

EEE213 Power Electronics and Electromechanism

Module Overview

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Room EE318

Assignments and Midterm Exam

- Allocation of Time:**

Lectures	Seminar	Tutorials	Lab/Practice	Private Study	Total
12		6		52	70

- Assessment:**

Assignment	10%
Lab	10%
2-hour Final exam	80%



Assignments and Lab

- **Assignments**

- Questions after each lecture (for reviewing purpose)
- 2 assignments (compulsory submission, 5% each)

- **Lab**

- Week 8
- 10% in final marks

- *Resit exam takes 80% in the total resit mark!*
- *Missing assignment and midterm marks cannot be re-sitted.*



Content

- Fundamental ON-OFF nature of power electronic switches;
- Principles of Steady State Converter Analysis;
- Steady-State Equivalent Circuit Modeling, Losses, and Efficiency;
- Switch Realization;
- Converter Dynamics and Control;
- Applications of power electronics;
- Introduction to DC and AC drives.

Learning Outcomes

- *Intellectual Abilities*
 - To be able to recognise the ON-OFF nature of power electronics switches (circuits operate in a time series of transient modes, which is quite different from sinusoidal operation);
 - To be able to apply this understanding to the analysis and synthesis of circuits.
- *Practical Skills*
 - The design of simple AC - DC rectifiers;
 - The design of simple DC - DC converters;
 - The design of a AC-AC converter.
 - Simulate power electronic system by using LTspice

References

- *Recommended Texts:*
 - Erickson, Robert W., and Dragan Maksimovic. “*Fundamentals of power electronics*”. Springer Science & Business Media, 2007.
 - N. Mohan, T.M. Undeland and W.P. Robbins, “*Power Electronics: Converters, Applications and Design*”, 3rd Edition, Higher Education Press, 2004.
 - 开关功率变换器:开关电源的原理、仿真和设计(原书第3版)

Learning materials

- Coursera, **Power Electronics Specialization**, University of Colorado Boulder. <https://www.coursera.org/specializations/power-electronics#courses>
- University of Colorado Boulder, **ECEN 4797/5797 Introduction to Power Electronics**. <http://ecee.colorado.edu/~ecen5797/>
- ETH Zurich, **Interactive Power Electronics Seminar (iPES)**. <http://www.ipes.ethz.ch/>

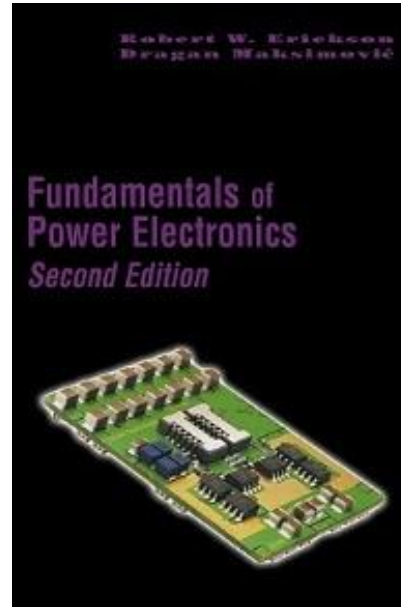


Iconic figure in power electronics



David Middlebrook

**Professor Emeritus of Electrical Engineering,
California Institute of Technology**



Robert W. Erickson



Dragan Maksimovic

Maksimovic, Dragan, et al. "Modeling and simulation of power electronic converters." *Proceedings of the IEEE*. 2001

Appendix – Power Electronics related academic organisations

- ***Academic organisations:***

- IEEE (The Institute of Electrical and Electronic Engineering)
 - PELS (The Power Electronics Society)
 - IES (The Industry Electronics Society)
 - IAS (The Industry Applications Society)
- IET (The Institute of Engineering and Technology)
- J.IEE (The Institute of Electrical Engineers of Japan)
- CES (China Electrotechnical Society 中国电工技术学会)
 - PES (Power Electronics Society 电力电子学会)
- CSEE (Chinese Society for Electrical Engineering 中国电机工程学会)
- CPSS (China Power Supply Society 中国电源学会)

Appendix – Power Electronics related academic journals and conferences

- ***Important Journals and Conferences:***
 - IEEE
 - IEEE Transactions on Power Electronics
 - IEEE Transactions on Industry Electronics
 - IEEE Transactions on Industry Applications
 - APEC, ECCE, IECON, COMPEL

Appendix – Power Electronics related companies

- Texas Instruments
- International Rectifier
- Linear Technology

- ABB
- Siemens
- GE

- SMA
- Enphase
- Sungrow (阳光电源)

- Delta (台达) Huawei (华为) NARI (南瑞) SH Electric (上海电气)

Appendix – Power Electronics related PG program

- ***USA and Canada:***

- U of Colorado at Boulder <http://ecee.colorado.edu/copec/index.php>
- VT CPES <https://cpes.vt.edu/>
- UT Knoxville <http://power.eecs.utk.edu/index.htm>
- UIUC <http://energy.ece.illinois.edu/>
- Queen's University, CA, <http://my.ece.queensu.ca/Research/Groups/Power-Electronics/index.html>

- ***EU:***

- Aalborg CORPE DK <http://www.corpe.et.aau.dk/>
- ETH Zurich <https://www.pes.ee.ethz.ch/en/home.html>

- ***Asia pacific:***

- RMIT, UTS, Canterbury, HKPolyU, UNIST