First year Core Electronics course sequence

Quarter 1 (12 weeks = 306 clock hours)

ELTR100 – DC 1 75 hours = 4 credits

ELTR105 – DC 2 75 hours = 4 credits

ELTR110 – AC 1 78 hours = 4 credits

ELTR115 – AC 2 78 hours = 4 credits

Quarter 2 (12 weeks = 306 clock hours)

ELTR120 – Semiconductors 1 90 hours = 5 credits

ELTR125 – Semiconductors 2 90 hours = 5 credits

ELTR130 – Opamps 1 66 hours = 3 credits

ELTR135 – Opamps 2 60 hours = 3 credits

Quarter 3 (12 weeks = 306 clock hours)

ELTR140 – Digital 1 90 hours = 5 credits

ELTR145 – Digital 2 90 hours = 5 credits

ELTR152 – Microprocessors 126 hours

Recommended schedule

Day 1

Topics: *Introduction to trades and programs*
Questions: *(none)*
Lab Exercises: *Gather books, tools, and parts*

Day 2

Topics: *Basic concepts of electricity, simple circuits, and voltmeter/ammeter usage*
Questions: *1 through 20*
Lab Exercises: *Voltmeter usage (question 101) and Ammeter usage (question 102)*

Day 3

Topics: *Ohm's Law and electrical safety*
Questions: *21 through 40*
Lab Exercise: *Circuit with switch (question 103)*

Day 4

Topics: *Ohm's Law, Joule's Law, scientific notation, and metric prefixes*
Questions: *41 through 60*
Lab Exercise: *Ohm's Law (question 104)*

Day 5

Topics: *Resistors, precision, the standard color code, and ohmmeter usage*
Questions: *61 through 80*
Lab Exercise: *Ohmmeter usage (question 105)*

Day 6

Topics: *Circuit connections, soldering technique, and solderless breadboards*
Questions: *81 through 100*
Lab Exercise: *Ohm's Law (question 106)*

Day 7

Exam 1: *includes Ohm's Law performance assessment*
Lab Exercises: *PCB soldering (question 107) and exploring solder-together kit*

Practice and challenge problems

Questions: *110 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (simple lamp circuit) due at end of ELTR100, Section 3
Question 108: Troubleshooting log
Question 109: Sample troubleshooting assessment grading criteria
Solder-together kit due at end of ELTR100, Section 3

Recommended schedule

Day 1

Topics: *Series circuits and troubleshooting*
Questions: *1 through 20*
Lab Exercises: *Series resistances (question 61)*

Day 2

Topics: *Series circuits, wire resistance, and overcurrent protection*
Questions: *21 through 40*
Lab Exercise: *Series DC resistor circuit (question 62)*

Day 3

Topics: *Series circuits, voltage divider circuits, and Kirchhoff's Voltage Law*
Questions: *41 through 60*
Lab Exercise: *Series DC resistor circuit (question 63)*

Day 4

Exam 2: *includes Series DC resistor circuit performance assessment*
Lab Exercise: *Troubleshooting practice (simple light bulb circuit)*

Practice and challenge problems

Questions: *66 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (simple lamp circuit) due at end of ELTR100, Section 3
Question 64: Troubleshooting log
Question 65: Sample troubleshooting assessment grading criteria
Solder-together kit due at end of ELTR100, Section 3

Recommended schedule

Day 1

Topics: *Parallel circuits, current sources, and troubleshooting*
Questions: *1 through 20*
Lab Exercises: *Parallel resistances (question 61)*

Day 2

Topics: *Parallel circuits, Kirchhoff's Current Law, and chemical batteries*
Questions: *21 through 40*
Lab Exercise: *Parallel DC resistor circuit (question 62)*

Day 3

Topics: *Parallel circuits, current divider circuits, and temperature coefficient of resistance*
Questions: *41 through 60*
Lab Exercise: *Parallel DC resistor circuit (question 63)*

Day 4

Exam 3: *includes Parallel DC resistor circuit performance assessment*
Troubleshooting assessment due: *Simple lamp circuit*
Question 64: Troubleshooting log
Question 65: Sample troubleshooting assessment grading criteria
Project due: *Solder-together electronic kit*

Troubleshooting practice problems

Questions: *66 through 75*

General concept practice and challenge problems

Questions: *76 through the end of the worksheet*

Recommended schedule

Day 1

Topics: *Series-parallel circuit analysis*
Questions: *1 through 15*
Lab Exercise: *Kirchhoff's Voltage Law (question 61)*

Day 2

Topics: *Series-parallel circuits and Wheatstone bridges*
Questions: *16 through 30*
Lab Exercise: *Wheatstone bridge (question 62)*

Day 3

Topics: *Series-parallel circuits, safety grounding, and troubleshooting*
Questions: *31 through 45*
Lab Exercise: *Series-parallel DC resistor circuit (question 63)*

Day 4

Topics: *Loaded voltage dividers*
Questions: *46 through 60*
Lab Exercise: *Loaded voltage divider (question 64)*

Day 5

Exam 1: *includes Series-parallel DC resistor circuit performance assessment*
Lab Exercise: *Troubleshooting practice (loaded voltage divider circuit – question 64)*

Practice and challenge problems

Questions: *67 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (voltage divider) due at end of ELTR105, Section 3
Question 65: Troubleshooting log
Question 66: Sample troubleshooting assessment grading criteria

Recommended schedule

Day 1

Topics: *Magnetism, electromagnetism, and electromagnetic induction*
Questions: *1 through 20*
Lab Exercises: *Electromagnetism (question 71)*

Day 2

Topics: *Applications of electromagnetism and induction, Lenz's Law*
Questions: *21 through 40*
Lab Exercise: *Electromagnetic induction (question 72)*

Day 3

Topics: *Introduction to Thévenin's and Norton's theorems*
Questions: *41 through 55*
Lab Exercise: *Thévenin's theorem (question 73)*

Day 4

Topics: *Thévenin's, Norton's, and Maximum Power Transfer theorems*
Questions: *56 through 70*
Lab Exercise: *Thévenin's theorem (question 73, continued)*

Day 5

Exam 2: *includes Thévenin equivalent circuit performance assessment*
Lab Exercise: *Troubleshooting practice (loaded voltage divider circuit – question 74)*

Practice and challenge problems

Questions: *77 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (voltage divider) due at end of ELTR105, Section 3
Question 75: Troubleshooting log
Question 76: Sample troubleshooting assessment grading criteria

Recommended schedule

Day 1

Topics: *Inductance and inductors*
Questions: *1 through 20*
Lab Exercises: *Series inductances (question 81) and parallel inductances (question 82)*

Day 2

Topics: *Capacitance and capacitors*
Questions: *21 through 40*
Lab Exercises: *Series capacitances (question 83) and parallel capacitances (question 84)*

Day 3

Topics: *Time constants*
Questions: *41 through 60*
Lab Exercise: *RC discharge circuit (question 85)*

Day 4

Topics: *Time constant circuits*
Questions: *61 through 80*
Lab Exercise: *Time-delay relay (question 86)*

Day 5

Exam 3: *includes RC discharge circuit performance assessment*
Troubleshooting Assessment due: *Loaded voltage divider (question 87)*
Question 88: Troubleshooting log
Question 89: Sample troubleshooting assessment grading criteria

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Practice and challenge problems

Questions: *90 through the end of the worksheet*

Recommended schedule

Day 1

Topics: *Basic concepts of AC and oscilloscope usage*
Questions: *1 through 20*
Lab Exercise: *Analog oscilloscope set-up (question 81)*

Day 2

Topics: *RMS quantities, phase shift, and phasor addition*
Questions: *21 through 40*
Lab Exercise: *RMS versus peak measurements (question 82) and measuring frequency (question 83)*

Day 3

Topics: *Inductive reactance and impedance, trigonometry for AC circuits*
Questions: *41 through 60*
Lab Exercise: *Inductive reactance and Ohm's Law for AC (question 84)*

Day 4

Topics: *Series and parallel LR circuits*
Questions: *61 through 80*
Lab Exercise: *Series LR circuit (question 85)*

Day 5

Exam 1: *includes Inductive reactance performance assessment*
Lab Exercise: *Oscilloscope probe (× 10) compensation (question 86)*

Practice and challenge problems

Questions: *89 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (AC bridge circuit) due at end of ELTR110, Section 3
Question 87: Troubleshooting log
Question 88: Sample troubleshooting assessment grading criteria

Recommended schedule

Day 1

Topics: *Capacitive reactance and impedance, trigonometry for AC circuits*
Questions: *1 through 20*
Lab Exercise: *Capacitive reactance and Ohm's Law for AC (question 71)*

Day 2

Topics: *Series and parallel RC circuits*
Questions: *21 through 40*
Lab Exercise: *Series RC circuit (question 72)*

Day 3

Topics: *Superposition principle, AC+DC oscilloscope coupling*
Questions: *41 through 55*
Lab Exercise: *Parallel RC circuit (question 73)*

Day 4

Topics: *Passive RC and LR filter circuits*
Questions: *56 through 70*
Lab Exercise: *Time-domain phase shift measurement (question 74)*

Day 5

Exam 2: *includes Series or Parallel RC circuit performance assessment*
Lab Exercise: *Troubleshooting practice (variable phase shift bridge circuit – question 75)*

Practice and challenge problems

Questions: *78 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (AC bridge circuit) due at end of ELTR110, Section 3
Question 76: Troubleshooting log
Question 77: Sample troubleshooting assessment grading criteria

Recommended schedule

Day 1

Topics: *RLC circuits*
Questions: *1 through 15*
Lab Exercise: *Passive RC filter circuit design (question 61)*

Day 2

Topics: *RLC circuits and AC bridge circuits*
Questions: *16 through 30*
Lab Exercise: *Passive RC filter circuit design (question 61, continued)*

Day 3

Topics: *Series and parallel resonance*
Questions: *31 through 45*
Lab Exercise: *Measuring inductance by series resonance (question 62)*

Day 4

Topics: *Resonant filter circuits, bandwidth, and Q*
Questions: *46 through 60*
Lab Exercise: *Passive resonant filter circuit (question 63)*

Day 5

Exam 3: *includes Passive RC filter circuit design performance assessment*
Troubleshooting Assessment due: *Variable phase shift bridge circuit (question 64)*
Question 65: Troubleshooting log
Question 66: Sample troubleshooting assessment grading criteria

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Practice and challenge problems

Questions: *67 through the end of the worksheet*

Recommended schedule

Day 1

Topics: *Mutual inductance and transformer theory*
Questions: *1 through 15*
Lab Exercise: *Transformer voltage/current ratios (question 61)*

Day 2

Topics: *Transformer step ratio*
Questions: *16 through 30*
Lab Exercise: *Auto-transformers (question 62)*

Day 3

Topics: *Maximum power transfer theorem and impedance matching with transformers*
Questions: *31 through 45*
Lab Exercise: *Auto-transformers (question 63)*

Day 4

Topics: *Transformer applications, power ratings, and core effects*
Questions: *46 through 60*
Lab Exercise: *Differential voltage measurement using the oscilloscope (question 64)*

Day 5

Exam 1: *includes Transformer voltage ratio performance assessment*
Lab Exercise: *work on project*
Project: *Initial project design checked by instructor and components selected (sensitive audio detector circuit recommended)*

Practice and challenge problems

Questions: *66 through the end of the worksheet*

Impending deadlines

Project due at end of ELTR115, Section 3
Question 65: Sample project grading criteria

Recommended schedule

Day 1

Topics: *Power in AC circuits*
Questions: *1 through 20*
Lab Exercise: *Lissajous figures for phase shift measurement (question 71)*

Day 2

Topics: *Power factor correction*
Questions: *21 through 40*
Lab Exercise: *Power factor correction for AC motor (question 72)*

Day 3

Topics: *Alternator construction and introduction to polyphase AC*
Questions: *41 through 55*
Lab Exercise: *Power factor correction for AC motor (question 72, continued)*

Day 4

Topics: *AC motor construction and polyphase AC circuits*
Questions: *56 through 70*
Lab Exercise: *work on project*

Day 5

Exam 2: *includes Lissajous figure phase shift measurement performance assessment*

Practice and challenge problems

Questions: *74 through the end of the worksheet*

Impending deadlines

Project due at end of ELTR115, Section 3
Question 73: Sample project grading criteria

Recommended schedule

Day 1

Topics: *Mixed-frequency signals and harmonic analysis*
Questions: *1 through 15*
Lab Exercise: *Digital oscilloscope set-up (question 61)*

Day 2

Topics: *Intro to calculus: differentiation and integration (optional)*
Questions: *16 through 30*
Lab Exercise: *Passive integrator circuit (question 62)*

Day 3

Topics: *Passive integrator and differentiator circuits*
Questions: *31 through 45*
Lab Exercise: *Passive differentiator circuit (question 63)*

Day 4

Topics: *Using oscilloscope trigger controls*
Questions: *46 through 60*
Lab Exercise: *work on project*

Day 5

Exam 3: *includes oscilloscope set-up performance assessment*
Project due
Question 64: Sample project grading criteria

Practice and challenge problems

Questions: *65 through the end of the worksheet*

Recommended schedule

Day 1

Topics: *Semiconductor theory and PN junctions*
Questions: *1 through 20*
Lab Exercise: *Rectifier diode characteristics (question 91)*

Day 2

Topics: *Diodes and rectifier circuits*
Questions: *21 through 40*
Lab Exercise: *Full-wave, center-tap rectifier circuit (question 92)*

Day 3

Topics: *AC-DC power supply circuits and troubleshooting*
Questions: *41 through 60*
Lab Exercise: *Full-wave bridge rectifier circuit (question 93)*

Day 4

Topics: *Special diodes and zener voltage regulators*
Questions: *61 through 80*
Lab Exercise: *Zener diode voltage regulator circuit (question 94)*

Day 5

Topics: *Electron versus Conventional flow notation*
Questions: *81 through 90*
Lab Exercise: *LED current limiting (question 95)*

Day 6

Exam 1: *includes rectifier circuit performance assessment*
Project selection: *Initial project design checked by instructor and components selected (Dual output AC-DC power supply strongly recommended)*
Lab Exercise: *Work on project*

Troubleshooting practice problems

Questions: *97 through 106*

General concept practice and challenge problems

Questions: *107 through the end of the worksheet*

Impending deadlines

Project due at end of ELTR120, Section 3
Question 96: Sample project grading criteria

Recommended schedule

Day 1

Topics: *Bipolar junction transistor theory*
Questions: *1 through 15*
Lab Exercise: *BJT terminal identification (question 76)*

Day 2

Topics: *Bipolar junction transistor switching circuits*
Questions: *16 through 30*
Lab Exercise: *BJT switch circuit (question 77)*

Day 3

Topics: *Junction field-effect transistor (JFET) theory*
Questions: *31 through 45*
Lab Exercise: *JFET switch circuit (question 78)*

Day 4

Topics: *Insulated gate field-effect transistor (MOSFET) theory*
Questions: *46 through 60*
Lab Exercise: *Work on project*

Day 5

Topics: *Review*
Questions: *61 through 75*
Lab Exercise: *Work on project*

Day 6

Exam 2: *includes transistor switch circuit performance assessment*
Lab Exercise: *Work on project*

Troubleshooting practice problems

Questions: *80 through 89*

General concept practice and challenge problems

Questions: *90 through the end of the worksheet*

Impending deadlines

Project due at end of ELTR120, Section 3
Question 79: Sample project grading criteria

Recommended schedule

Day 1

Topics: *Clipper, clamper, and voltage multiplier circuits*
Questions: *1 through 10*
Lab Exercise: *Diode clipper circuit (question 51)*

Day 2

Topics: *Thyristor devices*
Questions: *11 through 20*
Lab Exercise: *Work on project*

Day 3

Topics: *Thyristor power control circuits*
Questions: *21 through 30*
Lab Exercise: *SCR latch circuit (question 52)*

Day 4

Topics: *Pulse-width modulation power control*
Questions: *31 through 40*
Lab Exercise: *PWM power controller, discrete (question 53)*

Day 5

Topics: *Switching power supply circuits*
Questions: *41 through 50*
Lab Exercise: *Work on project*

Day 6

Exam 3: *includes thyristor latch circuit performance assessment*
Project due
Question 54: Sample project grading criteria

Troubleshooting practice problems

Questions: *55 through 64*

General concept practice and challenge problems

Questions: *65 through the end of the worksheet*

Recommended schedule

Day 1

Topics: *The BJT as a linear amplifier, current mirrors*
Questions: *1 through 15*
Lab Exercise: *Current mirror (question 76)*

Day 2

Topics: *Common-collector BJT amplifiers, transistor amplifier biasing*
Questions: *16 through 30*
Lab Exercise: *Signal biasing/unbiasing network (question 77)*

Day 3

Topics: *Common-emitter BJT amplifiers*
Questions: *31 through 45*
Lab Exercise: *Common-collector amplifier circuit (question 78)*

Day 4

Topics: *Common-base BJT amplifiers, gain expressed in decibels*
Questions: *46 through 60*
Lab Exercise: *Common-emitter amplifier circuit (question 79)*

Day 5

Topics: *Input and output impedances of amplifier circuits*
Questions: *61 through 75*
Lab Exercise: *Common-base amplifier circuit (question 80)*

Day 6

Exam 1: *includes Amplifier with specified voltage gain performance assessment*
Lab Exercise: *Troubleshooting practice (oscillator/amplifier circuit – question 81)*

Troubleshooting practice problems

Questions: *84 through 93*

General concept practice and challenge problems

Questions: *94 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (oscillator/amplifier) due at end of ELTR125, Section 3
Question 82: Troubleshooting log
Question 83: Sample troubleshooting assessment grading criteria

Recommended schedule

Day 1

Topics: *Load lines and amplifier bias calculations*
Questions: *1 through 15*
Lab Exercise: *Common-drain amplifier circuit (question 61)*

Day 2

Topics: *FET amplifier configurations*
Questions: *16 through 25*
Lab Exercise: *Common-source amplifier circuit (question 62)*

Day 3

Topics: *Push-pull amplifier circuits*
Questions: *26 through 35*
Lab Exercise: *Audio intercom circuit, push-pull output (question 63)*

Day 4

Topics: *Multi-stage and high-frequency amplifier designs*
Questions: *36 through 50*
Lab Exercise: *Audio intercom circuit, push-pull output (question 63, continued)*

Day 5

Topics: *Amplifier troubleshooting*
Questions: *51 through 60*
Lab Exercise: *Troubleshooting practice (oscillator/amplifier circuit – question 64)*

Day 6

Exam 2: *includes Amplifier circuit performance assessment*
Lab Exercise: *Troubleshooting practice (oscillator/amplifier circuit – question 64)*

General concept practice and challenge problems

Questions: *67 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (oscillator/amplifier) due at end of ELTR125, Section 3
Question 65: Troubleshooting log
Question 66: Sample troubleshooting assessment grading criteria

Recommended schedule

Day 1

Topics: *Basic oscillator theory and relaxation oscillator circuits*
Questions: *1 through 10*
Lab Exercise: *BJT multivibrator circuit, astable (question 51)*

Day 2

Topics: *Phase-shift and resonant oscillator circuits*
Questions: *11 through 20*
Lab Exercise: *Wien bridge oscillator, BJT (question 52)*

Day 3

Topics: *Harmonics*
Questions: *21 through 30*
Lab Exercise: *Colpitts oscillator, BJT (question 53)*

Day 4

Topics: *Fundamentals of radio, amplitude modulation, and frequency modulation* (optional)
Questions: *31 through 50*
Lab Exercise: *Troubleshooting practice (oscillator/amplifier circuit – question 55)*
Just for fun (not required): *AM radio transmitter (question 54)*

Day 5

Exam 3: *includes Oscillator Circuit performance assessment*
Troubleshooting Assessment due: *oscillator/amplifier circuit (question 55)*
Question 56: Troubleshooting log
Question 57: Sample troubleshooting assessment grading criteria

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Troubleshooting practice problems

Questions: *58 through 67*

General concept practice and challenge problems

Questions: *68 through the end of the worksheet*

Recommended schedule

Day 1

Topics: *Differential pair circuits*
Questions: *1 through 15*
Lab Exercise: *Discrete differential amplifier (question 56)*

Day 2

Topics: *The basic operational amplifier*
Questions: *16 through 25*
Lab Exercise: *Discrete differential amplifier (question 56, continued)*

Day 3

Topics: *Using the operational amplifier as a comparator*
Questions: *26 through 35*
Lab Exercise: *Comparator circuit (question 57)*

Day 4

Topics: *Using the operational amplifier as a voltage buffer*
Questions: *36 through 45*
Lab Exercise: *Opamp voltage follower (question 58)*

Day 5

Topics: *Additional applications of feedback* (optional)
Questions: *46 through 55*
Lab Exercise: *Linear voltage regulator circuit (question 59)*

Day 6

Exam 1: *includes Comparator circuit performance assessment*
Lab Exercise: *Select an opamp project to prototype and troubleshoot by the end of the next course section (ELTR130, Section 2)*

Troubleshooting practice problems

Questions: *62 through 71*

General concept practice and challenge problems

Questions: *72 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (project prototype) due at end of ELTR130, Section 2
Question 60: Troubleshooting log
Question 61: Sample troubleshooting assessment grading criteria

Recommended schedule

Day 1

Topics: *Using the operational amplifier as a noninverting voltage amplifier*
Questions: *1 through 15*
Lab Exercise: *Opamp as noninverting amplifier (question 61)*

Day 2

Topics: *Using the operational amplifier as an inverting voltage amplifier*
Questions: *16 through 30*
Lab Exercise: *Opamp as inverting amplifier (question 62)*

Day 3

Topics: *Voltage/current converter and summer circuits*
Questions: *31 through 40*
Lab Exercise: *Troubleshooting practice on prototyped project*

Day 4

Topics: *Differential and instrumentation amplifier circuits*
Questions: *41 through 50*
Lab Exercise: *Op-amp as difference amplifier (question 63)*

Day 5

Topics: *Precision rectifier circuits*
Questions: *51 through 60*
Lab Exercise: *Precision half-wave rectifier (question 64)*

Day 6

Topics: *Review*
Lab Exercise: *Troubleshooting practice on prototyped project*

Day 7

Exam 2: *includes Inverting or Noninverting amplifier circuit performance assessment*
Troubleshooting Assessment due: *Opamp project prototype*
Question 65: Troubleshooting log
Question 66: Sample troubleshooting assessment grading criteria

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Troubleshooting practice problems

Questions: *67 through 76*

General concept practice and challenge problems

Questions: *77 through the end of the worksheet*

Recommended schedule

Day 1

Topics: *Operational amplifier AC performance*
Questions: *1 through 10*
Lab Exercise: *Opamp slew rate (question 56)*

Day 2

Topics: *AC calculations and filter circuit review*
Questions: *11 through 25*
Lab Exercise: *Opamp gain-bandwidth product (question 57)*

Day 3

Topics: *Active filter circuits*
Questions: *26 through 35*
Lab Exercise: *Sallen-Key active lowpass filter (question 58)*

Day 4

Topics: *Active filter circuits (continued)*
Questions: *36 through 45*
Lab Exercise: *Sallen-Key active highpass filter (question 59)*

Day 5

Topics: *Switched-capacitor circuits (optional)*
Questions: *46 through 55*
Lab Exercise: *Bandpass active filter (question 60)*

Day 6

Exam 1: *includes Active filter circuit performance assessment*
Lab Exercise: *Work on project*

Troubleshooting practice problems

Questions: *62 through 71*

General concept practice and challenge problems

Questions: *72 through the end of the worksheet*

Impending deadlines

Project due at end of ELTR135, Section 2
Question 61: Sample project grading criteria

Recommended schedule

Day 1

Topics: *Operational amplifier oscillators*
Questions: *1 through 10*
Lab Exercise: *Opamp relaxation oscillator (question 46)*

Day 2

Topics: *Calculus explained through active integrator and differentiator circuits*
Questions: *11 through 20*
Lab Exercise: *Opamp triangle wave generator (question 47)*

Day 3

Topics: *Logarithm review*
Questions: *21 through 35*
Lab Exercise: *Opamp LC resonant oscillator (question 48)*

Day 4

Topics: *Log/antilog circuits* (optional)
Questions: *36 through 45*
Lab Exercise: *Work on project*

Day 5

Topics: *Review*
Lab Exercise: *Work on project*

Day 6

Exam 2: *includes Oscillator circuit performance assessment*
Project due
Question 49: Sample project grading criteria

Troubleshooting practice problems

Questions: *50 through 59*

General concept practice and challenge problems

Questions: *60 through the end of the worksheet*

Recommended schedule

Day 1

Topics: *Logic states and simple gate circuits*
Questions: *1 through 10*
Lab Exercise: *OR gate, diode-resistor logic (question 51)*

Day 2

Topics: *TTL logic gates and truth tables*
Questions: *11 through 20*
Lab Exercise: *AND gate, simple BJT logic (question 52)*

Day 3

Topics: *CMOS logic gates and truth tables*
Questions: *21 through 30*
Lab Exercise: *IC logic gate usage (question 53)*

Day 4

Topics: *Relay circuits and truth tables*
Questions: *31 through 40*
Lab Exercise: *AND gate, relay logic (question 54)*

Day 5

Topics: *Logic circuit performance parameters*
Questions: *41 through 50*
Lab Exercise: *Gate-relay interposing (question 55)*

Day 6

Exam 1: *includes IC logic gate performance assessment*

Troubleshooting practice problems

Questions: *57 through 66*

DC/AC review problems

Questions: *67 through 86*

Basic principles of microcontrollers

Questions: *87 through 96*

General concept practice and challenge problems

Questions: *97 through the end of the worksheet*

Impending deadlines

Project due at end of ELTR140, Section 3
Question 56: Sample project grading criteria

Recommended schedule

Day 1

Topics: *Boolean algebra, basic concepts and identities*
Questions: *1 through 20*
Lab Exercise: *work on project*

Day 2

Topics: *Boolean algebra, simplification laws*
Questions: *21 through 40*
Lab Exercise: *Gate circuit from Boolean expression (question 96)*

Day 3

Topics: *SOP and POS expressions*
Questions: *41 through 60*
Lab Exercise: *Gate circuit from truth table (question 97)*

Day 4

Topics: *Karnaugh mapping*
Questions: *61 through 75*
Lab Exercise: *work on project*

Day 5

Topics: *DeMorgan's Theorem and gate universality*
Questions: *76 through 95*
Lab Exercise: *NAND gate universality (question 98)*

Day 6

Exam 2: *includes Boolean-to-gate performance assessment*

Troubleshooting practice problems

Questions: *100 through 109*

General concept practice and challenge problems

Questions: *110 through the end of the worksheet*

Impending deadlines

Project due at end of ELTR140, Section 3
Question 99: Sample project grading criteria

Recommended schedule

Day 1

Topics: *Numeration systems*
Questions: *1 through 10*
Lab Exercise: *work on project*

Day 2

Topics: *Digital codes*
Questions: *11 through 20*
Lab Exercise: *Gray code to binary converter (question 56)*

Day 3

Topics: *Binary arithmetic*
Questions: *21 through 30*
Lab Exercise: *Half adder circuit (question 57)*

Day 4

Topics: *Binary arithmetic circuits*
Questions: *31 through 40*
Lab Exercise: *Full adder circuit (question 58)*

Day 5

Topics: *Digital circuit troubleshooting*
Questions: *41 through 55*
Lab Exercise: *Analog-digital converter IC (question 59)*

Day 6

Exam 3: *includes binary adder circuit performance assessment*
Project due
Question 60: Sample project grading criteria

DC/AC review problems

Questions: *61 through 80*

General concept practice and challenge problems

Questions: *81 through the end of the worksheet*

Recommended schedule

Day 1

Topics: *Latch circuits*
Questions: *1 through 10*
Lab Exercise: *S-R latch from individual gates (question 51)*

Day 2

Topics: *555 timer circuit*
Questions: *11 through 20*
Lab Exercise: *555 timer in astable mode (question 52)*

Day 3

Topics: *Gated latch circuits*
Questions: *21 through 30*
Lab Exercise: *Troubleshooting practice (decade counter circuit – question 54)*

Day 4

Topics: *Flip-flops*
Questions: *31 through 40*
Lab Exercise: *Troubleshooting practice (decade counter circuit – question 54)*

Day 5

Topics: *Flip-flops (continued)*
Questions: *41 through 50*
Lab Exercise: *J-K flip-flop IC (question 53)*

Day 6

Exam 1: *includes S-R latch circuit performance assessment*
Lab Exercise: *Troubleshooting practice (decade counter circuit – question 54)*

Troubleshooting practice problems

Questions: *57 through 66*

DC/AC/Semiconductor/Opamp review problems

Questions: *67 through 86*

General concept practice and challenge problems

Questions: *87 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (counter circuit) due at end of ELTR145, Section 3
Question 55: Troubleshooting log
Question 56: Sample troubleshooting assessment grading criteria

Recommended schedule

Day 1

Topics: *Counter circuits*
Questions: *1 through 10*
Lab Exercise: *2-bit counter from flip-flops (question 56)*

Day 2

Topics: *Counter circuits (continued)*
Questions: *11 through 20*
Lab Exercise: *4-bit up/down counter IC (question 57)*

Day 3

Topics: *Shift registers*
Questions: *21 through 30*
Lab Exercise: *Troubleshooting practice (decade counter circuit – question 60)*

Day 4

Topics: *Shift registers and serial data communication*
Questions: *31 through 40*
Lab Exercise: *Frequency divider circuit (question 58)*

Day 5

Topics: *Memory technologies*
Questions: *41 through 55*
Lab Exercise: *4-bit universal shift register IC (question 59)*

Day 6

Exam 2: *includes Counter circuit performance assessment*
Lab Exercise: *Troubleshooting practice (decade counter circuit – question 60)*

Troubleshooting practice problems

Questions: *63 through 72*

DC/AC/Semiconductor/Opamp review problems

Questions: *73 through 92*

General concept practice and challenge problems

Questions: *93 through the end of the worksheet*

Impending deadlines

Troubleshooting assessment (counter circuit) due at end of ELTR145, Section 3
Question 61: Troubleshooting log
Question 62: Sample troubleshooting assessment grading criteria

Recommended schedule

Day 1

Topics: *Encoders and decoders*
Questions: *1 through 10*
Lab Exercise: *4-line to 16-line decoder (question 41)*

Day 2

Topics: *Multiplexers and demultiplexers*
Questions: *11 through 20*
Lab Exercise: *Arbitrary logic function with multiplexer (question 42)*

Day 3

Topics: *Display decoder/driver circuits*
Questions: *21 through 30*
Lab Exercise: *7-segment display circuit (question 43)*

Day 4

Topics: *Programmable logic technology*
Questions: *31 through 40*
Lab Exercise: *Troubleshooting practice (decade counter circuit – question 44)*

Day 5

Exam 3: *includes Arbitrary logic function performance assessment*
Troubleshooting Assessment due: *Decade counter circuit*
Question 45: Troubleshooting log
Question 46: Sample troubleshooting assessment grading criteria

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Troubleshooting practice problems

Questions: *47 through 56*

DC/AC/Semiconductor/Opamp review problems

Questions: *57 through 76*

General concept practice and challenge problems

Questions: *77 through the end of the worksheet*