

EE543 Hybrid and Electric Car Technology

Schedule 2015 R603 Monday 6:30-21:20pm

| Week | Date | Description | Lecturer |
|------|--------|--|----------------|
| 1 | 11-Jan | HEV and EV (+Assignment announcement) | Norbert Cheung |
| 2 | 18-Jan | HEV and EV Design options | Norbert Cheung |
| 3 | 25-Jan | HEV and EV Design options (Presentation) | Norbert Cheung |
| 4 | 1-Feb | Vehicle Dynamics and Motor drives (Presentation) | Norbert Cheung |
| | 8-Feb | New Year | |
| 5 | 16-Feb | Vehicle Dynamics and Motor drives (Presentation) | Norbert Cheung |
| 6 | 22-Feb | Vehicle Dynamics and Motor drives (Presentation+Test) | Norbert Cheung |
| 7 | 29 Feb | Introduction Electric Power Conversion | Eric Cheng |
| 8 | 7-Mar | Electric power conversion | Eric Cheng |
| 9 | 14-Mar | Energy storage (Presentation) | Eric Cheng |
| 10 | 21-Mar | Energy storage (Presentation) | Eric Cheng |
| 11 | 28 Mar | Easter Holiday | |
| 12 | 4-Apr | Ching Ming Festival | |
| 13 | 28-Mar | Emerging technologies (Presentation+Test) | Eric Cheng |
| 14 | 11-Apr | Emerging technologies (Presentation) | Eric Cheng |

Presentation time table:

| Week | Date | Description | Lecturer |
|------|--------|---------------------|----------------|
| 1 | 11-Jan | N/A | Norbert Cheung |
| 2 | 18-Jan | N/A | Norbert Cheung |
| 3 | 25-Jan | Presentation: | Norbert Cheung |
| 4 | 1-Feb | Presentation: | Norbert Cheung |
| | 8-Feb | New Year | |
| 5 | 16-Feb | Presentation | Norbert Cheung |
| 6 | 22-Feb | Presentation +Test: | Norbert Cheung |
| 7 | 29 Feb | N/A | Eric Cheng |
| 8 | 7-Mar | N/A | Eric Cheng |
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Hybrid and Electric Car Technology EE543

Test: 25% (Two tests)

Assignment: 15%

Individual assignment, one report of around 10 pages with diagrams and references. You have to present in ppt.

Presentation: Allow 2-3 presentations per week. Presentation with Q&A up to 15 min,

Submission: Two weeks after presentation, submit the ppt and report to us.

Submission location:

<ftp://eeserver.ee.polyu.edu.hk/Upload/eric/EE543>

Format of file name:

studentname_student no.pdf or studentname_student no.doc

Once submitted, you cannot alter, but you may submit a better version lately on:

For homework: studentname_student no_V2.pdf or studentname_student no_V2.doc

All submission must be done individually and no group submission.

List of Prof. Eric Cheng's Assignment:

- 1) **Energy storage:** Discuss the energy storage in electric vehicle. You can include the different types such as battery, supercapacitor, hydrogen, fuel cell etc. Provide the comment on the technology, cost, availability and electronic interfacing.
- 2) **Vehicle electrical voltage:** Discuss the voltage used in vehicle design. You should also comment on the different voltage system for HEV, EV and petrol car. How is the support of the electronic and electrical components for different voltages in the car parts and components industry?
- 3) **Design an electric vehicle** with the following specification:
 - a. Weight 800kg
 - b. Maximum speed 50km/hr
 - c. Range per charge 150km
 - d. Maximum slope 14 degree
- 4) **Electric vehicle and hybrid EV in the market:** Write an essay on the existing electric vehicle in the market. Compare their performance, technology and cost.
- 5) **Alternative fuel for electric vehicle or hybrid electric vehicle:** Discuss the alternative fuel for electric vehicle or hybrid electric vehicle. You may include the possibility for fuel cell, alternative energy and other. What are the technology, performance and restriction?
- 6) **Vehicle charger:** What is the charger available in the market? What are their standard? What is the specification in voltage, power, AC or DC? The amount of installation ? The size, drawing, number of pins or cable size should be mentioned.
- 7) **Solar electric vehicle:** Design an electric vehicle using solar panel system with the following specification:
 - a. Weight 100kg
 - b. Maximum speed 20km/hr
 - c. Maximum slope 10 degree
- 8) **International standard on vehicle:** Examine the international standard for electric vehicle and hybrid electric vehicle. You may discuss mainly on the electric safety, electromagnetic compatibility, and the requirement from local authority. You have to discuss the charger standard as well?
- 9) **Air-conditioning system**
Design an air-conditioning for electric or hybrid vehicle. You show consider the energy storage is enough for the duration of air-conditioning. The air-conditioning affects the range of travelling. How does your system to accommodate this?
- 10) **Design a series or parallel Hybrid electric vehicle** with the following specification:
 - a. Weight 800kg
 - b. Maximum speed 50km/hr
 - c. Range per charge 400km
 - d. Maximum slope 14 degree

- 11) **What are the existing electric vehicle research teams in the world?** You should discuss what research project, leader, which institution and their capability. You have to discuss around 5 or more in the world.

12) **Survey of E-bus**

There are a number of E-bus manufacturer and users in the market. Conduct a survey to compare their performance in terms of size, cost, electrical, mechanical, and other possible items.

List of Dr. Norbert Cheung's Assignments:

13) **Battery Swapping System**

Instead of battery charging, we can change the battery in a refill station. Investigate the technical aspect and the feasibility of implementing such a system.

14) **Fast Charging System**

Find out the recent standard for fast battery charging system, and their technical issues. Also find some examples of recently installed fast charging system.

15) **Regenerative Braking**

How effective is regenerative braking? How much energy can it contribute back to the battery? What are the technical issues involved?

16) **City Planning and Government Support for Electric and Hybrid Vehicle**

Use Hong Kong (or other cities in the world), find out how government helps to promote EV and Hybrid vehicle.

17) **Electric Bus and Mini-Vans**

Find out some examples on EV for public transportation, and discuss their technical issues, and implementation issues.

18) **In-Wheel Motors**

Find out some examples of in-wheel motors and how they are implemented onto an electric vehicle.

19) **Electric Motor Cycles and Ultra light city transportation**

Examples on electric bicycles, motor cycles, scooter, golf carts, etc. And other forms of ultra light urban personal electric transport.

20) **Motors for Electric Vehicle**

Which type of motor will be dominant for EV? State your reason, and give some real examples.

21) **High Performance Electric Car**

Normally, people think electric car is slow, with poor performance. In this topic you need to find the "super" electric cars very high performance, and how these cars compared with the gasoline cars.

22) **Modern Trolley Bus**

Trolley Bus has been around for many years. But a new generation of trolley bus has been improved with modern technology. Find some examples on this kind of trolley bus.

22) **Electric Vehicle for Space Exploration**

Examine the structure, content, and technical issues for space exploration electric vehicle (e.g. for the moon and for Mars).

