North Central State College

MASTER SYLLABUS	2025-2026

A. Academic Division: Engineering Technology, Business & Criminal Justice Division

B. Discipline: Electronic Engineering Technology

C. Course Number and Title: ELET1520 AC Electricity

D. Assistant Dean: Brooke Miller, M.B.A.

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

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

G. Last Course/Curriculum Revision Date: Fall 2025 Origin date: 05/11/2011

H. Textbook(s) Title:

Optional:

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:

Optional:

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	
Information Literacy	
Quantitative Literacy	

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 – Entire term
2. Safely measure AC sine wave voltages and phase shifts of voltage and current in RLC circuits on an oscilloscope.	Lecture, Labs, and Quizzes – Entire term
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 – Entire term
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 – Entire term
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 – Entire term
6. Complex numbers and phasors: Analyze RC, RL, and RLC circuits and state the results in rectangular and polar form.	Lecture, Labs, and Quizzes – Second half of term
7. AC network theorems such as Superposition, Thevenin's and Norton's theorems	Lecture, Labs, and Quizzes – Second half of term

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 – Second half of term
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 – Second half of term
10. Analysis of basic filter circuits: Be able to determine resonant frequency and Q of series/parallel resonant circuits.	Lecture, Labs, and Quizzes – Second half of term

M. 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

N. College Procedures/Policies:

North Central State College believes that every student is a valued and equal member of the community.* Every student brings different experiences to the College, and all are important in enriching academic life and developing greater understanding and appreciation of one another. Therefore, NC State College creates an inclusive culture in which students feel comfortable sharing their experiences. Discrimination and prejudice have no place on the campus, and the College takes any complaint in this regard seriously. Students encountering aspects of the instruction that result in barriers to their sense of being included and respected should contact the instructor, assistant dean, or dean without fear of reprisal.

* *Inclusive of race, color, religion, gender, gender identity or expression, national origin (ancestry), military status (past, present or future), disability, age (40 years or older), status as a parent during pregnancy and immediately after the birth of a child, status as a parent of a young child, status as a foster parent, genetic information, or sexual orientation*

Important information regarding College Procedures and Policies can be found on the syllabus supplement located at
https://ncstatecollege.edu/documents/President/PoliciesProcedures/PolicyManual/Final%20PDFs/14-081b.pdf

North Central State College

SYLLABUS ADDENDUM

Academic Division:	Engineering Technology, Business, and Criminal Justice	**Discipline:**	Electronic Engineering Technology
Course Coordinator:	Jonathan DeWitt		
Course Number:	ELET1520	**Course Title:**	AC Electricity
Semester / Session:	Spring 2026 / Session A & B	**Start / End Date:**	1/12/2026 – 5/8/2026

Instructor Information

Name:	Jonathan DeWitt	**Phone Number:**	419-755-4776
		E-Mail Address:	jdewitt@ncstatecollege.edu
Office Location:	007 AT Kehoe	**Office Hours:**	M & W – 2:30 PM-4:30 PM

I. Topical Timeline (Subject to Change):

Week	Topics	Assignment	Due Date
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	Chapter 11 Homework Chapter 12 Lab	At start of week 2 as designated in Canvas At close of week 1 as designated in Canvas
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	Chapter 12 Homework Labs 36 and 37 Chapters 11 and 12 Quiz	At start of week 3 as designated in Canvas At close of week 2 as designated in Canvas At start of week 3 as designated in Canvas
3	List procedures when determining frequency with a scope Use the computer to solve circuit problems Define inductance and self-inductance	Lab 40 and PWM Servo Lab Chapter 13 Homework and Chapter 14 Homework Chapters 13 and 14 Quiz	At close of week 3 as designated in Canvas At start of week 3 and start of week 4 respectively as designated in Canvas At start of week 4 as designated in Canvas
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	Lab 42	At start of week 4 as designated in Canvas

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	Oscilloscope Lab Quiz Practice Remote Control Extension Cord Lab	At start of week 5 as designated in Canvas At start of week 5 as designated in Canvas
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	Oscilloscope Lab Quiz Chapter 15 Homework	At start of week 6 as designated in Canvas At start of week 7 as designated in Canvas
7	Calculate ac electrical parameters for series RL circuits Calculate ac electrical parameters for parallel RL circuits	Remote Controlled Vehicle Lab Part 1 Chapter 16 Homework	At close of week 7 as designated in Canvas At start of week 8 as designated in Canvas
8	Define mutual inductance Calculate turns, voltage, current, and impedance ratios	Midterm Exam Remote Controlled Vehicle Lab Part 2	At close of week 8 as designated in Canvas At close of week 8 as designated in Canvas
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	Chapter 17 Homework Lab 47	At start of week 10 as designated in Canvas At close of week 9 as designated in Canvas
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	Chapter 18 Homework Chapter 17 and 18 Quiz Lab 43	At start of week 11 as designated in Canvas At start of week 11 as designated in Canvas At close of week 10 as designated in Canvas
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	Remote Control Vehicle Lab Part 3 Chapter 19 Homework	At close of week 11 as designated in Canvas At start of week 12 as designated in Canvas

12	Draw or describe operation of simple R and C circuits Analyze appropriate series and parallel RC circuit parameters using the Pythagorean theorem	Lab 50	At close of week 12 as designated in Canvas
13	Use vector analysis to analyze series and parallel *RC* circuit parameters	Lab 52 and Lab 45 Part 1	At close of week 13 as designated in Canvas
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	Lab 54 and Lab 45 Part 2 Chapter 20 Homework	At close of week 14 as designated in Canvas At start of week 15 as designated in Canvas
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	Lab 58	At close of week 15 as designated in Canvas
16	Final Exam	Ultrasonic Distance Sensor Lab Final Exam	At close of week 16 as designated in Canvas At close of week 16 as designated in Canvas

II. 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.

III. Grading and Testing Guidelines:

Quizzes	20%
Homework	20%
Labs	30%
Exams	30%
Total	100%

Mid-Term Course Grading Policy

A) North Central State requires that at the mid-point of an academic course, students enrolled in that course be notified of their progress. A letter grade will be calculated based on the work completed at the mid-way point in the term.

B) North Central State College uses the standard 4.00 letter grade system (with pluses and minuses). Faculty will issue a grade to each student at the mid-point in the term and then again at the end of the term. Mid-term grades are not recorded in any permanent record or on a student's academic transcript.

C) Mid-term grades provide students with early feedback (both positive and negative) about their academic performance. Mid-term grades provide an opportunity for students to receive positive reinforcement and motivation if they are doing well, and intervention if they are struggling. Mid-semester grades allow faculty, advisors and other service providers on campus to intervene with students who are in academic difficulty, while there is still time to make improvement.

IV. Examination Policy:

Student must makeup missed Quizzes and/or Exams ***before*** the next class meets.
No makeup exam (Midterm or Final) will be allowed unless the student notifies the instructor within the same day or the following calendar day of the reason for absence.

V. Class Attendance and Homework Make-Up Policy:

Attendance will be taken during every class. No points are deducted for absenteeism, but the student will be dropped for the class for excessive absenteeism.

VI. Classroom Expectations:

As an NC State Student your conduct in this course is subject to the NC State Student Code of Conduct. (See your Canvas course for links.)

As a future professional in your field, you will be expected to conduct yourself as a professional in this course in ALL work and communications - be it assignments, discussion forums, Canvas Inbox, emails etc.

This includes but is not limited to:

- Being respectful of classmates' opinions, work and comments
  Good test = Is this something I would/should say to a co-worker in person?
- Being respectful in communications with the instructor
  Good test = Is this something I would/should say to my boss in the workplace?
- Being respectful of diversity
  Good test = Is this a comment/joke that is at some other groups, ethnicity, political etc. expense?
  Note: Offensive "jokes", slurs or hate speech will NOT be tolerated
- Using Non-Profane, Appropriate Language
  Good test = Is this language you would use in the workplace or in front of your grandmother?
- Using proper. NON-"Text speak" Language to make Yourself Easily Understood
  Good test = Could my older boss understand what I have written?

Failure to conduct yourself as a professional and meet standards above in this course will result in the following consequences in this course:

- 1st Instance = Written warning from the instructor documenting issue
  (No points deductions)
- 2nd offense = Mandatory meeting with the instructor and or Department Chair or Division Dean
  (Related assignment/Participation subject to Point Deductions)
- 3rd offense: College Disciplinary procedures filed with the NC State Judicial Committee as a violation of the Student Code of Conduct.
  (Course Grade subject to F)

Extreme or repeated unprofessional behavior will result in initiating college disciplinary procedures as outlined in the NC State Student Code of Conduct. NCSC Disciplinary hearings can result in a variety of consequences, including and up to suspension or being expelled from the college.