SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: DIGITAL AND PULSE CIRCUITS

CODE NO.: ELN-115

PROGRAM: ELECTRICAL/ELECTRONIC TECHNICIAN

SEMESTER: TWO

AUTHOR: EDWARD SOWKA

DATE: JANUARY 1995

PREVIOUS OUTLINE DATED: JANUARY 1993

APPROVED: W. Filipowich — CO-ORDINATOR — Jan 9, 1995 — DATE

L L Chaput — DEAN — 95-01-09 — DATE

COURSE NAME: DIGITAL AND PULSE CIRCUITS

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COURSE LENGTH: 6 HOURS / WEEK @ 16 WEEKS (4 HRS. THEORY, 2 HRS. LAB)

PREREQUISITES: ELN-100

PHILOSOPHY/GOALS:

THIS COURSE IS A STUDY OF MODERN DIGITAL AND PULSE ELECTRONIC CIRCUITS. THE STUDENT WILL GAIN AN UNDERSTANDING OF DIGITAL NUMBERING SYSTEMS, BOOLEAN ALGEBRA, COMMON DIGITAL INTEGRATED CIRCUITS, AND PULSE/WAVESHAPING CIRCUITS. EMPHASIS IS PLACED ON THE HANDS-ON APPROACH INCLUDING DESIGN AND TROUBLESHOOTING.

STUDENT PERFORMANCE OBJECTIVES:

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

1. UNDERSTAND TERMINOLOGY ASSOCIATED WITH PULSE WAVEFORMS AND BE ABLE TO MEASURE PULSE WAVEFORM CHARACTERISTICS.

2. UNDERSTAND DIGITAL NUMBERING SYSTEMS.

3. INTERPRET AND UNDERSTAND SCHEMATIC DIAGRAMS EMPLOYING TTL/CMOS INTEGRATED CIRCUITS.

4. TEST AND TROUBLESHOOT DIGITAL LOGIC CIRCUITS/WAVESHAPING CIRCUITS BY CORRECTLY OPERATING AND INTERPRETING TEST EQUIPMENT.

5. DESIGN SIMPLE LOGIC AND WAVESHAPING CIRCUITS.

TOPICS TO BE COVERED:

1. PULSE WAVEFORMS

2. DIGITAL NUMBERING SYSTEMS

3. TTL LOGIC DEVICES AND CIRCUITS

4. WAVESHAPING DEVICES AND CIRCUITS.

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LEARNING ACTIVITIES / REQUIRED RESOURCES:

1. PULSE WAVEFORM ANALYSIS:

Upon successful completion of this topic, the student will be able to;

- UNDERSTAND, DEFINE, CALCULATE AND MEASURE THE FOLLOWING PULSE WAVEFORM CHARACTERISTICS; **Pulse Amplitude, Period, Pulse Width, Pulse Space, Duty Cycle, Rise time, Fall time, Overshoot, Undershoot, Ringing**

2. DIGITAL NUMBERING SYSTEMS:

Upon successful completion of this topic, the student will be able to;

- SUCCESSFULLY COUNT AND CONVERT BETWEEN THE FOLLOWING NUMBER SYSTEMS; **Decimal, Binary, Octal, Hexadecimal, Binary Coded Decimal**
- UNDERSTAND THE **Gray and ASCII** CODES

3. BASIC TTL LOGIC FUNCTIONS:

Upon successful completion of this topic, the student will be able to;

- UNDERSTAND, BUILD, TEST AND TROUBLESHOOT CIRCUITS EMPLOYING THE FOLLOWING LOGIC FUNCTIONS; **AND, NAND, OR, NOR, INVERTER, XOR, XNOR FLIP-FLOPS (D-Type, S/R, J/K) SYNCHRONOUS and ASYNCHRONOUS LC. COUNTERS, REGISTERS, ENCODERS and DECODERS, DIGITAL DISPLAYS, A/D & D/A.**
- INTERPRET SCHEMATIC DIAGRAMS EMPLOYING THESE DEVICES

4. PULSE AND WAVESHAPING CIRCUITS:

Upon successful completion of this topic, the student will be able to;

- UNDERSTAND, BUILD, TEST AND TROUBLESHOOT CIRCUITS EMPLOYING THE FOLLOWING: **R-C Timing Circuits (Constant-Current Generator), Integrators and Differentiators, Schmitt Triggers**

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REQUIRED STUDENT RESOURCES:

- Textbook - **Digital Systems, Principles and Applications by Ronald J. Tocci 6th Edition**

- Toolkit including basic hand tools and a Protoboard

- **Digital Parts Package** - Contains the IC's required to perform lab experiments

- Instructor handouts as required

METHODS OF EVALUATION:

THE GRADING SYSTEM WILL BE AS FOLLOWS:

A+ = 90% to 100%
A = 80% to 89%
B = 70% to 79%
C = 55% to 69%
R = Repeat

TESTING WILL CONSIST OF BOTH **THEORY and PRACTICAL TESTS** AND **QUIZZES.** AT LEAST 1 **WEEK's** NOTICE WILL BE GIVEN FOR MAJOR TESTS, WHILE QUIZZES WILL BE GIVEN WITHOUT NOTICE TO VERIFY SHORT TERM RETENTION.

THE FINAL GRADE WILL BE DETERMINED AS FOLLOWS:

50% Theory
40% Practical
10% Subjective

THE SUBJECTIVE EVALUATION WILL CONSIST OF ATTENDANCE, PARTICIPATION, PROFESSIONAL WORK ETHIC AND THE DEMONSTRATED PROFICIENCY IN THE USE OF TEST EQUIPMENT.

LABORATORY ATTENDANCE IS MANDATORY UNLESS DISCUSSED WITH THE INSTRUCTOR **IN ADVANCE.** HISTORICALLY, ATTENDANCE IN THEORY CLASSES IS DIRECTLY PROPORTIONAL TO THE GRADE RECEIVED.

SPECIAL NOTES:

1. THE INSTRUCTOR RESERVES THE RIGHT TO MODIFY THE COURSE AS DEEMED NECESSARY TO MEET THE NEEDS OF THE STUDENTS.

2. STUDENTS WITH SPECIAL NEEDS, ARE ENCOURAGED TO DISCUSS ACCOMMODATIONS, CONFIDENTIALLY, WITH THE INSTRUCTOR.