

Short Course on Wireless Power Transfer Technologies

Date: 14 December 2018 (Friday)

- 9:30 am – 12:30 pm
- 2:00 pm – 5:00 pm

Lecturer: Professor Michael Tse, PhD, FIEEE, FIEAust

*Chair Professor of Electronic Engineering
The Hong Kong Polytechnic University*

15 December 2018 (Saturday)

- 9:30 am – 12:30 pm

Venue: Room CD634, The Hong Kong Polytechnic University

About the Lecturer

Text



Prof. Michael Tse is a world renowned power electronics researcher specializing in converter topologies and control with applications to lighting systems and wireless power transfer. He received a number of prestigious awards and titles including a number of IEEE Transactions Best Paper Prizes, international Invention Awards, IEEE Distinguished Lectureship, and honorary titles from academia. He is currently Editor-in-Chief of IEEE Transactions on CAS II and NOLTA Japan, and editor of a few research journals. He has an H-index of 70 and an aggregate citations of over 19000 (Google Scholars).

Course Objective

Wireless power transfer is becoming a popular mode of power transfer for a wide range of applications including mobile phone charging, biomedical implant power supplies, electric vehicle charging, etc. In this short course, we will introduce the essential technologies in wireless power transfer, covering basic circuit theory, essential compensation methods, control principles, transformer design, standards, and practical design applications.

Course Content

This 1.5-day course on wireless power transfer (WPT) consists of 5 parts:

PART I - Overview: The course will begin with a brief tour of the history of WPT, and a review of the different types of technologies. A discussion of the current trends, key challenges, standards and clarification of some misconceptions in WPT will be presented.

PART II - Circuit Fundamentals and Models: Some essential background theory will be discussed, including the transformer models, relevant circuit analysis methods, LC resonance and efficiency. An overview of the key problems in WPT will be given. This part serves to prepare participants for the in-depth study of WPT circuit, control and efficiency optimization.

PART III - Compensation Design: The core of WPT is the compensation circuit. In this course we will provide participants with a complete design-oriented exposition of all second-order compensation circuits, i.e., series-series, series-parallel, parallel-parallel and parallel-series compensations. The key properties of the various types of compensation circuits will be presented, along with the latest information on the subtle relation between output characteristics and optimal loads which will complete our understanding of the entire compensation problem. Higher order compensation will be briefly discussed.

PART IV - Transformer Design: The main parameters of planar transformers and circular pads will be described, along with important results from empirical studies. Winding configurations and core modifications leading to improved coupling will be discussed, with practical design examples.

PART V - Control and Other Issues: Power electronics is indispensable in WPT systems. The control of the essential inverter and rectifier interfacing the input and load will be presented. Common control methods using PLL and PWM will be discussed, and the challenge in max efficiency tracking will be explained. Finally, some design examples of practical WPT systems will be presented.

Course Fee

Regular Participants: HK\$2,500 (Early Bird Group Discount: If you enroll in a group with 5 persons on or before 31 October 2018, one person will be free-of-charge)

Students and University Research Personnel: HK\$1,000 (Full sponsorship is available)

Online Registration

<http://www.eie.polyu.edu.hk/shortcourse/wpt>
Deadline: 31 October 2018 (Early Bird)
30 November 2018

Enquiry

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