

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

COURSE PLAN – PART I			
Degree	B.Tech	Course Title	VEHICULAR ELECTRIC POWER SYSTEMS
Course Code	EEHO14	No. of Credits	04
Course Code of Pre-requisite subject(s)	EEPC15, EEPC19		
Session	JULY 2022	Section	A , B
Name of Faculty	Mr. BABU THOMAS Mr. ABHAYA KUMAR SAHOO	Department	EEE
Name of Course Coordinator(s) (if, applicable)	--		
Email	407321002@nitt.edu 407121001@nitt.edu	Telephone No.	8281334201 9776977123
Course Type	<input type="checkbox"/> Core course	<input checked="" type="checkbox"/>	Honors course

SYLLABUS (APPROVED IN BoS)

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance, Capabilities, Automation system computer facilities.

Introduction to electric components used in hybrid and electric vehicles- Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, and Switched Reluctance Motor drives- drive system efficiency.

Energy storage technologies in hybrid vehicles-flywheel, hydraulic, fuel cell and hybrid fuel cell energy storage system-ultra capacitors- comparison- battery charging control.

Introduction to energy management strategies used in hybrid and electric vehicle, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy strategies.

Electrical power system in air craft, sea and undersea vehicles, space vehicles-hybrid vehicle control strategies supporting subsystem.

COURSE OBJECTIVES

This course introduces the fundamental concepts, principles and analysis of hybrid and electric vehicles.

COURSE OUTCOMES (COs)

- Upon completion of the course, the student will be able to
1. Understand the various aspects of hybrid and electric vehicles.
 2. Impart the concept of selection of electrical machines for hybrid and electric vehicles.
 3. Analyze various energy storage technologies for hybrid and electric vehicles.
 4. Explain energy management techniques for hybrid and electric vehicles.
 5. Demonstrate the power system of various vehicular system

Aligned Programme Outcomes (POs)

COs / POs	Course outcomes(COs)					
	1	2	3	4	5	
Programme Outcomes (POs)	1	M	H	H	H	H
	2	M	M	L	H	M
	3	L	L	L	L	L
	4	L	L	L	L	L
	5	M	H	M	M	H
	6	L	L	L	L	L
	7	M	L	L	L	L
	8	H	H	H	H	H
	9	M	M	M	M	M
	10	M	M	M	M	M
	11	L	L	L	L	L
	12	H	H	H	H	H
	13	M	M	M	M	M
	14	H	H	H	H	H

COURSE PLAN – PART II

COURSE OVERVIEW

This course on electric and hybrid electric vehicles involves understanding the basics of electric vehicles, motor drive options and energy management strategies.

**COURSE TEACHING AND LEARNING
ACTIVITIES**

S.No	Week	Topic	Mode of Delivery
1	(Week 1) 10.8.22 to 11.8.22 (2 Contact Hours)	Course Plan Details & Introduction to HEVs and EVs	PPT/Chalk & Talk
2	(Week 2) 16.8.22 to 18.8.22 (3 Contact Hours)	Hybrid vehicle types, Vehicle performance and parameters	PPT/Chalk & Talk
3	(Week 3) 22.8.22 to 25.8.22 (4 Contact Hours)	Power charger types for EVs and drive trains	PPT/Chalk & Talk
4	(Week 4) 29.8.22 to 1.9.22 (3 Contact Hours)	Mathematical model of EV	PPT/Chalk & Talk
5	(Week 5) 5.9.22 to 8.9.22 (4 Contact Hours)	Electric Propulsion Systems & Classification of Electric motor drives, DC motor drives, Modeling of Induction motor	PPT/Chalk & Talk
6	(Week 6) 12.9.22 to 15.9.22 (4 Contact Hours)	dq axis Transformation, Field oriented control of Induction motor, Properties of Permanent magnet materials,	PPT/Chalk & Talk
7	(Week 7) 19.9.22 to 22.9.22 (4 Contact Hours)	Control of BLDC motor drives, Switch Reluctance motor drives, Assessment 1	PPT/Chalk & Talk
8	(Week 8) 26.9.22 to 29.9.22 (4 Contact Hours)	Energy storage technologies- flywheel	PPT/Chalk & Talk
9	(Week 9) 3.10.22 to 6.10.22 (3 Contact Hours)	Hydraulic and fuel cell	PPT/Chalk & Talk
10	(Week 10) 10.10.22 to 13.10.22 (4 Contact Hours)	Ultra capacitors, battery charging control- Constant current and constant voltage control	PPT/Chalk & Talk

11	(Week 11) 17.10.22 to 20.10.22 (4 Contact Hours)	Energy management strategy, AER-Focused Control strategy, Assessment 2	PPT/Chalk & Talk
12	(Week 12) 25.10.22 to 27.10.22 (3 Contact Hours)	Blended Control strategy, Comparison of different energy management strategies, Energy storage design	PPT/Chalk & Talk
13	(Week 13) 31.10.22 to 3.11.22 (4 Contact Hours)	Problems on Energy management, Problems on Energy storage design.	PPT/Chalk & Talk
14	(Week 14) 7.11.22 to 10.11.22 (3 Contact Hours)	Electric Power systems in air crafts	PPT/Chalk & Talk
15	(Week 15) 14.11.22 to 17.11.22 (4 Contact Hours)	Electric Power systems in sea and undersea vehicles	PPT/Chalk & Talk
16	(Week 16) 21.11.22 to 24.11.22 (4 Contact Hours)	Electric Power systems in Space Vehicles Assessment 3	PPT/Chalk & Talk
17	(Week 17) 28.11.22 to 30.11.22 (3 Contact Hours)	Hybrid vehicles control strategies Compensation Assessment	PPT/Chalk & Talk

COURSE ASSESSMENT METHODS				
Sl. #	Mode of Assessment	Week	Duration	Weightage
1	Assessment 1 (1st and 2nd Units) (Written test)	Week 7	60 Mins	25%
2	Assessment 2 (3 rd and 4 th Units) (Written test)	Week 11	60 Mins	25%
3	Assessment 3 Assignment/Presentation	Continuous evaluation		20%
CA	Compensation Assessment (CT1/CT2) (Entire syllabus) (Written test)	Week 17	60 Mins	25%
4	Final Assessment (Entire syllabus) (Written test)	Dec 1 st week	90 Mins	30%

Note:

1. Exact date and time for the assessments will be as per the Office of the Dean (Academic) instructions.
2. Attending all the assessments (i.e., Assessment 1 to 4) is MANDATORY for every student.
3. If any student is not able to attend Assessment-1 / Assessment-2 due to genuine reason, he/she is permitted to attend the Compensation Assessment (CPA) with 25% weightage.
4. In any case, CPA will not be considered as an improvement test.

Grading the students

1. Grading will be based on the clusters (range) of the total marks (all the assessments i.e., Assessment 1 to 4, put together for each student) scored. For grading, Gap theory or Normalized curve method will be used to decide the clusters (range) of the total marks.
2. The passing minimum shall be as per the Office of the Dean (Academic) instructions. Hence, every student is expected to score the minimum mark to pass the course as prescribed by the Office of the Dean (Academic). Otherwise the student would be declared fail and 'F' grade will be awarded.

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc.

1. Ali Emadi, Mehrdad Ehsani, John M. Miller, 'Vehicular Electric Power Systems: Land, Sea, Air, and Space Vehicles', CRC Press, 2003.
2. Ion Boldea and S.A Nasar, 'Electric drives', CRC Press, 2005.
3. Sandeep Dhameja, 'Electric Vehicle Battery Systems', Newnes, 2002
4. Chris Mi, M. Abul Masrur, David Wenzhong Gao, 'Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives', Wiley, 2011.
5. Iqbal Husain, 'Electric and Hybrid Vehicles: Design Fundamentals', CRC Press, 2nd Edition, 2010

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

1. Feedback from the students during class committee meetings
2. Anonymous feedback through questionnaire

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

CORRESPONDENCE

1. All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/ any other information regarding this course) will be done through their webmail.
2. Queries (if required) may be emailed to us / contact us during 10.30 am to 11.30 am on Monday and Wednesday with prior intimation for any clarifications.

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

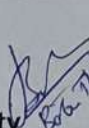
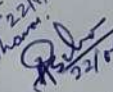
3. At least **75% attendance** in each course is **mandatory**.
4. A maximum of 10% shall be allowed under On Duty (OD) category.
5. Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

6. Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
7. Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
8. 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.
9. The above policy against academic dishonesty shall be applicable for all the programmes.

FOR APPROVAL

Course Faculty

 22/10/22
Baba Thana
 22/10/22

CC-Chairperson



HOD

