North Central State College

MASTER SYLLABUS
2019-2020

A. Academic Division: Business, Industry, and Technology

B. Discipline: Electronic Engineering Technology

C. Course Number and Title: ELET1520 AC Electricity

D. Course Coordinator: Jonathan DeWitt
Assistant Dean: Toni Johnson, PhD

Instructor Information:

- Name: Click here to enter text.
- Office Location: Click here to enter text.
- Office Hours: Click here to enter text.
- Phone Number: Click here to enter text.
- E-Mail Address Click here to enter text.

E. Credit Hours: 3
Lecture: 2 hours
Laboratory: 2 hours

F. Prerequisites: ELET1510
Co-requisite(s): MATH1051

G. Syllabus Effective Date: Fall, 2019

H. Textbook(s) Title:

Foundations of Electronics Circuits & Devices Electron Flow Version

- Author(s): Meade
- Copyright Year: 2006
- Edition: 5th
- ISBN #: 978-1418-0053-75

I. Workbook(s) and/or Lab Manual:

Laboratory Projects to Accompany Foundations of Electronics

- Author(s): Meade
- Copyright Year: 2006
- Edition: 5th
- ISBN #: 978-1418-0418-30

J. Course Description: A course covering alternating circuit theory including basic concepts of voltage, current, resistance, impedance, inductance, capacitance, phase angle, and their relationships to each other in an AC circuit. Transformers, resonance and use of AC instruments is also included. OET 003

K. College-Wide Learning Outcomes

College-Wide Learning Outcome	Assessments - - How it is met & When it is met
Communication – Written	
Communication – Speech	
Intercultural Knowledge and Competence	
Critical Thinking	Class discussions, class activities, tests, and labs - weekly
Information Literacy	
Quantitative Literacy	Class discussions, class activities, tests, and labs - Regularly throughout the semester

L. Course Outcomes and Assessment Methods:

Upon successful completion of this course, the student shall:

Outcomes	Assessments – How it is met & When it is met
1. Sinusoidal wave properties: Safely measure the RMS values of voltage and current of an AC sine wave using both digital and analog multimeters or clip-on ammeters.	Lecture, Labs, and Quizzes during week 1 and throughout the remainder of the semester.
2. Safely measure AC sine wave voltages and phase shifts of voltage and current in RLC circuits on an oscilloscope.	Lecture, Labs, and Quizzes during weeks 3 and 4 and throughout the remainder of the semester.
3. Compute the peak voltage, peak-peak voltage, RMS voltage, frequency and cycle time period from a calibrated oscilloscope display of an AC sine wave.	Lecture, Labs, and Quizzes during week 2 and throughout the remainder of the semester.
4. Behavior of transformers: Describe the electromagnetic principles of transformer action: a. The pulsating magnetic field in the primary. b. The induced voltage in the secondary. c. The use of high permeability cores to maximize coupling. d. The techniques used to minimize core losses.	Lecture, Labs, and Quizzes during week 5 and throughout the remainder of the semester.
5. Compute the following transformer parameters: a. Turn ratio (given primary and secondary voltages) b. Turns ratio (given primary and secondary currents) c. Secondary voltage (given turns ratio and primary voltage) d. Secondary voltage (given rated VA and secondary current) e. Secondary current (given turns ratio and primary current) f. Secondary current (given rated VA and secondary voltage) g. Power losses and efficiency (given power input and output) h. h. Volt-ampere rating (given rated secondary voltage and current)	Lecture, Labs, and Quizzes during week 6 and throughout the remainder of the semester.
6. Complex numbers and phasors: Analyze RC, RL, and RLC circuits and state the results in rectangular and polar form.	Lecture, Labs, and Quizzes during weeks 10 and 11 and throughout the remainder of the semester.
7. AC network theorems such as Superposition, Thevenin's and Norton's theorems	Lecture, Labs, and Quizzes during weeks 7 and 8 and throughout the remainder of the semester.

Outcomes	Assessments – How it is met & When it is met
8. Power factor analysis, Three-phase and/or poly-phase systems Compute the per-phase voltage, current, volt-amps, power and power factor for both wye-connected and delta-connected loads on balanced three-phase line when given line voltage, line current and total load power.	Lecture, Labs, and Quizzes during weeks 8 and 9 and throughout the remainder of the semester.
9. Steady-state behavior of RC circuits under AC conditions, Steady-state behavior of RL circuits under AC conditions, Steady-state behavior of RLC circuits under AC conditions: Describe graphically the relative frequency response at the output of simple R-C, R-L and R-L-C networks for changing frequency.	Lecture, Labs, and Quizzes during weeks 12 and 13 and throughout the remainder of the semester.
10. Analysis of basic filter circuits: Be able to determine resonant frequency and Q of series/parallel resonant circuits.	Lecture, Labs, and Quizzes during weeks 14 and 15

M. Topical Timeline (Subject to Change):

Week 1

- Basic AC Quantities and Measurements
- Draw a graphic illustrating an ac waveform
- Define cycle, alternation, period, peak, peak-to-peak, and effective value (rms)
- Compute effective, peak, and peak-to-peak values of ac voltage and current
- Explain average with reference to one-half cycle of sine-wave ac
- Define and calculate frequency and period
- Describe the phase relationships of *V* and *I* in a purely resistive ac circuit

Week 2

- List the key sections of the oscilloscope
- List precautions when using scopes
- List procedures when measuring voltage with a scope
- List procedures to display and interpret waveforms
- List procedures relating to phase measurement

Week 3

- List procedures when determining frequency with a scope
- Use the computer to solve circuit problems
- Define inductance and self-inductance

Week 4

- Reactive components
- Explain Faraday's and Lenz's laws
- Calculate induced cemf values for specified circuit conditions
- Calculate inductance values from specified parameters
- Calculate inductance in series and parallel
- List common problems of inductors

Week 5

- Illustrate *V-I* relationships for a purely resistive ac circuit
- Illustrate *V-I* relationships for a purely inductive ac circuit
- Explain the concept of inductive reactance
- Write and explain the formula for inductive reactance
- Use Ohm's Law to solve for *XL*
- Use the *XL* formula to solve for inductive reactance at different frequencies and with various inductance values
- Use the *XL* formula to solve for unknown *L* or *f* values

- Determine *XL*, *IL*, and *VL* values for series- and parallel-connected inductances

Week 6

- Use vectors to determine magnitude and direction
- Determine circuit impedance using the Pythagorean theorem
- Determine *VT* and *IT* using the Pythagorean theorem
- Determine ac circuit parameters using trigonometry

Week 7

- Calculate ac electrical parameters for series *RL* circuits
- Calculate ac electrical parameters for parallel *RL* circuits

Week 8

- Define mutual inductance
- Calculate turns, voltage, current, and impedance ratios

Week 9

- Define capacitor, capacitance, dielectric, dielectric constant, electric field, farad, *RC* time constant, and leakage resistance
- Describe capacitor charging action and discharging action
- Calculate charge, voltage, capacitance, and stored energy, using the appropriate formulas

Week 10

- Determine total capacitance in circuits with more than one capacitor (series and parallel)
- Calculate circuit voltages using appropriate *RC* time-constant formulas
- Illustrate *V-I* relationships for purely resistive and purely capacitive circuits

Week 11

- Explain capacitive reactance
- Use Ohm's Law to solve for *XC* value(s)
- Use the capacitive reactance formula to solve for *XC* value(s)
- Use the *XC* formula to solve for unknown *C* and *f* values
- Use Ohm's Law and reactance formulas to determine circuit reactances, voltages, and currents for series- and parallel-connected capacitors

Week 12

- Draw or describe operation of simple *R* and *C* circuits
- Analyze appropriate series and parallel *RC* circuit parameters using the Pythagorean theorem

Week 13

- Use vector analysis to analyze series and parallel *RC* circuit parameters

Week 14

- Solve *RLC* circuit problems using the Pythagorean approach and trig functions
- Define and illustrate ac circuit parameters using both rectangular and polar form notation
- Define real numbers and imaginary numbers
- Analyze *RLC* circuits and state results in rectangular and polar forms
- List the key characteristics of series and parallel resonant circuits

Week 15

- Calculate the resonant frequency of circuits
- Calculate *L* or *C* values needed for resonance at a given *fr*
- Calculate *Q* factor for series and parallel resonant circuits
- Determine bandwidth and bandpass of resonant circuits
- Draw circuit diagrams for three types of filters
- Use the computer to solve circuit problems

N. Course Assignments:

1. Class activities and discussions
2. Learning checks: Selected Learning Checks are completed during chapter reviews.
3. Homework: Selected problems and questions for each chapter must be completed and turned in as homework.

4. Labs: Selected labs will be completed for each chapter throughout the semester
5. Tests: A test will be given at the end of each chapter during the semester.
6. Final: There will be a comprehensive final at the end of the semester.

O. Recommended Grading Scale:

NUMERIC	GRADE	POINTS	DEFINITION
93–100	A	4.00	Superior
90–92	A-	3.67	Superior
87–89	B+	3.33	Above Average
83–86	B	3.00	Above Average
80–82	B-	2.67	Above Average
77–79	C+	2.33	Average
73–76	C	2.00	Average
70-72	C-	1.67	Below Average
67–69	D+	1.33	Below Average
63-66	D	1.00	Below Average
60-62	D-	0.67	Poor
00-59	F	0.00	Failure

P. Grading and Testing Guidelines:

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Q. Examination Policy:

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R. Class Attendance and Homework Make-Up Policy:

Click here to enter text.

S. Classroom Expectations:

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T. College Procedures/Policies:

Important information regarding College Procedures and Policies can be found on the syllabus supplement located at https://sharept.ncstatecollege.edu/committees/1/curriculum/SiteAssets/SitePages/Home/SYLLABUS%20SUPPLEMENT.pdf

The information can also be found Choose an item.