

# EET 251 Electricity and Electronics

**Department of Technology  
Spring 2009**

**Instructor:** Prof. Vigs Chandra, PhD  
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**Office:** 405 Whalin Technology Complex

**Class schedule:**

**Section: 002, CRN: 22577; TR: 8:00 am – 9:55 am, Room 407/400**

**Office Hours:**

**MW: 8 - 10 am, MTWR: 4 - 6 pm.** If my office door is open at other times I will most likely be available for discussion. Come right in.

**Credit hours:**

3

**Prerequisite:**

Grade of at least “C” in MAT 095 or a minimum math ACT score of 18 or a minimum SAT math score of 490.

**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.

**TEXTBOOK:**

The material covered in-class using a combination of lecture, demonstration and laboratory activities will serve as the main source of information for EET 251. Students may use the recommend text and laboratory manual as supplementary materials for the course:

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

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 OBJECTIVES:**

Upon completing EET 251 the student should be able to:

- A. Understand the fundamental concepts of electricity and electronics
- B. Use common electrical instruments.
- C. Apply basic mathematical concepts to solve electrical circuit problems.
- D. Apply electrical circuit laws and theories to simplify and solve problems in electrical circuits.
- E. Apply electrical circuit theory and vector representations to solve voltage, current and power problems in AC series and parallel circuits.
- F. Simulate the operation of electrical circuits using Multisim 7<sup>®</sup>.

## **COURSE OUTLINE:**

- A. Introduction
- B. What is electricity?
  1. Structure of matter
    - a. Electrons
    - b. Protons
    - c. Neutrons
  2. Static electricity
    - a. Uses and applications
    - b. Static sensitive devices
- C. Direct Current (DC) Electricity
  1. Factors
    - a. Resistance
    - b. Electromotive force (voltage)
    - c. Current flow
  2. Units of measurement and Instrumentation
    - a. Coulomb
    - b. Ohm
    - c. Watt
    - d. Ampere
  3. Current flow through circuits
    - a. Conductors
    - b. Insulators
    - c. Semiconductor material
  4. Electric circuits
  5. Ohm's Law
  6. Voltage Divider Circuits
  7. Kirchhoff's Voltage and Current Laws
  8. Determining circuit voltage and current values – Mesh and Superposition Method

9. Power considerations - Thevinin's Theorem and Maximum Power Transfer
10. Bridge Circuits

D. Magnetism/Electromagnetism

1. Laws and theories
2. Fields and polarity
3. Units
4. Electromagnetic Devices
  - a. Relays
  - b. Solenoids
  - c. Transformers
5. Oscilloscopes
  - a. General purpose
  - b. Dual trace

E. Alternating Current (AC) Electricity

1. Resistive circuits
2. Reactive circuits
  - a. Inductive
  - b. Capacitive
3. Power calculations
4. Series and parallel AC circuits
  - a. R-L
  - b. R-C
  - c. R-L-C
5. Timing Circuits
  - a. R-C time constants
  - b. R-L time constants

F. Applications of Electricity and Electronics (time permitting)

1. Thermal Electric Devices
  - a. Fuses and circuit breakers
  - b. Heating element
  - c. Inductive and capacitive heating
2. Luminous Effect
  - a. Incandescent lamps
  - b. Arc lamps
  - c. Vapor lamps
  - d. Fluorescent lighting
3. AC-DC Motors and Generators
  - a. Single phase AC machines
  - b. Three- phase AC machines
  - c. Delta and Wye connections
  - d. DC machines
  - e. Rectification

## **COURSE REQUIREMENTS:**

Students are expected to:

- Attend each lecture and laboratory session.
- Complete all assignments, quizzes, and laboratory activities on time.
- Complete the assessments covering material from: homework, labs, and from assigned readings in the text.
- Maintain a 3-ring binder or folder for organizing class materials.

## **EVALUATION:**

Each student will be evaluated as follows:

- Assessments (40%) – 3 assessments including a final.
- Homework (15%) – approximately 6-9 homework assignments, or paragraphs on various topics related to electricity and electronics
- Lab assignments (35%) – approximately 12-15 laboratory activities including simulation
- Quizzes (10%) – approximately 3-5 in-class, open notes format quizzes

1<sup>st</sup> assessment – In-class, covering lectures and laboratory activities related to introductory electricity and DC circuit concepts. To be held during the 6<sup>th</sup> week (Feb. 16 – 20) of the semester.

2<sup>nd</sup> assessment – In-class, covering lectures and laboratory activities, related to analysis of DC circuits, magnetism and introductory AC circuits. To be held during 12<sup>th</sup> week (March 30 – April 3) of the semester.

Final Assessment – In-class, comprehensive, covering all class materials, including lectures and laboratory activities. The final assessment will be weighed more than the 1<sup>st</sup> and 2<sup>nd</sup> assessment. To be held Tuesday, May 5, 8am – 10am.

You may rework and resubmit your labs, homework, quizzes and assessments (excluding the final) for limited partial credit.

### **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.

### **Attendance Policy:**

After the second unexcused absence, each unexcused absence will cause two percent deduction in the overall percentage. Five (5) and seven (7) unexcused absences will result in one letter grade lower each. Your grade will be an automatic F if you have more than seven (7) unexcused absences. If you have a university accepted excused absence, make-up work is permitted with no penalty. Makeup labs/exams will be permitted only if you had sought and received my approval prior to the absence which caused you to miss the related lab/exam. You will benefit most by way of understanding the content of the course by completing all the assignments in a timely manner. If you know in advance that you will be absent, please inform me at the earliest. Email ([yigs.chandra@eku.edu](mailto:yigs.chandra@eku.edu)) usually is the fastest way of contacting me, or you may call (859) 622-1187.

**Academic Integrity Statement:**

Students are advised that ECU's Academic Integrity Policy will strictly be enforced in this course. The Academic Integrity policy is available at <http://www.academicintegrity.ecu.edu>. Questions regarding the policy may be directed to the Office of Academic Integrity.

**Cell Phones:**

Cellular phones should be off or on silent ring during class in order to keep classroom distractions at a minimum. Under special circumstances students are permitted to use the phone but should seek my approval prior to class.

**Grades:**

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

Saturday, March 7 - Mid-term grades will be made viewable online (EKUDirect/StudentService/Midterm Grades - Student records)

Monday, Jan. 19 - End of Add/Drop period: Last day to drop a full-semester course without a "W" appearing on your university transcript; last day to register for or add additional full-semester courses. It is the last day for a full tuition refund. It is also the last day to convert "Pass-Fail" or "Audit" classes to a normal grade and credit option. Completed forms must be returned to: Registrar's Office (SSB 239), or Corbin, Danville, or Manchester ECU offices.

Friday, Mar. 20: (Friday of the 10th week of semester) – Last day to withdraw full-semester classes or withdraw from the university.

Tuesday, May 12 – Final grade available online (EKUDirect/StudentRecords/Official Grade Report).

**STATEMENT OF DISABILITY:****ADA**

If you are registered with the Office of Services for Individuals with Disabilities, please obtain your accommodation letters from the OSID and present them to the course instructor to discuss any academic accommodations you need. If you believe you need accommodation and are not registered with the OSID, please contact the Office in the Student Services Building Room 361 by email at [disserv@ecu.edu](mailto:disserv@ecu.edu) or by telephone at (859) 622-2933 V/TDD. Upon individual request, this syllabus can be made available in an alternative format.

☺ The work you do in the laboratory, and the grade you earn, should reflect your personal abilities, and accomplishments. Individual homework and lab reports are required from each student. I encourage you to discuss class assignments with other students. However any work you submit must be your own.

☺ Any suggestions leading to improvements in the content or presentation of the course, especially in the laboratory work, are most welcome.