

The Fall 2014 BME/ISE 3511 Bioelectronics course is divided into essentially four sections:

- Basic Concepts and Theory of Electricity, Magnetism, and Electronics
- Direct Current Circuits Analysis
- Alternating Current Circuit Analysis
- Introduction to Digital Electronics

Students are responsible for all of the assigned reading material. Not all of the material will be covered during class lectures; nevertheless, it is considered essential to understanding the course material and for successfully achieving the course learning objectives. Students who fall behind, will most likely be left behind. It is up to you to keep current.

The main textbook, *Practical Electronics for Inventors* 3ed, Paul Scherz and Simon Monk, McGraw Hill, 2013 is a thorough and utilitarian textbook for a hands-on electronics class such as BME/ISE 3511. Electronic theory is presented in a straight-forward, easy-to-read and understand manner. Various chapters cover passive and active components; AC and DC circuits; filters; power supplies; semiconductors (diodes, transistors, optoelectronics); integrated electronics (operational amplifiers, oscillators, timers, voltage regulators); audio electronics; digital electronics (logic gates, sequential and combinational logic, counters, shift registers, buffers, latches, drivers, displays, memory devices); motors (DC, RC servos, stepper) as well as sections on safety; wiring & grounding information; useful facts, formulas, component data; laboratory instruments/measurements; error analysis; and micro-controller circuits and newly added chapters on Sensors, Microcontrollers, and Modular Electronics.

Supplementing the main textbook is Milton Gussow's *Schaum's Outline Of Basic Electricity*, 2ed (McGraw Hill, 2007), which not only contains additional explanatory reading material, but also a wealth of practical problems. Each chapter includes both *solved problems* and *supplemental problems*. Answers are provided for all questions/problems. A large number of typical problems have been suggested. It is not necessary for students to work all of the assigned problems; but each student should feel competent in solving each type of example problem. The assigned homework problems will be used as models for exam questions. Students are encouraged to work collaboratively and to seek help from the recitation instructor as needed. An electronic calculator is highly recommended.

The proposed schedule is tentative. The topics and subtopics are guidelines and are not meant to be restrictive or all inclusive. If necessary and at the instructor's discretion the order and timing of the topics may be altered during the course of the semester.

Please refer to page 2 for suggested reading assignments from *Practical Electronics for Inventors*.
See page 3 for suggested reading and homework assignments from *Schaum's Outline Of Basic Electricity*.

Practical Electronics for Inventors, 3ed

Week	Chapter	Topic	Section	Pages
Background Information and Basic Concepts				
0	Chapter 1	<i>Introduction to Electronics</i>		pp 1 - 3
	Chapter 2	<i>Basic Information</i> Wire Gauges Grounds Mains Power	Section 2.9 Section 2.10 Section 2.22	pp 39 - 40 pp 40 - 49 pp 92 - 94
	Chapter 3	<i>Basic Electronic Circuit Components</i> Wires, Batteries, Switches, Relays Fuses and Circuit Breakers	Sections 3.1 - 3.4 Section 3.9	pp 253 - 299 pp 397 - 399
	Chapter 7	<i>Hands-On Electronics</i> Safety Multimeters Electronic Laboratory	Section 7.1 Section 7.3 Sections 7.5.12 - 7.5.19	pp 551 - 556 pp 571 - 575 pp 611 - 626
	Appendix A	Power Distribution	Sections A.1 - A.4	pp 953 - 958
1	Chapter 2	<i>Basic Theory of Electronics</i> Current, Voltage, Conduction, Resistance, Resistivity, Conductivity Insulators, Conductors, Semiconductors Heat and Power Thermal Conduction and Resistance Decibels	Sections 2.1 - 2.4 Section 2.5 Section 2.6 Section 2.7 Section 2.8 Section 2.31	pp 5 - 23 pp 23 - 28 pp 28 - 31 pp 31 - 34 pp 34 - 37 pp 204 - 207
Principles of DC Circuits				
2	Chapter 2	<i>Basic Theory of Electronics</i> Ohm's Law, Circuits and Sources Kirchhoff's Laws & Superposition Thevenin & Norton Circuits	Sections 2.11 - 2.16 Sections 2.17 - 2.18 Section 2.19	pp 49 - 69 pp 69 - 75 pp 76 - 80
	Chapter 3	<i>Basic Electronic Circuit Components</i> Resistors	Section 3.5	pp 299 - 324
Semiconductors and Optoelectronics				
5	Chapter 4	<i>Semiconductors</i> Semiconductors & Diodes	Sections 4.1 - 4.2	pp 401 - 428
6	Chapter 5	<i>Optoelectronics</i> Photons, LEDs Photoresistors, Photodiodes, Solar Cells	Sections 5.1 - 5.3 Sections 5.4 - 5.6	pp 495 - 512 pp 512 - 517
Principles of Alternating Voltages and Currents, Complex Impedance, Passive (RCL) Filters				
8	Chapter 2	<i>Basic Theory of Electronics</i> AC Circuits, RMS Voltages & Currents Capacitors and Inductors Resonance, Impedance, Networks, Transients	Sections 2.20 - 2.21 Sections 2.23 - 2.24 Sections 2.30 - 2.34	pp 80 - 92 pp 94 - 155 pp 188 - 235
	Chapter 3	<i>Basic Electronic Circuit Components</i> Capacitors, Inductors, Transformers	Sections 3.6 - 3.8	pp 324 - 396
9	Chapter 2	<i>Basic Theory of Electronics</i> Transient Circuits	Sections 2.34 - 2.36	pp 223 - 245
	Chapter 9	<i>Filters</i> Passive RCL Low Pass and High Pass Filters	Sections 9.1 - 9.7	pp 663 - 675
Digital Electronics				
12	Chapter 12	<i>Digital Electronics</i> Binary Arithmetic, Digital Logic Gates	Sections 12.1 - 12.2	pp 717 - 740

Schaum's Outline of Basic Electricity, 2ed

Week	Chapter	Topic	Pages	Solved Problems	Supplemental Problems
1	1	The Nature of Electricity	1 - 9	1.1 - 1.10	1.11 - 1.22
1	2	Electrical Standards and Conventions	15 - 21	2.1 - 2.10	2.21 - 2.31
1	2	Graphical Symbols and Electrical Diagrams	27 - 33	2.63 - 2.68	2.69 - 2.78
2	6	Batteries	97 - 105	6.1 - 6.8	6.9 - 6.17
2	10	Magnetism and Electromagnetism	205 - 218	10.1 - 10.11	10.12 - 10.34
2	19	Transformers	455 - 464	19.1 - 19.15	19.16 - 19.49
8	3	Ohm's Law and Power	39 - 49	3.1 - 3.10	3.11 - 3.35
8	4	Direct-Current Series Circuits	52 - 62	4.1 - 4.13	4.14 - 4.43
8	5	Direct-Current Parallel Circuits	75 - 85	5.1 - 5.12	5.13 - 5.42
8	7	Kirchhoff's Laws	110 - 118	7.1 - 7.6	7.7 - 7.24
9	9	Network Calculations	153 - 172	9.1 - 9.18	9.19 - 9.64
9	12	Principles of Alternating Current	252 - 262	12.1 - 12.16	12.17 - 12.42
9	14	Capacitance, Capacitive Reactance, and Capacitive Circuits	305 - 317	None	None
9	13	Inductance, Inductive Reactance, and Inductive Circuits	275 - 290	None	None
9	15	RCL Circuits	332 - 345	None	None

Handy References:

Practical Electronics for Inventors

Appendix A	Power Distribution	3rd Edition pp 953 - 958
Appendix B	Error Analysis	pp 959 - 962
Appendix C	Useful Facts and Formulas	pp 963 - 908

Schaum's Outline of Basic Electricity, 2ed

Table	Page
2-1 Base Units of the International Metric System	15
2-2 Supplementary SI Units	15
2-3 Derived SI Units	16
2-4 Metric Prefixes Used in Electricity	16
2-5 Powers of 10	17
2-6 Metric Prefixes Expressed as Powers of 10	19
2-7 Examples of Letter Symbols for Circuit Components	28
4-1 Copper Wire Table	58
4-2 Properties of Conducting Materials	59
6-1 Types of Cells	105
10-1 International System of Units for Magnetism	218
12-1 Conversion Table for AC Sine Wave Voltage and Current	260
13-1 Summary Table for Series and Parallel RL Circuits	290
14-1 Types of Capacitors	308
14-2 Summary Table for Series and Parallel RC Circuits	317
17-1 Summary Table of Complex Impedance	403
18-1 Summary Table for AC Circuit Relationships	415
18-2 Summary of Complex Power Relationships	419
20-1 Voltage and Current Relationships for Common 3 Transformer Connections	476
21-1 Comparison of Series and Parallel Resonance	510
22-1 Time Constant Factors	529