

# SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



Sault College

## COURSE OUTLINE

Course Title : **Electronic Circuits**

Course No.: **ELN-109**

Program: **Electrical / Electronics / Instrumentation Technician**

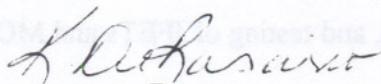
Semester: **Two**

Author(s): **Bill Armstrong**

Date: **January 1999**

Previous  
Outline Dated: **September 1995**

Approved:

  
\_\_\_\_\_  
Dean

  
\_\_\_\_\_  
Date

**Copyright © 1997 The Sault College of Applied Arts & Technology**  
*Reproduction of this document by any means, in whole or in part, without the prior written permission of The Sault College of Applied Arts & Technology is prohibited. For additional information, please contact Kitty DeRosario, Dean, School of Trades & Technology, (705) 759-2554, Ext. 642.*

**RECEIVED**  
JAN 12 1999

SAULT COLLEGE LIBRARY  
SAULT STE. MARIE

**Course Name**  
**Electronic Circuits**

**Course No.:**  
**ELN-109**

**TOTAL CREDITS:** 5

**PREREQUISITES:** ELN 100

**COURSE LENGTH:** 5 Hrs. / Week @ 17 Weeks

**TOTAL CREDIT HOURS:** 85

## **I. COURSE DESCRIPTION**

This course is a detailed study of single stage, multi stage, voltage and power amplifiers employing BJT's, JFET's, MOSFET's and OPAMP's. This course will also include the study of various switching circuits and their applications. Hands on skills will be reinforced in the practical component of this course, which includes device testing, circuit assembly, testing and troubleshooting.

## **II. TOPICS TO BE COVERED:**

1. BJT amplifiers
2. JFETs, MOSFETs and their applications
3. Operational amplifiers and their applications
4. Switching circuits and their applications

## **III. LEARNING OUTCOMES AND ELEMENTS OF PERFORMANCE:**

### **A. Learning Outcomes:**

1. Analyse, assemble, test and troubleshoot various BJT amplifier configurations
2. Understand the characteristics, operation, biasing, and testing of JFETs and MOSFETs.
3. Analyse, assemble, test and troubleshoot various JFET and MOSFET circuits.
4. Understand the characteristics and operation of Operational Amplifiers.
5. Analyse, assemble, test and troubleshoot various OPAMP circuits.
6. Analyse, assemble, test and troubleshoot various switching circuits.

## **B. Learning Outcomes with Elements of Performance:**

**Upon successful completion of this course, the student will demonstrate the ability to:**

1. Analyse, assemble, test and troubleshoot various BJT amplifier configurations.

### **Potential elements of the performance:**

- \* Perform a complete dc and ac analysis of multistage common-emitter amplifiers.
- \* Test and troubleshoot multistage amplifiers to determine which amplifier stage is faulty.
- \* Perform a complete dc and ac analysis of a Darlington emitter-follower amplifier.
- \* Use Electronic Workbench to simulate and test a Darlington emitter-follower amplifier circuit.
- \* Perform a complete ac analysis of a common-base amplifier.
- \* Use Electronic Workbench to simulate and test a common-base amplifier circuit.
- \* Describe and analyse the operation of class B and class AB power amplifiers.
- \* Calculate compliance and maximum efficiency for various class A, class B, and class AB amplifiers.
- \* Test and troubleshoot class B and class AB amplifiers.

2. Understand the characteristics, operation, biasing, and testing of JFETs and MOSFETs

### **Potential elements of the performance:**

- \* Identify the two types of JFETs and describe the construction and operation of each.
- \* Plot transconductance curves to determine the range of "Q-POINT" values for different JFETs using specification sheets.
- \* Describe and analyse the different types of JFET biasing circuits.
- \* Perform a complete dc and ac analysis of JFET amplifiers
- \* Assemble and test JFET amplifiers for correct dc and ac voltages.
- \* Troubleshoot the circuit if measurements and calculations do not match and then you identify and correct the problem.
- \* Identify the two types of MOSFETs and describe the construction and operation of each.
- \* Describe and analyse the different types of MOSFET biasing circuits.
- \* Describe the purpose served by power MOSFET drivers.
- \* Assemble and test different MOSFET circuits.

**3. Understand the operation and characteristics of Operational Amplifiers (OPAMPS)**

**Potential elements of the performance:**

- \* Describe the operational amplifier.
- \* Explain IC identification of an OPAMP.
- \* Explain the term differential amplifier.
- \* Describe the operation of a discrete differential amplifier.
- \* Using a specification sheet, list and understand the operating and electrical characteristics of OPAMPS.
- \* List common OPAMP faults and the symptoms of each.
- \* Understand frequency response of an OPAMP.
- \* Describe and analyse the operation of common OPAMP circuits.
- \* Assemble, test and troubleshoot if necessary common OPAMP circuits.

**4. Understand common switching circuits and their applications**

**Potential elements of the performance:**

- \* Describe and analyse the operation of the basic BJT, JFET AND MOSFET switches.
- \* Describe and analyse the operation of inverting and noninverting Schmitt triggers.
- \* Describe the internal construction and operation of the 555 timer.
- \* Describe and analyse 555 timer astable and monostable multivibrators.
- \* Understand the operation of different types of relays.
- \* Understand the operation of different opto devices used in switching circuits.
- \* Describe and analyse the operation of a constant current generator.
- \* Assemble and test common switching circuits.
- \* Troubleshoot common switching circuits if so required.

#### **IV. REQUIRED STUDENT RESOURCES:**

- \* Text - Introductory Electronic Devices and Circuits - 4<sup>th</sup> Edition  
Author - Robert T. Paynter
- \* Lab Manual to accompany text
- \* 1st Year Electronic Parts Package

#### **V. METHODS OF EVALUATION:**

The following Grading System will be used:

A+	= 90% - 100
A	= 80% - 89%
B	= 70% - 79%
C	= 60% - 69%
R	= less than 59% (Repeat Course)
X	= Temporary Grade as per College Policy

The final grade will be derived as follows:

Theory - Tests ( 3 or 4 ) and Quizzes	= 60%
Lab - Practical tests and reports	= 30%
Attendance and work ethics	= <u>10%</u>
<b>TOTAL</b>	<b>=100%</b>

#### **VI. SPECIAL NOTES:**

1. The Instructor reserves the right to modify the course as is deemed necessary to meet the needs of the students.
2. Students with special needs (Physical Limitations, Visual/Hearing Impairments etc. ) are encouraged to discuss confidentially, required accommodations with the instructor and/or contact the Special Needs Office, Room E1204, Extension 493, 717 or 491.
3. Attendance to lab activities is compulsory, unless discussed with the instructor in advance of the absence. Your attendance and final grade are directly related.

#### **VII. PRIOR LEARNING ASSESSMENT:**

Students who wish to apply for advanced credit in this course, should consult with the Professor.

### IV. REQUIRED STUDENT RESOURCES:

- \* Text - Introductory Electronic Devices and Circuits - 4<sup>th</sup> Edition  
Author - Robert T. Paynter
- \* Lab Manuals to accompany text
- \* 1st Year Electronic Parts Package

### V. METHODS OF EVALUATION:

The following Grading System will be used:

- A+ = 90% - 100
- A = 80% - 89%
- B = 70% - 79%
- C = 60% - 69%
- R = less than 59% (Repeat Course)
- X = Temporary Grade as per College Policy

The final grade will be derived as follows: Theory - Tests (3 or 4) and Quizzes = 60%  
 Lab - Practical tests and reports = 30%  
 Attendance and work ethics = 10%  
 TOTAL = 100%

### VI. SPECIAL NOTES:

1. The instructor reserves the right to modify the course as is deemed necessary to meet the needs of the students.
2. Students with special needs (Physical Limitations, Visual/Hearing Impairments etc.) are encouraged to discuss confidentially, required accommodations with the instructor and/or contact the Special Needs Office, Room E1204, Extension 493, 717 or 491.
3. Attendance to lab activities is compulsory, unless discussed with the instructor in advance of the absence. Your attendance and final grade are directly related.

### VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in this course, should consult with the Professor.