

# Optional Courses for an Instrumentation Curriculum

## 9. Analytical Instrumentation

An intermediate level course. Pre-requisites: None

### **COURSE DESCRIPTION:**

A study of analytical instruments emphasizing their utilization in continuous process applications including sampling systems, chromatography, pH, conductivity, and other air and water quality instruments.

### **LEARNING OUTCOMES:**

Describe the functions, strengths and limitations of various analytical instruments; and operate various analytical instruments to analyze samples.

## 10. Fieldbus Systems

An advanced level course. Pre-requisites: Process Systems and Control, and Intro to Digital Electronics

### **COURSE DESCRIPTION:**

A study of digital data systems. This includes installation; use of various communication protocols such as Foundation Fieldbus, Profibus, HART, high speed Ethernet (HSE) and AS-i; configuration of device parameters, control system design, calibration and troubleshooting. Also introduces user interfaces and data connectivity with OPC.

### **LEARNING OUTCOMES:**

Describe installation, configuration, calibration and troubleshooting techniques used in digital devices and systems.

## 11. Process Systems and Control

An intermediate level course. Pre-requisites: Industrial Controls II

### **COURSE DESCRIPTION:**

An in-depth study of industrial processes including fluid flow and material transport, heating/cooling, furnaces and boilers, separation/mixing, distillation, reaction, extraction, and automatic control requirements of these processes. Instruction includes control system design, control loop adjustments and analysis.

### **LEARNING OUTCOMES:**

Explain the static and dynamic aspects of processes; describe the automatic control requirements of processes; analyze process variables and adjust the control loop; and determine the considerations of automatic control and material accountability.

# Optional Courses for an Instrumentation Curriculum

## 12. Electrical Controls I

An intermediate level course. Pre-requisites: Intro to Digital Electronics

### **COURSE DESCRIPTION:**

A study of electric motors, electrical measurement and control devices common to a modern industrial environment. Topics include an understanding of electrical ladder logic and its various components, and basic motor control configurations.

### **LEARNING OUTCOMES:**

Describe the types of electric motors and explain the operation and function of various motor control devices.

## 13. Electrical Controls II

An advanced level course. Pre-requisite: Electrical Controls I and PLC I

### **COURSE DESCRIPTION:**

Covers concepts of variable speed drives; frequency speed circuitry and troubleshooting. Includes replacing circuitry, preventive maintenance and troubleshooting of single phase and three phase motors.

### **LEARNING OUTCOMES:**

The student will demonstrate a working knowledge of variable speed drives and frequency speed circuitry to troubleshoot, repair and perform preventive maintenance on single phase and three phase motors.

## 14. PLC I

An intermediate level course. Pre-requisites: Intro to Digital Electronics

### **COURSE DESCRIPTION:**

An introduction to programmable logic controllers (PLC), PLC types, theory, installation, applications, operations and documentation. The course also includes PLC programming devices.

### **LEARNING OUTCOMES:**

Describe the types of PLCs and explain the operation and function of various PLC devices.

## 15. PLC II

An advanced level course. Pre-requisites: PLC I

### **COURSE DESCRIPTION:**

An advanced programmable logic control course that covers the programming, testing, and troubleshooting of specific programmable logic control applications. Also covers the advanced instruction set.

### **LEARNING OUTCOMES:**

Configure programmable logic controllers (PLCs) to perform various tasks. Explain how PLCs control the process environment; operate and troubleshoot PLCs; and program PLCs.

# Optional Courses for an Instrumentation Curriculum

## 16. Distributed Control Systems (DCS)

An advanced level course. Pre-requisite: Process Systems and Control

### **COURSE DESCRIPTION:**

This course covers the basic concepts and fundamentals of Distributed Control Systems (DCS). Topics include: system hardware and software requirements, engineering tools, operator tools, graphic representation, control strategies, configuration techniques, I/O modules and interface, collecting displaying and storing data, host and field networks, and manufacturing support.

### **LEARNING OUTCOMES:**

Describe the types of Distributed Control Systems and explain the operation and function of the various components of the system.

## 17. Computers and Networks

An introductory level course. Pre-requisite: None

### **COURSE DESCRIPTION:**

A fundamental computer and network course that provides an explanation of the hardware, software, network architectures and communication protocols. Emphasis on terminology, acronyms and hands-on activities.

### **LEARNING OUTCOMES:**

The student will define and recognize terms, expressions and phrases associated with computers and networks; utilize computer and network equipment; identify protocols and topologies to differentiate between various network systems.

## 18. Solid State Circuits

An introductory level course. Pre-requisite: Electrical Fundamentals

### **COURSE DESCRIPTION:**

A study of various semiconductor devices incorporated in circuits and their applications. Emphasis on circuit construction, measurements and analysis.

### **LEARNING OUTCOMES:**

The student will analyze circuit operation with various semiconductor device applications; measure, test and troubleshoot circuits containing various semiconductor devices.

# Optional Courses for an Instrumentation Curriculum

## 19. Asset Management/Documentation

An advanced level course. Pre-requisite: Process Systems and Control

### **COURSE DESCRIPTION:**

This course covers concepts that take advantage of the communication capabilities of intelligent field devices that are used in predictive maintenance documentation and the use of this information.

### **LEARNING OUTCOMES:**

The student will learn how to put into operation a system; terminology and acronyms; how to create a database; database management; and the use of the information in production and maintenance.