DEVRY UNIVERSITY
ELECTRONICS I
ECT150

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TEXT: Meade, Foundations of Electronics Circuits and Devices (4th ed), Thompson

CONTACT HOURS: 5.0 CREDIT HOURS: 5.0

UNIT TOPIC

I. OHM'S LAW; SERIES AND PARALLEL CIRCUITS; POWER; TROUBLESHOOTING

II. THEVENIN'S AND NORTON'S THEOREMS; MAXIMUM POWER TRANSFER; CAPACITANCE AND INDUCTANCE; R-C AND R-L CIRCUIT TRANSIENT ANALYSIS

III. ALTERNATING CURRENT; TRANSFORMERS; REACTIVE CIRCUITS;FILTERS AND RESONANCE

This course introduces basic electricity and electrical circuit concepts. Topics include calculation of current, voltage, resistance and power in series, parallel and combination circuits with direct current (DC) power sources, and voltage and current in resistive-capacitive (R-C) and resistive-inductive (R-L) circuits during switch transitions. The second part of the course deals with the nature of alternating current (AC), reactance an transformers. Voltage and current non-resonant and resonant AC circuits and filters are studied. Strategies or troubleshooting electrical circuits are developed. Prerequisite: MATH-105 / 5-0-5

ATTENDANCE

Daily class attendance is required. *You are responsible for the material presented in all class sessions, regardless of your presence or absence*. Absence of more than 8 class sessions is cause for dismissal from the course, with a grade of F. You are expected to be on time for every class meeting. If you will not be able to make it to class on time, please call the instructor in advance to make arrangements.

HOMEWORK

Homework is due at the beginning of class (xx00 UTC). *Late homework is not accepted for any reason*. Homework carries the weight of one major exam (100 points) in the course. Failure to do homework will severely damage to your grade.

Homework Performance Standards

- For problems involving calculations, all work must be shown. If a numerical answer is obtained without doing a calculation, state clearly that this is the case. For example: "By inspection, the potential is 25 Volts."

- When showing work for numerical problems, all defining equations will be stated first. The last step in the problem will be substitution of values into the equations. For example:

  Given V = 20V and R = 5 Ohms, find the current I.

  $I = \frac{V}{R}$ (Comment: The defining equation, Ohm's law, is stated.)

  $I = \frac{20V}{5\Omega} = \underline{\underline{4A}}$ (Comment: Note that units are clearly displayed for the answer.)

- When a numerical answer is given, it must be boxed or underlined and have correct units attached.

- No credit will be given for any problems that have not been worked according to these instructions, or any additional instructions given by the instructor.

- The homework solutions are intended as an example of proper work. You can access them from the instructor's web site (if available).

- Photocopies of work are unacceptable. Only original work will be accepted. (Make a backup of all work prior to turning it in.)

- Homework that is difficult to read (messy) will not be graded. Please write clearly.

GRADING

There are 3 major exams, an unspecified number of quizzes given at random intervals, various homework assignments, and a final examination given in the 15th week of the course.Your grade will be determined as follows:

2 Highest Major Exams @ 100 points each:	200 points
Quizzes/Homework :	100 points
Final Exam (Comprehensive):	150 points
Laboratory	100 points
	550 points total for course

Important:

- *There is one drop test. The lowest grade from the three major exams is not counted. <u>There are no "make-up" exams given</u>. Only one examination will be dropped during the term. All students must take the final exam.*

- *To earn a passing grade in this course, a passing grade percentage is required in both the laboratory and lecture portions of the course. 60% is the minimum passing percentage. A minimum of 60 points is required to pass lab, and 270 points is required to pass lecture.*

DETERMINATION OF LETTER GRADE FOR THIS COURSE

90 - 100 % = A 80 - 89 % = B 70 - 79 % = C 60 - 69 % = D
<60 % = F

PLAGIARISM AND OTHER FORMS OF CHEATING

Copying the work of another, and claiming it to be your own is <u>plagiarism</u>. This includes (but is not limited to) copying others homework, copying from a lab manual or textbook, or collusion. The minimum penalty for cheating in any form is a grade of zero for the element involved; in some cases, failure of the course and/or expulsion from the Institute will also result. *All cases of misconduct will be documented and forwarded to Student Services for disciplinary consideration*. The DeVry Student Handbook contains complete information on this topic.

MISCELLANEOUS INFORMATION

EMERGENCY PROCEDURES - Each classroom has a plaque (located near the door) with instructions for evacuation in the event of an emergency. The instructor will remain in charge of your class group should the situation arise.

FOOD and DRINK are not allowed in the classrooms and labs at DeVry.

HOMEWORK / READING ASSIGNMENTS

All assignments refer to the course textbook.

I. OHM'S LAW; SERIES AND PARALLEL CIRCUITS; POWER; TROUBLESHOOTING

Chapters 1-6, pp. 1-238 (DC, power, DC network analysis)

II. THEVENIN'S AND NORTON'S THEOREMS; MAXIMUM POWER TRANSFER; CAPACITANCE AND INDUCTANCE; R-C AND R-L CIRCUIT TRANSIENT ANALYSIS

Chapter 7, pp. 239-266 (Network theorems)
Chapter 13, pp. 410-430 (Inductance and L-R circuits)
Chapter 17, pp. 530-571 (Capacitance and R-C circuits)

III. ALTERNATING CURRENT; TRANSFORMERS; REACTIVE CIRCUITS;FILTERS AND RESONANCE

Chapter 11, pp. 348-380 (AC Quantities)
Chapter 12, pp. 381-408 (Oscilloscope)
Chapter 14, pp. 440-461 (Inductive Reactance)
Chapter 16, pp. 502-518 (Transformers)
Chapter 18, pp. 573-596 (Capacitive Reactance)
Chapter 15, pp. 463-500 (RL AC Analysis)
Chapter 19, pp. 597-628 (RC AC Analysis)
Chapters 20,21 pp. 629-720 (RLC Circuits, Resonance, Filters)

TERMINAL OBJECTIVES FOR ECT150

At the conclusion of the course, the student will be able to:

1. Given a schematic of a simple circuit with a DC source and load, construct the circuit and operate the power supply. Use the multimeter to measure the source and load voltages in the circuit.

2. Given at least ten carbon composition resistors with different values, determine the value and tolerance of each resistor by reading the color code. Use a multimeter to measure the exact value of each of these resistors and compare the color-coded values to the measured values.

3. Given the schematic diagram of a series circuit with a maximum of four resistors, use a multimeter to measure voltage across and current through each component in the circuit and validate Ohm's Law.

4. Given the schematic diagram of a series circuit with three to five resistors, use a multimeter to measure voltage at several points with respect to a common ground.

5. Given the schematic diagram of a parallel circuit with three to five resistors measure voltage and current in the circuit and determine power dissipated in a load.

6. Given the schematic of a power supply, an external source resistance, and a various load resistances, measure the current and voltage in the load with a multimeter and determine the maximum voltage and power transferred to the load.

7. Given a schematic diagram of a series circuit with a minimum of three resistors, measure the voltage across each resistor and validate Kirchhoff's Voltage Law.

8. Given a schematic diagram of a parallel circuit with three to five branches, measure the current through each branch, the total current in the circuit, and validate Kirchhoff's Current Law.

9. Given a schematic diagram of a series/parallel combination circuit, measure the voltage and current present in the circuit and verify all measured values with values calculated using the concept of equivalent circuits and applying Ohms Law.

10. Given a series/parallel circuit with two voltage sources, determine the currents in the circuit using the superposition theorem. Measure the current in the circuit and verify all calculated values.

11. Given a schematic diagram of an RC circuit and a DC supply, calculate the time constant for the circuit. Measure the charging and discharging voltage and current and verify the time constant calculation.

12. Given a combination circuit with an AC source and five resistive elements, use a digital voltmeter and an oscilloscope to verify Ohm's Law, Kirchhoff's Voltage and Current Laws and the power equation.

13. Given a combination circuit with a DC source and five resistive elements, use a digital voltmeter and an oscilloscope to verify Ohm's Law, Kirchhoff's Voltage and Current Laws, and the power equation.

14. Given an oscilloscope, a function generator, and a frequency counter, all interconnected at some operating frequency, determine the frequency and period of the signal observed on the oscilloscope, compare it to the indicated frequency and period on the frequency counter and the function generator, and explain any differences.

15. Given a series RC circuit, an oscilloscope and a function generator, observe and graph the effects of frequency on impedance, phase angle, Vr and Vc.

16. Given an oscilloscope, a function generator, and a series resonant RLC circuit measure and graph the amplitude and phase relationship of the voltage on each component as a function of frequency.

17. Given an oscilloscope, a function generator, a multimeter, and a resonant series RLC circuit, measure and graph the impedance and the amplitude and phase relationship of the current for each component as a function of frequency.

18. Given an oscilloscope, a function generator, and a resonant parallel RLC circuit, measure the circuit voltages and calculate the current and impedance to demonstrate their relationship at resonance.

19. Given an oscilloscope, and a function generator, construct and analyze the frequency response of both a differentiator circuit and an integrator circuit by using different waveforms.

20. Demonstrate the ability to simulate the operation of a series RC circuit using a software package, such as multiSIM, or PSpice to observe circuit performance.

21. Demonstrate the ability to simulate the operation of a resonant series RLC circuit using a software package, such as multiSIM, or PSpice to observe circuit performance.

22. Demonstrate the ability to simulate the operation of a resonant series RLC circuit using a software package, such as multiSIM, or PSpice to determine the impedance and the amplitude and phase relationship of the current for each component as a function of frequency.

23. Demonstrate the ability to simulate the operation of a resonant parallel RLC circuit using a software package, such as multiSIM, or PSpice to observe the circuit voltages and calculate the current and impedance as functions of frequency.

Every class is to some extent a unique interactive experience, which may cause some variance within the stated objectives, in either content or level. Individual faculty, based on their experience and expertise, are encouraged to add objectives, as they deem appropriate, and to communicate these directly to the class. The outcomes of the course will depend on the design of the course, the quality of instruction, and the motivation and capabilities of the students, including time available for studying and the effectiveness of the effort.

ECT150/L
Mid-Term Grade Estimation Worksheet
Professor Wheeler

The following table can be used to estimate your standing in this course as of midterm. *You will be required to fill out the data in this table, and bring it to our mid-term class meeting.*

There are **no** midterm grades delivered by the DeVry system; by filling in the data in this table, you will compute your own midterm grade. You are responsible for keeping track of the information on this worksheet.

Laboratory Portion of Midterm Grade:

In the table below, the number of points possible for each lab is given. Write in your scores (from your returned papers).

Lab 1	Lab 2	Lab 3	Lab 4	Lab 5	Lab 6	Lab 7
100	100	100	100	100	100	100

Your midterm lab grade percentage is the sum of all the lab scores entered, divided by the number of labs assigned (probably 3 or 4 depending on schedule).

A: Lab Midterm Grade Percentage: _____

Class Midterm Grade:

Your midterm grade will consist of 100 percentage points from homework, 100 percentage points from exam #1, and 50 percentage points from laboratory. Complete the data in the table below:

Assignment	HW 1	HW 2	HW 3	HW 4	HW 5	HW 6
Possible Points	14	23	26	12	13	32
Your Score						

Note: Add only the homeworks assigned; may not include HW5 or HW 6.

B: Total Possible Points (Sum of assigned homeworks): _____

C: Homework points you've earned (Sum of your homework scores): _____

D: Your midterm homework percentage = 100 * (C/B) = _____

E: Your score on exam 1: _____

Your class midterm grade = $\dfrac{\left(\dfrac{A}{2}+D+E\right)}{2.5}$ = _____