THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

SCHOOL OF ENGINEERING AND APPLIED SCIENCE
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
ECE 2115: ENGINEERING ELECTRONICS LABORATORY

Midterm Project:
DC Power Supply

OBJECTIVES

Your goal is to **simulate**, **design**, **build**, and **demonstrate** a practical DC power supply that can be used as the power supply of various consumer electronic devices. Your power supply must meet or exceed the following specifications.

DESIGN SPECIFICATIONS

- Your power supply will have an on state indicator (LED)
- **Input Voltage:** $120V_{RMS}$ @ 60Hz
- **Voltage Output:** Two regulated outputs of $12V_{DC}$ and $-12V_{DC}$
- **Load regulation:** < 2%
    1. Assume 100Ω full load (You can connect multiple resistors in parallel so that no resistor dissipates more power than its maximum power limit)
        a. Instead of resistors in parallel, a "power resistor" may be used
    2. Note, GTA may set the load to 10Ω, to allow midterm project to support the load of the final project – $10W_{RMS}$ Amplifier
    3. An inductor may need to be inserted in design to meet ripple requirements
- **Ripple:** < 1%

DEMONSTRATION (60%)

You have to demonstrate that your circuit meets all the specifications to your GTA. Look over the grading criteria on the next page to see how the demonstration will be graded.

REPORT (40%)

Write a formal lab report that includes the following:

- Block diagram of major stages
- Circuit diagram
- Multisim simulation
- Circuit theory and operation
- Test results meeting the specifications

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Midterm Project Grading Sheet

STUDENT'S NAME: _____

SETUP (45%)

(student must have each item with circuit to show GTA during demonstration)

Schematic and hand calculations must contain:

____(2.5) Schematic
____(5) Ripple calculation, correctly determining size of filter capacitor
____(5) Load resistor calculation, accounting for individual power dissipation of resistor
____(2.5) Load regulation calculation
____(5) LED's resistor size calculation
____(5) Current draw of each branch calculated, meets regulator spec
____(5) Power dissipation of all components after regulator calculated
____(2.5) Neatness
____(5) Multisim simulation with graphs
____(2.5) Proper calibration of oscilloscope *(CH-1 on source voltage, CH-2 on output signal)*
____(5) Student is able to explain operation of circuit

CIRCUIT DEMONSTRATION (55%)

(student is to perform all measurements – show to GTA)

____(5) LED indicator lights up
____(5) DMM measures $12V_{DC}$ across load
____(5) DMM measures $-12V_{DC}$ across load
____(5) Proper output of voltage regulator on scope ($12V_{DC}$ overlaid onto CH-1)
____(2.5) Ripple < 1%
____(2.5) Load Regulation < 2%
____(5) Proper Output of Filter Capacitor on Scope
____(5) Proper Output of Rectifier on Scope (May need to pull filter cap)
____(2.5) Proper Load Resistance = 100Ω (or 16Ω)
____(5) Power Dissipated by load = 1.44W (measure current to show) (or 9W)
____(5) Power dissipated by each load resistor below tolerance limit of resistor (require measurement of current to verify)
____(5) Current flowing in LED branch ~20mA
____(2.5) Voltage across LED < 3V

TOTAL: _____ (100)