

Introduction to Biomedical Engineering

Introduction to Biomedical Engineering Technician Tools & Techniques

Technician Tools and Techniques

Designed as a quick-reference guide for students and entry-level technicians.

1. Core Areas of Work

Area	Typical Tasks	Why It Matters
Equipment Maintenance	Preventive checks, calibration, repairs	Guarantees reliable patient care and compliance with regulatory standards
Instrumentation & Testing	Signal acquisition, performance verification	Ensures diagnostic accuracy and safety
Safety & Compliance	Hazard analysis, documentation, sterilization	Protects patients, staff, and meets FDA/ISO requirements
Data Management	Logbooks, software updates, network integration	Enables traceability and supports clinical decision-making

2. Essential Hand Tools

Tool	Primary Use	Key Features / Tips
Precision Screwdriver Set (Phillips, flat, Torx)	Opening/adjusting device housings	Magnetic tips, ergonomic handles, size-coded
Needle-nose Pliers	Bending, gripping small components	Insulated handles for live work
Hex/Allen Wrench Set (1–6 mm)	Fastening internal brackets, adjusting mounts	Chrome-vanadium steel for torque
Tweezers (anti-static)	Handling ICs, sensors, connectors	Fine tip, rubber grip
Digital Calipers (0–150 mm)	Measuring component dimensions	±0.01 mm accuracy, lockable jaw
Multimeter (True-RMS)	Voltage, current, resistance checks	Auto-range, continuity beep, safety CAT-III rating
Oscilloscope (Portable)	Waveform inspection of biosignals	100 MHz bandwidth, USB data export

Introduction to Biomedical Engineering

Tool	Primary Use	Key Features / Tips
Battery Analyzer	Capacity, internal resistance testing	Programmable discharge curves
Torque Wrench (0-10 Nm)	Securing screws to manufacturer spec	Click or digital readout

3. Specialized Instrumentation

Instrument	Typical Applications	Calibration Frequency
Electrocardiograph (ECG) Analyzer	Verifying lead integrity, signal gain	Annually (or per OEM)
Pulse Oximeter Simulator	Testing SpO ₂ sensors, alarm thresholds	Every 6 months
Infusion Pump Tester	Flow rate verification, alarm checks	Quarterly
Defibrillator Analyzer	Energy output, waveform shape, safety checks	Every 6 months
Ventilator Test Lung	Compliance & resistance simulation	Annually
Ultrasound Phantom	Imaging resolution, depth calibration	Every 12 months
Sterilizer Biological Indicator (BI) Reader	Verifying autoclave cycles	Per load or weekly, per policy

4. Common Measurement Techniques

Technique	What It Measures	Typical Equipment	Key Procedure Steps
Voltage/Current Verification	Power supply integrity, battery output	Multimeter, bench power supply	1. Isolate circuit 2. Measure open-circuit voltage 3. Load test if required
Signal Integrity (Noise) Test	Baseline noise, interference	Oscilloscope, spectrum analyzer	1. Ground reference 2. Capture waveform 3. Compare to spec (e.g., < 1 µV RMS)

Introduction to Biomedical Engineering

Technique	What It Measures	Typical Equipment	Key Procedure Steps
Frequency Response	Bandwidth of sensors/amplifiers	Function generator + oscilloscope	1. Sweep frequency 2. Record amplitude 3. Plot Bode