

**D R. BABASAHEB AMBEDKAR
MARATHWADA UNIVERSITY,
AURANGABAD.**



Syllabus of

B.Sc. III YEAR

Instrumentation Practice

Semester-V & VI

[Effective from 2011-12 & onwards]

Semester V

Paper XVII Instrumentation IX

Maximum Marks : 50

- 1. Instruments and their representation :** Introduction, Typical applications of Instrument systems, measurement of system parameters, control of certain process or operation, simulation of system conditions, verification of phenomena or scientific studies, functional elements of a measurement system, description of functional elements of instruments
- 2. Transducers :** Typical examples of transducer element, characteristics of transducer element, Bourdon tube pressure gauge, Bourdon pressure gauge with electrical readout, Electrodynamic displacement measuring instrument, Types of Instruments, Deflection and null types, Analog and digital types, Self generating and power operated types, Microprocessor based instrumentation, Advantages and disadvantages of computer based instrumentation systems, standards of measurements, calibration.
- 3. Static performance characteristics of instruments:** Types of errors, Systematic or cumulative errors, accidental or random errors, miscellaneous or gross type errors, Types of uncertainties, external estimate of uncertainty, Internal estimate of uncertainty, Static performance parameters, Accuracy, Precision, Accuracy versus precision, Specification of instrument static characteristics, selection of the instruments.

Text Book: Instrumentation Measurement and Analysis by B.C.Nakra, K.K. Chaudhari, TMH New Delhi.

Semester V

Paper XVIII Instrumentation X

Maximum Marks : 50

1. **Bio-medical system** : Bio-electric potentials, Resting potential, Action potential, propagation of action potential, Electrocardiogram, Electroencephalogram, Physiological effects due to electric currents, leakage currents, Physiological effects due to magnetic fields, Safety codes for electro-medical equipments.
2. **Physiological Transducers**: Transducers in general, Active transducers, Passive transducers, Pressure transducers, Catheter tip pressure transducers, Temperature transducers, Pulse sensors, Respiration sensors.
3. **Analytical Instruments I** : pH meter, pH measurement, Measurement of blood $p\text{CO}_2$, Blood $p\text{O}_2$ measurement, Catheter tip electrode for measurement of $p\text{O}_2$ and $p\text{CO}_2$, Complete blood gas analyzer, Photo-electric calorimeter, Calorimeter.

Text Books:

1. Bio-medical Electronics and Instrumentation by Prof. S.K. Venkata Ram, Galgotia Publications.
2. Handbook of Biomedical Instrumentation by R.S.Khandpur, TMH, New Delhi

Semester V

Paper XV : Practical Paper IX

A. Experiments	20 Marks
1. Resistance as displacement transducer	
2. Thermistor as temperature transducer	
3. Study of LVDT	
4. Measurement of divergence of Laser beam	
B. Project	20 Marks
C. Industrial Visit Report I	10 Marks

Paper XVI : Practical Paper X

A. Experiments	20 Marks
1. Characteristics of Photo-diode.	
2. Measurement of blood pressure variations with time	
3. Graphical presentation of BP variation using EXCEL	
4. Study of Digital to analog converter	
B. Project	30 Marks

Semester VI

Paper XXI Instrumentation XI Maximum Marks : 50

- 1. Special Transducer Elements:** Analog Transducers: Electromechanical transducers, Potentiometric resistance type transducer, Inductive type transducers, Capacitive type transducers, Ionisation transducers, Opto-electrical transducers, Photo-emissive transducers, photo-conductive transducer, photovoltaic transducer, opto-electrical frequency domain transducer, vibrating string transducer, binary codes, digital encoders
- 2. Intermediate elements:** Amplifiers, mechanical amplifying element, optical amplifying element, electrical amplifying elements, Filters, A/D Converters, D/A Converters , Data transmission elements, electrical type data transmission elements, position type data transmission elements, Pneumatic type transmission elements, radio frequency transmission system.
- 3. Indicating, Recording and Display elements:** Digital Voltmeters, Cathode Ray Oscilloscopes, Galvanometric recorders, servo type potentiometric recorders, Magnetic tape recorders, data acquisition systems, data display, data storage.

Text Book: Instrumentation Measurement and Analysis by B.C.Nakra, K.K. Chaudhari, TMH New Delhi.

Semester VI

Paper XXII Instrumentation XII

Maximum Marks : 50

- 1. Measuring and Monitoring systems :** Electrocardiograph (ECG), Block diagram of Electrocardiograph, ECG Recorder principles, Computer aided ECG analysis, Electroencephalograph (EEG), Electromyograph (EMG), Phonocardiogram Stethoscope (PCG), Electroretinograph (ERG), Electrooculograph (EOG), Audiometer, Ballisto- Cardiograph (BCG), BP measuring Instrument, Blood Flow meter, Cardiac Monitors.
- 2. Biological Stimulators and Controllers :** Electromyography, Electroneurography (ENG), Muscle and nerve stimulators, Transcutaneous Electrical Nerve Stimulation (TENS), Thermography, Defibrillators, Heart-Lung machine, Diathermy, Pacemakers, Blood pumps.
- 3. Analytical Instruments II :** Blood cell counter, Laser based blood cell counting, Dark field method of blood cell counting , Mass Spectrometer, Scintillation Counter, Automation of chemical tests, Oximeters.

Text Books:

- 1. Bio-medical Electronics and Instrumentation** by Prof. S.K. Venkata Ram, Galgotia Publications.
- 2. Handbook of Biomedical Instrumentation** by R.S.Khandpur, TMH, New Delhi

Semester VI

Paper XXIII : Practical Paper XI

- A. Experiments** **20 Marks**
1. Measurement of Skin Resistance by GSR meter
 2. Measurement of respiration Rate
 3. Determining random sugar contents in blood using digital glucometer
 4. Measurement of RBC's
- B. Project** **20 Marks**
- C. Industrial Visit Report II** **10 Marks**

Paper XIV : Practical Paper XII

- A. Experiments** **20 Marks**
1. Study of Analog to digital converter
 2. Measurement of BP by mercury manometer
 3. Study of the variation of Oxygen contents of blood using Oximeter
 4. Measurement of WBC's
- B. Project** **30 Marks**