SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR

SYLLABUS EFFECTIVE FROM: 2017-18
M. Sc. (INSTRUMENTATION & CONTROL)

Distribution of Internal Examination Marks		
For each theory paper: [I, II, III & IV Semesters]		**Average marks**
i	Theory Test = 1, duration = 90 minutes	15
ii	Quiz Tests = 3, (10 marks each). The total marks to be reduced to	10
iii	Seminar presentation	05
	Total	**30**
Practical: [I, II, III & IV Semesters]		**Average marks**
i	Practical test duration = 3 hours	20
ii	Practical Record / Journal & Viva Voce of experiments	10
	Total	**30**
Project work: [I, II, III & IV Semesters]		**Average marks**
i	Evaluation of Project / Project Report / Viva Voce	30
	Total	**30**

M. Sc. (INSTRUMENTATION & CONTROL) – FIRST SEMESTER
PS01CINC21: TRANSDUCERS & INSTRUMENTATION
Total Marks:100 (External – 70, Internal – 30)

Classification of Transducers, Basic Requirements of Transducer, Principles of Displacement Transduction. Strain**:** Factors affecting Strain Measurements, Operation of Resistance Gauge, Types of Electrical Strain Gauge, Gauging Techniques, Strain Gauge Circuits & Temperature Compensation

Vibration**:** Characteristics, Devices, Pressure**:** Diaphragms, Elastic Elements, Transduction Methods, Solid State, Thin Film, Calibration, Types of Flow Meters

Temperature**:** Platinum Type Sensors, Thermisters, Thermocouples, IC Temperature Sensors, Radiation Measurement, Optical Pyrometer, Calibration, Force**:** Load Cell & its Types, Torque Measurement & its Type, Piezoelectric**:** Phenomenon, Force, Torque, Pressure & Acceleration Transducers

Hall - Effect Transducers & Applications, Photoelectric**:** Phenomenon, Photoconductive, Photovoltaic & Photo-emissive Transducers, Ionization Displacement Transducer, Nuclear Radiation Transducer, Radioactive Transducers, Digital Transducers

BOOKS:
1. *Instrumentation Devices & Systems,* C. S. Rangan, G. R. Sarma & V. S. V. Mani, Tata McGraw-Hill Publishing Company Limited.

2. *Transducers and Instrumentation,* D. V. S. Murty, Prentice Hall of India Private Limited.

3. *Instrumentation Measurement and Analysis,* B. C. Nakra, & K. K. Chaudhry, Tata McGraw-Hill Publishing Company Limited.

4. *Principles of Industrial Instrumentation,* D. Patranabis, Tata McGraw-Hill Publishing Company Limited.

M. Sc. (INSTRUMENTATION & CONTROL) – FIRST SEMESTER
PS01CINC22: MICROPROCESSOR & MICROCONTROLLER SYSTEMS
Total Marks:100 (External – 70, Internal – 30)

8085 Microprocessor: Introduction, Instructions & Examples, Interrupt Control, Serial I/O Control, Memory Interfacing & Applications, 8255 Peripheral Interface, 8254 Interval Timer, 8259 Interrupt Controller, DAC & ADC.

8051 Microcontroller: Architecture, Internal Memory, Special Function Registers, I/O Ports, Timers / Counters, Serial Port Interface, Interrupt Structure & Addressing Modes.

8051 Instruction Set: Data Transfer, Arithmetic, Logical & Branch Group, Programming Examples, Assembler Directives, 8051 System Design & Applications.

Classification of Embedded System, Embedded system applications, Embedded System components, Von-Neumann v/s Harvard architectures, CISC and RISC architectures, Microcomputer Development Systems, IDE components: Editor, Project wizard, Assembler, Compiler, Simulator, In Circuit Emulator (ICE) / On Chip Debugger (OCD), Logic Analyzer

BOOKS:

1. *Microprocessor – I,* V. J. Vibhute & P. B. Borole, Tech – Max Publications.

2. *Microprocessors – Architecture, Programming and Applications with the 8085,* Ramesh S. Gaonkar, Penram International Publishing.

3. *Embedded System Design using The 8051 Microcontroller Family,* Satish Shah, Bension Education.

4. *The 8051 Microcontroller - Architecture, Programming and Applications,* Kenneth J. Ayala, Penram International Publishing.

5. *Introduction to Embedded System,* Shibu K V, Tata McGraw hills

M. Sc. (INSTRUMENTATION & CONTROL) – FIRST SEMESTER
PS01CINC23: PRINCIPLES OF CONTROL SYSTEMS
Total Marks:100 (External – 70, Internal – 30)

Classification of Control System, Open Loop & Closed Loops, Effect of Feedback on**:** Overall Gain, Stability, Sensitivity & External Disturbance, Concept of Transfer Function, Block Diagram of Control Systems, Rules for Block Diagram Reduction & Examples, Analysis of Multiple Input-Output Systems, Signal Flow Graphs**:** Properties, Methods, Mason's Gain Formula & Applications

Laplace Transforms**:** Definition & Important Theorems, Examples, Equations of Electric Networks, Modeling of Mechanical System Elements & Equations, Classification of Time Response, Steady State Analysis, Derivation of Steady State Error, Analysis of Type 0, 1 & 2 Systems, Analysis of First & Second Order Systems

Stability of Control Systems, Relative Stability, Hurwitz's Criterion, Routh's Criterion**:** Special Cases, Applications, Advantages & Limitations, Examples, Root Locus**:** Concept, Angle & Magnitude Condition, Rules for Construction & Inverse, General Steps to Solve Problems, Examples

Bode Plot**:** Standards Factors of G(jω) H(jω), Steps to Sketch, Frequency Response of**:** Bode Plot, Polar Plot & M-∅ Plot, Types of Compensation, Compensating Networks, Types of Servo motors

BOOKS:
1. *Principles of Control Systems,* U. A. Bakshi & V. U. Bakshi, Technical Publications.

2. *Automatic Control Systems,* Benjamin C. Kuo, Prentice Hall of India Private Limited.

3. *Feedback Control Systems,* S. D. Bhide, J. N. Shinde & S. Satyanarayan, Tech-Max Publications.

4. *Control Systems Engineering,* I. J. Nagrath & M. Gopal, New Age International Publishers.

5. *Modern Control Engineering,* Katsuhiko Ogata, Pearson Education Asia.

6. *Control Systems Principles and Design,* M. Gopal, Tata McGraw-Hill Publishing Company Limited.

Operational Amplifier**:** Open Loop Gain, Zero-Crossing Detector, Applications of Voltage Level Detector, Wave Converters, Audio Mixer, DC Offsetting an AC Signal, Multi-channel Amplifier, IC Precision Comparator & Window Detector.

DC Voltmeter, Voltage to Current Converters, LED tester, Current Amplifier, Phase Shifter, Peak Detector, AC-to-DC Converter, Dead Zone Circuits, Differential Amplifier, Amplifier Gain, Frequency Response, Slew Rate, Output Voltage & Noise in Output Voltage, Instrumentation Amplifier - Sensing & Measurement, Signal Conditioning.

Active Filters & Design Procedure**:** Butterworth Low pass, High pass Butterworth, Band pass, Notch Filter & Examples, Frequency Doubling, Phase Angle Detection, Analog Divider

DAC-08, AD670, Amplitude Modulation Circuits, Amplitude Demodulation Circuits & Frequency Shifting, Lock in Amplifier, Phase-Locked Loop, Sample & Hold Unit, IC & Applications**:** LM380, NE/SE566 & ICL8038.

BOOKS:
1. *Operational Amplifiers and Linear Integrated Circuits,* Robert F. Coughlin & Frederick F. Driscoll, Pearson Education Asia.

2. *Op-Amps and Linear Integrated Circuits,* Ramakant A. Gaykwad, Prentice Hall of India Private Limited.

3. *Introduction to Instrumentation and Control,* A. K. Ghosh, Prentice Hall of India Private Limited.

4. *Transducers and Instrumentation,* D. V. S. Murty, Prentice Hall of India Private Limited.

5. *The Art of Electronics,* Paul Horowitz & Winfield Hill, Cambridge University Press.

M. Sc. (INSTRUMENTATION & CONTROL) –   FIRST SEMESTER
PS01EINC22: NETWORK ANALYSIS
Total Marks:100 (External – 70, Internal – 30)

Transient Response of RC, RL, RLC Circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using Laplace transform

Terminal pairs or Ports, Network functions for one-port and two-port networks, poles and zeros of Network functions, Restrictions on pole and zero Locations for driving point functions and transfer functions, Time domain behavior from the pole-zero plot

Relationship of two-port variables, short-circuit Admittance parameters, open circuit impedance, parameters, Transmission parameters, hybrid parameters, relationships between parameter sets, Inter-connection of two port networks

Principles of network topology, graph matrices, network analysis using graph theory, Positive real functions, synthesis of one port and two port networks, elementary ideas of Active networks

BOOKS:
1. *Network Analysis & Synthesis,* Umesh Sinha, StyaPrakash Publication

2. *Network Analysis & Synthesis,* F. F. Kuo, John Wiley & Sons, Inc.

3. Network Analysis, Van Valkemberg, Prentice Hall of India Private Limited.

4. Network Analysis Architecture & Design, Mc Cave, Morgan.