SYLLABUS

UNIT 1 (Weeks 1-5)

Learning Outcomes:

Prove your Skills! (Refresher assignment: Proof of Skills)
Apply Ohm's Law, KVL, KCL to reduce and analyze simple DC circuits
Find Thevenin and Norton equivalencies of circuits
Analyze circuits with multiple sources using superposition
Determine the response of circuits containing Operational Amplifiers (inverting/non-inverting amps, summing/differential amps, comparators)

Day & Date	Powerpoint	Pre-Lecture Course Videos	Pre-recorded Full length Lectures & Level Up Problems	Topics and Activities in Class	Preparation Reading	Assignments/Labs Class Problems	Assigned	Due
M 1/9	**LEC1**	**LEC1.1** **LEC1.2**	**Fall 2020 Introduction Lecture** **Passive Sign Convention KCL, KVL, Ohm's Law Level UP Problems**	Course introduction, units, symbols and variables, ideal/practical sources and loads, power, Ohm's law	Chapter 1 & 2.1	**CP01** **CP01 Solution**	**HW1** Design Ideation Proof of Skills Day 1 Intro	
W 1/11				Refresh, relearn, teach, or learn skills to be successful….			Proof of Skills Day 1 (cont.)	
R 1/12	**LEC2**	**LEC2.1** **LEC2.2**	**WebEx Live KCL, KVL, Circuit Reduction, Nodal Set Up Problem Lecture**	Kirchhoff's laws, equivalent circuits, circuit reduction, V/I dividers, electrical measurements	2.2 thru 2.6	**CP02** **CP02 solution** Team Assignment 1	Proof of Skills Day 2	**Proof of Skills Day 1 (online Gradescope)**
M 1/16	**Martin Luther King Day!**			**Enjoy a short break!**				
W 1/18				Refresh, relearn, teach, or learn skills to be successful….			Proof of Skills Day 2 (cont.)	
R 1/19	**LEC3**	**LEC3.1** **LEC3.2**	**WebEx Live Super Day, Mesh Analysis, Super Node, Super Mesh, Superposition Lecture**	KCL, KVL Node and Mesh Analysis, Linear systems and solutions	3.1, 3.2	**CP03** **CP03 solution** Team Assignment 2	Proof of Skills Day 3	**Proof of Skills Day 2 (online Gradescope)**
M 1/23	**LEC4**	**LEC4.1** **LEC4.2**	**WebEx Live Dependent Sources and Bridge**	Superposition, dependent sources	3.3, 4.1, 4.2	**CP04** **CP04 solution**	**HW2** Proof of Skills Day 3 (cont.)	**HW 1**

			Circuits Lecture			Team Assignment 3		
W 1/25			**Alpha and Omega Lab Continuum Full Length Explanation (Fall 2020)**	Refresh, relearn, teach, or learn skills to be successful….			Proof of Skills Day 4	**Proof of Skills Day 3 (online Gradescope)**
R 1/26	**LEC5**	**LEC5.1**	**WebEx Live Thevein/Norton Lecture** **Thevenin Norton Mesh Nodal Dependent Source Level UP Problems**	Bridge circuit, Thevenin/Norton equivalent sources, Maximum signal transfer, Interface circuit design	3.4, 3.5, 3.6	**CP05** **CP05 solution**	Proof of Skills Day 4 (cont.)	
M 1/30	LEC5 (cont.)					CP05 (cont.)		**Proof of Skills Day 4 (online Gradescope)**
W 2/1				Alpha Lab Topic: Sensors and Decisions, Comparators and Voltage Dividers Omega Lab Topic: MS1 Planning		**Alpha Lab 1** **Omega Lab MS1 Planning** Milestone 1 (MS1) Begin		**P**roof of Skills Check-In (Video)
R 2/2	**LEC6**	**LEC6.1** **LEC6.2**	**WebEx Live All Things Op Amp Lecture**	Ideal Op-Amps, Op-Amp circuit analysis, Lab instrumentation, amplifiers, statistical analysis	4.3-4.6	**CP06** **CP06 solution**	**HW3**	**HW2**
M 2/6	**LEC6 (cont.)**					**CP06 (cont.)** Team Assignment 4		
Tues 2/7								**Omega Lab Project Plan Review**
W 2/8				Alpha Lab Topic: Comparators and Voltage Dividers, Mathematical Operational Amplifiers, Voltage Dividers as a Component Omega Lab Topic: MS1 Doing (start with simulation and analysis THEN build)		**Alpha Lab 1** **Omega Lab MS1**		

R 2/9	**LEC7** **LEC8**	Exam Review **LEC8.1** **LEC8.2**		Exam Review Starting Unit 2 Below!		**CP07** **CP08** **CP08 solution**	**HW4** Design Ideation	**HW3**
Tuesday 2/14	**Exam 1**			Exam 1 7-9 pm **CARNEGIE 113** Fully in-person				

UNIT 2 (Weeks 6-9)

Learning Outcomes:

Calculate the transient response of circuits with capacitors and inductors
Analyze the responses of RLC series and parallel circuits
Analyze circuits with resistance, inductance, and capacitance in terms of impedance
Find the time domain response of circuits using Laplace transforms

Day &	Powerpoint	Pre-Lecture Course Videos	Pre-recorded Full length Lectures & Level Up Problems	Topics and Activities	Preparation		Assignments Labs	
Date					Reading	Class Problems	Assigned	Due
M 2/13	**LEC8**	**LEC 8.3** **LEC 8.4**	**WebEx Live Dynamic Component and First Order Circuit Diff Eq.**	Capacitor, Inductor, Differentiator, Integrator Op Amp Circuits	5.1-5.4, 6.1,6.2,6.4	**CP08** **CP08 solution**		
Tuesday 2/14	**Exam 1**							
W 2/15				Alpha Lab Topic: Capacitance (C), Inductance (L), RC Circuits Omega Lab MS1 Presentation Day			**Alpha Lab** 2	**Milestone 1 Check-Ins and PoC documents *are extended to next week due to Exam 1.*** **You're welcome** 😉
R 2/16	**LEC9**	**LEC 9.1** **LEC 9.2**	**WebEx Live First Order Transient Circuits**	RC Circuits (Natural Response) RC Circuits (Forced Response), RC/RL General Equation	7-1 thru 7-3	**CP09** **CP09 solution**		

Tues 2/21 (Monday schedule)	**LEC10**	**LEC 10.1**	Pre-Lecture **WebEx Live RC Series Circuit with an Exponential Input**		7.4-7.5	**CP10** **CP10 solution** Team Assignment 5		
W 2/22				Alpha Lab Topic: RC/RL Circuits, Thevenin Omega Lab Topic: MS2 Begin			**Omega Lab MS1 Project Presentation Day** **Omega Lab MS2 Planning** **Alpha Lab** 2	**Alpha Lab 1 Proof of Concept Document** **Alpha Lab 1 Check-In** **Omega Lab Proof of Concept 1 Document** **MS1 LTSpice Schematic**
R 2/23	**LEC11**	**LEC 11.1** **LEC 11.2**	**WebEx Live 2nd order Diff. Eq. Lecture**		6-3	**No** CP11 **CP10 (cont.)**	**HW5**	**HW4**
M 2/27	**LEC12**	**LEC 12.1** **LEC 12.2**	**WebEx Live Laplace Transforms Intro, Pole Zero Diagrams, 2nd Order Diff eq. Full Analysis (with initial conditions)**		9-1 thru 9-4	**CP12** **CP12 solution** Team Assignment 6		
Tuesday 2/28								**Omega Lab MS1 Project Manual Deadline** **Omega Lab Project Plan MS2 Review**
W 3/1				Alpha Lab Topic: RLC Circuits, 2nd order step response				
R 3/2	**LEC13**	**LEC 13.1**		Partial Fraction Expansion, Simple	9-5, 9-6	**CP13** **CP13 solution**	**HW6**	**HW5** **Note* Proof of**

		LEC 13.2		Real Poles, Complex Conjugates				**Skills Deadline for Essential Skills or you'll be encouraged to drop course**
Spring Circuits Break: March 6-March 10 **Note: You will likely need to keep some lab activity to stay on track.**								
M 3/13	**LEC14** **LEC15**	**LEC 14.1** **LEC 14.2** **LEC 15.1**	**WebEx Live Laplace Initial Conditions (Spring 2020..skip intro!)** **Laplace and Initial condition Sources Level UP Problems**	Complete System Response Zero Initial conditions, Non-Zero Initial conditions	9-6	**CP14** **CP14 solution** **CP15** **CP15 solution** Team Assignment 7		
W 3/15				Alpha Lab Topic: Other forced responses				
R 3/16	**LEC16** **Exam 2 Review LEC 17**		**Exam 2 Review Level UP Problems**	Complete System Response, Non-Zero Initial conditions (cont.)		**CP16** **CP16 solution** **CP 17** **CP17 solution**	**HW7**	**HW6**
Tuesday 3/21	**Exam 2**			Exam 2 7-9 pm **CARNEGIE 113** Fully in-person				

UNIT 3 (WEEK 10-12)

Learning Outcomes:

Analyze AC circuits in the frequency domain

Find the AC steady-state responses of circuits with resistances, inductances, and capacitances in terms of impedance
Recognize and analyze RLC series and parallel resonant circuits
Understand power in AC circuits
Transformer Circuits

Day & Date	Powerpoint	Pre-Lecture Course Videos	Pre-recorded Full length Lectures & Level Up Problems	Topics and Activities in Class	Assignments		Assignments/Labs	
					Reading	Class Problems	Assigned	Due
M 3/20	**LEC18**	**LEC18.1** **LEC18.2**	**WebEx Live Phasor Lecture**	Steady state, Complex Frequency, Impedance review	8.1-8.4, 10.1, 10.2, 11-1, 11-2	**No CP**		
Tuesday 3/21	**Exam 2**							
W 3/22				Alpha Lab Topic: Phasors, Complex Power Omega Lab Topic: MS3 Begin				
R 3/23	**LEC19** LEC20.1	**LEC19.1**	**WebEx Live Phasor +Unit 1 Lecture** **Phasor Level UP Problems**	Sinusoids and Phasors AC circuit analysis (ladder networks) AC steady state measurements	10.3-10.6 8.5	**CP19** **CP19 Solution** **CP20** **CP20 solution** Team Assignment 8		
M 3/27	**LEC21**	**LEC21.1**	**WebEx Live Power Circuits Lecture** **Power Circuits Level UP Problems**	Kirchhoff's laws with Phasors Frequency dependence of circuits	Reread 8.1-8.4	**CP21** **CP21 solution** Team Assignment 9		
W 3/29				Alpha Lab Topic:			**Omega Lab MS2**	**Alpha Lab 2 Proof of**

				Complex Power Omega Lab Topic: MS3			**Project Presentation Day** Omega Lab MS3 Planning **Alpha Lab 3**	**Concept Document** **Alpha Lab 2 Check-In** **Omega Lab Proof of Concept 2 Document** **Omega Lab 2 Check-In**
R 3/30	**LEC21**	**LEC21.2**	**WebEx Live Power Circuits (cont.) Transformers Background Lecture**	Power Circuits Power factor correction	16.1-16-4	**CP21** **CP21 solution**	**HW 8**	HW 7
M 4/3	**LEC22**	**LEC22.1** **LEC22.2**	**WebEx Live Transformer Lecture** **Transformers Level UP Problems**	Mutual Inductance Dot Convention Ideal Transformer	15.1-15.4	**CP22** **CP22 solution**		
Tues 4/4								Omega Lab MS2 Project Manual Deadline **Omega Lab Project Plan MS3 Review**
W 4/5				Alpha Lab Topic: Transformers, Mutual Inductance Omega Lab Topic: MS3				

R 4/6	LEC 24	**LEC 24.1** **LEC 24.2**	**Exam 3 Concept Review and Links to Level UP Problems** **WebEx Live First Order Filters**	Exam 3 Review Unit 4 Begins! First Order filters		**CP24** **CP24 solution** Team Assignment 10		
Tues 4/11	**Exam 3**			Exam 3 7-9 pm **CARNEGIE 113** Fully in-person				

UNIT 4 (WEEK 13-15)

Learning Outcomes:

Frequency response of circuits
Build and design filters
Understand Bode plots

Day &	**Powerpoint**	Pre-Lecture Course	Pre-recorded Full length Lectures & Level Up Problems	**Topics and Activities**	**Preparation**		**Assignments/Labs**	
Date		Videos		**in Class**	**Reading**	**Class Problems**	**Assigned**	**Due**
M 4/10	**LEC25**	**LEC25.1**	**Filter Level UP Problems** **WebEx Live 2nd Order Filters 1**	2nd Order Filters	12.1, 12.2	**CP25** **CP 25 solution** Team Assignment 11	**HW9**	HW8
W 4/12				1st order filters				
R 4/13	**LEC26** **LEC 27**	**LEC26.1 (cont. from above)**	**WebEx Live Second Order Filters 2** **Filter Design Level UP Problems**	Resonance Series/Parallel resonance	12.5, 12.6, 14.1-14.5	**CP26** **CP26 solution** **CP27** **CP27 solution**		

M 4/17	**LEC 27**	**Continued from above**				Team Assignment 12 (Bring Laptops!)		
W 4/19				Alpha Lab topic: 2nd order filters Omega Lab topic: MS3				
R 4/20	**LEC28**	**LEC28.1**		Course Review Special filters Butterworth Salen-Key			**HW10** ***Optional***	**HW 9**
M 4/24				Make-Up if needed				
W 4/26							**Omega Lab Milestone 3 Check-in** **Omega Lab MS3 Project Presentation Day**	**Alpha Lab 3 Proof of Concept Document** **Alpha Lab 3 Check-In** **Omega Lab 3 Proof of Concept** Omega Milestone 3 Check-In
4/27-4/30			Study Days					
M 5/1								**All Optimizations Due** **HW10 Due** **Metacognition Journal Due**
Final				**Final Exam** **TBD**				