Course Information Sheet

COMMUNICATIONS AND INFORMATION TECHNOLOGY

COURSE IDENTIFICATION

Course Name: ELECTRO PRINCIPLES I **Credits** 8

Course Number: ETEC1120 **Scheduled Classroom Hrs/Wk:** 8

Prerequisite No: N/A **Prerequisite Name:** N/A

Co requisite No: N/A **Co requisite Name:** N/A

NOTE: This course is a prerequisite for ELEC1225, ELNC1226, ELNC1222 & ELNC1236

Minimum Grade required: 50% (specify by program where applicable)

Graduation Requirements: A cumulative grade point average of 60%, based on courses within a program curriculum, is required for graduation from Niagara College.

Offered in the following programs/term:

Computer/Electrical/Electronics Engineering Technician

Prepared by: Edward Stark **Date:** June 27,2002

Co-ordinator: Edward Stark **Date:** June 27,2002

Approved by: L. Tiberi **Date:** June 27,2002

(Director)

Division: Communications and Information Technology

Current Academic Year: 2002/2003

COURSE DESCRIPTION:

This is an entry level course in electrical and electronic theory and practice for the technician student. Basic concepts of ac and dc circuits are explored.This course provides the student with the skills necessary to use meters, oscilloscopes and other measuring instruments. Semiconductor principles, diodes and rectifier circuits are introduced with an emphasis on practical troubleshooting and diagnostic principles.

COURSE NAME AND NO: ELECTRO PRINCIPLES I - ETEC1120

TEXTBOOKS REQUIRED:

1. ROBBINS, Allan H. and MILLER, Wilhelm C.
   CIRCUIT ANALYSIS THEORY AND PRACTICE - Second Edition (text)
   Delmar Publishers. *[ISBN 0-7668-0626-X]*

2. PAYNTER, Robert T.
   INTRODUCTORY ELECTRONIC DSEVICES AND CIRCUITS Conventional Flow Version - Fifth Edition (text)
   Prentice Hall Publishers. *[ISBN 0-13-927203-8]*

SUPPORT MATERIALS:

- First Year Parts Kit (See Bob Holder – Central Supply)

REFERENCE BOOKS:

1. BOYLESTAD, Robert L.
   CIRCUIT ANALYSIS (Canadian Edition)
   Prentice Hall Publishing. *[ISBN 0-13-900903-5]*

2. MALVINO, Albert P.
   ELECTRONIC PRINCIPLES
   McGraw-Hill Publishing. *[ISBN 0-02-802833-3]*

COURSE ATTENDANCE POLICY:

1. Attendance is mandatory for lab periods.
2. A signature must be acquired from the professor during the lab exercise.
3. Performance marks will be lost if you are late for a lab.
4. Lab reports must be submitted one week after the scheduled lab time.
5. All labs must be submitted to pass.
6. A doctor's certificate is required in the event of missing a test.
7. The student is responsible for the acquisition of all course materials and due dates.

COURSE NAME AND NO: ELECTRO PRINCIPLES I - ETEC1120

STUDENT ACADEMIC MISCONDUCT:

A student is subject to the penalties for academic misconduct as stated in the policies section of the student handbook.

TYPES OF EVALUATION USED IN THIS COURSE AND THEIR WEIGHT

TYPE	WEIGHT (percentage of final grade)
QUIZS:	10%
LABS:	30%
LAB TESTS:	10%
TERM TEST #1:	15%
TERM TEST #2:	15%
FINAL EXAM:	20%

NOTE: NO RETESTS - Absence without permission from a test will result in a mark of zero. No retests will be given.

COURSE GOALS:

After successfully completing this course the student will be able to do the following:

1. Define, calculate and measure the basic electrical quantities in DC resistive circuits.
2. Analyse, build and troubleshoot simple resistive circuits.
3. Build and troubleshoot simple diode circuits.
4. Convert between peak, average and RMS AC values.
5. Use an oscilloscope to view and calculate the frequency of different waveforms.
6. Calculate the time constant for resistive/capacitive circuits.
7. Understand the theory behind solid state & the pn junction
8. Understand the theory and practical uses of diodes in electronic circuits
9. Understand and build full and half wave rectifier circuits.
10. Understand how capacitors work, the RC time constant and its practical application.

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SPECIFIC CURRICULUM OBJECTIVES BY UNIT:

UNIT 1: Review Scientific & Engineering Notation

Upon successful completion of this unit, the student will be able to use scientific and engineering notation. The student will be able to express quantities using standard prefix notation.

A. Curriculum Objectives: (R&M chapter 1)

1.1 Round numbers.
1.2 Express values using the correct number of significant digits
1.3 Use scientific and engineering notation.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets and testing

UNIT 2: Voltage & Current

Upon successful completion of this unit, the student will be able to explain the roll that current, voltage and resistance play in a basic DC circuit.

A. Curriculum Objectives: (R&M chapter 2)

2.1 Define the fundamental units of electromotive force, electric current and resistance.
2.2 Measure voltage, current and resistance in a simple DC circuit.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (EXPERIMENT #1 LAB EQUIPMENT)

UNIT 3: RESISTANCE

Upon successful completion of this unit, the student will be able to calculate the resistance of a conductor based on its physical parameters and temperature. The student will also be able to calculate the resistance and tolerance of common carbon and metal film resistors.

A. Curriculum Objectives: (R&M chapter 3)

3.1 Calculate conductor resistance.
3.2 Read color-coded resistor values.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (LAB #2 OHM'S LAW)

UNIT 4: OHM'S LAW, POWER, ENERGY AND EFFICIENCY

Upon successful completion of this unit, the student will be able to calculate current, voltage, resistance, power, energy and efficiency for a simple DC circuits.

A. Curriculum Objectives: (R&M chapter 4)

4.1 State and apply Ohms Law.
4.2 Define the units for electrical energy and power.
4.3 Calculate the efficiency of a system involving a simple electric circuit.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (LAB #2 OHM'S LAW)

UNIT 5: SERIES DIRECT CURRENT CIRCUITS

Upon successful completion of this unit the student will be able to analyse series DC circuits using Ohm's Law and Kirchhoff's Voltage Law.

A. Curriculum Objectives: (R&M chapter 5)

5.1 Identify series circuits and compute the current, voltage and power for each circuit component.
5.2 State and apply Kirchhoff's Voltage Law.
5.3 Use the concept of internal resistance to explain the operation of a practical or actual voltage source
5.4 State and apply the Voltage Divider Rule.
5.5 Analyse schematics using voltage subscripts and circuit grounds.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (LAB #3 SERIES DC CICUITS AND LAB #4 POWER SUPPLY CHARACTERISTICS)

UNIT 6: PARALLEL DIRECT CURRENT CIRCUITS

Upon successful completion of this unit the student will be able to analyse parallel DC circuits using Ohm's Law and Kirchhoff's Current Law.

A. Curriculum Objectives: (R&M chapters 6)

6.1 Identify parallel circuits and compute the current, voltage and power for each circuit component.
6.2 State and apply Kirchhoff's Current Law.
6.3 State and apply the Current Divider Rule.
6.4 Use conductance to analyse a parallel circuit.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (LAB #5 PARALLEL DC CIRCUITS)

UNIT 7: SERIES-PARALLEL CIRCUITS

Upon successful completion of this unit the student will be able to analyse series-parallel DC circuits using Ohm's Law and Kirchhoff's Voltage and Current Laws.

A. Curriculum Objectives: (R&M chapter 7)

7.1 Analyse series-parallel circuits by isolating the series and parallel circuit components.
7.2 Interpret the different types of schematic diagrams commonly used in industry.
7.3 Analyse unloaded and loaded potentiometers circuits.
7.4 Calculate the loading effects when using an ammeter or voltmeter.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (LAB #6 SERIES-PARALLEL DC CIRCUITS & LAB #7 VARIABLE RESISTORS AND METER LOADING)

UNIT 8: CAPACITANCE

Upon successful completion of this unit the student will be able to analyse the static and transient behaviour of capacitors in DC circuits.

A. Curriculum Objectives: (R&M chapters 10 & 11)

8.1 Define capacitance.
8.2 Determine the total capacitance of series-parallel circuits.
8.3 Compute RC time constant.
8.4 Calculate the transient current and voltages in an RC circuit.
8.5 Determine the energy stored in a capacitor.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (LAB #8 CAPACITOR CHARGING AND DISCHARGING)

UNIT 9: AN INTRODUCTION TO ALTERNATING CURRENT

Upon successful completion of this unit the student will be able to convert between the different AC values and use a function generator and oscilloscope to measure the magnitude and frequency of different waveforms.

A. Curriculum Objectives: (R&M chapters 13 & 15)

9.1 Calculate an induced voltage.
9.2 Convert between peak, average and RMS values.
9.3 Use a function generator and oscilloscope.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (LAB #9 AN INTRODUCTION TO THE OSCILLOSCOPE)

UNIT 10: SOLID-STATE PRINCIPLES

Upon successful completion of this unit the student will be able to explain the operation of a PN junction under different bias conditions.

A. Curriculum Objectives: (Paynter chapter 1)

10.1 Describe and sketch the Bohr model of the atom.
10.2 Distinguish among insulators, conductors and semiconductors in terms of their electrical characteristics and atomic structure.
10.3 Describe the process of semiconductor doping.
10.4 List the characteristics of n- and p- type semiconductors and compare them with intrinsic semiconductors.
10.5 Describe the formation and operation of a p-n junction.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (LAB #10 DIODE CHARACTERISTICS)

UNIT 11: DIODES

Upon successful completion of this unit the student will be able to build and troubleshoot simple diode circuits.

A. Curriculum Objectives: (Paynter chapter 2)

11.1 Describe three ways of modeling a junction diode.
11.2 Use each diode model to perform calculations in simple circuits.
11.3 Determine which model is appropriate for a given situation.
11.4 Test diodes using an ohmmeter.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (LAB #10 DIODE CHARACTERISTICS & LAB #11 DIODE CIRCUITS)

UNIT 12: RECTIFIER CIRCUITS

Upon successful completion of this unit the student will be able to build and troubleshoot half-wave and full wave rectifier circuits.

A. Curriculum Objectives: (Paynter chapter 3)

12.1 Build and troubleshoot half-wave rectifier circuits.
12.2 Build and troubleshoot full-wave rectifier circuits.
12.3 Calculate rectifier circuit currents and voltages.

B. Evaluation of Course/Component Curriculum Objectives:

Problem sets, testing and labs (LAB #12 RECTIFIER CIRCUITS)