

1. Course number and name

COE 481 – Real-time Industrial Networks

2. Credits and contact hours

3 credit hours, 3 contact hours

3. Prerequisites or co-requisites

Prerequisites: COE 370 (Communication Networks) or COE 371 (Computer Networks I)

4. Name and Contact Information of Instructor

Dr. Hicham H. Hallal

5. Course Description (Catalog Description)

Explores industrial computer network principles, commercial industrial networks, third generation industrial networks, network layout and intrinsic safety considerations, software issues, real-time data processing and case studies.

6. Textbook, title, author, and year

T. Ozkul, *Fieldbus Network Design: Real-Time Industrial Networks*, CreateSpace Press, 2010.

Supplemental material

J. Berge, *Fieldbuses for Process Control: Engineering, Operation and Maintenance*, ISA press, 2001.

7. Specific goals for the course

Upon completing the course, student will be able to:

1. Understand the basic terminology for process control like 4-20 mA current loop, process control instruments and classical process control architectures like Direct Digital Control (DDC), Distributed Control System (DCS)
2. Design HART network with one or multiple devices. Select wiring and choose power supply voltage
3. Explain and analyze CAN network functions and the non-destructive protocol used for arbitration
4. Identify the advantages of Foundation Fieldbus (FF) over the traditional process control systems. Evaluate and reason the cost benefits behind Foundation Fieldbus
5. Design Foundation Fieldbus network H1 segment
6. Identify and know functions of FF system like LAS, probe node, active list
7. Select the good engineering design practices for FF like leaving enough room for future expansion and taking care of redundancy
8. Design redundant Ethernet for Foundation Fieldbus (HSE) and know where to use what type of media. (twisted pair, fiber optic cable, distances etc.)
9. Design intrinsically safe systems when the environment is explosive/flammable
10. Identify additional devices to use to make safe networks.

8. Teaching and Learning Methodologies

Methods include lectures, labs, homework assignments, quizzes and project, exams and class discussions

9. Course Topics and Schedule:

Topic	Weeks
Introduction to automation networks	2
Fieldbus benefits, savings and concerns	2
Installation and commissioning of third generation industrial networks	2
Network and device configuration for Hart networks	2
Control unit design; hardwired and microprogrammed control	2
Network and device configuration for Fieldbus networks	2
Engineering and design of Fieldbus networks	1
Availability and safety issues of Fieldbus, intrinsic safety considerations	2
Case studies of Fieldbus networks.	1
Total	16