

SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
B. Sc. SEMESTER – 5
INSTRUMENTATION COURSE CODE : US05CINS21 (4 Credit Course)
COURSE TITLE : 8085 Microprocessor Architecture and Programming - 1
(Effective from June 2020)

UNIT 1:

Microprocessors (μ P): Microprocessor as a Programmable Device; Machine Language, 8085 Assembly Language, High - Level Languages, 8085 Programming Model: 8085 Hardware Model, 8085 Programming Model; Instruction Classification, Instruction, Data Format, and Storage: Instruction Word Size, Related examples/programs

UNIT 2:

Microprocessor Architecture and its operations: μ P - Initiated Operations and 8085 Bus Organization; Memory: Latch as a Storage Element, Memory Map and Addresses; Input and Output (I/O) Devices: Peripheral - Mapped I/Os, Memory – Mapped I/Os; Logic Devices for Interfacing: Tri - State Devices, Buffer, Decoder, Encoder, Related examples/programs

UNIT 3 :

The 8085 MPU: The 8085 μ P, μ P Communication and Bus Timings, Demultiplexing the Bus AD7 - AD0, Generating Control Signals, A detailed look at the 8085 MPU and its Architecture, Related examples/programs

Unit 4 :

Data Transfer Operations, Arithmetic Operations, Logic Operations, Branch Operations, Related examples/programs

Text Books:

1. Microprocessor Architecture, Programming, and Application by Ramesh. S. Gaonkar
2. Understanding 8085/8086 Microprocessor and Peripheral ICs Through Questions and Answers By S. K. Sen
3. Microprocessor (8085) by B. Ram

SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
B. Sc. SEMESTER – 5
INSTRUMENTATION COURSE CODE : US05CINS22 (4 Credit Course)
COURSE TITLE : Process Measurement Technique - I
(Effective from June 2020)

Unit-1: Temperature Measurement:

Definition & Scales, Liquid in glass thermometer, Bimetallic thermometer, Filled System thermo meter, Liquid filled, gas filled, Vapour Pressure thermometer, Thermocouple Laws and material types

Unit-2: Pressure Measurement:-I

Terminology: Absolute pressure, Atmospheric pressure, Gauge pressure, Static pressure, Vacuum, Total pressure and their units, Manometers: U-tube, Inclined manometer, Ring balance manometer

Unit-3: Pressure Measurement:-II

Mechanical Gauges: Bourdon Tube, Diaphragm, Bellows, Low pressure gauges: Mcleod guage, Pirani guage, ionization gauge, Dead weight Tester.

Unit-4: Level & Density Measurement:

Direct methods: Sight glass, Float & Tape, Float & Shaft, Float & Spring: Electrical methods: Capacitance level indicator, Ultrasonic method, Radioactive method; Air and liquid purge method of level measurement.

Text Books:

1. Process instrumentation by D.P. Eckman
2. Mechanical measurement and control by D.S. Kumar
3. Principles of industrial instruments by Patranabis
4. Instrumentation measurement and analysis by Nakara and Chaudhary
5. Principles of measurement and instrumentation by A.S. Morris

SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
B. Sc. SEMESTER – 5
INSTRUMENTATION COURSE CODE : US05CINS23 (4 Credit Course)
COURSE TITLE : Introduction to Control Systems
(Effective from June 2020)

Unit – 1 : Controller Principles - 1

Introduction, Process Characteristics: Process Equation, Process Load, Transient, Process Lag, Self Regulation; Control System Parameters: Error, Variable Range, Control Parameter Range, control Lag, Dead Time, Cycling, Controller Modes; Discontinuous Controller Modes (with Electronic Design): Two - Position Mode, Multiposition Mode, Floating - Control Mode

Unit – 2 : Controller Principles - 2

Continuous Controller Modes (with Electronic Design): Proportional (P) Control Mode, Integral (I) Control Mode, Derivative (D) Control Mode; Composite Control Modes (with Electronic Design): PI, PD, PID

Unit – 3 : Instrument Air System (IAS)

Introduction, Characteristics of Air, Various Factors for Designing IAS: Sizing Criteria, Pressure Level, Air Supply Source (Small Scale Requirement, Typical IAS); Compressor System: Positive Displacement Type, Dynamic; Compressor Cooling, Compressor Control, Oil Removal, Dryer (Desiccant Type, Refrigeration Type), Necessity for Dryers, Distribution System

Unit – 4 : Control Valves

Introduction, Valve Terminology, Valve Capacity, Valve Rangeability, Body Design: Globe Bodies; Angle, Needle, Ball, Butterfly, Diaphragm, Pinch, Drag, Flow Characteristics, Trim Design: Materials, Plugs, Seats, Guides, Cage; Bonnet Assembly, Actuators: Pneumatic Type, Electric Type, Electrohydraulic type; Positioners: Pneumatic, Electropneumatic

Text Books:

1. Process Control Instrumentation Technology By Curtis Johnson
2. Handbook of Instrumentation By W. G. Andrew
3. Computer - Based Industrial Control By Krishna Kant
4. Process Control (Concepts, Dynamics and Applications) By S. K. Singh
5. Control System By Nagrath and Gopal

SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
B. Sc. SEMESTER – 5
INSTRUMENTATION COURSE CODE : US05CINS24 (4 Credit Course)
COURSE TITLE : Programmable Logic Controller – 1
(Effective from June 2020)

Unit – 1 : Ladder Diagram Fundamentals - 1

Introduction, Basic Components and Their Symbols: Control Transformers, Fuses, Switches, Indicator Lamps, Relays, Time Delay Relays

Unit – 2 : Ladder Diagram Fundamentals - 2

Fundamentals of Ladder Diagrams: Basic Diagram Framework, Wiring, Reference Designators, Boolean Logic and Relay Logic, AND, OR, AND OR and OR AND, Ground Test, The Latch, Two - Handed Anti - Tie Down, Anti Repeat, Single Cycle, Combined Circuit, Master Control Relays and Control Zones; Machine Control Terminology

Unit – 3 : The Programmable Logic Controller (PLC)

Introduction, A Brief History, PLC Configurations, System Block Diagram, Update - Solve the Ladder - Update, Update, Solve the Ladder

Unit – 4 : Fundamental PLC Programming

Introduction, Physical Components Vs Program Components, Example Problem - Lighting Control, Internal Relays, Disagreement Circuit, Majority Circuit, Oscillator, Holding Contacts, Always - ON and Always - OFF Contacts, Ladder Diagram Having More Than One Rung

Text Books:

1. Programmable Logic Controllers (Programming Methods and Applications) By John R. Hackworth & Frederick D. Hackworth, Jr.
2. Automatic manufacturing system using PLCs By Jack Hugh
3. Programmable Logic Controller By Petruzella
4. Introduction to programmable logic controller By Thomas Hughes

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B. Sc. SEMESTER – 5

INSTRUMENTATION COURSE CODE : US05CINS25 (6 Credits, 12 hours per week)

**COURSE TITLE : Instrumentation Practicals
(Effective from June 2020)**

01. Introduction to 8085 μ P kit
02. Data transfer operations
03. Arithmetic operations - I
04. Logic operations
05. Bit Manipulation Operations
06. Branch Operations
07. Time Delay programming
08. Analog to Digital conversion
09. Other μ P experiments based on theory
10. Study of LVDT characteristics
11. Study of RTD characteristics
12. Study of Strain gauge characteristics
13. Proportional controller study
14. Frequency modulation and demodulation
15. TRIAC for phase control
16. SCR for half and full wave phase control
17. Study of Thermocouple characteristics
18. Study of Dead Weight Tester
19. Characteristics of FET

SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
B. Sc. SEMESTER – 5
INSTRUMENTATION COURSE CODE : US05DINS26 (2 Credit Course)
COURSE TITLE : Industrial Electronics
(Effective from June 2020)

Unit – 1 : Transformers

Working principle, construction, core type transformer, shell type transformer, theory of ideal transformer, EMF equation of transformer, voltage transformation ratio, transformer with losses but no magnetic leakage : Transformer on No-load, transformer on load, transformer with winding resistance but no magnetic leakage, equivalent resistance, magnetic leakage, transformer with resistance and leakage reactance, equivalent circuit

Unit – 2 : DC Generators and Motors

DC Generator, generator Principle, simple loop generator : construction, working, total losses in D.C. Generator. D.C. Motors: principles, comparison of Generator and Motor action, significance of back emf, voltage equation of a motor, condition for maximum power, torque, armature torque of a motor, shaft torque, Speed of a dc motor : for series and shunt motors, speed regulation, torque and speed of a motor

Unit – 3 : Induction and Synchronous Motors

Classification of A.C. motors, general principle, construction, production of revolving magnetic field (two and three phase), why does the rotor rotate? Slip. Synchronous motor, introduction, principle of operation, method of starting, motor on load with constant excitation, power flow within synchronous motor, synchronous motor applications

Unit – 4 : Special Machines

Stepper motor: step angle, applications, Types of stepper motors, variable reluctance stepper motor, multi-stack VR stepper motor, permanent magnet stepping motor, hybrid stepper motors

Text Book :

1. A text book of Electrical Technology by B.L. Theraja & A. K. Theraja S. Chand & Company Ltd., New Delhi
2. Electrical Engineering Fundamentals by Vincent Del Toro, PHI Pvt. Ltd., New Delhi