

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: CONTROL SYSTEMS 1
Code No.: ELN 214-6
Program: COMPUTER ENGINEERING TECHNOLOGY
Semester: III
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APPROVED:

Chairperson

J.P. Crozitto

Date

CONTROL SYSTEMS I
Course Name

ELN 214-6
Course Number

PHILOSOPHY/GOALS:

To provide an introductory study of closed loop control systems, including transducers, error detectors, amplifiers, compensation networks and synchro systems as applied to speed, position and process control systems.

METHOD OF ASSESSMENT (GRADING METHOD):

1. Written tests will be conducted at regular intervals.
2. Quizzes may be given without prior notice.
3. Laboratory reports will be graded weekly.
4. Grading: Theory - 70%
 Lab Work- 30%

Grades: A - 76 - 100%
 B - 66 - 75%
 C - 55 - 65%
 X - 50 - 55%
 R - less than 50%

TEXTBOOK(S):

Introduction to Control Systems Technology; 2nd Ed., (Bateson).

Industrial Solid-State Electronics, Devices and Systems, (Maloney).

SPECIFIC OBJECTIVES

A) Basic concepts and Terminology:

- (i) Block diagrams
- (ii) Open loop and closed loop control

B) Control System Evaluation:

- (i) Advantages of automatic control
- (ii) Effects of load changes
- (iii) Objectives of a control system
- (iv) Damping and instability
- (v) Criteria of good control

C) Types of Control:

- (i) Regulator and follow-up systems
- (ii) Process control
- (iii) Servomechanisms
- (iv) Sequential control
- (v) Numerical control
- (vi) Analog control
- (vii) Digital control

BLOCK 2 -Measuring Means Components

1. To be able to recall that a transducer is a device used for converting a signal or physical quantity of one kind into a corresponding physical quantity of another kind.
2. To be able to recall the principle of operation, characteristics, limitations, advantages and simple applications of the following sensors and transducers.

A) Motion Sensors:

1) Linear Motion:

- a) Linear motion potentiometers
- b) Linear motion variable inductors
- c) Linear motion variable capacitors
- d) Linear variable differential transformers

2) Angular Motion:

- a) Angular motion potentiometer
- b) Angular motion variable capacitor
- c) Rotary variable differential transformer
- d) Variable reluctance angular position transducer

Level Limit Sensors Continued:

- d) Temperature Sensors
 - 1) Bimetallic sensors
 - 2) Fluid pressure sensors
 - liquid filled
 - vapour filled
 - 3) Resistive sensors
 - resistance temperature detectors
 - thermistors
 - 4) Thermocouple sensors
 - 5) Radiation Pyrometers

- e) Radiation Sensors
 - 1) Light sensors
 - Photoemissive sensors
 - Photoconductive sensors
 - Photovoltaic sensors
 - 2) X-Ray sensors
 - 3) Nuclear radiation sensors
 - Geiger-Mueller tube
 - Ionization chamber
 - Scintillation counter

- f) Thickness Sensors
 - 1) Inductive sensors
 - 2) Ultrasonic sensors
 - 3) X-ray sensors

- g) Proximity Sensors
 - 1) Magnetic
 - 2) Inductive
 - 3) Capacitive

- h) Density Sensors
 - 1) Photoelectric
 - 2) Linear differential transformer

- i) Moisture Sensors
 - 1) Hair hygrometer
 - 2) Lithium Chloride

BLOCK 3 - Measuring Means Characteristics

1. To be able to explain the following terms:

- a) Speed of response
- b) Accuracy, calibration, calibration curve, conformity, critical damping, dead time, dead zone, dynamic error, dynamic lag, error, full-scale range, hysteresis, lag coefficient, linearity, measured variable reliability, reproducibility, resolution, sensitivity, span and static error.

BLOCK 4 - Synchros

1. To be able to recall the principles of operation, characteristics, methods of zeroing and troubleshooting of the following synchro elements:
 - a) Synchro transmitter
 - b) Synchro receiver
 - c) Differential synchro transmitter
 - d) Differential synchro receiver
 - e) Synchro control transformer

2. To be able to recall the principle of operation, characteristics and troubleshooting of the following synchro systems:
 - a) Synchro transmitter and receiver
 - b) Synchro transmitter and receiver with a differential transmitter or receiver
 - c) Synchro transmitter and control transformer

BLOCK 5 - Final Control Elements and Amplifiers

1. To be able to recall the principles of operation, characteristics, limitations, advantages and applications of the following:
 - a) Solenoid valves
 - b) Two-position electrically driven valves
 - c) Proportional position electric motor driven valves
 - d) Electropneumatic valves
 - e) Electrohydraulic valves
 - f) Valve characteristics
 - g) Relays and Contactors
 - h) Thyristors
 - i) Split phase AC motors
 - j) Two-phase AC servomotors
 - k) AC servo amplifiers
 - l) DC servo motors
 - m) DC servo amplifiers

BLOCK 6 - Industrial Closed Loop Control Systems

1. To be able to recall the principles of operation of:
 - a) Thermistor control of Quench Oil temperature
 - b) Proportional Mode Pressure Control Systems
 - c) Proportional Plus Reset Temperature Control
 - d) Strip Tension Control
 - e) Edge Guide Control
 - f) Automatic Weighing Systems
 - g) Carbon Dioxide Control for a Carburizing Furnace
 - h) Relative Humidity Control