

# ECE 562

Lecture contents

Fall 2008

# Week 1 Lecture 1 Summary

Slides	Topic
3-9	Overall expectations and trends
10-18	Applications
19-27	Efficiency
28-43	Circuit elements
43-46	Wrap-up

# Week 1 Lecture 2

## Summary

Slides	Topic
3-8	Power conversion tasks
9-17	Efficiency characteristics
18-40	Buck converters and filtering
41-45	Circuit elements
46-48	PSpice setup
49-67	Commercial power supply characteristics

# Week 2 Lecture 1 Summary

Slides	Topic
2-11	Boost converter
12-20	Waveform effects, i.e. ripple
21-26	Commercial circuits
27-31	Circuit efficiency
32-34	Chapter summary
35,36	What companies want from Engineers
37-57	Boost convertor characteristics

# Week 2 Lecture 2 Summary

Slides	Topic
3-7	Converter applicatons
8-18	Improving waveforms
19-21	Commercial applications
22-32	Resonant converters
34-53	Ripple characteristics and calculations
54-61	Circuit topology and losses

# Week 3 Lecture 1 Summary

Slides	Topic
3-11	Buck converters
12-21	Current sensors and waveforms
22-31	Commercial chip characteristics
32-34	Converter efficiencies
34-53	Problem 2.2 review
54-63	Cuk converter topology and losses
64-71	Problem 2.3 Sepic converter

# Week 3 Lecture 2

## Summary

Slides	Topic
3-6	Talk qualities
7-16	Capacitor realities and mechanisms
17-36	Capacitor impedances
37-40	Commercial capacitors
41-53	Buck converters

# Week 4 Lecture 1

## Summary

Slides	Topic
3-9	Types of capacitors
10-16	Capacitor ESR's and construction
17-23	Electrolytic capacitors
24-33	Comparison of capacitor types
34-48	Non-ideal capacitor behaviors
49-55	Super capacitors
56-65	Super-capacitor applications



# Week 4 Lecture 2

## Summary

Slides	Topic
3-8	Inductor overview
9-17	Inductor properties
18-37	Commercial inductors
38-60	Current saturation
61-69	Inductor ratings
70-77	Inductor sizing
78-80	Resistors
81-86	In-circuit properties
87-98	Inductor role in circuits

# Week 5 Lecture 1 Summary

Slides	Topic
3-7	DC transformers
8-16	Converter efficiencies
17-21	Source of losses
22-37	Overview of loss and efficiency
38-45	Homework Problem 3.7

# Week 5 Lecture 2

## Summary

Slides	Topic
3-9	Power consumption in switches
10-14	Current losses
15-21	Managing heat
22-34	Homework Problem 3.8
35-39	Homework Problem 3.9
40-43	Homework problem 3.10
44-51	Buck converters

# Week 6 Lecture 1 Summary

Slides	Topic
3-5	LED drivers
7-12	Capacitors
13-15	Boost converters
16-21	Isolated supplies
22-24	Switch losses
25-35	Homework problem 4.2
36-44	Homework problem 4.4
45-74	Diodes and switches
76-81	IGBT's and FET's
82-85	Bidirectional switches
86-96	Inverters and 4-quadrant switches
97-101	PCB limits and measurements

# Week 6 Lecture 2 Summary

Slides	Topic
3-4	Device sizes decrease over time
5-15	MOSFET operation
16-21	MOSFET characteristics
22-31	MOSFET resistance
32-34	MOSFET body diodes
35-44	Reducing switch losses
45-51	Commercial MOSFET's
52-59	MOSFET parasitics and other non-ideal behaviors
60-81	Efficiency and conclusion summary

# Week 7 Lecture 1 Summary

Slides	Topic
3-5	In-class talk criteria
6-13	Homework Problem 4.5
14-19	Packaging and cooling
20	Thermal class participation
21-34	Heat transfer
35-36	P-N junction cooling
37-51	Power diodes
52-66	Diode characteristics
67-81	Bipolar junction transistors

# Week 7 Lecture 2

## Summary

Slides	Topic
3-6	In-class talk criteria
7-25	Insulated Gate Bipolar Transistors (IGBTs)
26-28	IGBT applications
29-44	IGBT switch characteristics
45-46	Homework problem 4.7
47-52	Switching efficiencies
53-57	Varistors

# Week 8 Lecture 1

## Summary

Slides	Topic
3-15	Thyristors and SCR's
16-20	Chapter 4 summary
21-26	Reduction of load current
27-29	Mode boundaries
30-38	Problem 5.1
39-42	Discontinuous conduction mode
43-46	Inductor – capacitor currents
47-57	Summaries



# Week 8 Lecture 2 Summary

Slides	Topic
3-9	MPU performance and power conversion
10-14	Fuel cell power sources
15-31	Power regulation for LED's
32-44	DCM convertors and mode boundaries
45-54	Problem 5.4 and 5.5

# Week 9 Lecture 1 Summary

Slides	Topic
3-9	Convertor and negative-input circuits
10-13	Transformer basics
14-30	Transformer isolation
31-44	Voltage spikes in transformers
51-59	Problem 6.4
60-63	MOSFET switching
64-66	Transformer summary

# Week 10 Lecture 1 Summary

Slides	Topic
3-6	Linear vs. Switch mode converter
7-11	Regulator requirements and applications
12-15	PWM
16-35	Flyback converters
36-43	Resonance and ringing
44-48	Diode stresses
49-51	Synchronous rectification
52-55	Problem 6.5
56-66	Lm in flyback converters
67-77	Problem 6.2
78-89	Snubbers

# Week 10 Lecture 2 Summary

Slides	Topic
3-12	Transistor types, switch losses, and packaging
13-18	Capacitor and inductor selection
19-26	Flyback converter examples
27-31	Transformer losses
32-53	Forward converter
54-66	Roles of diodes
67-80	Forward converter and diode reset
81-104	Active clamping of transformer

# Week 11 Lecture 1 Summary

Slides	Topic
3-6	Progress in microelectronics
7-11	Resonant converters
12-21	RLC impedance
22-29	Impedance in resonant converters
30-33	DC-DC resonant converters
34-40	Solving for resonant converter
41-45	Fluorescent lamp circuits

# Week 11 Lecture 2

## Summary

Slides	Topic
3-9	RLC circuits and resonance
10-13	Resonant converter principles
14-17	Trends in power electronics
18-336	Switching efficiency
37-44	Zero current and zero voltage switching
45-63	Problem 19.1
64-73	Analysis of resonant converters
74-86	Conversion ratio and filter networks