SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE NAME: DIGITAL ELECTRONICS

CODE NO.: ELN-107

PROGRAM: ELECTRONIC/ELECTRICAL/COMPUTER TECHNICIAN

SEMESTER: TWO

DATE: JANUARY 1993

PREVIOUS OUTLINE DATED: JANUARY 1992

AUTHOR: B. ARMSTRONG

NEW: REV.: __XX__

APPROVED: _W. Filipowich_   _Jan 7/93_
                 CO-ORDINATOR   DATE

                 JR Argila   _92.01.11_
                 DEAN   DATE

COURSE NAME   CODE NO.
DIGITAL ELECTRONICS   ELN107

TOTAL CREDIT HOURS: 80

PREREQUISITE(S):   ELN-100   (EL/ET)
                    ELN-106   (CET)

PHILOSOPHY/GOALS:

THIS COURSE IS A STUDY OF THE PRINCIPLES AND TECHNIQUES
OF MODERN DIGITAL SYSTEMS. THE STUDENT WILL GAIN AN
UNDERSTANDING OF NUMBERING SYSTEMS AND BOOLEAN ALGEBRA,
THE PHYSICAL AND CONCEPTUAL PRINCIPLES OF LOGIC GATES,
COMBINATIONAL LOGIC CIRCUITS, FLIP-FLOPS, COUNTERS,
REGISTERS AND INTERFACING CIRCUITS.

STUDENT PERFORMANCE OBJECTIVES:

UPON SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENT
WILL BE ABLE TO:

1. TEST AND TROUBLESHOOT DIGITAL LOGIC CIRCUITS & SYSTEMS

2. IDENTIFY LOGIC GATE SYMBOLS AND DESCRIBE THEIR
   FUNCTIONALITY.

3. INTERPRET AND UNDERSTAND LOGIC DIAGRAMS.

4. CONSTRUCT AND TEST DIGITAL LOGIC CIRCUITS.

5. CORRECTLY OPERATE ASSOCIATED TEST EQUIPMENT TO
   TROUBLESHOOT DIGITAL CIRCUITS.

TOPICS TO BE COVERED:

1. OVERVIEW OF DIGITAL LOGIC SYSTEMS

2. DIGITAL NUMBERING SYSTEMS

3. TTL GATES AND COMBINATIONAL LOGIC CIRCUITS

4. TTL FLIP-FLOPS AND SEQUENTIAL LOGIC CIRCUITS

5. ATITHMETIC LOGIC CIRCUITS

6. TTL COUNTERS AND REGISTERS

7. DIGITAL ENCODING, DECODING AND INTERFACE CIRCUITS

8. OTHER I.C. LOGIC FAMILIES

9. ELECTRICAL CHARACTERISTICS OF TTL AND CMOS

COURSE NAME	CODE NO.
DIGITAL ELECTRONICS	ELN-107

LEARNING ACTIVITIES	REQUIRED RESOURCES

1. INTRODUCTION TO DIGITAL SYSTEMS

Textbook as specified:

UPON SUCCESSFUL COMPLETION OF THIS
BLOCK, THE STUDENT WILL BE ABLE TO:

Read Chapter One

1.1 Distinguish between digital and
analog systems.

1.2 Understand the block diagram of
a computer system.

2. NUMBERING SYSTEMS

Textbook as specified:

UPON SUCCESSFUL COMPLETION OF THIS
BLOCK, THE STUDENT WILL BE ABLE TO:

Read Chapter Two
Complete assignment
Video on Numbering Systems

2.1 Understand the following digital
number systems:
BINARY, OCTAL, HEXADECIMAL, BCD

2.2 Convert one number system to
another, and perform simple
arithmetic calculations.

3. TRANSISTOR-TRANSISTOR LOGIC GATES

Textbook - Chapter two

UPON SUCCESSFUL COMPLETION OF THIS
BLOCK, THE STUDENT WILL BE ABLE TO:

Handouts - Basic TTL Gates
IC Nomenclature

3.1 Recall & understand the Logic
Symbol, Truth Table, Boolean
Expression & operation of the
AND, OR, NOT, NAND & NOR Gates.

Lab - "Basic Logic Gates"
"Combinational
Circuits"

3.2 Develop the logic circuit from
the Boolean expression & develop
the boolean expression for any
logic circuit.

3.3 Apply Boolean Laws & Theorems to
simplify logic circuits.

3.4 Apply Alternate Logic Gate
representatons.

4. COMBINATORIAL LOGIC CIRCUITS

Textbook - Chapter Four

UPON SUCCESSFUL COMPLETION OF THIS
BLOCK, THE STUDENT WILL BE ABLE TO:

Lab - "Combinational
Circuits"
"Troubleshooting"

4.1 Simplify logic circuits using the
Sum of Products form

CODE NO.
ELN-107

LEARNING ACTIVITIES	REQUIRED RESOURCES

4.2 Design, make operational and troubleshoot combinatorial logic circuits.

5. FLIP-FLOPS

UPON SUCCESSFUL COMPLETION OF THIS BLOCK, THE STUDENT WILL BE ABLE TO:

ñ Textbook - Chapter Five

5.1 Understand the operation of the NAND and NOR latches.

ñ Lab - "Basic Flip-Flops"
ñ   "Flip-Flop Circuits"

5.2 Recall and understand the logic symbol and operation of the following flip-flops:
    J/K FLIP-FLOP
    S/C FLIP-FLOP
    D-TYPE FLIP-FLOP
    D-TYPE LATCH

ñ Handout -Flip-Flop Summary

5.3 Distinguish Synchronous and Asynchronous operation.

5.4 Design, build and troubleshoot flip-flop circuits.

6. ARITHMETIC OPERATIONS & CIRCUITS

ñ Textbook - Chapter Six

UPON SUCCESSFUL COMPLETION OF THIS BLOCK, THE STUDENT WILL BE ABLE TO:

6.1 Perform algebraic operations in the binary number system.

6.2 Understand basic logic circuits used to perform these operations.

7. COUNTERS AND REGISTERS

ñ Textbook - Chapter Seven

UPON SUCCESSFUL COMPLETION OF THIS BLOCK, THE STUDENT WILL BE ABLE TO:

ñ Lab - "Asynchronous
ñ   Counters"
ñ   - "Synchronous

7.1 Distinguish Synchronous and Asynchronous counters.

ñ   Counters"
ñ   - "BCD Counters"

7.2 Understand the operation of, design and construct circuits utilizing the following counters;
UP/DOWN, RIPPLE, DECADE & BCD.

COURSE NAME
DIGITAL ELECTRONICS

CODE NO.
ELN-107

LEARNING ACTIVITIES		REQUIRED RESOURCES
7.3 Understand the operation of the following types of counters; PIPO, PISO, SISO & SIPO	ñ ñ ñ ñ ñ ñ	
8. ENCODERS AND DECODERS	ñ ñ	Textbook - Chapter Nine
UPON SUCCESSFUL COMPLETION OF THIS BLOCK, THE STUDENT WILL BE ABLE TO:	ñ ñ ñ	Lab activities for this block are associated with Block 7.
8.1 Analyze and utilize Decoders and Encoders in various circuit Applications.	ñ ñ ñ ñ	
9. IC ELECTRICAL CHARACTERISTICS AND INTERFACING	ñ ñ	Textbook - Chapter Eight
UPON SUCCESSFUL COMPLETION OF THIS BLOCK, THE STUDENT WILL BE ABLE TO:	ñ ñ ñ	
9.1 Identify other logic families and understand their electrical characteristics.	ñ ñ ñ	
9.2 Distinguish TTL and CMOS devices.	ñ	
9.3 Understand the principles in interfacing TTL and CMOS families	ñ ñ ñ	
9.4 Understand the operation of A/D and D/A Converters.	ñ ñ	

ADDITIONAL RESOURCE MATERIALS:

The Instructor may provide additional handouts and/or materials as required.

COURSE NAME
DIGITAL ELECTRONICS

CODE NO.
ELN-107

METHOD(S) OF EVALUATION

1. Testing will consist of both theory and practical.
   At least one weeks notice will be given for all major
   tests.

2. Quizzes will be given from time to time without notice

   Theory   - 60%
   Lab   - 40%

   TOTAL   - 100%

THE GRADING SYSTEM USED WILL BE AS FOLLOWS:

A+ = 90 - 100%
A = 80 - 89%
B = 70 - 79%
C = 55 - 69%
R   REPEAT

The student must attain a 55% in both the theory and lab
portions to successfully complete the course.

REQUIRED STUDENT RESOURCES:

TEXT BOOKS: 1. Digital Systems: Principles & Applications
               Fifth Edition
               R.J. Tocci

The student will require the Toolkit used in Semester 1

Each student must purchase their Digital IC package which
contains all components required to perform lab
activities. These IC's are available in the campus shop
for a cost of about $10.00.

ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY BOOK SECTION:

1. Thomas L. Floyd Digital Fundamentals Merrill 1990

2. Malvino/Leach Digital Principles & Applications
                  McGraw Hill 1988

SPECIAL NOTES:

1. Lab Attendance is compulsory and is included in the
   evaluation process.

2. The instructor reserves the right to modify the course
   to meet the needs of the students.