

#192

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ON

COURSE OUTLINE

COURSE TITLE: INDUSTRIAL ELECTRONICS

CODE NO.: ELN 213 - 4

SEMESTER: THREE

PROGRAM: ELECTRICAL/ELECTRONIC TECHNICIAN/TECHNOLOGY

AUTHOR: WALLY FILIPOWICH

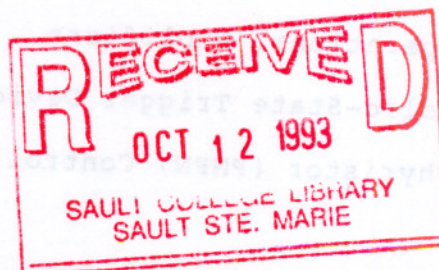
DATE: AUGUST, 1991

PREVIOUS OUTLINE DATED: OCTOBER, 1987

APPROVED:

*W.P. Crozeth*  
DEAN

9/06/10  
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.

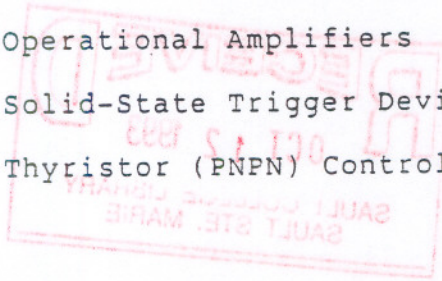
**II. STUDENT PERFORMANCE OBJECTIVES:**

Upon successful completion of this course the student will:

- 1) Understand PC Timing Circuits, basic relays and switching 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.

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

3) OPERATIONAL AMPLIFIERS

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

LEARNING ACTIVITIES

1) SOLID STATE TRIGGER DEVICES

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

2) TRANSISTOR (BJT) CONTROL DEVICES

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



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

5) THYRISTOR (PNPN) CONTROL DEVICES

- a) Latching devices
- b) Silicon controlled rectifier (SCR)
  - 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

LEARNING ACTIVITIES

IV.

1) SWITCHING, TRIGGERING, AND DIGITAL

- 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, analysis and troubleshooting of industrial control circuits.

2) OPTOELECTRONICS

- a) Fundamentals of light
- b) Photoelectric devices
  - photoelectric cell
  - photomultiplier
  - photoconductive tubes
- c) Photoconductive sensors
  - photo diode
  - photo transistors
  - photo IC's
- d) Light - emitters
  - LED's
  - LED's
  - LASERS
  - LCD's
  - Nixie Tubes
  - Alphanumeric displays
- e) Photocouplers
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3) OPERATIONAL AMPLIFIERS

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



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

Assessments will consist of major tests and quizzes for approximately 60% 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)

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 (66% to 79%)
- C Satisfactory or acceptable achievement in all areas subject to assessment (55% to 65%)
- 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)
- 2) Protoboard
- 3) Lab Log Book

VII. SPECIAL NOTES

Students with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

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

