Manual Transmission Structure, Power Flows and Gear Ratios, Manual Transmission Clutch and its structure. Drivetrain and Differential.	10



<b>4</b>	<b>Vehicle fundamentals</b> Vehicle resistance, Types: Rolling Resistance, grading resistance, Aerodynamic drag vehicle performance, Calculating The Acceleration Force, maximum speed, Finding The Total Tractive Effort, Torque Required On The Drive Wheel, Transmission: Differential, clutch & gear box, Braking performance.	<b>10</b>
<b>5</b>	<b>Conversions and motors</b> Introduction of DC-DC, AC-AC, AC-DC, DC-AC, four-quadrant operation, Driver circuits. Principle and working of DC motor, Characteristics and Types of DC Motors- Overview (Speed torque characteristics) of Permanent Magnet motor, BLDC Motor, Induction motor. Comparison of all motors.	<b>6</b>
<b>6</b>	<b>Hybrid Powertrain:</b> Series HEVs, Parallel HEVs, Series-Parallel HEVs, Complex HEVs, Operating Modes, Degree of Hybridization, Comparison of HEVs, Plug-in Hybrid Electric Vehicles (PHEVs) Real Life examples of HEVs, compare and contrast the performance of ICE vehicles, HEVs and EVs.	<b>6</b>
	<b>Total</b>	<b>52</b>

**Books Recommended:****Text books:**

1. Vehicle Powertrain Systems by Behrooz Mashadi and David Crolla, Wiley, 2012
2. Automotive Aerodynamics by Joseph Katz, Wiley, 2016
3. Automotive Chassis Engineering, by David C. Barton and John D. Fieldhouse, Springer, 2018
4. Automotive Engineering Powertrain, Chassis System and Vehicle Body Edited by David A. Crolla, Elsevier, 2009
5. Automotive Power Transmission Systems by Yi Zhang and Chris Mi, Wiley, 2018
6. Linear Electric Machines, Drives, and MAGLEVs Handbook, by Ion Boldea, CRC Press. 2013
7. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles by Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay, and Ali Emadi, CRC Press 2005
8. Electric Vehicle Technology Explained by James Larminie and John Lowry, John Wiley, 2003
9. Electric and Hybrid Vehicles- Design Fundamentals by Iqbal Husain, CRC Press, 2005

**Reference Books:**

1. Encyclopaedia of Automotive Engineering edited by David Crolla et al, Wiley, 2014
2. Design and Control of Automotive Propulsion Systems by Zongxuan Sun and Guoming Zhu, CRC Press, 2015
3. The Automotive Transmission Book by Robert Fischer, Ferit Küçükay, Gunter Jürgens, Rolf Najork, and Burkhard Pollak, Springer, 2015
4. Noise and Vibration Control in Automotive Bodies by Jian Pang, Wiley, 2019

**Continuous Assessment (A):**

Course	Assessment Tools	Marks	Time (hrs.)
Theory	One Term test (based on 40 % syllabus)	25 each (Avg.25)	1
	Second Term test (next 40 % syllabus ) / presentation / assignment / course project / group discussion / any other.		as applicable
Audit course	Performance in the assignments / quiz / power point presentation / poster presentation / group project / any other tool.	--	
Laboratory	Performance in the laboratory and documentation.	25	
Tutorial	Performance in each tutorial & / assignment.	25	
Laboratory & Tutorial	Performance in the laboratory and tutorial.	25	

The final certification and acceptance of term work will be subject to satisfactory performance upon fulfilling minimum passing criteria in the term work / completion of audit course.

**Semester End Assessment (B):**

Course	Assessment Tools	Marks	Time (hrs.)
Theory / * Computer based	Written paper based on the entire syllabus.	75	3
	* Computer based assessment in the college premises.		
Oral	Questions based on the entire syllabus.	25	as applicable
Practical	Performance of the practical assigned during the examination and the output / results obtained.	25	2
Oral & Practical	Project based courses - Performance of the practical assigned during the examination and the output / results obtained. Based on the practical performed during the examination and on the entire syllabus.	as per the scheme	2