

Department of Mechanical and Materials Engineering
PhD Comprehensive Study Guide
MECHATRONICS

Circuits Textbook:

Nilsson and Riedel, Electric Circuits, Eleventh edition. Pearson, 2018

Chapter 2. Circuit Elements

- 2.1 Voltage and Current Sources
- 2.2 Electrical Resistance (Ohm's Law)
- 2.4 Kirchhoff's Laws

Chapter 3. Simple Resistive Elements

- 3.1 Resistors in Series
- 3.2 Resistors in Parallel
- 3.3 The Voltage-Divider and Current-Divider Circuits

Chapter 4. Techniques of Circuit Analysis

- 4.2-4.4 Node-Voltage Method
- 4.5-4.7 Mesh-Current Method

Chapter 5. The Operational Amplifier

- 5.1 to 5.6 (terminals, inverting, summing, non-inverting, difference)

Mechatronics Comprehensive Textbook:

William Bolton, Mechatronics : electronic control systems in mechanical and electrical engineering; Seventh edition. Pearson UK, 2018, ISBN-10: 1292250976

Chapter 4: Digital signals

- 4.1 Digital signals
- 4.2 Analogue and Digital Signals
- 4.3 Digital to Analogue conversion
- 4.5 Data acquisition

Chapter 7 Pneumatic and hydraulic actuation systems

- 7.2 Pneumatic and hydraulic systems
- 7.3 Directional control valves
- 7.4 Pressure control valves
- 7.5 Cylinders
- 7.6 Servo and proportional control valves

Chapter 9 Electrical Actuation Systems

- 9.2 Mechanical switches (relays)
- 9.3 Solid-state switches
 - 9.3.1 Diodes
 - 9.3.4 MOSFETs
- 9.4 Solenoids
- 9.5 Direct current motors
- 9.6 Alternating current motors
- 9.7 Stepper motors
- 9.8 Direct Current servomotors

Chapter 10: Microprocessors and microcontrollers

- 10.3 Microcontrollers
- 10.5 Programming

Chapter 15 Communication Systems

- 15.1 Digital communications
- 15.6 Serial Communication interfaces
- 15.7 Parallel communication interfaces

Chapter 24 Mechatronic systems

- 24.2 Robotics