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: ELET2450 Electronics

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

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

F. Prerequisites: ELET1520

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 #: 9781418041830

J. Course Description: This course explores the use of diode applications, bipolar and unipolar transistors, Field Effect Transistors, oscillators, feedback, thyristors and the 555 timer. Topics will include power supplies, multi-stage amplifiers, inverting and non-inverting op-amps, filters, SCRs and Triacs. OET 005

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. Explain the conditions that exist at the PN junction of an unbiased, reverse biased, or forward biased diode.	Lecture, Labs, and Quizzes – Entire term
2. Draw diagrams of half-wave, full-wave, and bridge rectifier circuits and explain how each works.	Lecture, Labs, and Quizzes – Entire term
3. Measure RMS, Peak, and average voltages of various rectifier circuits.	Lecture, Labs, and Quizzes – Entire term
4. Describe how a zener diode is used and calculate the various values related to zener circuits.	Lecture, Labs, and Quizzes – Entire term
5. Given a NPN or a PNP transistor, student will be able to determine the proper bias polarity and current flow.	Lecture, Labs, and Quizzes – Entire term
6. Given specific values, student will be able to interrelate alpha, beta, IC, IE, IB, ICEO, ICBO.	Lecture, Labs, and Quizzes – Second half of term
7. Given a common base transistor circuit with component values, student will be able to determine the Q point and plot the load line. Analyze the voltage gain, and input/output impedances of multi-stage amplifiers. Determine the power gains and efficiencies of Class A and Class B amplifiers.	Lecture, Labs, and Quizzes – Second half of term
8. Given a Junction Field Effect transistors values, the student will be able to interrelate IDSS, VGS(off), gm, gmo, and ID. Given the operating parameters, the student will be able to design both a JFET current source and a JFET analog switch	Lecture, Labs, and Quizzes – Second half of term
9. Describe the characteristics and operation of both depletion-mode and enhancement mode MOSFETs. Describe how E-MOSFETs are used in digital switching. Calculate voltage gains of common-source JFET amplifiers.	Lecture, Labs, and Quizzes – Second half of term
10. Calculate cut-off frequencies and the bandwidths of various op-amp circuits.	Lecture, Labs, and Quizzes – Second half of term
11. Given an amplifier the student will be able to calculate the values of all coupling and bypass capacitors.	Lecture, Labs, and Quizzes – Second half of term

Outcomes	Assessments – How it is met & When it is met
12. The student will be able to calculate, for a differential or operational amplifier, the: a. output voltage. b. voltage gain. c. common-mode rejection ratio (CMRR).	Lecture, Labs, and Quizzes – Second half of term
13. Using operational amplifiers, the student will be able to design: a. an inverting amplifier. b. a non-inverting amplifier. c. a voltage follower. d. a summing amplifier.	Lecture, Labs, and Quizzes – Second half of term
14. Describe the operation of both RC and LC sinusoidal oscillators.	Lecture, Labs, and Quizzes – Second half of term
15. Use the 555 timer in both its monostable and astable modes.	Lecture, Labs, and Quizzes – Second half of term
16. Given a circuit, the student will be able to identify the type of negative feedback being used.	Lecture, Labs, and Quizzes – Second half of term
17. Describe the operation of various thyristors and how they are turned on and off.	Lecture, Labs, and Quizzes – Second half of term
18. Describe the operation of series and shunt voltage regulators. Describe the operation and characteristics of IC voltage regulators.	Lecture, Labs, and Quizzes – Entire 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:	ELET2450	**Course Title:**	Electronics
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	Describe the difference between valence electrons and conduction-band electrons Describe the main difference between n-type semiconductor materials and p-type semiconductor materials Draw a diagram of a P-N junction, including the depletion region Draw a P-N junction that shows the polarity of applied voltage for forward biasing the junction Draw a P-N junction that shows the polarity of applied voltage for reverse biasing the junction	Chapter 22 Quiz Lab 61	At close of week 1 as designated in Canvas
2	Explain the difference between the barrier potential and reverse breakdown voltage for a P-N junction Sketch the I-V curve for a typical P-N junction, showing both the forward and reverse bias parts of the curve Describe how to connect a dc source to a junction diode for forward bias and for reverse bias Sketch the waveforms found in an ac circuit consisting of a diode and resistor Explain the function of diode clamping and clipper circuits Describe the operation and specifications for zener diodes	Lab 64 Chapter 23 Homework Chapter 23 Quiz	At close of week 2 as designated in Canvas At start of week 3 as designated in Canvas
3	Explain the function of a simple zener diode circuit Describe the operation of LEDs Determine the value of a resistor to be placed in series with an LED for proper operation	Lab 66 Chapter 24 Homework Chapter 24 Quiz	At close of week 3 as designated in Canvas At start of week 4 as designated in Canvas
4	List the basic elements of a power supply system Draw the three basic types of rectifier circuits: half-wave, center-tapped full-wave, and bridge circuits Explain the paths for current flow through the three basic types of rectifier circuits	Lab 68	At close of week 4 as designated in Canvas

	Describe the waveforms found across the diode(s) and at the output of the three basic types of rectifier circuits		
5	Determine the unfiltered dc output voltage of specified rectifier circuits Briefly describe power supply filter action Identify power supply filter configurations Explain the purpose of a power supply voltage regulator	Lab 69 Chapter 25 Homework Chapter 25 Quiz	At close of week 5 as designated in Canvas At start of week 6 as designated in Canvas
6	Draw the symbols and identify the emitter, base, and collector leads for NPN and PNP transistors Draw the symbols for NPN and PNP transistors and show the proper voltage polarities for the base-emitter terminals and for the collector-base terminals Explain the meaning and cite the mathematical symbols for emitter current, base current, collector current, base-emitter voltage, and collector-emitter voltage	Lab 70	At close of week 6 as designated in Canvas
7	Describe how increasing the forward-bias base current in a BJT amplifier decreases the voltage between the emitter and collector Describe the operation of a BJT when applied as a switch Explain the meaning of the curves shown on a family of collector characteristic curves Describe the meaning of the maximum voltage, current, and power ratings listed in BJT data sheets	Lab 71 Chapter 26 Homework	At close of week 7 as designated in Canvas At start of week 8 as designated in Canvas
8	Midterm Exam	Midterm Exam Lab 72	At close of week 8 as designated in Canvas At close of week 8 as designated in Canvas
9	Explain the basic transistor amplification process Describe the input and output characteristics of common transistor amplifier stages List the advantages of each common type of transistor amplifier stage Describe the difference between small-signal and power amplifier circuits Classify amplifiers by class of operation	Lab 75 Part 1	At close of week 9 as designated in Canvas
10	Describe the classification of amplifiers and their operation from their load lines List typical applications for each classification of amplifier Perform a basic analysis of a common-emitter, Class A BJT that uses voltage-divider biasing	Lab 75 Part 2 Chapter 27 Homework	At close of week 10 as designated in Canvas At start of week 11 as designated in Canvas
11	Describe the semiconductor structure and identify the schematic symbols for N- and P-channel JFETs, D-MOSFETs, and E-MOSFETs Determine the proper voltage polarities for operating N- and P-channel FETs Explain the difference between depletion and enhancement modes of operation for FETs Identify and explain the operation of common-source, common-drain, and commongate FET amplifier circuits	Lab 73 Chapter 27 Homework Chapters 26 and 27 Quiz	At close of week 11 as designated in Canvas At start of week 12 as designated in Canvas

	Name some common practices for storing and handling MOSFET devices to ensure that they are not destroyed by static electricity		
12	Draw op-amp symbol(s) Define the term differential amplifier Draw a block diagram of typical circuits used in op-amps List the key characteristics of an ideal op-amp Identify linear and nonlinear applications circuits for op-amps Distinguish between inverting and noninverting op-amp circuits	Lab 76	At close of week 12 as designated in Canvas
13	Explain the derivation of the term operational amplifier (op-amp) Perform voltage gain and resistance calculations for standard inverting and noninverting op-amp circuits Describe the operation of op-amps in voltage amplifiers, voltage followers, comparators, and Schmitt-trigger amplifiers Describe the function of op-amps in circuits originally designed for analog computers: summing amplifiers, differential amplifiers, differentiators, and integrators	Lab 78	At close of week 13 as designated in Canvas
14	Identify from schematic diagrams the BJT, FET, and op-amp versions of the Hartley, Colpitts, and Clapp oscillators Identify the tuning components and describe the procedure for determining the oscillating frequency of the Hartley, Colpitts, and Clapp oscillators Explain the operation of a crystal oscillator Identify from schematic diagrams the phase-shift and Wien-bridge oscillators Identify the tuning components and describe the procedure for determining the oscillating frequency of the phase-shift and Wien-bridge oscillators Define the operation of a monostable multivibrator and calculate the duration of the output pulse Define the operation of an astable multivibrator and determine the operating frequency for both symmetrical and nonsymmetrical output waveforms	Lab 79 Chapter 28 Homework	At close of week 14 as designated in Canvas At start of week 15 as designated in Canvas
15	Describe what a thyristor is Describe in detail the way an SCR can be switched on and off Explain the operation of simple SCR circuits including a power “on/off ” push-button control circuit and an electronic “crowbar” Identify the symbols for, and describe the operation of, the gate-controlled switch, silicon-controlled switch, and light-activated VSCR Identify and explain the purpose of thyristors connected in inverse parallel, or back-toback Identify the schematic symbol and explain the operation of a diac	Lab 80	At close of week 15 as designated in Canvas

	Explain the details for starting and ending the conduction of a triac Identify phase-control power circuits that use thyristors Describe basic troubleshooting procedures for thyristors		
16	Final Exam	Final Exam	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:

Labs	50%
Homework	10%
Quizzes	10%
Midterm	15%
Final	15%
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.