

Nirma University
School of Technology, Institute of Technology
B. Tech (Instrumentation and Control Engineering)

Semester VII

L	T	P	C
3	0	0	3

Course Code	2ICDE04
Course Title	Maintenance of Instruments & Systems

Course Outcomes (CO):

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

1. summarize the role and responsibilities of instrumentation maintenance engineer
2. apply the concepts of calibration and maintenance for various applications
3. discuss the corrective measures for troubleshooting of instruments and systems
4. recommend methods and actions to be followed for safety of instruments and systems

Syllabus

**Teaching
Hours**

UNIT 1: Introduction

History of instrumentation and control maintenance, need for instrumentation and control maintenance and engineering.

02

UNIT 2: Fundamental principles

Maintenance vs. troubleshooting, calibration and reasons to calibrate, vocabulary, instrument symbols, instrument line symbols, tab numbers, drawings, diagrams, and schematics, Specifications.

04

UNIT 3: Instrumentation & control system maintenance personnel

Knowledge factors, skills, training of maintenance workers, multi-craft / multi-skilled personnel, job titles and descriptions, Credentialing.

03

UNIT 4: Maintenance management

Need for maintenance management, maintenance philosophy, maintenance management organization, basic requirements for a maintenance department, planning and scheduling, work order system, MTTF, MTTR, and availability, training maintenance workers, computerized maintenance management systems, office/shop layout, centralized/decentralized shops.

08

UNIT 5: Maintenance engineering

Engineering assistance, maintenance involved in new projects, successful maintenance, the high maintenance system, documentation control, alternative methods of maintenance,

07

power, grounding and isolation requirements, instrument air requirements, communication requirements, primary element location.

UNIT 6: Calibration and tuning

06

Field calibration, calibrating in hazardous locations, in-shop calibration, other aspects of calibration, loop classification by control function, control algorithms, loop tuning, flow loops.

UNIT 7: Maintenance and troubleshooting

09

Troubleshooting, basic troubleshooting techniques, designed with maintenance in mind, pneumatic field instruments, electronic field instruments, smart transmitters, control valves, discrete switches, primary elements, panel and behind-panel instruments, DCS and PLC maintenance, troubleshooting communication circuits.

UNIT 8: Safety

06

Electrical hazards, hazardous areas, contamination, pressures and vacuums, high voltage, moving and rotating machinery, high and low temperatures, gases and chemicals, program Changes, software control, proper tools and test equipment, work area cleanliness, safety meetings, process considerations, communication Troubleshooting.

Industrial visits will be arranged to demonstration the troubleshooting and maintenance of instruments & systems.

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. L D Goettsche, Maintenance of instruments and systems, ISA.
2. A Brunelli, Calibration handbook of measuring instruments, ISA
3. L R Higgins, R Keith Mobley, R Smith, Maintenance engineering handbook, Mc-Graw Hill
4. S K Srivastava, Maintenance Engineering, S Chand

L= Lecture, T= Tutorial, P= Practical, C = Credit