University of Science and Technology of Hanoi
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COURSE SYLLABUS

Subject: Automatism/Industrial Data Processing

Academic field: Space and Aeronautics

Lecturer: Dr. Phan Thanh Hoa

Phone: 090 464 2189

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Academic year: 2015-2016

COURSE DESCRIPTION

Credit points	4 ECTS	
Level	Undergraduate	
Teaching time Location	USTH building	
Time Commitment	Lecture	**34_hrs**
	Assignments	**04_hrs**
	Computer Lab/Practice	**10_hrs**
	Total	48_hrs
Prerequisites	Consent of instructor	
Recommended background knowledge	Basic programming, Digital Communications, Electronic Engineering (SA2.8)	
Subject description:	Automatism/Industrial Data Processing is the creation and implementation of technology that automatically processes data. This technology includes computers and other communications electronics that can gather, store, manipulate, prepare and distribute data to serve or control specific operations such as motor control, electric generator, production lines etc.,	
Objectives & Outcome	**Objectives:** 1. To introduce the basic principles of networking 2. To learn industrial protocols and the way of data processed and transferred in industrial network 3. To equip the students with the relevant knowledge to understand and solve technical problems in industrial automation systems. **Outcome:** Upon completion of this course, the student will be able to: 1. Identify the need for network protocols during data exchange 2. Demonstrate the use of serial standards as required in an industrial plant environment. 3. Analyze and identify the methods of communications	

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	4. Compare the different protocols used as industrial standards 5. Demonstrate a working programmable logic controller network in a simulated industrial automated application.	
Assessment/ Evaluation	**Theory examination**	70%
	Exercise	5%
	Practice	20%
	Attendance	5%
Prescribed Textbook(s)		

COURSE CONTENTS & SCHEDULE

Class	Contents	Hours			Ref./Resources	Assignment(s)
		Lect.	Exr.	Prc.		
1	**Fundamental of Industrial Data Communication Systems** Review of Data Acquisition, Automation System Architecture - Hierarchical Levels, Functional Layered Models - OSI reference model, System engineering approach, Input / Output Structures, Control Unit Structure, Protocols, Communication principles and modes: network topology, transmission media, noise, cable characteristic and selection; bridges, routers and gateways, Instrumentation and control devices.	7h	2h		Practical Data Communications for Instrumentation and Control; Industrial Network for Communications and Control, Data Communications and Networking	Assignments
2	**Industrial Communication Standards and Protocols:** **Serial communication standards:** Standards organizations, Serial data communication interface standards, Balanced and unbalanced transmission lines, Synchronous and asynchronous communication, RS 232,422,485 standards. **Industrial protocols:** XON/OFF Signaling, Binary Synchronous Protocol (BSC),	10h			Practical Data Communications for Instrumentation and Control, Practical Industrial Data communications	

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	HDLC/SDLC protocol, CSMA/CD, CA protocol, OSI implementation for Industrial communications, Industrial control applications: ASCCII-based protocol – ANSI –X 3.28 -2.5.					
3	**HART Communication Protocol** Architecture - physical, data link, application layer, communication technique, normal and burst mode of communication, benefits of HART.	8h			Practical Data Communications for Instrumentation and Control, Practical Industrial Data communications	
4	**Open industrial Fieldbus and DeviceNet systems** **Industrial Ethernet:** 10Mbps, 100Mbps Ethernet, Gigabit Ethernet, Industrial Ethernet. **Foundation fieldbus:** Fieldbus requirement, features, advantages, fieldbus components, types, architecture–physical, data link, application layer, system and network management, wiring, segment functionality checking, function block application process. **PROFIBUS:** Architecture, OSI-model, PROFIBUS types – PA, DP & FMS and their comparison, Designing PROFIBUS, Network design, Advantages and Applications of PROFIBUS in industries.	8h	2h		Practical Data Communications for Instrumentation and Control, Practical Industrial Data communications	Assignments
5	**Programmable Logic Controller – PLC** Controller operation Ladder diagram	1h		10h	Fundamental of industrial instrumentation and process control	Reports

Notes:

- *Abbreviation: Lect. (lecture), Exr. (Exercise), Prc. (Practice).*
- *Assignments may include assignments, practical work, reports, exercises ...for each class sessions*

Reference Literature:

1. John Park, Steve Mackay, Edwin Wright, *Practical Data Communications for Instrumentations and Control*, 1st Edition ELSEVIER, 2003.
2. Deon Reynders, Steve Mackay, Edwin Wright, *Practical Industrial Data Communications*, 1st Edition ELSEVIER, 2005.
3. William C. Dunn, *Fundamental of industrial instrumentation and process control*, Mc Graw-Hill, 2005.
4. Behrouz A. Forouzan, *Data Communications and Networking*, 2nd Edition, Mc Grow – Hill, 2001.

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