

Course Description

Power computation, diodes and rectifier circuits, power factor correctors, switch mode power converters, magnetic components, switch capacitor power converters, linear regulators, and integrated circuit techniques for controller design. *Prerequisite(s)*: ELEC 3400

List of Topics

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| Week 1 | Introduction; Power Computation |
| Week 2 | Power Factor and Crest Factor; Diodes Circuits |
| Week 3 | Rectifier Circuits; Voltage Doubler |
| Week 4 | Switching Converters; Steady State Operation |
| Week 5 | Other Switching Converter Topologies and Their Characteristics |
| Week 6 | Non-ideal Performance of Switching Converters; DCM Operation |
| Week 7 | Control Methodology; Band-Band Control |
| Week 8 | PWM Control; PFM Control |
| Week 9 | Current-Mode Control; Peripheral Building Blocks |
| Week 10 | SMPC Closed-Loop Response and Stability; Magnetic Materials |
| Week 11 | Air-gap and Inductor Design |
| Week 12 | Linear Regulators; Shunt and Series Regulators |
| Week 13 | Stability and Compensation Technique; Protection Circuitry |

Statement of Objectives/Outcomes:

On successful completion of this course, students will be able to:

CO1 - recognize magnetic quantities such as magnetic flux, permeability and reluctance, and compute magnetic quantities relating to inductors and transformers.

CO2 - recognize and compute electrical quantities such as power and work done related to both DC and AC circuits.

CO3 - compute operating parameters and characterize the performance of power converters and regulator circuits.

CO4 - analyze and design component parameters for power converters and regulator circuits.

CO5 - apply software (CAD) tools to design, simulate and analyze power converters and regulator circuits.

Textbook(s):

Lecture notes will be available on the course webpage.

References:

1. D.W. Hart, *Power Electronics*, McGraw-Hill, 2011.
2. P.T. Krein, *Elements of Power Electronics*, Oxford, 1998.
3. R.W. Erickson and D. Maksimovic, *Fundamentals of Power Electronics*, Second Edition, KluwerAcademic Publishers, 2001.

Relationship of Course to Program Outcomes:

Please refer to the Report Section 4.3.2 (iii).

Grading Scheme:

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| Homework | 10% |
| Project | 15% |
| Midterm Examination | 25% |
| Final Examination | 50% |