

## Syllabus

# Power Electronics

Autumn Semester, 2024

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**Power electronics** deals with the applications of high-efficient switching-mode electronic devices for the control and conversion of electric power. The required firing signals for power semiconductor devices are generated by low-level electronic circuits.

Combining power, electronics, and control, power electronics can be defined as an interdisciplinary technology. The course, **Power Electronics**, emphasizes the fundamental principles of power conversions. It covers device characteristics, conversion techniques and applications on switching-mode power supply, motor drive and electric utility.

## 1. Course Modules & Schedule (64 Class-hours)

1)	Introduction	2 Class-hours	Sept. 10
2)	Power Devices	4 Class-hours	Sept. 12, 19
	<i>Experiment 1</i>	2 Class-hours (3 <sup>rd</sup> Week)	TBA
3)	Diode Rectifiers	2 Class-hours	Sept. 24
4)	Thyristor AC-DC	4 Class-hours	Sept. 29, Oct. 8
	Discussion	2 Class-hours	Oct. 15
	<i>Experiment 2</i>	2 Class-hours (7 <sup>th</sup> Week)	TBA
5)	DC-DC Converters	4 Class-hours	Oct. 10, Oct. 17
	Discussion	2 Class-hours	Oct. 29
	<i>Experiment 3</i>	2 Class-hours (9 <sup>th</sup> Week)	TBA
	Advanced Seminars	2 Class-hours	Oct. 24
6)	DC-AC Inverters	4 Class-hours	Oct. 31, Nov. 5
	Discussion	2 Class-hours	Nov. 12
	<i>Experiment 4</i>	2 Class-hours (11 <sup>th</sup> Week)	TBA
7)	Snubber Circuits	2 Class-hours	Nov. 14
8)	Firing Circuits	2 Class-hours	Nov. 19
9)	Switching-Mode Power Supply	4 Class-hours	Nov. 21, 26
10)	Introduction of Motor Drive	2 Class-hours	Nov. 28
11)	DC Motor Drive	4 Class-hours	Dec. 3, 5
	<i>Experiment 5</i>	2 Class-hours (14 <sup>th</sup> Week)	TBA
12)	AC Motor Drive	4 Class-hours	Dec. 12, 17
	Discussion	2 Class-hours	Dec. 24
	Advanced Seminars	4 Class-hours	Dec. 19

Review

2 Class-hours

Dec. 26

*Final Exam (closed-book)*

TBA

## 2. Grading

- |                                     |     |
|-------------------------------------|-----|
| ● Class Participation               | 10% |
| ● Homeworks                         | 20% |
| ● Experiments                       | 20% |
| ● Final Exam ( <i>closed-book</i> ) | 50% |

## 3. References (available at Tsinghua Library)

- 1) Mohan, Undeland, Robbins, *Power Electronics*, 3<sup>rd</sup> Edition, John Wiley & Sons, Inc., 2003.
- 2) Philip T. Krein, *Elements of power electronics*, New York: Oxford University Press, 1998.
- 3) Cyril W. Lander, *Power Electronics*, 3<sup>rd</sup> Edition, McGraw Hill International Editions, 1993.
- 4) Daniel W. Hart, *Introduction to power electronics*, Upper Saddle River, N.J.: Prentice Hall, 1997.
- 5) D. A. Bradley, *Power electronics*, 2nd ed., New York: McGraw-Hill, 1995.
- 6) John G. Kassakian, *Principles of power electronics*, Reading, Mass.: Addison-Wesley, 1991.
- 7) H. W. Whittington, *Switched mode power supplies: design and construction*, Taunton, England: Research Studies Press, 1992.