

SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Biomedical Science)
Semester: II
Syllabus with Effect from: June - 2014

Paper Code: PT02CBMC02	Total Credit: 4
Title of Paper: Instrumentation	

Unit	Description in Detail	Weightage (%)
I	<p>Characteristics of Instruments Generalized scheme of a measurement systems, basic methods of measurements, Errors in measurements, types of errors. Reliability of measurement systems, failure rate, reliability improvement, availability, redundancy, choice of components, and materials. Different types of noises in measurements and its suppression methods. Static characteristics of instruments – accuracy, precision, sensitivity, linearity, resolution, hysteresis, threshold, input impedance, loading effect – generalized mathematical model of measurement systems – dynamic characteristics – Modeling of Transducers – operational transfer function – zero, first and second order instruments – impulse, step, ramp and frequency response of the above instruments-techniques for dynamic compensation.</p>	25%
II	<p>Transducers Classification and Basic requirements of Transducers, selection of transducers, Principles of displacement Transduction, circuit based on transduction. Temperature transducer, displacement transducer, pressure transducers and catheter tip transducers., Strain: Factors affecting strain measurements, operation of resistance gauge, types of Characteristics devices Piezoelectric: Phenomenon Force, strain, torque, pressure & acceleration Transducer Hall Effect transducers & applications, photoconductive and photo-emissive transducers, Ionization displacement transducer, nuclear radiation transducer, radioactive transducers, digital transducers.</p>	25%
III	<p>Process Measurements & Sensors Pressure: Diaphragms, Elastic elements, Transduction Methods, Solid state, thin film, Calibration, Platinum type sensors, Thermistors, Thermocouples, IC Temperature Sensors, Radiation measurement, optical pyrometers, calibration, Force: Load cell and its types, Torque measurement and its types.</p>	25%
IV	<p>Optoelectronics Optical sources: LED- Introduction, Structures & characteristics, LASER- Basic concepts, optical Emission from semiconductor & non semiconductor LASERS. Optical detectors: Introduction, detection principles, absorption, quantum efficiency, responsivity, Long wavelength cut off, phototransistors and photoconductive detectors. Optical fiber, Ray theory, single mode fibers, attenuation, losses, dispersion, polarization, Refractive Index profile, cut off wavelength measurement etc.. advantages/ disadvantages and various applications.</p>	25%



Basic Text & Reference Books:-

- Instrumentation devices & Systems, C. S. Rangan, G. R. Sarma & S. V. Mani, TATA McGraw Hill Publishing Company Limited.
- Transducers and Instrumentation, D. V. S. Murty, Prentice Hall of India Pvt. Ltd.
- Instrumentation Measurement and Analysis, B. C. Nakra & K. K. Chaudhry, TATA McGraw Hill Publishing Company Limited.
- Principles of Industrial Instrumentation, D. Patranabis, TATA McGraw Hill Publishing Company Limited.
- Electronic Instrumentation, Kalsi H. S., TATA McGraw Hill Education
- Electronic Instrumentation and Instrumentation Technology, M. M. S. Anand, Prentice Hall of India, New Delhi
- Optical fiber communications-Principles and Practice, John M. Senior, Pearson Education
- Semiconductor Optoelectronic Devices, Pallabh Bhattacharya, Prentice Hall of India Pvt. Ltd.
- Advanced Electronic Communication System. Wayne Tomasi, Prentice Hall of India Pvt. Ltd.

