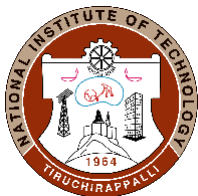




DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING

| COURSE PLAN – PART I | | | |
|--|--|--------------------------|------------------------------------|
| Name of the programme and specialization | M.Tech- Power Electronics | | |
| Course Title | E-Vehicle Technology and Mobility | | |
| Course Code | EE703 | No. of Credits | 03 |
| Course Code of Pre-requisite subject(s) | Electrical Machines and Power Converters | | |
| Session | January 2021 | Section (if, applicable) | M.Tech 1 st yr – II Sem |
| Name of Faculty | Dr. P. Srinivasarao Nayak | Department | EEE |
| Official Email | psnayak@nitt.edu | Telephone No. | 7702843070 |
| Name of Course Coordinator(s) (if, applicable) | | | |
| Official E-mail | | Telephone No. | |
| Course Type (please tick appropriately) | Elective | | |
| Syllabus (approved in BoS) | | | |
| <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> | | | |



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 |

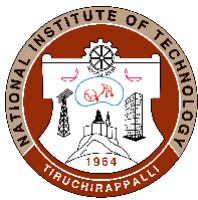
COURSE PLAN – PART II

COURSE OVERVIEW

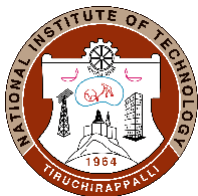
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8COURSE TEACHING AND LEARNING ACTIVITIES

| S.No | Week/Contact Hours | Topic | Mode of Delivery |
|------|---|--|---|
| 1. | Week 1 06 – 10 January 2021 (3-Contact hour) | Introduction to electric vehicles: EV verses gasoline vehicles, | Online tools, related software and corresponding videos |
| 2. | Week 2 13 – 17 January 2021 (3-Contact hours) | vehicle dynamics fundamentals, e-drivetrain, Electric motor, | Online tools, related software and corresponding videos |
| 3. | Week 3 20 – 24 January 2021 (3 Contact hours) | Power electronic in electric vehicles, Regenerative braking. | Online tools, related software and corresponding videos |
| 4. | Week 4 27 – 31 January 2021 (3 Contact hour) | Battery Technology for EVs: Storage technologies for EV, | Online tools, related software and corresponding videos |
| 5. | Week 5 3 – 7 February 2021 (3 Contact hours) | Battery working principles, Battery losses, | Online tools, related software and corresponding videos |



| | | | |
|-----|---|---|---|
| 6. | Week 6 10 – 14 February 2021 (3 Contact hours) | Li-ion batteries, Battery pack and battery management system. | Online tools, related software and corresponding videos |
| 7. | Week 7 17 – 21 February 2021 (3 Contact hours) | Charging Technology of EVs: AC charging - Type 1,2,3, | Online tools, related software and corresponding videos |
| 8. | Week 8 24 – 28 February 2021 (3 Contact hour) | DC charging, Fast charging and its limitations, | Online tools, related software and corresponding videos |
| 9. | Week 9 2 – 6 March 2021 (3 Contact hours) | Smart charging and applications, Vehicle to X (V2X), X2V technology. | Online tools, related software and corresponding videos |
| 10. | Week 10 9 – 13 March 2021 (1 Contact hour) | Future trends in e-Vehicles: Wireless charging of EV, | Online tools, related software and corresponding videos |
| 11. | Week 11 16 – 20 March 2021 (3 Contact hours) | On-road charging of EV, Battery swap technology, | Online tools, related software and corresponding videos |
| 12. | Week 12 23 – 27 March 2021 (3 Contact hours) | Solar powered EVs, Charging EVs from renewables. | Online tools, related software and corresponding videos |
| 13. | Week 13 30 March – 3 April 2021 (3 Contact hours) | E-mobility: electrification challenges, business, connected mobility and autonomous mobility- | Online tools, related software and corresponding videos |
| 14. | Week 14 6 - 10 April 2021 (2 Contact hours) | Case study in Indian Roadmap Perspective, Policy- EVs in infrastructure system, | Online tools, related software and corresponding videos |
| 15. | Week 15 13 - 17 April 2021 (3 Contact hours) | Integration of EVs in smart grid, social dimensions of EVs. | Online tools, related software and corresponding videos |
| 16. | Week 16 20 - 24 April 2021 | <i>Compensation Assessment (CPA)</i> | |
| 17. | Week 17 & 18 April 27 - 15 May 2021 (90 minutes) | <i>End Semester Examination (Final Assessment)</i> | |



| COURSE ASSESSMENT METHODS | | | | |
|--|--|--|-----------------|--------------------|
| S.No | Mode of Assessment | Week | Duration | % Weightage |
| 1 | Class Test – I | Week 6 | 75 minutes | 25 |
| 2 | Class Test – II | Week 12 | 75 minutes | 25 |
| 3 | Assignments/Surprise Test/ Attendance/Project/Seminar | Work will be carried out along with the course | | 20 |
| 4 | Compensation Assessment | Week 16 | 75 minutes | 25 |
| 5 | Final Assessment | Week 17/18 | 90 minutes | 30 |
| <p>ESSENTIAL READINGS: Textbooks, Reference books, website address, journals,etc</p> <p>Reference Books:</p> <ol style="list-style-type: none"> 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) | | | | |
| <ol style="list-style-type: none"> 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. | | | | |
| <p>ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)</p> <ul style="list-style-type: none"> ➤ 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

- 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. Narayan 02/02/2021 CC- Chairperson [Signature] Approved by Mail HOD _____



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 | | 35% or (Class average/2) whichever is greater. |

- 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.