Subject : **Electric Vehicle (EE512/EE512A/EE512B)**

Subject Description

1.0 General Information
Level of study: 5
Credits: 3.0

The course is to study the recent development in electric vehicle and its the basic concept. You will have vigorous course work including homework, miniproject and quiz.

Lecturer: Dr. Norbert Cheung , Room CF604, Tel: 2766 6182, email: norbert.cheung@polyu.edu.hk
Prof. Eric Cheng, Room CF629, Tel: 27666162, email: eeecheng@polyu.edu.hk
Teaching Assistant: To be Announced.

Office hours: You can contact us by email or come to our office. You can also make appointment with us for any queries of the course. During the Covid-19, we can also set up Zoom/Team meeting with you.

2.0 Learning Outcomes

a. Understand the importance of EVs for environment, energy sustainability and climate change.
b. Understand various underpinning technologies for modern EVs, including electric motor drives, energy storage, batteries, charging methods, infrastructure and auxiliary systems.
c. Explain the emerging technologies such as hybrid electric vehicles (HEVs), fuel cell electric vehicles (FEV) and energy storage methods.

3.0 Teaching Methods
Lecture [Online]:
18:30 - 21:20, Monday, From 7 Sep 2020 ~ 30 Nov 2020
Total number of lectures: 13

4.0 Assessment
Assignment : 20% (Home work)
Short Test : 30% (Two 30-60 mins in-class short tests, each test 15%, open book and open note)
Miniproject : 20% (report and presentation)
Examination: 30% (One three-hour examination, close book or open book is to be announced)

Booklist & Reading

1. K. T. Chau, Electric Vehicle Machines and Drives: Design, Analysis and Application, Wiley, 2015.
2. C.C. Chan and K.T. Chau, Modern Electric Vehicle Technology, London: Oxford University Press, 2001
3. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, New York: RC Press, 2003

All the teaching materials including notes and power points can be downloaded from
Prof. Eric Cheng -:PolyU Blackboard
Dr. Norbert Cheung -> https://ncheung.weebly.com/-ee512.html

6.0 Miniproject

Students will be divided into around groups of around 2~3 people; total of number of students is around 88.

Each project selects a project from the miniproject list. They will then present the project and submit the report two weeks after the presentation.

The report is usually 10-12 pages.

List of Miniproject

0. Autonomous Driving Examples – Self-driving, smart city, technology, etc
1. EV examples: e.g. Tesla, GM Bolt, Leaf, Jaguar, etc.
2. Hybrid & Fuel cell EV examples: e.g. Prius; Honda FC car; comparison between EV, hybrid & FC; etc.
3. Electric Propulsion examples: e.g. Tesla motor drive; In-wheel motor example, etc.
4. Examples of other EV types: Trucks, bike, bus, trolley car, skate board, etc.
5. Battery Technology examples: e.g. Graphene battery; super capacitor, cells arrangement, battery swapping, etc.
6. Auxiliary System examples: e.g. electric A/C; ABS braking; regenerative braking, power steering etc.
7. Charging system examples: e.g. high power charging standards; inductive charging; payment method, etc.
8. Town planning examples: e.g. Shenzhen example; EV car hire; solar charging, hyperloop, etc.

7.0 Homework

Assignment may be given after some lectures as homework. The assignment should be returned to the lecturer through BLACKBOARD/UPLOAD at the following lecture. The deadline of each homework is specified in the time schedule.

8.0 Coursework and Mini report submission:

Upload to web (Dr. Norbert Cheung)

The upload link will be available in the web site: www.ncheung.com (soon) Submit your report (in pdf) and presentation slides (in ppt) Do NOT send excessively large file, trim down your file size. Free formatting.

By Blackboard (Prof. Eric Cheng)

Submission must be submitted electronically to the Blackboard. Solution of the homework will be released after the marking, usually within 1-2 weeks.

Format of file name:

Your homework/ quiz will be submitted through Blackboard.

For MiniProj report: *MiniPNo_ StudentName.pdf or MiniPNo_studentname.doc*

For homework: *AssNo_ StudentName_StudentNo.pdf or AssNo_studentname_studentNo.doc*

Note: *All homework submission must be done individually and no group submission. For Miniproject report, nominate one of the group member to submit the report. The report must be written with all members' names. Your mark may the same with your group member.*

9. Late policy

Late work is penalized based on calendar days (including weekends and holidays). For example, if an assignment is due on Friday, it will be penalized 20% if it is turned in on Saturday, 40% on Sunday, and no credit for Monday or later. Work turned in late will be penalized as follows:

Late on day due	10% penalty
One calendar day late	20% penalty
Two calendar days late	40% penalty

10. Illness

If you are ill, especially with a fever, please stay home and rest. If it is during a quiz or exam, doctor's note is needed. Please notify the instructor via email if you are missing class due to illness.

11. Academic Integrity

Among these is turning in another's work as your own, committing plagiarism, which is the copying of portions of another's words from a published or electronic source without acknowledgement of that source and consulting solution keys not authorized by the instructor. The penalty for a breach of academic integrity is a double-zero (-100%) for the work in question on the first offense and a failing grade for the course as a whole with repeated offenses. Academic Integrity issues during quiz and exam is needed to report to Academic Secretary or Head of Department.

12. Rubrics and further information

Miniproject: Presentation skill, report's technical content, impact

Homework: All problems must be supported with an appropriate amount of work. Generally, this means that enough work is shown to demonstrate that the student worked through all steps of the problem. Answers without supporting work will receive no credit.

Quiz: It usually covers the course materials right before the quiz. Because of Covid-19, quiz will be online. Student has to download the quiz paper and finish and submit within the time limit. Quiz is open-book and open-note, and you are only allowed to refer to your own note, instructor's note, text/reference books and the information in Blackboard. No other materials are allowed.

13.0 Syllabus & Schedule

Week	Date	Lecturer	Descriptions	Assignment/report/text
1	7 Sep	Norbert Cheung	**LESSON 1: INTRODUCTION & ELECTRIC VEHICLE DEVELOPMENT** - Multiproject announcement	
2	14 Sep	Norbert Cheung	**LESSON 2: ELECTRIC VEHICLE SYSTEMS**	
3	21 Sep	Norbert Cheung	**LESSON 3: ELECTRIC PROPULSION**	Homework 1: due in 1 week
4	28 Sep	Norbert Cheung	**LESSON 4: ELECTRIC MOTORS FOR EV** - Capacitor based , power factor correction	
5	5 Oct	Norbert Cheung	**LESSON 5: TEST I**	**QUIZ 1**
6	12 Oct	Norbert Cheung	**LESSON 6: SMART VEHICLE SENSORS**	Homework 2**:** due in 1 week
7	19 Oct	Eric Cheng	**LESSON 7: POWER TRAIN**	
8	26 Oct		**LESSON 8: HOLIDAY CHUNG YEUNG FESTIVAL**	
9	2 Nov	Eric Cheng	**LESSON 9: BATTEYR AND ENERGY STORAGE**	Homework 3: Due in 1 week
10	9 Nov	Eric Cheng	**LESSON 10: HYBRID ELECTRIC VEHICLE SYSTEMS**	
11	16 Nov	Eric Cheng	**LESSON 11: ELECTRIC VEHICLE INFRASTCUTURE**	**QUIZ 2**
12	23 Nov	Eric Cheng	**LESSON 12: ENRGY AND ENVIRONMENT**	Homework 4: Due in 1 week
13	30 Nov	Eric Cheng	**LESSON 13: LOOKING BACK, LOOKING FORWARD AND FUTURE VEHICLE DEVELOPMENT** Summary and revision.	

Project presentation list: (2~3 persons in a group)

Week	Date	Group 1	
1	7 Sep	No Miniproject presentation	
2	14 Sep +Bonus 30%	Topic 0: Autonomous Driving	
3	21 Sep +Bonus 15%	Topic 1: EV examples	
4	28 Sep	Topic 2: Hybrid and Fuel Cell examples	
5	5 Oct	TEST– No presentation	
6	12 Oct	Topic 3: Electric Propulsion examples	
7	19 Oct	Topic 4: Examples of other EV types	
8	26 Oct	No Mini-project presentation – Public Holiday	
9	2 Nov	Topic 5: Battery Technology examples	
10	9 Nov	Topic 6: Auxiliary System examples	
11	16 Nov	Test – No Presentation	
12	23 Nov	Topic 7: Charging system examples	
13	30 Nov	Topic 8: Town Planning examples	