NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF EEE

COURSE PLAN – PART I			
Name of the programme and specialization	**I Year M. Tech, POWER ELECTRONICS**		
Course Title	**ELECTRIC AND HYBRID VEHICLES**		
Course Code	**EE687**	**No. of Credits**	**03**
Course Code of Pre-requisite subject(s)	**Power Conversion Techniques, Electrical Machines**		
Session	**July**	**Section (if, applicable)**	
Name of Faculty	**Dr. P. Srinivasa Rao Nayak**	**Department**	**EEE**
Official Email	**psnayak@nitt.edu**	**Telephone No.**	**0431-2503269**
Name of Course Coordinator(s) (if, applicable)			
Official E-mail		**Telephone No.**	
Course Type (please tick appropriately)	☐ **Core course**	**Elective 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.

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Basic concepts of electric traction, introduction to various electric drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

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

Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

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.

COURSE OBJECTIVES
This course introduces the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
MAPPING OF COs with POs

Course Outcomes	**Programme Outcomes (PO)** (Enter Numbers only)
1. Understand mathematical models, performance and characteristics of hybrid and electric vehicles.	**1,4,7,8**
2. Analyze the concepts, topologies and power flow control of electric traction systems.	**1,3,4,8**
3. Appraise the configuration and control of various hybrid electric motor drives.	**7,10**
4. Plan & design appropriate vehicle management system.	**1,4,7,8,10,12**

COURSE PLAN – PART II

COURSE OVERVIEW

Students get exposure to the fundamentals of Electric vehicle (EV) and Hybrid Electric vehicle (HEV). Further they will be exposed to modeling of EV and HEV, Matching the electric machine and the internal combustion engine, Sizing the propulsion motor and power electronics, selecting the energy storage technology and analyzing implementation issues in energy strategies.

COURSE TEACHING AND LEARNING ACTIVITIES (Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Weeks 1 to 2 (6 contact hours)	Basics & importance of hybrid and electric vehicles, Impact of modern drive-trains on energy supplies. Basics of vehicle performance, Mathematical models to describe vehicle performance.	Lecture C&T/ PPT or any suitable mod
2	Weeks 3 to 5 (8 contact hours)	Basic concept of hybrid traction &, power flow control in hybrid drive-train topologies, Basic concepts of electric traction and electric drive-train topologies, fuel efficiency analysis.	Lecture C&T/ PPT or any suitable mod
3	Week 5 (1 contact hours)	Numerical examples/ problem solving	Group work (exercise)
4	Weeks 6 to 7 (6 contact hours)	Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor, Induction Motor, Permanent Magnet Motor and Switch Reluctance Motor drives, drive system efficiency.	Lecture C&T/ PPT or any suitable mod

5	Weeks 8 to 10 (8 contact hours)	Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor and power electronics, selecting the energy storage technology, Communications, supporting subsystems.	Lecture C&T/ PPT or any suitable mod
6	Week 10 (1 contact hours)	Numerical examples/ problem solving	Lecture C&T/ PPT or any suitable mod
7	Weeks 11 to 12 (6 contact hours)	Introduction and classification of energy management strategies used in hybrid and electric vehicle, comparison of different energy management strategies, implementation issues of energy strategies.	Lecture C&T/ PPT or any suitable mod

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	First Assessment (Written test) (1st and 2nd Units)	6th Week	75 minutes	25
2	Second Assessment (Written test) (3rd and 4th Units)	11th Week	75 minutes	25
3	Take Home / Team Task	3rd to 11th week	Work will be carried out along with the course	10
4				
CPA	Compensation Assessment* (Written test) (1st to 4th Units)	12th week	75 minutes	25
5				
6	Final Assessment * (Written test)	14th week	120	40

***mandatory; refer to guidelines on page 4**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Shall be obtained at the end of the course

COURSE POLICY (including compensation assessment to be specified)

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

- 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 _____ **CC- Chairperson** _____ **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		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.