SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
B. Sc. SEMESTER – 6
INSTRUMENTATION COURSE CODE : US06CINS21 (4 Credit Course)
COURSE TITLE : 8085 Microprocessor Architecture and Programming - 2
(Effective from June 2020)

Unit – 1

Example of an 8085 - Based Microcomputer: The 8085 Machine Cycles and Bus Timings, Opcode Fetch Machine Cycle, Memory Read Machine Cycle, Basic Interfacing Concepts: Peripheral I/O Instructions, I/O Execution, Absolute Vs Partial Decoding

Unit – 2

Programming Techniques: Looping, Counting, and Indexing; Additional Data Transfer and 16 - bit Arithmetic Instructions, Arithmetic Operations Related to Memory

Unit – 3

Logic Operations: Rotate; Logic Operations: Compare, Counters and Time Delays, Hexadecimal Counter, Modulo Ten Counter, Generating Pulse Waveforms

Unit – 4

Stack, Subroutine, Restart, Conditional Call, and Return Instructions, BCD to Binary Conversion, Binary to BCD Conversion, BCD to Seven - Segment LED Code Conversion, Binary to ASCII and ASCII to Binary Conversion

Text book:

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 – 6
INSTRUMENTATION COURSE CODE : US06CINS22 (4 Credit Course)
COURSE TITLE : Process Measurement Technique – 2
(Effective from June 2020)

Unit-1: Flow Measurement: I

Flow of fluid in pipes & Bernoulli's equation, nature of flow, Head flow meters: Orifice plate, Venturimeter, Venturi nozzle, Pitot tube, Multiplying pitot tube, Variable Head flow meter: Rotameter. Quantity meters: Piston type, Nutating disk meter, Rotary vane type.

Unit-2: Flow Measurement: II

Open Channel meters: Rectangular weir, V-notch weir, Trapezoidal weir, Electrical type flow meters: Turbine type, Electromagnetic flow meter, Hot wire anomometer, Ultrasonic method, Mass Flow measurement.

Unit-3: Force and Torque Measurement:

Force: Hydraulic force meter, Pneumatic force meter, Proving ring, Strain gauge load cell, Pressductors load cell. Torque: Inline rotating torque meter, inline stationary torque meter, Proximity sensors.

Unit-4: Speed Measurement:

Speed: Revolution Counter, Tacho-scope, Slipping clutch tachometer, Centrifugal force techometer, Drag cup, Contact less electrical tachometers, Tacho-generators.

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 – 6
INSTRUMENTATION COURSE CODE : US06CINS23 (4 Credit Course)
COURSE TITLE : Advanced Control Systems
(Effective from June 2020)

Unit – 1 : Advanced Process Control Strategies

Introduction, Cascade Control, Feedforward Control, Predictive control Systems: Model Based Control; Multivariable Control System, Adaptive Control

Unit – 2 : Supervisory Control And Data Acquisition Systems (SCADA)

Channel Scanning, Conversion to Engineering Units, Data Processing, Distributed SCADA System; Remote Terminal Unit: Input/Output Modules, Communication Modules, Special Software Facilities

Unit – 3 : Distributed Digital Control (DDC)

Distributed Vs Centralised, Advantages of Distributed Control Systems; Functional Requirements of (Distributed) Process Control System: Plant Operator's Requirements, Maintenance Engineer's Requirements, Design Engineer's Requirements, Manager's Requirements, Distributed Control Systems Evolution, System Architecture, Distributed Control Systems

Unit – 4 : Modeling and Simulation for Plant Automation

Introduction, Definition of Terms, Why do we need the system Modeling?, Uses of Systems Simulation, How to Build the Mathematical Model of a Plant?, Model Evaluation and Improvement, Modern Tools for Modeling and Simulation of Systems, Application Examples, Future Perspectives

Text Books:

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

SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
B. Sc. SEMESTER – 6
INSTRUMENTATION COURSE CODE : US06CINS24 (4 Credit Course)
COURSE TITLE : Programmable Logic Controller – 2
(Effective from June 2020)

Unit – 1 : Advanced Programming Techniques

Introduction, Ladder Program Execution Sequence, Flip Flops, R - S Flip Flop, One Shot, D Flip Flop, T Flip Flop, J - K Flip Flop, Counters, Sequencers, Timers, Flashers, Timed One Shot, Timed Sequencer, Master Control Relays and Control Zones

Unit – 2 : Mnemonic Programming Code

Introduction, AND Ladder Rung, Entering Normally Closed Contacts, OR Ladder Rung, Simple Branches, Complex Branches

Unit – 3 : Wiring Techniques

Introduction, PLC Power Connection, Input Wiring, Inputs Having a Single Common, Isolated Inputs, Output Wiring, Relay Outputs, Solid State Outputs,

Unit – 4 : Analog I/O

Introduction, Analog (A/D) Input, Analog (D/A) Output, Analog Data Handling, Analog Input Potential Problems

Text Book:

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

SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
B. Sc. SEMESTER – 6
INSTRUMENTATION COURSE CODE : US06CINS25 (6 Credits, 12 hours per week)
COURSE TITLE : Instrumentation Practicals
(Effective from June 2020)

1. Arithmetic operations - II
2. Counter programming
3. Programming using Stack & Subroutine
4. Code conversion programming
5. BCD Arithmetic
6. 16 - Bit Data Operations
7. Digital to Analog conversion
8. And other experiments based on theory
9. Study of Hall effect
10. Eg measurement using four probe method
11. Voltage to frequency converter
12. PID Controller Study
13. Pulse modulation and demodulation
14. Study of UJT Characteristics
15. RC phase shift oscillator
16. Impedance by Voltage drop
17. Multivibrator using IC555

SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
B. Sc. SEMESTER – 6
INSTRUMENTATION COURSE CODE : US06DINS26 (2 Credit Course)
COURSE TITLE : Analytical Instrumentation
(Effective from June 2020)

Unit-1 pH measurement

Introduction, principle of pH measurement, pH electrodes: hydrogen, glass, calomel, combined, The asymmetry potential, Buffer solutions, pH meters: null detector, direct reading, chopper amplifier type, Vibrating condenser amplifier type, zero corrected DC amplifier type.

Unit-2 GAS chromatography:

Introduction, basic parts of chromatograph, carrier gas supply, sample injection system and the size of the sample, chromatographic column, thermal compartment, Detection system: Thermal Conductivity Detector, Flame Ionization Detector (FID), Electron Capture Detector (ECD), Argon ionization Detectors, Cross-sectional area Ionization Detectors.

Unit-3 Gas analyzers and Conductivity:

Gas analyzers: O2: Magnetic wind type, Dumbbell type, CO2, CO: IR type, gas chromatography type H2: thermal conductivity type. Conductivity: Introduction, measurement of conductance: null method, direct reading method, conductivity cells, Temperature compensation in conductivity measurements, Conductivity measurements using high frequency methods,

Unit-4 Liquid Chromatography:

Introduction, Type of liquid Chromatography, the liquid chromatograph, high pressure pump system, gradient elution, sample injection system, The column, Detection system: UV-Visible- Spectrophotometric absorption, fluorescence detector, Refractive Index detectors, adsorption detectors, electrical conductivity detectors, Thermal detectors.

Text Books:

1. Handbook of analytical instrumentation by R.S. Khandpur
2. Bio-medical instrumentation and measurement by Cromwell, Weibell and Pfeiffer