

電動機械 (Electric Machinery)
(EE382000)

課程簡介
(Course introduction)

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EE 382000 電動機械 (Electric Machinery)

學分數：3 授課教師：廖聰明 (C. M. Liaw) (62188, 31142)

一、課程說明 (Course Description)

介紹機電能量轉換原理、各式電機之結構、操作原理、運轉特性以及固態控制。另外，亦介紹電力系統之組成、輸配、應用、用電安全、電源品質、備用電源及一些特殊設備之電源系統等。供同學通盤了解電力工程之有關事務 (與電動機械實驗配合進行，欲修電動機械實驗者請修電動機械課程)。

This course introduces the following topics for various electric machines: electro-mechanical energy conversion principle; structures, operation principle, running characteristics, power electronic control, etc. In addition, some basic power engineering concepts are also introduced, such as power system configuration, transmission and distribution, electricity applications, electric safety, power quality, standby power and some special electric power systems. From this course the students can generally understand the basic electric power engineering affairs. The students are suggested to take this course if they want to participate the course of "Electric machinery laboratory" offered in the followed semester.

二、指定用書 (Text Books)

1. 講義 (Lecture notes).
2. P. C. Sen, "Principles of Electric Machines and Power Electronics," 3rd Edition, John Wiley & Sons, 2014.

三、參考書籍(References)

- [1] T.L. Skvarenina, W.E. DeWitt, *Electrical Power and Controls*, 2001.
- [2] T. Wildi, *Electrical Machines, Drives and Power Systems*, 3rd Edition, 2005.
- [3] Zia A. Yamayee and Juan L. Bala, *Electromechanical Energy Devices and Power Systems*, John Wiley, 1998.
- [4] J. J. Cathey, *Electric Machines: Analysis and Design Applying Matlab*, McGraw, 2001.
- [5] R. Krishnan, *Electric Motor Drives Modeling, Analysis and Control*, Prentice Hall, New Jersey, 2001.
- [6] B. K. Bose, *Modern Power Electronics and AC Drives*, Prentice Hall, New Jersey, 2002.
- [7] A. E. Fitzgerald, Charles Kingsley, Jr. and Stephen D. Umans, *Electric Machinery, 6/e*, McGraw-Hill Higher Education, 2003
- [8] Stephen Chapman, *Electric Machinery Fundamentals*, McGraw-Hill, 2003.
- [9] John Chiasson, *Modeling and high-performance control of electric machines*, John Wiley & Sons, 2005.
- [10] S. E. Lyshevski, *Nano- and Micro- Electromechanical Systems. Fundamentals of Nano- and Microengineering*, CRC Press, 2005.
- [11] Charles A. Gross, *Electric machines*, CRC Press, 2006.
- [12] B. K. Bose, *Power Electronics And Motor Drives: Advances and Trends*, Academic Press, 2006.
- [13] James L. Kirtley, *Electric Power Principles: Sources, Conversion, Distribution and Use*, John Wiley, 2010.
- [14] Paul C. Krause, *Electromechanical Motion Devices*, Wiley-IEEE Press, 2012.

四、教學方式 (Teaching Method)：面授 (Oral teaching)。

五、教學進度 (Syllabus)：

1. 機電能量轉換及機電整合簡介 (Introduction to electro-mechanical energy conversion principle and mechatronics)。(5%)
2. 電力系統概要：發電、輸配電、電力系統暫態、用電安全、備用電源、特殊設備電源系統、電力品質等 (Introductory power system: generation, transmission and distribution, electric transients, electric safety, power quality, standby power and some special electric power systems)。(5%)
3. 電力電子概要：功率半導體概要、電源供應器概要、馬達驅動器概要等(Introductory power electronics: power semiconductor devices, switching power supplies, motor drives)。(5%)
4. 電動機械 (Electric machinery) (85%)：
 - (1) 磁路分析、永久磁鐵磁路分析 (Magnetic circuit analysis, permanent-magnet magnetic circuit analysis)。
 - (2) 變壓器 (Transformers)。
 - (3) 步進馬達之結構、驅動及應用 (Stepping motors: Structures, driving control and applications)。
 - (4) 直流馬達及發電機 (DC motors and generators)。
 - (5) 同步馬達及發電機 (Synchronous motors and generators)。
 - (6) 感應馬達及發電機 (Induction motors and generators)。
 - (7) 直流無刷馬達及其於週邊設備之應用 (Brushless DC motors and their applications)。
 - (8) 開關磁阻式馬達及其他特殊馬達 (Switched-reluctance machines and other special machines)。
 - (9) 馬達之 SoC 固態速度控制實作實驗 (步進馬達及直流馬達) (Solid-state stepping motor driving control experiment, solid-state DC motor speed control experiment (optional))。

六、成績考核 (Evaluation)

作業、期中考、期末考 (Exercise, mid-term tests, final test)。

七、可連結之網頁位址

- (1) 發放紙本講義。(Teaching materials are provided in class)。
- (2) 進入系連結之個人網頁。(Personal website: <http://www.ee.nthu.edu.tw/cmliaw/>)。