



DEPARTMENT OF ELECTRICAL AND ELECTRONICS  
ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech- Power Systems		
Course Title	e-Vehicle Technology and Mobility		
Course Code	EE703	No. of Credits	3
Course Code of Pre-requisite subject(s)	Electrical Machines and Power Converters		
Session	January 2020	Section (if, applicable)	M.Tech 1 <sup>st</sup> yr – II Sem
Name of Faculty	Dr. P. Srinivasarao Nayak	Department	EEE
Official Email	psnayak@nitt.edu	Telephone No.	7708243070
Name of Course Coordinator(s) (if, applicable)			
Official E-mail		Telephone No.	
Course Type (please tick appropriately)	✓		
<b>Syllabus (approved in BoS)</b>			
<p>Introduction to electric vehicles: EV verses gasoline vehicles, vehicle dynamics fundamentals, e-drivetrain, Electric motor, Power electronic in electric vehicles, Regenerative braking.</p> <p>Battery Technology for EVs: Storage technologies for EV, Battery working principles, Battery losses, Li-ion batteries, Battery pack and battery management system.</p> <p>Charging Technology of EVs: AC charging - Type 1,2,3, DC charging, Fast charging and its limitations, Smart charging and applications, Vehicle to X (V2X), X2V technology.</p> <p>Future trends in e-Vehicles: Wireless charging of EV, On-road charging of EV, Battery swap technology, Solar powered EVs, Charging EVs from renewables.</p> <p>E-mobility: electrification challenges, business, connected mobility and autonomous mobility-case study in Indian Roadmap Perspective, Policy- EVs in infrastructure system, integration of EVs in smart grid, social dimensions of EVs.</p>			



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### COURSE OBJECTIVES

This course introduces the fundamental concepts, principles, analysis and design of e-vehicles.

### MAPPING OF COs with Pos

Course Outcomes	Programme Outcome (PO)
1. Understand the operation principle of electric vehicles.	1, 2, 6, 7, 8
2. Choose a suitable motors and analyze different power electronics in EVs.	1, 6, 7, 10
3. Understand the battery technology.	3, 5, 7, 8, 10, 12
4. Understand future technology for EVs such as smart charging, wireless charging and solar EVs.	1, 2, 5, 7, 8, 10, 14
5. Distinguishing between different policy perspectives and innovation in future mobility.	1, 2, 5, 6, 7, 8, 9, 12

### COURSE PLAN – PART II

#### COURSE OVERVIEW

Students get exposure to the fundamentals of e-vehicle technology and mobility. Further they will be expose to modelling of EV, selecting the energy storage technologies and battery management system, fast and smart charging technology and its limitations, G2V, V2G, wireless charging system, battery swapping technology, charging EV's from renewable energy sources, challenges and current issues in e-mobility.

#### 8COURSE TEACHING AND LEARNING ACTIVITIES

S.No	Week/Contact Hours	Topic	Mode of Delivery
1.	Week 1 (3 Contact hour)	Introduction to electric vehicles: EV verses gasoline vehicles,	Chalk & Talk/PPT
2.	Week 2 (2 Contact hours)	vehicle dynamics fundamentals, e-drive train, Electric motor,	Chalk & Talk/PPT
3.	Week 3 (3 Contact hours)	Power electronic in electric vehicles, Regenerative braking.	Chalk & Talk/PPT
4.	Week 4 (3 Contact hour)	Battery Technology for EVs: Storage technologies for EV,	Chalk & Talk/PPT



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5.	Week 5 (3 Contact hours)	Battery working principles, Battery losses,	Chalk & Talk/PPT
6.	Week 6 (3 Contact hours)	Li-ion batteries, Battery pack and battery management system.	Chalk & Talk/PPT
7.	Week 7 (3 Contact hours)	Charging Technology of EVs: AC charging - Type 1,2,3,	Chalk & Talk/PPT
8.	Week 8 (2 Contact hour)	DC charging, Fast charging and its limitations,	Chalk & Talk/PPT
9.	Week 9 (3 Contact hours)	Smart charging and applications, Vehicle to X (V2X), X2V technology.	Chalk & Talk/PPT
10.	Week 10 (2 Contact hour)	Future trends in e-Vehicles: Wireless charging of EV,	Chalk & Talk/PPT
11.	Week 11 (2 Contact hours)	On-road charging of EV, Battery swap technology,	Chalk & Talk/PPT
12.	Week 12 (3 Contact hours)	Solar powered EVs, Charging EVs from renewables.	Chalk & Talk/PPT
13.	Week 13 (2 Contact hours)	E-mobility: electrification challenges, business, connected mobility and autonomous mobility-	Chalk & Talk/PPT
14.	Week 14 (2 Contact hours)	Case study in Indian Roadmap Perspective, Policy- EVs in infrastructure system,	Chalk & Talk/PPT
15.	Week 15 (2 Contact hours)	Integration of EVs in smart grid, social dimensions of EVs.	Chalk & Talk/PPT

## COURSE ASSESSMENT METHODS

S.No	Mode of Assessment	Week	Duration	% Weightage
1	Cycle Test – I	Week 6 10 – 14 February 2020	75 minutes	25



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2	Cycle Test – II	Week 12 23 – 27 March 2020	75 minutes	25
3	Assignments	Work will be carried out along with the course		10
4	Compensation Assessment	Week 16 20 - 24 April 2020	75 minutes	25
5	Final Assessment	Week 17/18 April 27 - 15 May 2020	120 minutes	40

**ESSENTIAL READINGS: Textbooks, Reference books, website address, journals, etc**  
**Reference Books:**

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi. "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
2. Sheldon S. Williamson, Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Springer, 2013.
3. Sandeep Dhameja. "Electric Vehicle Battery Systems", Newnes, 2000  
.http://nptel.ac.in/courses/108103009/
4. Tariq Muneer and Irene Illescas García, "The automobile. In Electric Vehicles: Prospects and Challenges", Elsevier, 2017.

**COURSE EXIT SURVEY**

Shall be obtained at the end of the course.

**COURSE POLICY (including compensation assessment to be specified)**

1. Attending all the assessments mandatory for every student
2. One compensation assessment will be conducted for those students who are being physically absent for the assessment 1 and/or 2, only for the valid reason.
3. At any case CPA will not be considered as an improvement test.
4. Absolute/Relative grading will be adopted for the course.

**ATTENDANCE POLICY** (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

**ACADEMIC DISHONESTY & PLAGIARISM**



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- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

FOR APPROVAL

Course Faculty

*P. S. Senthil*  
21/01/2020

CC- Chairperson

*S. Manoj*  
21/1/2020

HOD

*S. Sridhar*



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### Guidelines

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.