

# University of Hartford, Ward College of Technology

Prepared and Taught by the Department of Electronic Engineering Technology

In Academic Year 2000 - 2001

## COURSE INFORMATION DOCUMENT

### EL 110 - Introduction to Electricity & Electronics

Fall Semester, 2000

This Course is Normally Taken in First Year, Fall Semester

#### 2000-2001 Catalog Data:

**EL 110 Introduction to Electricity/Electronics** [3] An introduction to the origins of mankind's awareness of electricity and the development of scientific understanding of it in the 19<sup>th</sup> and 20<sup>th</sup> centuries. Static vs. dynamic, DC vs. AC, power generation/distribution and uses, costs, electrical safety and hazards. Common electrical circuits, elementary use of Ohm's law, power and cost considerations. Electronics from a block diagram approach: power supplies, amplifiers, oscillators, RF devices and systems including radio, television, satellite communication, cellular phone technology, GPS. Computers and their applications. Two lecture hours, two-hour lab. Prerequisite: ability to use algebra on a high-school level. Laboratory fee.

**Credits:** 3 Credits (2 for lecture, 1 for laboratory)

**Course Hours:** Lecture, 2 hours/week for 14 weeks = 28 contact hours, Laboratory, 3 hours/week for 14 weeks = 42 contact hours, Total Hours = 70 contact hours  
Many students spend 2 to 3 hours outside of class for each contact hour.

**Required Textbook:** *Electricity and Electronics: A Survey*, 4/e, Patrick & Fardo, Prentice Hall, 1998

**Supplemental Materials:** Scientific calculator (TI-86 is recommended), standard laboratory tools.

**Course Coordinator  
and Prepared By:**

Prof. Walter Banzhaf, P.E. \_\_\_\_\_

**Approved By:**

Department Chair \_\_\_\_\_

#### Notes:

1. The topics listed below are guidelines; what is actually covered in the course may vary. Students will be notified in writing of any variances from what is printed below.
2. Students are responsible for reading this document. Questions should be referred to the course instructor.
3. This document should be retained by the student for future need (e.g. transfer credits), as the course is revised periodically, and it may be difficult or impossible to obtain a copy.

#### Goals:

This course serves three constituencies: 1. Ward College students in Electronic and Audio ET & Hartt students in Music Production/Technology, 2. sophomores in the IIT (Integrated Information Technology) program, and 3. Any other University student.

For the first group, this new course serves two purposes: it will stimulate an informed interest in the discipline, and it will allow students in their first semester to concurrently take MTH 112, which is needed to succeed in EL 111, DC Fundamentals. EL 111 can then be taken in the students' second semester, after the mathematics has been mastered and with a heightened appreciation for and understanding of the discipline.

For any other University student, this course will provide insights into and an appreciation for the technical aspects that underlie our technological society which is so dependent upon electronics.

**Assessment:**

Students are expected to do regular written homework assignments, and to respond in prose to questions on quizzes and examinations. While some of the work is inherently mathematical, an estimated 50% of lab reports, quiz, test and homework will be written. For each laboratory experiment/project/field trip, a written laboratory report will be required. Student research, using libraries and the WWW, is an expected part of laboratory reports.

Innovative, interest-catching projects, such as monitoring electrical energy consumption in a dorm room or home, and documenting its cost, will be required. Thus, written work will count for about 50% of a student's course grade.

**Prerequisites by Topic:** Prerequisite: ability to use algebra on a high-school level.

**Grading Criteria:**

**Course Average Determined by:** 2 Tests @ 15% = 30%; Quiz/Homework Avg. = 25%; Final Exam = 10%; In-Lab Performance = 10% ; Laboratory Reports = 25%.

**Course Grade As Follows:** 100-93 = A; 92-90 = A-; 89-88 = B+; 87-83=B; 82-80 = B-; 79-78 = C+; 77-73 = C; 72-70 = C-; 69-68 = D+; 67-63 = D; 62-60 = D-; under 60 = F.

**Credit By Exam:**

Credit for this course may be earned using the University "Credit By Exam" method, *if* the student's transcript does not show that this course was taken in the last five years. Students who elect this option should have substantial knowledge in the subject area, both theoretical and applied, and should expect a comprehensive written exam of two to three hours duration, and a practical exam in the laboratory. The practical exam will consist of completing a laboratory experiment from the list that follows.

**Course Topics:** Lecture Topics (2 hours per week):

Mankind's awareness of electricity/scientific understanding	1.3 hour
Types of electricity - static vs. dynamic, DC vs. AC, terminology & units	1.3 hour
Generation of AC power, distribution	1.3 hour
Electrical safety, hazards	1.3 hour
Basic electrical circuits & devices, schematic diagrams, notation	2 hours
Ohm's law, power law	2.7 hours
Cost of electrical energy, batteries vs. commercial electric utilities	1.3 hour
Block diagram approach to electronics, examples of familiar devices	1.3 hour
Power supplies, diodes as rectifiers	1.3 hour
Amplifiers	1.3 hour
Oscillators	0.7 hour
Other building blocks (mixers, detectors, hardware, connectors, cables)	1.3 hour
Radio systems	1.3 hour
Television systems	1.3 hour
Satellite-based communications	2 hours
Cellular phone technology - present and future	1.3 hour
Global positioning system	1 hour
Computers and their applications	2 hours
Examinations in class	2 hours

**Total lecture contact time = 28 hours**

**Tests: 2 class hours, with the final exam (nominally 2 hours) given during Final Exam Week.**

**Computer Usage:**

1. Students use the WWW and appropriate search engines to research topics in the course.

**Laboratory Projects** (including major items of equipment and instrumentation used):

1. Static electricity vs. Dynamic Electricity, Electromagnets, Capacitors;
2. DC vs. AC, Terminology & Units;
3. Using Basic Lab Instruments;
4. Circuit Construction from a Schematic Diagram;
5. Series & Parallel Circuits;
6. Using a Pencil "Lead" as a Dimmer, DC Motor Speed Control;
7. Transformers: Up, Down, and Conservation of Energy;
8. Switches, Terminology, Uses for Logical Operations;
9. Oscilloscope, Your Voice and Its Pitch/Intensity;
10. Oscillators - Measure and Hear Frequency of Lab Generator, Construct IC Oscillator;
11. Amplifiers - Gain, Voltage Levels, Power Levels, Feedback;
12. Photocells as Sensors, Timers, Burglar Alarms;
13. Electrical Field Trip - Observe 60 Hz. Systems on Campus and the Neighborhood;
14. Radio Frequency Field Trip - Observe Antennas and Communication Systems.

For advanced or students seeking to be challenged, other laboratory projects may be substituted, with permission of instructor, for a numbered lab project above. These include: A. Light meter/ light-triggered oscillator; B. IC-based LED flasher with variable speed; C. Intercom; D. Electronic "Cricket" (low duty-cycle oscillator); E. Light-variable frequency oscillator. The equipment used is basic EET laboratory instruments: digital multimeter, power supply, oscilloscope (*a very basic introduction*).

**Oral and Written Communication Requirements:** Students write comprehensive laboratory reports for every laboratory project. **These are done individually.** Oral communication is done in lecture and laboratory, using a Socratic technique, in which students must ask questions and respond to questions using professional vocabulary and proper English.

**Calculus Usage:** Calculus is taught to students in semesters 3 and 4; since this is a first-semester course, no calculus is used.

**Library Usage:** Students are told how to use the University library to obtain technical information, and are taught how to use the world-wide web to obtain supplemental information, with my blessing, encouragement and assistance. This supplemental information is used by the better students to augment their laboratory reports. The requirement of including supplemental material in laboratory reports is not done until DC Fundamentals (EL 111), in second semester.