College of San Mateo
Official Course Outline

1. **COURSE ID:** ELEC 445 **TITLE:** Industrial Data Communications Systems
   Units: 4.0 units **Hours/Semester:** 48.0-54.0 Lecture hours; 48.0-54.0 Lab hours; and 96.0-108.0 Homework hours
   Method of Grading: Letter Grade Only
   Prerequisite: ELEC 112

2. **COURSE DESIGNATION:**
   Degree Credit
   Transfer credit: CSU
   AA/AS Degree Requirements:
   CSM - GENERAL EDUCATION REQUIREMENTS: E2c.Communication and Analytical Thinking
   CSM - GENERAL EDUCATION REQUIREMENTS: E5d. Career Exploration and Self-Development

3. **COURSE DESCRIPTIONS:**
   Catalog Description:
   A practical course in industrial data communication starting from the basics. This course demonstrates how to design and maintain industrial communications systems in an industrial production environment.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
   Upon successful completion of this course, a student will meet the following outcomes:
   1. Demonstrate the use of traditional and current serial standards as required in an industrial plant environment.
   2. Demonstrate a working programmable logic controller network in a simulated industrial automated application.
   3. Describe and define different Ethernet varieties with design methods that utilize LANs.
   4. Describe current wireless systems for industrial automation.
   5. Identify the security needs of the IT department.
   6. Identify and solve wireless technology problems in a real industrial automated application.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
   Upon successful completion of this course, a student will be able to:
   1. Demonstrate the use of traditional and current serial standards as required in an industrial plant environment.
   2. Demonstrate a working programmable logic controller network in a simulated industrial automated application.
   3. Describe and define different Ethernet varieties with design methods that utilize LANs.
   4. Describe current wireless systems for industrial automation.
   5. Identify the security needs of the IT department.
   6. Identify and solve wireless technology problems in a real industrial automated application.

6. **COURSE CONTENT:**
   Lecture Content:
   The course covers the standards and techniques needed to design and maintain a communications system in an industrial production environment such as listed in the following:
   • Data Communications
   • Electronic data communications and automated process control
   • Data Communication Terminology
   • Serial Communications Standards
   • Data Link Layer Basics and Data Encoding
   • ISOIOSI Reference Model
   • LAN Technologies to automate process control
   • Ethernet Technology, Cabling and Configuration Rules
   • Repeaters, Bridges, Routers, and Gateways
   • TCP/IP
   • Error detection and correction schemes
   • Ethernet Readiness for an industrial environment

- Industrial Ethernet Design Techniques
- PLC software systems
- PLC Networks in an automated industrial setting
- Industrial Networks and Fieldbuses
- Wireless communication systems
- The Five Rules for Troubleshooting industrial data communication networks .

Lab Content:

The lab content reinforces the lecture content and materials in a practical, applied manner.

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**

Typical methods of instruction may include:

A. Other (Specify): a. Lectures; b. Handouts; c. Homework assignments; d. On-line research; e. Computer based training activities; f. Lab activities; g. Internet videos.

8. **REPRESENTATIVE ASSIGNMENTS**

Representative assignments in this course may include, but are not limited to the following:

Writing Assignments:

Case analysis and short papers.

Reading Assignments:

Reading assigned from textbook and other supplemental materials.

9. **REPRESENTATIVE METHODS OF EVALUATION**

Representative methods of evaluation may include:

A. a. Quizzes (retention check of lecture and reading assignments) b. Tests (critical thinking skill set on blocks of information) c. Examinations (mid-term, final – retention and critical think evaluation) d. Homework assignments (reading and writing assignments with problem solving emphasis) e. Lab experiments (hands on skill set and critical problem solving evaluated) f. Lab practical (theory application with critical thinking and hands on problem solving evaluated)

10. **REPRESENTATIVE TEXT(S):**

Possible textbooks include:

A. Kuphaldt, Tony . *Lessons in Industrial Instrumentation*, ed. Creative Commons , 2016

Other:

A. Topic appropriate chapter selections from the Control Guru's Practical Process Control website available at http://www.controlguru.com/pages/table.html
B. Topic appropriate articles published in the online edition of Control Engineering magazine available at http://www.controeng.com
C. Topic appropriate selections from the B&B Electronics website available at http://www.bb-elec.com/Learning-Center
D. Topic appropriate articles published in the online edition of Control Engineering magazine available at http://www.controeng.com

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Course Originator: Anne Figone