SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
SEMESTER – 4 : Core I – Paper I (Theory)
INSTRUMENTATION COURSE CODE : US04CINS21 (4 Credit Course)
COURSE TITLE : Signal Conditioning and Data Acquisition System
(According to new course structure – Effective from June 2019)

Unit 1: Qualities of Measurements

Introduction, Performance characteristics, Static characteristics, Error in measurement, Types of static error, Sources of error, Dynamic characteristics, Statistical analysis, Standard, Electrical standards, Atomic frequency and time standards, Graphical representation of measurements as a distribution, Numerical

Unit 2: Signal Conditioning

Introduction, Operational amplifier (Op-Amp), Non-inverting Op-Amp, Inverting Op-Amp, Integrator using Op-Amp, Differentiator using Op-Amp, Summing amplifier, Comparator, Instrumentation amplifier, Instrumentation system, Instrumentation amplifier using transducer bridge, Temperature indicators using thermistor, Light intensity meter, Analog weight scale, Chopped and modulated DC amplifier

Unit 3: Filters

Fundamental theorems of filters, Passive filters, Types of filters, Basic low pass filter, Basic high pass filter, Active filters, Classification of active filters, Butterworth filter, First order high pass Butterworth filter, Second order high pass Butterworth filter, Higher order filter, Band pass filter, Wide band pass filter, Narrow band pass filter, Band reject (Stop) filter, Wide band reject filter, Narrow band reject filter, All pass filter, Designing procedures for FLT-U2, Microprocessor based digital filter, Applications of digital filters

Unit 4: Data Acquisition System (DAS)

Introduction, Objective of DAS, Signal conditioning of the inputs, Ratiometric conversions, Logarithm compression, Single channel DAS, Analog - to - digital converters (A/D), Pre - amplification and filtering, Multichannel DAS, Multichannel analog multiplexed system, Multiplexing the outputs of sample/hold, Multiplexing after A/D conversion, Multiplexing low level data, Computer based DAS, Digital - to - analog (D/A) and Analog - to - digital (A/D) converters, Data logger

Text Books :

1. Electronic Instrumentation by H. S. Kalsi
2. Instrumentation measurement and analysis by Nakra and Chaudhri
3. Electronic instrumentation and measurement techniques by Helfric and Copper

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SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
SEMESTER – 4 : Core I – Paper II (Theory)
INSTRUMENTATION COURSE CODE : US04CINS22 (4 Credit Course)
COURSE TITLE : Electronic Instrumentation and Fibre Optics
(According to new course structure – Effective from June 2019)

Unit -1 : Instrument Calibration

Introduction: Comparision Methods: DC Voltmeter Calibration, Deflection Instrument Calibration, DC Ammeter calibration AC Instrument Calibration, Ohmmeter Calibration, Watt meter Calibration. Digital Multimeter as Standard Instrument, Calibration Instruments: Precision DC Voltage Source, Voltage Calibrator, Potentiometers: Basic Potentiometer, Potentiometer with switched resistors, Calibration methods: DC Ammeter Calibration, DC Voltmeter Calibration

Unit -2 : Loggers and recorders

Introduction, Difference between recorder and logger, Strip Chart Recorder: PMMC, Galvanometer type, PMMC writing mechanism, Dynamic behaviour of Galvanometric Recorders, Potentiometric/Servo/Null Balancing recorders, Ultrasonic Pen position sensing typical Strip chart recorder plot, chart speed, types of chart and accessories, multipoint recorders, X - Y recorders and is applications, Digital X-Y Plotters, Magnetic recorders, Basic components of tape recorder, Magnetic recording.

Unit - 3 : Signal Analyzers

Introduction, Distortion, Distortion measuring Instruments, Spectral Analyzer, Types of Spectral Analyzer, FET Analyzer, Vector analyzer ,Digitizing Oscilloscope, Logic Analyzer: Oscilloscope/logic Analyzer, Types of Logic Analyzer, Logic timing Analyzer, Logic State Analyzer, Block diagram of Logic Analyzer, Interfacing target system, selection of logic Analyzer.

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Unit - 4 : Fiber Optics

Advantages/Disadvantages, Applications, Ray theory transmission, Total Internal Reflection, Modes of Propagation, Fibre Specifications, Numerical problems, Types of Fibers: Step index, graded index, multi-mode & single mode, Preparation and material systems of optical fibers, optical fiber cables, numerical problems
Applications: Optical Communications system basics, current developments, fiber optic sensors, Attenuation in fiber optics: introduction, intrinsic attenuation, extrinsic attenuation, numerical problems

Text Books:

1. Electronic Instrumentation and Measurements – David Bell
2. Electronic Instrumentation and Instrumentation Technology by M.M.S.Anand
3. Lasers and Optical Fiber Communnication by P.Sarah

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SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
SEMESTER – 4 : Core I – Paper I (Practicals)
INSTRUMENTATION COURSE CODE : US04CINS23 (2 Credit 4 hours)
COURSE TITLE : INSTRUMENTATION PRACTICALS
(According to new course structure – Effective from June 2019)

1. Introduction to electronic components and equipments
2. Study of Operational Amplifier (Op-Amp) - Inverting Summing Amplifier
3. Study of Operational Amplifier (Op-Amp) - Non Inverting Summing Amplifier
4. Study of Operational Amplifier (Op-Amp) - Difference Amplifier
5. Study of Wein Bridge oscillator
6. Frequency determination using wein bridge
7. Study of Colpitt's Oscillator
8. Study of Feedback Amplifier
9. Study of Tuned Voltage Amplifier
10. Direct Coupled Amplifier
11. Voltage Multiplier
12. Study of Random Access Memory (7489)
13. Study of Arithmetic and Logic Unit (ALU - 74181)

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SARDAR PATEL UNIVERSITY
SYLLABUS FOR INSTRUMENTATION
SEMESTER – 4 : Core I – Paper II (Practicals)
INSTRUMENTATION COURSE CODE : U[illegible](2 Credit 4 hours)
COURSE TITLE : INSTRUMENTATION PRACTICALS
(According to new course structure – Effective from June 2019)

1. Introduction to electronic components and equipments
2. Study of Analog to Digital Converter (R-2R Ladder)
3. Study of Analog to Digital Converter (Weighted Resistor type)
4. Study of Digital to Analog Converter (SAR Type)
5. Study of Digital to Analog Converter (Counting Type)
6. Shift Register
7. Ring Counter
8. Logicom - III
9. BCD Counter
10. Half Adder
11. Full Adder
12. Half Subtractor
13. Full Subtractor

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