CASE WESTERN RESERVE UNIVERSITY

Case School of Engineering

Department of Electrical Engineering and Computer Science

ENGR 210. Introduction to Circuits and Instruments Spring 2005 <u>DRAFT</u> Agenda and Assignment Dates

Notes:

- 1. Labs are posted on MON mornings and reports are collected the following week, at scheduled lab times.
- 2. HW is posted and collected on WED mornings (in lecture), and solutions are posted on WED afternoons.
- 3. Quizzes are given on FRI mornings (in lecture), and solutions are posted on FRI afternoons.
- 4. Reading is from The Analysis and Design of Linear Circuits, 4th Ed., Thomas and Rosa, Wiley, 2004.

1/28	Date	Class	Due	Agenda	Reading	Lab
1/14 3	1/10			Course Outline and Information	1.1	
1/17	1/12	2		Electrical units, engineering notation	1.1-1.3	intro
1/19	1/14	3		passive sign convention; Ohm's Law	1.3-2.1	
1/21 5 Q1 KCL; KVL; element constraints 2.2-2.3 Ohm's Law 1/24 6 series/parallel 2.3 L2 1/26 7 HW2 equivalent R; source transforms 2.4 Computer-basec 1/28 8 Q2 voltage and current dividers 2.5 Instruments 1/31 9 fuses; circuit reduction 2.5-2.6 L3 1/31 9 fuses; circuit reduction 2.5-2.6 L3 2/4 11 Q3 Cramer's method; supernodes 3.1 LabVIEW and 2/4 11 Q3 Cramer's method; supernodes 3.2 L4 2/9 13 HW4 linear circuits; proportionality 3.3 Function Generate 2/11 14 Q4 turning sources OFF; superposition 3.3 Function Generate 2/14 15 Thevenin and Norton equivalent circuits 3.4 L5 2/18 17 Q5 interface circuits 3.6 Superposition 2/23	1/17			Martin Luther King Day		
1/24	1/19	4	HW1	switches; v and I sources"		
1/26	1/21		Q1	KCL; KVL; element constraints	2.2-2.3	Ohm's Law
1/28	1/24	6		series/parallel	2.3	L2
1/31			HW2	equivalent R; source transforms		Computer-based
2/2 10 HW3 node voltage techniques 3.1 LabVIEW and DMMs 2/4 11 Q3 Cramer's method; supernodes 3.1 DMMs 2/7 12 mesh current techniques 3.2 L4 2/9 13 HW4 linear circuits; proportionality 3.3 Function Generate and Oscillosome Generate Gen	1/28		Q2	voltage and current dividers	2.5	
2/4 11 Q3 Cramer's method; supernodes 3.1 DMMs 2/7 12 mesh current techniques 3.2 L4 2/9 13 HW4 linear circuits; proportionality 3.3 Function Generate 2/11 14 Q4 turning sources OFF; superposition 3.3 and Oscilloscope 2/14 15 Thevenin and Norton equivalent circuits 3.4 L5 2/16 16 HW5 maximum power transfer 3.5 KCL and 2/18 17 Q5 interface circuits 3.6 Superposition 2/21 18 dependent sources 4.1-4.2 L6 2/23 19 HW6 Thevenin and Norton of active circuits 4.2 Thevenin Equivaler 2/28 21 summing/subtracting amplifiers 4.5 L7 3/2 22 HW7 voltage follower, multi OP AMP circuits 4.5 Intro to Operations 3/4 23 Q7 comparators 4.6 L8 3/16	1/31	9		fuses; circuit reduction	2.5-2.6	L3
2/7	2/2	10	HW3	node voltage techniques		LabVIEW and
2/9 13 HW4 linear circuits; proportionality 3.3 Function Generate and Continuous Companies 2/11 14 Q4 turning sources OFF; superposition 3.3 and Oscilloscop 2/14 15 Thevenin and Norton equivalent circuits 3.4 L5 2/16 16 HW5 maximum power transfer 3.5 KCL and 2/18 17 Q5 interface circuits 3.6 Superposition 2/21 18 dependent sources 4.1-4.2 L6 LE L6 2/23 19 HW6 Thevenin and Norton of active circuits 4.2 Thevenin Equivaler 4.2 Thevenin Equivaler 2/25 20 Q6 basic OP AMP amplifiers 4.5 Intro to Operation 3/2 L7 Intro to Operation 3/2 21 summing/subtracting amplifiers 4.5 Intro to Operation 4.5 Intro to Operation 3/4 23 Q7 comparators Spring Break Spring Br	2/4	11	Q3	Cramer's method; supernodes	3.1	DMMs
2/11 14 Q4 turning sources OFF; superposition 3.3 and Oscilloscopt 2/14 15 Thevenin and Norton equivalent circuits 3.4 L5 2/18 17 Q5 maximum power transfer 3.5 KCL and 2/18 17 Q5 interface circuits 3.6 Superposition 2/21 18 dependent sources 4.1-4.2 L6 2/23 19 HW6 Thevenin and Norton of active circuits 4.2 Thevenin Equivaler 2/25 20 Q6 basic OP AMP amplifiers 4.4 Circuits 2/28 21 summing/subtracting amplifiers 4.5 L7 Intro to Operation: 3/2 22 HW7 voltage follower; multi OP AMP circuits 4.5 Intro to Operation: 3/4 23 Q7 comparators 4.7 Amplifier 3/10 3/14 24 Instrumentation systems; transducers 4.6 L8 3/16 25 HW8 unit impulse, step & ramp; exponentials 5.1-5.3	2/7			mesh current techniques		
2/14 15 Thevenin and Norton equivalent circuits 3.4 L5 2/16 16 HW5 maximum power transfer 3.5 KCL and 2/18 17 Q5 interface circuits 3.6 Superposition 2/21 18 dependent sources 4.1-4.2 L6 2/23 19 HW6 Thevenin and Norton of active circuits 4.2 Thevenin Equivaler 2/25 20 Q6 basic OP AMP amplifiers 4.4 Circuits 2/28 21 summing/subtracting amplifiers 4.5 L7 3/2 22 HW7 voltage follower; multi OP AMP circuits 4.5 Intro to Operation: 3/4 23 Q7 comparators 4.7 Amplifier 3/7 Spring Break none 3/11 Instrumentation systems; transducers 4.6 L8 3/14 24 Instrumentation systems; transducers 4.6 L8 3/16 25 HW8 unit impu	2/9	13	HW4		3.3	Function Generator
2/16 16 HW5 maximum power transfer interface circuits 3.5 KCL and Superposition 2/18 17 Q5 interface circuits 3.6 Superposition 2/21 18 dependent sources 4.1-4.2 L6 2/23 19 HW6 Thevenin and Norton of active circuits 4.2 Thevenin Equivaler 2/28 21 summing/subtracting amplifiers 4.4 Circuits 3/2 22 HW7 voltage follower; multi OP AMP circuits 4.5 Intro to Operations 3/4 23 Q7 Spring Break .7 Amplifier 3/7 Spring Break .7 Amplifier 3/10 25 HW8 Init impulse, step & ramp; exponentials 5.1-5.3 Comparator and comparator and comparator and init impulse, step & ramp; exponentials 5.1-5.3 Comparator and	2/11	14	Q4	turning sources OFF; superposition	3.3	and Oscilloscope
2/18 17 Q5 interface circuits 3.6 Superposition 2/21 18 dependent sources 4.1-4.2 L6 2/23 19 HW6 Thevenin and Norton of active circuits 4.2 Thevenin Equivaler 2/28 20 Q6 basic OP AMP amplifiers 4.4 Circuits 2/28 21 summing/subtracting amplifiers 4.5 L7 3/2 22 HW7 voltage follower; multi OP AMP circuits 4.5 Intro to Operation: operation: operations 3/4 23 Q7 comparators 4.7 Amplifier 3/7 Spring Break none none none 3/11 24 Instrumentation systems; transducers 4.6 L8 3/14 24 Instrumentation systems; transducers 4.6 L8 3/18 26 Instrumentation systems; transducers 4.6 L8 3/18 26 Instrumentation systems; transducers 5.1-5.3 Comparator and Sourcers 3/21 27 <	2/14	15		Thevenin and Norton equivalent circuits	3.4	L5
2/21 18 dependent sources 4.1-4.2 L6 2/23 19 HW6 Thevenin and Norton of active circuits 4.2 Thevenin Equivaler 2/25 20 Q6 basic OP AMP amplifiers 4.5 L7 3/2 22 HW7 voltage follower; multi OP AMP circuits 4.5 Intro to Operations 3/4 23 Q7 comparators 4.7 Amplifier 3/7 Spring Break *** none *** 3/11 " " none *** 3/14 24 Instrumentation systems; transducers systems; transducers systems; transducers 4.6 L8 3/18 25 HW8 unit impulse, step & ramp; exponentials systems; transducers 5.1-5.3 Comparator and Systems; transducers 5.1-5.3 Comparator and Systems; transducers 4.6 L8 *** L9 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** <t< td=""><td>2/16</td><td>16</td><td>HW5</td><td>maximum power transfer</td><td>3.5</td><td>KCL and</td></t<>	2/16	16	HW5	maximum power transfer	3.5	KCL and
2/23 19 HW6 Thevenin and Norton of active circuits 4.2 Thevenin Equivaler Circuits 2/25 20 Q6 basic OP AMP amplifiers 4.4 Circuits 2/28 21 summing/subtracting amplifiers 4.5 Intro to Operations 3/4 23 Q7 comparators 4.7 Amplifier 3/4 23 Q7 comparators 4.7 Amplifier 3/7 Spring Break none 3/11 none 3/14 24 Instrumentation systems; transducers 4.6 L8 3/18 25 HW8 unit impulse, step & ramp; exponentials 5.1-5.3 Comparator and sinusoidal waveforms; rms & average power 5.4-5.6 Schmitt Trigger 3/21 27 Q8 No lecture (Quiz only) L9 L9 Schmitt Trigger 3/23 28 HW9 Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential 3/25 29 Q9 Integrators and differentiators	2/18	17	Q5	interface circuits	3.6	Superposition
2/25 20 Q6 basic OP AMP amplifiers 4.4 Circuits 2/28 21 summing/subtracting amplifiers 4.5 LT7 3/2 22 HW7 voltage follower; multi OP AMP circuits 4.5 Intro to Operations 3/4 23 Q7 comparators 4.7 Amplifier 3/7 Spring Break none 3/10 3/11 3/14 24 Instrumentation systems; transducers 4.6 L8 3/18 26 Instrumentation systems; transducers 4.6 L8 3/18 26 sinusoidal waveforms; rms & average power 5.1-5.3 Comparator and Social systems; transducers 3/21 27 Q8 No lecture (Quiz only) L9 3/223 28 HW9 Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L1	2/21	18		dependent sources	4.1-4.2	L6
2/28 21 summing/subtracting amplifiers 4.5 L7 3/2 22 HW7 voltage follower; multi OP AMP circuits 4.5 Intro to Operations 3/4 23 Q7 comparators 4.7 Amplifier 3/7 Spring Break 3/9 " none 3/11 " none 3/14 24 Instrumentation systems; transducers 4.6 L8 3/16 25 HW8 unit impulse, step & ramp; exponentials 5.1-5.3 Comparator and sinusoidal waveforms; rms & average power 5.4-5.6 Schmitt Trigger 3/21 27 Q8 No lecture (Quiz only) L9 3/23 28 HW9Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential 3/25 29 Q9 Integrators and differentiators 6.3 Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2,7.4,8.1 555 Timer	2/23	19	HW6	Thevenin and Norton of active circuits	4.2	Thevenin Equivalent
3/2 22 HW7 voltage follower; multi OP AMP circuits 4.5 lntro to Operations 3/4 23 Q7 comparators 4.7 Amplifier 3/7 Spring Break 4.7 Amplifier 3/9 " none 3/11 " none 3/14 24 Instrumentation systems; transducers 4.6 L8 3/16 25 HW8 unit impulse, step & ramp; exponentials 5.1-5.3 Comparator and sinusoidal waveforms; rms & average power 5.4-5.6 Schmitt Trigger 3/18 26 sinusoidal waveforms; rms & average power 5.4-5.6 Schmitt Trigger 3/21 27 Q8 No lecture (Quiz only) L9 3/23 28 HW9Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential 3/25 29 Q9 Integrators and differentiators 6.3 Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2, 7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8	2/25	20	Q6	basic OP AMP amplifiers	4.4	Circuits
3/4 23 Q7 comparators 4.7 Amplifier 3/7 3/9 " none 3/11 " none 3/14 24 Instrumentation systems; transducers 4.6 L8 3/16 25 HW8 unit impulse, step & ramp; exponentials 5.1-5.3 Comparator and sinusoidal waveforms; rms & average power 5.4-5.6 Schmitt Trigger 3/21 27 Q8 No lecture (Quiz only) L9 L9 3/23 28 HW9 Capacitors and Inductors, i-v characteristics of a.3 6.1-6.2 Exponential Waveforms 3/25 29 Q9 Integrators and differentiators 6.3 Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics of a.3 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2,7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasors manipulation 8.2 L11 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/8 <td>2/28</td> <td>21</td> <td></td> <td>summing/subtracting amplifiers</td> <td>4.5</td> <td>L7</td>	2/28	21		summing/subtracting amplifiers	4.5	L7
Spring Break Spri	3/2	22	HW7	voltage follower; multi OP AMP circuits	4.5	Intro to Operational
3/9 3/11	3/4	23	Q7	comparators	4.7	Amplifier
3/11 " 3/14 24 Instrumentation systems; transducers 4.6 L8 3/16 25 HW8 unit impulse, step & ramp; exponentials 5.1-5.3 Comparator and sinusoidal waveforms; rms & average power 5.4-5.6 Schmitt Trigger 3/21 27 Q8 No lecture (Quiz only) L9 3/23 28 HW9 Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential 3/25 29 Q9 Integrators and differentiators 6.3 Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2, 7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 L11 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/8 35 Q11 Frequency response; Bode diagrams 12.1 Filters	3/7			Spring Break		
3/14 24 Instrumentation systems; transducers 4.6 L8 3/16 25 HW8 unit impulse, step & ramp; exponentials 5.1-5.3 Comparator and sinusoidal waveforms; rms & average power 5.4-5.6 Schmitt Trigger 3/21 27 Q8 No lecture (Quiz only) L9 3/23 28 HW9 Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential Waveforms 3/25 29 Q9 Integrators and differentiators 6.3 Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2, 7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 L11 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 Active RC Filters 4/13 37 HW12 More frequency response examples 12.3 12.2<	3/9			и		none
3/16 25 HW8 unit impulse, step & ramp; exponentials 5.1-5.3 Comparator and sinusoidal waveforms; rms & average power 5.4-5.6 Schmitt Trigger 3/18 26 sinusoidal waveforms; rms & average power 5.4-5.6 Schmitt Trigger 3/21 27 Q8 No lecture (Quiz only) L9 3/23 28 HW9 Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential Waveforms 3/25 29 Q9 Integrators and differentiators 6.3 Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2, 7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 L11 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency response; bade diagrams 12.1 Filters <t< td=""><td>3/11</td><td></td><td></td><td>ű</td><td></td><td></td></t<>	3/11			ű		
3/18 26 sinusoidal waveforms; rms & average power 5.4-5.6 Schmitt Trigger 3/21 27 Q8 No lecture (Quiz only) L9 3/23 28 HW9 Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential 3/25 29 Q9 Integrators and differentiators 6.3 Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2,7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 L11 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 Active RC Filters 4/13 37 HW12 More frequency response examples 12.2	3/14	24		Instrumentation systems; transducers	4.6	L8
3/21 27 Q8 No lecture (Quiz only) L9 3/23 28 HW9 Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential 3/25 29 Q9 Integrators and differentiators 6.3 Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2, 7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 Active RC Filters 4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 <t< td=""><td>3/16</td><td>25</td><td></td><td></td><td></td><td>Comparator and</td></t<>	3/16	25				Comparator and
3/23 28 HW9Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential 3/25 29 Q9 Integrators and differentiators 6.3 Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2, 7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 HW11 Circuit analysis with phasors 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 L12 4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/20 40 State variables and differential equations 7.2 none 4/22 41 Time constants; initial/final value theorem 7.2 4/25 42 Responses other than state variables 7.2 Reading Days	3/18	26	si	nusoidal waveforms; rms & average powe	r 5.4-5.6	Schmitt Trigger
3/23 28 HW9 Capacitors and Inductors, i-v characteristics 6.1-6.2 Exponential 3/25 29 Q9 Integrators and differentiators 6.3 Waveforms 3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2, 7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 L12 4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/	3/21	27	Q8	No lecture (Quiz only)		L9
3/28 30 Series/parallel L/C, steady-state characteristics 6.4 L10 3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2, 7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 L12 4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/20 40 State variables and differential equations 7.2 none 4/25 42 Responses other than state variables 7.2 4/25 42 Responses other than		28	HW9C	apacitors and Inductors, i-v characteristic	s 6.1-6.2	Exponential
3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2, 7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 L11 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 L12 4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/20 40 State variables and differential equations 7.2 none 4/25 42 Responses other than state variables 7.2 4/25 42 Responses other than state variables 7.2	3/25	29	Q9	Integrators and differentiators	6.3	Waveforms
3/30 31 HW10 Forced sinusoidal response, phasors 7.1,7.2, 7.4,8.1 555 Timer 4/1 32 Q10 Euler identity; phasor manipulation 8.2 L11 4/4 33 Phasor current/voltage; impedance 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 L12 4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/20 40 State variables and differential equations 7.2 none 4/25 42 Responses other than state variables 7.2 4/25 42 Responses other than state variables 7.2	3/28	30	Ser	ries/parallel L/C, steady-state characterist	ics 6.4	L10
4/4 33 Phasor current/voltage; impedance 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 L12 4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/20 40 State variables and differential equations 7.2 none 4/22 41 Time constants; initial/final value theorem 7.2 7.2 4/25 42 Responses other than state variables 7.2 4/27,28 Reading Days 7.2	3/30	31	HW10	Forced sinusoidal response, phasors	7.1,7.2, 7.4,	8.1 555 Timer
4/4 33 Phasor current/voltage; impedance 8.2 L11 4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 L12 4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/20 40 State variables and differential equations 7.2 none 4/22 41 Time constants; initial/final value theorem 7.2 7.2 4/25 42 Responses other than state variables 7.2 4/27,28 Reading Days 7.2		32	Q10		8.2	
4/6 34 HW11 Circuit analysis with phasors 8.3-8.4 Passive RC 4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 L12 4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/20 40 State variables and differential equations 7.2 none 4/22 41 Time constants; initial/final value theorem 7.2 4/25 42 Responses other than state variables 7.2 4/27,28 Reading Days 7.2	4/4	33			8.2	L11
4/8 35 Q11 Frequency Response; Bode diagrams 12.1 Filters 4/11 36 Frequency response examples 12.2 L12 4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/20 40 State variables and differential equations 7.2 none 4/22 41 Time constants; initial/final value theorem 7.2 4/25 42 Responses other than state variables 7.2 4/27,28 Reading Days 7.2			HW11		8.3-8.4	Passive RC
4/1136Frequency response examples12.2L124/1337HW12More frequency response examples12.2Active RC Filters4/1538Q12Bandpass and notch filters12.34/1839Step response; zero-input response7.1,7.24/2040State variables and differential equations7.2none4/2241Time constants; initial/final value theorem7.24/2542Responses other than state variables7.24/27,28Reading Days					12.1	Filters
4/13 37 HW12 More frequency response examples 12.2 Active RC Filters 4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/20 40 State variables and differential equations 7.2 none 7.2 4/22 41 Time constants; initial/final value theorem 7.2 4/25 42 Responses other than state variables 7.2 4/27,28 Reading Days					12.2	
4/15 38 Q12 Bandpass and notch filters 12.3 4/18 39 Step response; zero-input response 7.1,7.2 4/20 40 State variables and differential equations 7.2 none 4/22 41 Time constants; initial/final value theorem 7.2 4/25 42 Responses other than state variables 7.2 4/27,28 Reading Days			HW12	More frequency response examples		Active RC Filters
4/1839Step response; zero-input response7.1,7.24/2040State variables and differential equations7.2none4/2241Time constants; initial/final value theorem7.24/2542Responses other than state variables7.24/27,28Reading Days						
4/2040State variables and differential equations7.2none4/2241Time constants; initial/final value theorem7.24/2542Responses other than state variables7.24/27,28Reading Days						
4/2241Time constants; initial/final value theorem7.24/2542Responses other than state variables7.24/27,28Reading Days						none
4/25 42 Responses other than state variables 7.2 4/27,28 Reading Days						
4/27,28 Reading Days					7.2	
1.5/3 Final 8130 - 11130 am	5/3			Final	8:30 - 11:30	am

ENGR 210 Circuits and Instrumentation

- modeling and circuit analysis
 voltage & current
 Kirchoff's Laws
 Theuenin & Norton circuits
- DC sensors and amplifiers
 operational amplifiers
- time dependent circuits
 transients
 time dependent waveforms
- frequency dependent circuits phasors
 frequency response
- Instrumentation
 digital multimeter
 waveform generator
 oscilloscope
 computer data acquisition Lab VIEW

Syllabus: vorlon.cwru.edu/~flm/engr210505/index, html

Text
Thomas & Rosa, The Analysis and Design of Linear Circuits, 4/e
John Wiley & Sons
ISBN 0-471-27213-2

Grading

25% Homework, due each Wednesday in class

25% Weekly quizzes* each Friday in class based on Wednesday's homework, closed book

based on Wednesday's homework, closed book

Truesday evening 6-8:30

Recitation Thursday evening 6:30-8:30 White 411

Location TBA

25% Laboratory*, as scheduled done in groups of two lab reports (short)

Glennam 308, ID card access workstation accounts

- telnel to cerne, curu, edu
"new user"
press "Enter" for password
follow instructions on screen
3 days to activate

25% Final Exam
comprehensive
May 3, 8:30-11:30

* No late assignments accepted Two Lowest (hw/quiz/lab)

will be dropped

** Errors in grading should be submitted to appropriate TA

— copy of assignment (lab, hw problem, quiz problem)

— written explanation of why your solution is correct

Electrical Engineering and Computer Science Department

Computing Facilities Introduction and Policy Statement.

The Electrical Engineering and Computer Science (EECS) Department computing facilities are comprised of many different computer labs:

- Jennings Computing Center (Olin 404.5)
- Circuits Lab (Glennan 308)

Labs are open to current EECS students or those taking EECS courses. Most labs are open 24 hours a day, 7 days a week to all students, faculty and staff with an active account (via their CWRU ID card) and a need to use the equipment in the lab. The labs are administered by the EECS Technical Staff.

Account Applications

Accounts are usually created within 2 to 3 business days. Plan accordingly!

To apply for an account, please read the information located at:

nttp://www.eecs.cwru.edu/newuser/

Please note that the Unix and NT systems both have DIFFERENT account databases. Therefore, you will have two separate accounts and, therefore, may have two separate passwords.

When you register for an account, a request will be made on your behalf for card access to the general purpose computing labs in Olin 404.5. For other labs, your instructor will probably have submitted a request on your behalf for the labs you will need to use.

1-1 Book

circuit - interconnection of electrical devices

signal - time varying quantity (voltage & current)

linear circuit - output amplitude proportional to input amplitude

e.g., Vout = K Vin

interface - pair of accessible terminals at which a signal can be measured

1-2 Symbols and Units

time t seconds frequency f hertz power P watts change of cowlombs voltage uolts impedance Z ohms resistance R ohms capacitonie C farads inductance L henrys amperes current i

Table 1-2 Standard Prefixes

some interesting specifications

micro acres ~ 4 square millimeters a Pentium IV contains about a kilometer of electrical connections

charge 1 coulomb = 6.25 x 10 electrons current $i = \frac{df}{dt}$ coulombs ampere voltage $v = \frac{dw}{d\varrho}$ joules coulombs. power = dw dq dt

power woltage chrient

[P = vi