Devi Ahilya University, Indore, India Institute of Engineering & Technology				**IV Year B.E. (Electronics and Telecommunication)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR7E4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
INDUSTRIAL COMMUNICATION	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning 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.

Prerequisites: Digital Communications

COURSE CONTENTS

UNIT I-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.

UNIT II-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), HDLC/SDLC protocol, CSMA/CD, CA protocol, OSI implementation for Industrial communications, Industrial control applications: ASCCII-based protocol – ANSI –X 3.28 -2.5.

UNIT III-HART Communication Protocol Architecture:
Physical, data link, application layer, communication technique, normal and burst mode of communication, benefits of HART.

UNIT IV- 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.

UNIT V-Programmable Logic Controller:
PLC Controller operation, Architecture,topology, SCADA integration PLC as RTU,Batch and sequential processing, Ladder diagram

Learning Outcomes:

Upon Completing the Course, Student will 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
4. Compare the different protocols used as industrial standards
5. Demonstrate a working programmable logic controller network in a simulated industrial automated application.

BOOKS RECOMMENDED:

[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.

List of Practical Assignments:

1. To study Amplitude Modulation and Frequency Modulation.
2. To study and simulate Pulse Width Modulation.
3. To study digital communication using ASK, FSK and PSK.
4. To study RS-232, RS-485 and RJ-45 communication standards.
5. To study types of Cables and Interference.
6. To study Modbus Protocol.
7. To study HART Protocol.
8. To study CANBUS, Device Net and SDS system.
9. To study network topologies and Ethernet.
10. To study mobile communication and satellite communication