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: ELET2450 Electronics

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: ELET1520

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 #: 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 during week1 and throughout the remainder of the semester.
2. Draw diagrams of half-wave, full-wave, and bridge rectifier circuits and explain how each works.	Lecture, Labs, and Quizzes during weeks 4 and 5 and throughout the remainder of the semester.
3. Measure RMS, Peak, and average voltages of various rectifier circuits.	Lecture, Labs, and Quizzes during weeks 2 and 3 and throughout the remainder of the semester.
4. Describe how a zener diode is used and calculate the various values related to zener circuits.	Lecture, Labs, and Quizzes during weeks 4 and 5 and throughout the remainder of the semester.
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 during weeks 6 and 7 and throughout the remainder of the semester.
6. Given specific values, student will be able to interrelate alpha, beta, IC, IE, IB, ICEO, ICBO.	Lecture, Labs, and Quizzes during weeks 7 and 8 and throughout the remainder of the semester.
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 during weeks 7 and 8 and throughout the remainder of the semester.
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 during weeks 9 and 10 and throughout the remainder of the semester.
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 during weeks 9 and 19 and throughout the remainder of the semester.
10. Calculate cut-off frequencies and the bandwidths of various op-amp circuits.	Lecture, Labs, and Quizzes during weeks 11 and 12 and throughout the remainder of the semester.

Outcomes	Assessments – How it is met & When it is met
11. Given an amplifier the student will be able to calculate the values of all coupling and bypass capacitors.	Lecture, Labs, and Quizzes during weeks 11 and 12 and throughout the remainder of the semester.
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 during weeks 11 and 12 and throughout the remainder of the semester.
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 during weeks 11 and 12 and throughout the remainder of the semester.
14. Describe the operation of both RC and LC sinusoidal oscillators.	Lecture, Labs, and Quizzes during weeks 13 and 14 and throughout the remainder of the semester.
15. Use the 555 timer in both its monostable and astable modes.	Lecture, Labs, and Quizzes during weeks 13 and 14 and throughout the remainder of the semester.
16. Given a circuit, the student will be able to identify the type of negative feedback being used.	Lecture, Labs, and Quizzes during 13 and 14 and throughout the remainder of the semester.
17. Describe the operation of various thyristors and how they are turned on and off.	Lecture, Labs, and Quizzes during week 15 and throughout the remainder of the semester.
18. Describe the operation of series and shunt voltage regulators. Describe the operation and characteristics of IC voltage regulators.	Lecture, Labs, and Quizzes during weeks 1 and 2 and throughout the remainder of the semester.

M. Topical Timeline (Subject to Change):

Devices and Circuits

Week 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

Week 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

Week 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

Week 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
- Describe the waveforms found across the diode(s) and at the output of the three basic types of rectifier circuits

Week 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

Week 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

Week 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

Week 8

- 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

Week 9

- 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

Week 10

- 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
- Name some common practices for storing and handling MOSFET devices to ensure that they are not destroyed by static electricity

Week 11

- Explain the derivation of the term *operational amplifier* (op-amp)
- 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

Week 12

- 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

Week 13

- 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

Week 14

- 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
- 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

Week 15

- Describe the operation of LEDs and photodiodes
- Determine the value of a resistor to be placed in series with an LED for proper operation
- Describe the purpose of laser diodes
- Understand the operation of seven-segment displays
- Understand the operation of optocouplers
- Understand fiber-optic cables
- Understand photoemitters and photodetectors

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.