Nirma University
School of Technology, Institute of Technology
B. Tech (Electronics and Instrumentation Engineering)
Department Elective

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Course Code	**2EIDE03**
Course Title	**Data Communication and Industrial Networking**

Course Outcomes (CO):

At the end of the course, students will be able to –

- explain the concepts of communication model and standards
- compare various industrial networking standards
- demonstrate the applications of communication protocols in the field of process automation

Syllabus **Teaching Hours**

UNIT 1: Introduction to Networks in Process Automation **03**

Introduction to Open system interconnection (OSI) model, network topology, media access methods, cables.

UNIT 2: Introduction to Physical Standards **05**

Introduction to RS-232, RS-485 standards, troubleshooting of the RS-232 and RS-485, RS-485 converters, difference between RS-232 and RS-485 standards, IEEE 802 standard

UNIT 3: Modbus and Modbus plus Protocols **06**

Introduction to communication model for industries, overview of Modbus, transmission modes, data types, function codes and frame design, overview of Modbus transmission control protocol/internet protocol (Modbus TCP/IP), Modbus Plus, troubleshooting of Modbus and Modbus Plus protocol, comparison of Modbus variants, introduction of tools.

UNIT 4: Fieldbus **06**

Fieldbus technology vs conventional communication methods, fieldbus devices, problems with fieldbus, wiring and installation practice with fieldbus, termination methods, installation of the complete system, troubleshooting of fieldbus system.

UNIT 5: Sensor and Device Level Protocols 06

Industrial Ethernet, actuator sensor interface (AS-I), controller area network (CAN), Device Net, highway addressable remote transducer (HART) protocol.

UNIT 6: Foundation Fieldbus

05

Overview of foundation fieldbus, physical layer and wiring rules, data link layer, application layer, user layer, error detection and diagnostics.

UNIT 7: ProfiBus

05

Overview of profibus variants, protocol stack and communication model, system operation, troubleshooting, comparison and applications of various standards, emerging technologies for industrial data communication.

UNIT 8: OPC for Process Control

03

Overview of open platform communications (OPC), OPC architecture, OPC DA3.0 data access, case studies.

UNIT 9: Industrial Ethernet and IIOT

06

Industrial Ethernet, Overview of Industrial internet of things (IIOT), Message Queuing Telemetry transport (MQTT), Advanced message queuing protocol (AMQP), Representational state transfer (REST), OPC unified architecture (OPC UA), The data hub transfer protocol (DHTP).

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. John Park, Steve Mackay, Edwin Wright, Practical Data Communications for Instrumentation and Control, Elsevier Publication
2. Behrouz Forouzan, Data Communications & Networking, Tata McGraw-Hill Publication.
3. Deon Reynders, Steve Mackay, Edwin Wright, Practical Industrial Data Communications: Best Practice Techniques, Elsevier Publication.
4. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, Apress
5. Giacomo Veneri, Antonio Capasso,Hands-on Industrial Internet of Things, Packt Publication