

#192

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ON

COURSE OUTLINE

**COURSE TITLE:** INDUSTRIAL ELECTRONICS

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**CODE NO.:** ELN 213 - 4

**SEMESTER:** THREE

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**PROGRAM:** ELECTRICAL/ELECTRONIC TECHNICIAN/TECHNOLOGY

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**AUTHOR:** WALLY FILIPOWICH

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**DATE:** AUGUST, 1993

**PREVIOUS OUTLINE DATED:** AUGUST, 1991

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**APPROVED:** \_\_\_\_\_  
DEAN

\_\_\_\_\_  
DATE

INDUSTRIAL ELECTRONICS  
COURSE NAME

ELN 213-4  
CODE NO.

TOTAL CREDIT HOURS 60 HRS.

PREREQUISITE(S): ELN 109 -- ELECTRONIC CIRCUITS

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**I. PHILOSOPHY/GOALS:**

To provide a detailed study of electronic timing, switching, trigger and control devices and circuits, together with their applications in industry.

**II. STUDENT PERFORMANCE OBJECTIVES:**

Upon successful completion of this course the student will:

- 1) Understand RC Timing Circuits, basic relays, switching circuits and Digital circuits.
- 2) Understand the concepts of optoelectronic devices
- 3) Understand the operation and application of Trigger Devices
- 4) Understand the operation and application of Control Devices
- 5) Test, analyze, troubleshoot circuits using the devices covered

**III. TOPICS TO BE COVERED:**

- 1) Timing, Switching, Relay and Digital Circuits
- 2) Optoelectronic Devices
- 3) Operational Amplifiers
- 4) Solid-State Trigger Devices
- 5) Thyristor (PNPN) Control Devices

**IV. LEARNING ACTIVITIES**

**REQUIRED RESOURCES**

**1) SWITCHING, TIMING, RELAY AND DIGITAL CIRCUITS**

- a) Transistor switching circuits
- b) RC time delay circuits
- c) Relay operation and SSR's
- d) Relay, solid-state and digital logic circuits
- e) Operation, application, testing, analyses and troubleshooting of industrial control circuits.

Textbook-Industrial Solid-state Electronics  
-CHAPTERS 1 & 2

Textbook-Introductory Electronic Devices and Circuits  
-CHAPTER 18

Textbook-Fundamentals of Electric Circuits  
-CHAPTERS 16 & 19

Instructor Handouts as required

**2) OPTOELECTRONICS**

- a) Fundamentals of light
- b) Photoelectric devices
  - photovoltaic cell
  - photoconductor
  - photoemissive tube
- c) Photoconductive sensors
  - photo diode
  - photo transistors
  - photo IC's
- d) Light emitters
  - LED's
  - IRED's
  - LASERS
  - LCD's
  - Nixie Tubes
  - Alphanumeric displays
- e) Photocouplers
- f) Fibre optics
- g) Application of optoelectronic devices in industrial control

Textbook-Industrial Solid-State Electronics  
-CHAPTER 11

Textbook-Introductory Electronic Devices and Circuits

Instructor Handouts as required

**3) OPERATIONAL AMPLIFIERS**

- a) OPAMPS - Construction, operation, characteristics and specifications
- b) OPAMP circuits, amplifiers, comparators, adders and subtracters, converters (voltage/current)

Textbook-Industrial Solid State Electronics  
-CHAPTER 8

Textbook-Introductory Electronic Devices and Circuits  
-CHAPTER 12, 14 & 16

Instructor Handouts as required

IV. LEARNING ACTIVITIES

REQUIRED RESOURCES

4) **SOLID STATE TRIGGER DEVICES**

- a) Operation, characteristics, specifications testing and application
  - four layer diode
  - unijunction transistor (UJT)
  - DIAC
  - SUS, SBS, PUT
- b) UJT relaxation oscillator
- c) The 555 timer - operation and application

Textbook-Industrial Solid State Electronics  
-CHAPTER 4,5 & 6

Textbook-Introductory Electronic Devices and Circuits  
-CHAPTER 19

Instructor Handouts as required

5) **THYRISTOR (PNPN) CONTROL DEVICES**

- a) Latching devices
- b) Silicon controlled rectifier
  - theory and operation
  - gate characteristics and control circuits
  - AC/DC load control (Half & Full Wave)
  - phase shift control
  - UJT/SCR control circuits
- c) Triacs
  - theory, operation, characteristics and application
  - critical rate of rise
- d) Other thyristor devices
  - LASCR, GCS, SCS, GTO
- e) DC motor speed control systems
  - Thyristor control of armature voltage and current
  - DC motor speed control systems

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V. **EVALUATION METHODS:** (INCLUDES ASSIGNMENTS,  
ATTENDANCE REQUIREMENTS, ETC.)

Assessments will consist of major tests and quizzes for approximately 50% of the overall mark.

Practical tests, lab quizzes, log book, oral and written assignments, and general lab assessment will make up approximately 40% of the overall mark. (Lab attendance is compulsory)

A subjective evaluation based on attendance, participation professional work ethic and the demonstrated ability to use test equipment will comprise approximately 10%.

The student must successfully pass both portions to achieve a passing grade.

The following grades will be assigned to students in post-secondary programs:

- A+ Consistently outstanding ( > 90%)
- A Outstanding achievement (80% to 89%)
- B Consistently above average achievement (70% to 79%)
- C Satisfactory or acceptable achievement in all areas subject to assessment (55% to 69%)
- R Repeat -- The student has not achieved the objectives of the course and the course must be repeated
- X A temporary grade, limited to situations with extenuating circumstances, giving a student additional time to complete course requirements

VI. **REQUIRED STUDENT RESOURCES**

- 1) Text -- Industrial Solid-State Electronics (2nd ed)  
by T. J. Maloney (Prentice-Hall)
  - Introductory Electronic Devices & Circuits  
by R.T. Paynter (Prentice-Hall)
  - 100 pg. Spiral-bound Navy Blue Science Notebook  
(Available in Campus Shop)
- 2) Protoboard
- 3) Lab Log Book

**VII. SPECIAL NOTES**

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.