

COURSE SYLLABUS  
**Electricity and Electronics EET 251 (11631)**  
FALL 2006

**EET 251-TR 8:00 a.m. – 9:55 a.m.**  
Rooms: Whalin 306 (lecture) & Whalin 400 (laboratory)

Credit Hours: Three (3) semester hours.  
Prerequisites: None

Instructor:	Dr. Ray Richardson
Phone:	859-622-1200
E-mail:	ray.richardson@eku.edu
Office:	Whalin 327
Office hours:	To Be Announced

Textbook:

Patrick, D. R., & Fardo, S. W. (2002). *Electricity and Electronics: A Survey* (5<sup>th</sup> ed.). New Jersey: Prentice Hall.

Lab Manual:

Patrick, D. R., Fardo, S. W., & Towers, R. L. (2002). *Laboratory Manual to accompany Electricity and Electronics: A Survey* (5<sup>th</sup> ed.). New Jersey: Prentice Hall.

**Course Description**

Principles of basic electricity circuit operation, and electronics. Topics include electrical components, measurements, power, properties of AC-DC, basic circuit laws, circuit simulation, magnetism, energy conversion, and rectification..

**Course Objectives**

This course is designed to create learning situations that will cause students to become one who:

1. Has an understanding of the basic notations, symbols and theories of electricity.
2. Is skilled in using common electrical instruments.
3. Can apply basic circuit laws and concepts to solve electrical circuit problems.
4. Understands AC waves, properties, components and measurement devices.
5. Understands magnetism, transformers, energy conversion and rectification.
6. Can perform circuit simulation.

**Course Outline**

A. Introduction (3 Classes)

1. Structure of matter – electrons, protons, neutrons
2. Electric Properties
  - a. Electromotive force – Voltage - Electric Pressure
  - b. Current Flow
  - c. Resistance
3. Static electricity – device hazard and protection
4. Safety
  - a. Household Hazards
  - b. Professional Hazards
5. Material Types
  - a. Conductors - Examples
  - b. Insulators - Examples
  - c. Others – Superconductors, Semiconductors, Resistors
6. Miscellaneous Topics
  - a. Switches
  - b. LEDs and Lamps

- c. Pots
  - d. Fuses – Circuit Breakers
  - e. Soldering
  - f. Printed Circuit Boards and Proto-boards
  - g. Digital Chips
  - h. Positive – Negative Lead Conventions
  - i. Power Generation, Fuel Types and Brown Outs
- B. Direct Current Electricity (10 Classes)
1. Units of measurement and abbreviations
    - a. Charge – Coulomb – Q
    - b. Ampere – Amps – A and I
    - c. Voltages – Volts – V
    - d. Resistance – R - Ohm -  $\Omega$
    - e. Power – W - Watt and watt-hour
  2. Meter Types
  3. Electric Circuits
    - a. Schematics
    - b. Wires
    - c. Parallel and Series Elements
  4. Voltage Sources
    - a. Symbols and Types
    - b. Electron Direction
    - c. Measurement
    - d. Determining Circuit Voltages
  5. Resistors
    - a. Symbols, Types and Color Bands
    - b. Metric Units and Scientific Notation
    - c. Measurement
    - d. Ohm's Law
      - e. Parallel Combinations
      - f. Series Combinations
      - g. Combination Circuits
    - h. Voltage Divider Circuits
  6. Kirchhoff's Laws
    - a. KVL – Single Loop
    - b. KCL and Current
      1. Measurement
      2. Series Elements
      3. KCL Application
  7. Existence of Equivalent Circuits
  8. Power, Energy, and Conservation of power
  9. Maximum Power Transfer
  10. Bridge Circuits\* – Topography and Functions
- C. Magnetism/Electromagnetism (4 Classes)
1. Fields and Poles
  2. Units
  3. Magnetic and Electromagnetic Devices
    - a. Permanent Magnets and Compasses
    - b. Relays and Solenoids
    - c. Miscellaneous Devices - Speakers, Bells, Circuit Breakers, etc.
  4. Electro-Magnetic Interaction and Induction
- D. Alternating Current (AC) (6 Classes)
1. Why AC?
  2. AC Properties – Peak, RMS, frequency, period, average, etc.
  3. AC Devices and Measurement.
    - a. MultiMeter – RMS

- b. Oscilloscopes – Use and Calibration
    - c. Function Generator\*
  - 4. Resistive circuits
  - 5. Capacitors
    - a. Functions
    - b. Capacitive Reactance
  - 6. Inductors
  - 7. Transformers
- E. Rectification (2 classes)
  - a. Diode Functionality
  - b. One Diode Rectifier
- F. Energy Conversion\* (1 class) – Solar Cells, Seebeck, Piezo-electric
- G. Computer Simulation – MultiSim or other Simulation package (4 to 6 labs throughout semester)
- H. Technical Writing – There will be at least one technical writing assignment.

### **Course Requirements**

- A. Complete all laboratory experiments and submit these to the instructor upon the prescribed date.
- B. Complete all tests in relation to material discussed and assigned including a comprehensive final examination.
- C. Complete all daily work, class work and outside assignments as prescribed by the instructor.

Notes: No make-up work will be permitted for un-excused absences. Course mid point grade is submitted on the 7<sup>th</sup> week of the semester.

### **Evaluation**

The following divisions are an accounting of how your grade will be calculated:

#### **Exams**

Test questions may be taken from any material covered in class, from reading assignments, and from laboratory assignments.

#### **Homework Assignments**

There will be approximately 6-12 Homework assignments worth 10 points each. Late assignments will be penalized heavily, 10% of possible grade for each day the assignment is late.

#### **Quizzes**

There may be a 10-minute quiz every class period. There will be approximately twenty quizzes and they will be worth 5-10 points each. Quizzes are a significant component of your grade.

#### **Laboratory Assignments**

There will be approximately 30 laboratory assignments worth 10-15 points each. Late assignments will be penalized heavily, 10% of possible grade for each day the assignment is late. Due dates for the laboratory assignments will be given in class.

#### **Final Project**

Your final project or research paper (your choice) will be worth 100 points. Papers should follow the APA format. If you need help with proper APA format please contact the Writing Center at the College of Arts and Sciences Department of English. The Writing Center's address is Case Annex 173 and the phone number is 622-6191.

#### **Class Presentation of Final Project**

Your class presentation of your final project will be worth an additional 25 points. Presentation will be during the week prior to final exams.

## Final Exam

Your final exam will be worth 200 points.

## Extra Credit

You may develop a personal portfolio or notebook for use as a tool to aid in your future studies and endeavors in electronics. A creditable portfolio should include, but not be limited to, class handouts, copies of all class homework work and copies of all laboratory work, class notes, and any additional documentation of competencies learned in electronics.

## Points Total

Unit Exam I	=	100 points
Unit Exam II	=	100 points
Unit Exam III	=	100 points
Quizzes	=	100 points, (approx.)
Home Work	=	100 points, (approx.)
Laboratories	=	400 points, (approx.)
Final Project	=	125 points
Final Exam	=	200 points
Total	=	1225 points, (approx.)

## Grades:

Grades will be calculated based on the total number of points offered in the course during the semester. The student's percentage of points earned will determine the final letter grade. Below is the grading scale:

100%-90%=	A
89.9%-80%	= B
79.9%-70%	= C
69.9%-60%	= D
59.9%-0%	= F

Mid-term grades will be available through Banner for the students who wish to know their grades from the class for the first half of the semester.

## Course Design

This course is designed as an introduction to the topics of electricity and electronics. The course is carefully designed to allow the student to achieve approximately 1/3 of their grade in examinations, 1/3 in laboratory exercises, and the remaining 1/3 in other assignments such as research papers, home work or quizzes.

Unlike traditional lecture courses, this class spends a significant amount of time in the laboratory completing simulation and hands-on exercises dealing with electricity and electronics. Because many students learn and retain much more by experimenting with concepts rather than only listening to them in lecture, these laboratory assignments will reinforce and add to concepts discussed in lecture.

The class will also have many active learning assignments woven into the lecture and laboratory meetings. Students should be finished with homework and well read at the beginning of each class ready to discuss the day's topic. Such activities will require significant classroom participation, and students should expect this. One such activity is the presentation of your research paper.

## Attendance Policy

Regular attendance is expected. If you know in advance that you will be absent please send me a dated note or email in advance. Students missing a class will need to obtain any notes or misses assignments

from their fellow students in class. Late assignments are reduced 10% per day they are late. Please note, this is not measured in class days, but days of the week. If you have a university accepted excused absence, make-up work is permitted with no penalty. No make-up. If a student misses a class it is their responsibility to obtain all notes and missed assignments from their fellow students. There will be no make-up for students with unexcused absences.

### **Parts Kit**

Each student enrolled in EET251 will be issued a parts kit in order to conduct laboratory experiments. Kits are available through the Department of Technology and will be distributed when related laboratory exercises are assigned. Each student must supply his or her own storage device (tackle box, tool box, etc.) for the kit.

Additional details regarding the procedures for the kit, and related topics will be shared with the class at a later date.

### **Cell Phones**

Cellular phones should be off or on silent ring during class in order to keep classroom distractions at a minimum. However, the instructor may give approval for phone uses in special circumstances (family illness, etc.).

### **Academic Honesty**

The work you do in this laboratory, and the grade you earn, should reflect your personal abilities, and accomplishments. No one else should receive credit for your work, and it would be fraudulent for you to receive credit for another person's work. Cheating will be dealt with decisively.

### **Due Dates**

If no extension is given to the entire class before the due date, then all work must be turned in on time. Late assignments will be penalized by 10% each day (M-F) they are late.

### **ADA**

If you are registered with the Office of Services for Individuals with Disabilities, please make an appointment with the course instructor to discuss any academic accommodations you need. If you need academic accommodations and are not registered with the Office of Services for Individuals with Disabilities, please contact the office on the third floor of the Student Services Building, by email at [disabilities@eku.edu](mailto:disabilities@eku.edu) or by telephone at (859) 622-2933 V/TDD. Upon individual request, this syllabus can be made available in alternative forms.