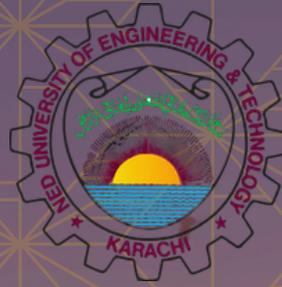


# EQUIPMENT CATALOGUE



**NED University of Engineering & Technology**  
**Faculty of Electrical and Computer Engineering**  
**Department of Biomedical Engineering**

**A Comprehensive Compendium of Testing Equipment**  
*2026 Edition*



# Message from the Leadership



At NED University, we believe that the greatest scientific and engineering challenges are solved not in isolation, but through collaboration and with shared use of knowledge and tools. It is with this core principle in mind that we proudly start this new chapter: the commercial opening of our advanced testing and characterisation facilities.

This initiative is a strategic step to maximise the impact of our research infrastructure. These state-of-the-art equipment, housed within the Department of Biomedical Engineering, represent a significant investment in the future. By transforming them into a shared resource, we ensure they not only advance internal research but also empower the broader academic and innovation ecosystem.

We are excited about the potential for interdisciplinary breakthroughs.

To the faculty, students, and researchers at NED University and our partner institutions, we extend a warm and sincere invitation. This is more than a service; it is a partnership. Our dedicated team of experts is ready to support your work, help you unravel complex problems, and contribute to your success.

We are confident that this platform will become a cornerstone for high-quality research and innovation. Welcome to a new chapter of collaboration. Let's discover together.

With best wishes,

**Prof. Dr Eraj Humayun Mirza**

**Chairperson, Department of Biomedical Engineering  
NED University of Engineering & Technology**

**Prof. Dr. Saad Ahmed Qazi**

**Dean Electrical & Computer Engineering (ECE)  
NED University of Engineering & Technology**

**Prof. Dr. Noman Ahmed**

**Pro-Vice Chancellor**

**NED University of Engineering & Technology**

**Prof. Dr Muhammad Tufail**

**Vice Chancellor**

**NED University of Engineering & Technology**



# **BMD PROFILE**

The Department of Biomedical Engineering was established in 2004. The department has successfully passed out over fifteen batches, fulfilling the university's and department's vision. To further support the on-going research, the department has developed advanced research facilities equipped with state-of-the-art instruments for material testing, fabrication, and other biomedical and bio-signal experimentation.

## **LAB FACILITIES PORTFOLIO**

The department of Biomedical Engineering is equipped with state-of-the-art equipment to cater for the evaluation and analysis of biomaterials as well as brain functioning analysis.

BMD also has a legacy of holding workshops and seminars on contemporary topics of interest in the subdisciplines of Biomedical engineering for academia and industry professionals. The details about lab testing facilities available at our department can be found in the catalogue. This lab catalogue is an effort to outreach the relevant institutes and industry so that strong linkages between industry and academia can be established.

Our research facilities are maintained by trained in-house personnel with specialized expertise in equipment operation, ensuring reliable and high-quality support for all users.

It is my privilege to lead and share the testing facilities available at the Department of Biomedical Engineering

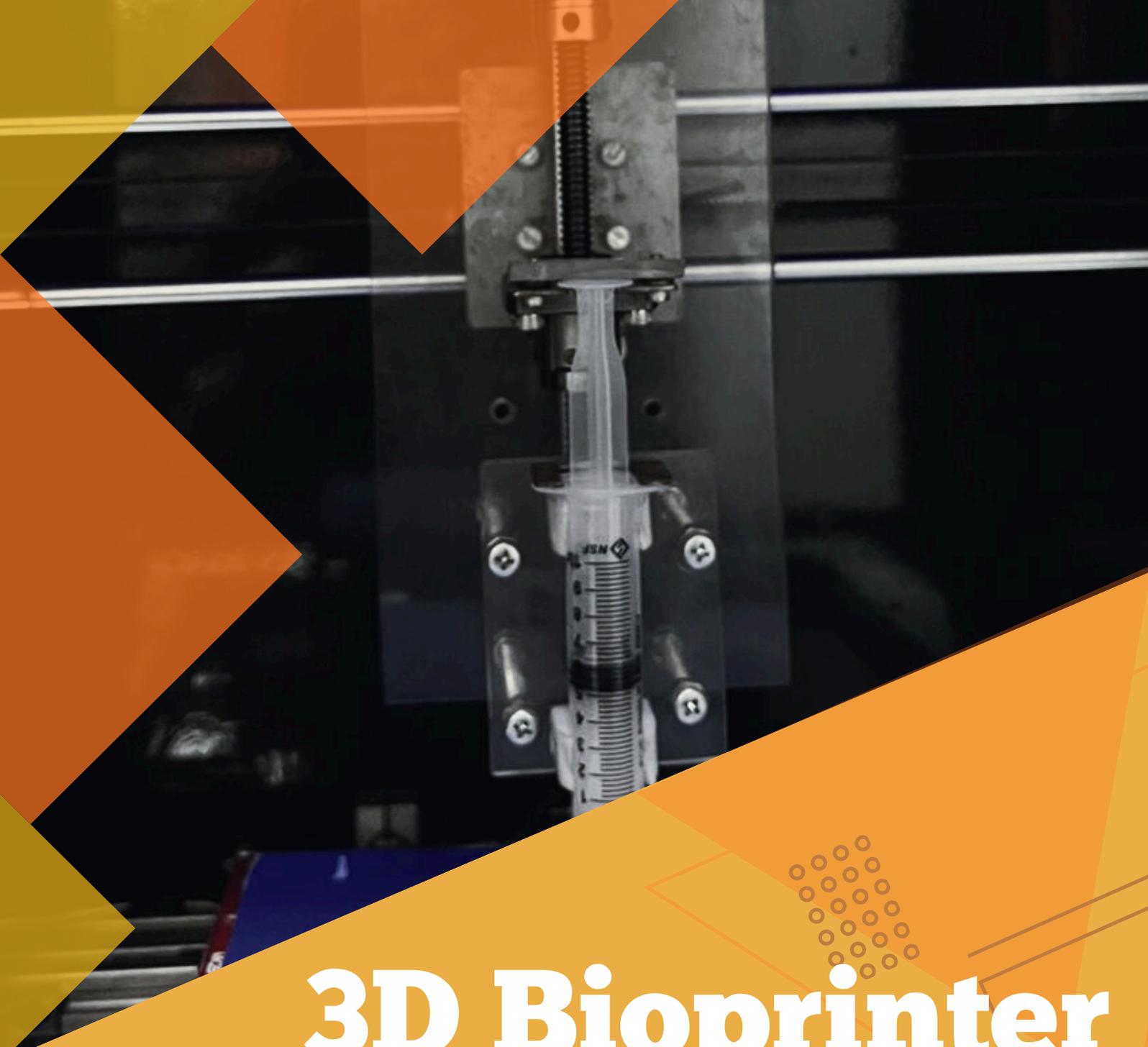
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# 3D Bioprinter INTRODUCTION

*A 3D bioprinter is a specialized additive manufacturing device that uses living cells, biomaterials, and growth factors, called bioinks, to create 3D biological structures layer by layer.*

# WORKING PRINCIPLE

3D bioprinting is a computer-assisted technology that involves the rapid printing of biofunctional materials and their supporting components in a layer-by-layer manner on a substrate or a tissue culture dish to create complex living tissues and organs having the desired 3D cellular architecture and functions. 3D bioprinting has become a popular technique in tissue fabrication, enabling the production of multifaceted biomimetic tissue with complex geometries using customized structures and autologous cells. 3D bioprinting uses liquid cell-based bioink that is imprinted directly on the substrate and employs different approaches to achieve the 3D tissue constructs

## APPLICATIONS

Engineered for the forefront of biomedical innovation, this bioprinter enables high-precision fabrication of complex, functional 3D structures. Its resolution, down to five micrometers, and integrated sterilization systems make it the ideal platform for advanced applications in regenerative medicine, including the creation of patient-specific tissue scaffolds, organ-on-a-chip models for drug screening, and the direct bioprinting of cell-laden constructs. From pioneering tissue engineering research to the development of sophisticated drug delivery systems and microfluidic devices, this equipment provides the critical capability to transform digital designs into biological reality.

## SPECIFICATIONS

<b>Printing Mechanism</b>	<b>Inkjet drop-on-demand</b>
<b>Resolution</b>	<b>High (micron level)</b>
<b>Material Variety</b>	<b>Supports bioinks, conductive inks, hydrogels, etc.</b>
<b>Sterilization</b>	<b>UV sterilization</b>



# Universal Testing Machine INTRODUCTION

*A universal testing machine (UTM) is an electromechanical device that tests the mechanical properties of materials and components by applying controlled forces, such as tension, compression, and bending.*

# WORKING PRINCIPLE

A UTM machine operates by applying a controlled force to a test specimen while measuring its response to stress and strain. This process provides critical data on tensile strength, compression resistance, elasticity and failure point. It helps to evaluate a material's mechanical behaviour with precision. This information is essential for applications in material development, quality control, and failure analysis. The machine typically consists of a rigid frame, a load cell for measuring force, a crosshead that applies the load, and grips to secure the specimen.

## APPLICATIONS

Universal Testing Machine can be used in various areas such as metal and steel industry, plastic industry, automotive industry, solar industry, medical technology, glass industry, aviation and aerospace industry. It is applicable for wide range of material for tension, compression, bending, shearing and low cycle test. Suitable for metal, rubber, plastic, spring, textile, and components testing. It is widely used in the corresponding industries, research and development, test institutes and training centers etc.

## SPECIFICATIONS

<b>Maximum Load</b>	<b>2 kN</b>
<b>Load Range</b>	<b>2%~100% FS</b>
<b>Displacement Resolution</b>	<b>0.01mm</b>
<b>Test Speed</b>	<b>0.05~500mm/min</b>



# Contact Angle Analyser INTRODUCTION

*Contact Angle is a measurement that quantifies the wetting of a solid by a liquid. It is defined geometrically as the angle formed by a liquid at the three-phase boundary point where a liquid, gas, and solid intersect. The well-known Young Equation describes the balance at the three-phase contact of solid, liquid, and gas.*

# WORKING PRINCIPLE

Contact angle measuring instruments can record droplet images and automatically analyse droplet shape. Droplet shape is a function of liquid surface tension, gravity, and density and humidity differences between different liquid samples and the ambient medium.

On solid surfaces, droplet shape and contact angle also depend on the properties of the solid (such as surface free energy and morphology). The obtained images were analysed using the droplet profile fitting method to determine the contact angle and surface tension. The surface free energy of the material can be calculated by performing contact angle measurements using several liquids with known surface tensions.

## APPLICATIONS

Materials Science & Engineering

- Characterise new materials' wettability, adhesion, and stickiness.
- Identify surface treatments for plastics, metals, glass, and ceramics.

Coatings & Adhesives

- Evaluate adhesion and stability of bonding and coating processes.
- Check spreadability and effectiveness of paints, inks, and agricultural chemicals. In essence, contact angle analysis provides fundamental data on how liquids interact with solids, guiding the design and quality control of products.

## SPECIFICATIONS

<b>Method</b>	<b>Sessile drop</b>
<b>Camera Type</b>	<b>(Charge Coupled Device) CCD</b>
<b>Sample Stage</b>	<b>3-axis adjustable</b>
<b>Surface Analysis</b>	<b>Wettability and Surface Energy</b>



# Hardness

# Tester

# (Brinell, Rockwell & Vickers)

## **INTRODUCTION**

*It is a versatile, multi-functional hardness tester combining Brinell, Rockwell, and Vickers methods, featuring automatic loading, dwelling, and unloading for ease of use in labs for various metals and hardened layers, offering direct Rockwell readings and requiring manual measurement for Brinell/Vickers.*

# WORKING PRINCIPLE

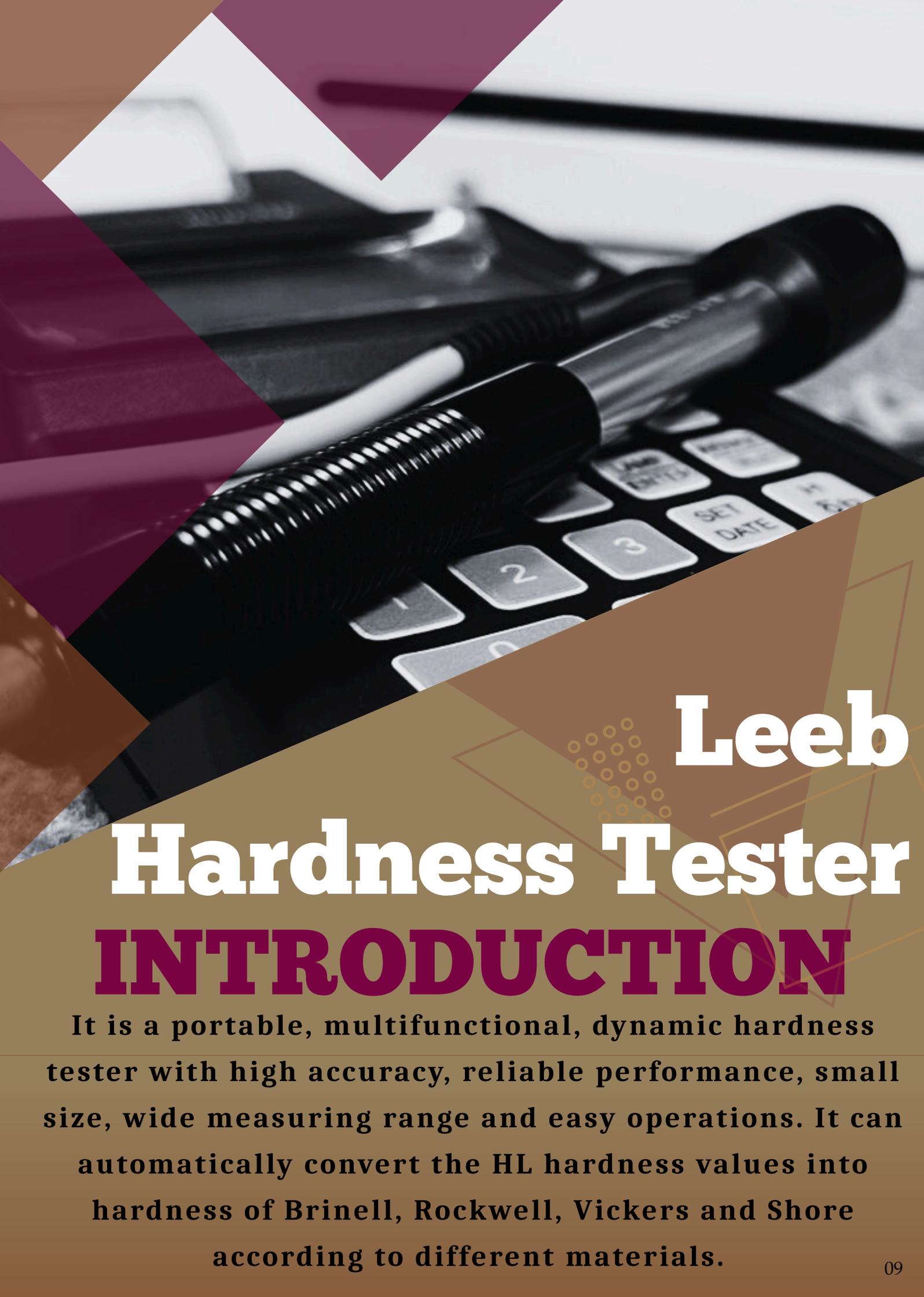
The hardness tester works on the principle of indentation hardness testing, using a standardized indenter (diamond or ball) to create an impression on a material under a specific load, then measuring the depth or size of that impression to determine hardness, automatically handling load application, dwell, and unloading for Brinell, Rockwell, and Vickers methods with high precision for various metals

## APPLICATIONS

- **Quality Assurance:** Confirming parts meet hardness specifications after manufacturing or treatment.
- **Material Selection:** Choosing appropriate materials for specific applications based on required hardness and durability.
- **Wear & Durability Analysis:** Studying material degradation, predicting service life, and optimizing components for resistance to abrasion or scratching.
- **Failure Analysis:** Investigating why materials or components failed in service by examining their hardness.
- **Research & Development:** Developing new materials and understanding material behavior under stress.

## SPECIFICATIONS

<b>Primary test force</b>	<b>98.07 N</b>
<b>Magnification</b>	<b>37.5 x, 75x</b>
<b>Rockwell Hardness range</b>	<b>20-67 (HRC), 30-100 (HRB), 70-85 (HRA)</b>
<b>Brinell Hardness range</b>	<b>4-450 (HB)</b>
<b>Vicker Hardness range</b>	<b>14-1000 (HV)</b>



# Leeb Hardness Tester INTRODUCTION

It is a portable, multifunctional, dynamic hardness tester with high accuracy, reliable performance, small size, wide measuring range and easy operations. It can automatically convert the HL hardness values into hardness of Brinell, Rockwell, Vickers and Shore according to different materials.

# WORKING PRINCIPLE

Leeb hardness tester is a dynamic method which works on the principle of energy measurement. During a hardness test, an impact body, equipped with tungsten carbide test ball, impacts under spring force against the test surface and then rebounds from the surface. Impact and rebound velocities are measured in a contactless manner. It is accomplished by the coil in the impact device and the permanent magnet built in the impact body. During the impact the magnet passes through the coil, impact the rebound movements induce electromotive force in the coil, the electromotive force is proportional to the velocities. The signals are checked and processed into Leeb hardness values.

## APPLICATIONS

- Hardness measurement of products for mass producing.
- Hardness measurement of heavy parts
- Hardness measurement of mould cavity.
- Hardness measurement of small space machinery
- Failure analysis of equipment
- Distinguishing metal materials.

## SPECIFICATIONS

<b>Measuring Accuracy</b>	<b>0.8%</b>
<b>Available Tests</b>	<b>HL, HRB, HRC, HB, HV, HSD</b>
<b>Output</b>	<b>On screen and Hardcopy</b>
<b>Working Temperature</b>	<b>0-40 °C</b>



# Metallurgical Microscope **INTRODUCTION**

*An inverted metallurgical microscope is for analysing opaque materials like metals and ceramics, allowing large or heavy samples to be placed directly on top for viewing microstructure, grain size, and defects using reflected light, making it ideal for quality control in manufacturing and materials science.*

# WORKING PRINCIPLE

An inverted metallurgical microscope works by shining light down from above the stage, through a condenser, onto the underside of a polished, opaque sample placed face-down, with objectives below the stage pointing up to capture the reflected light. This design allows observation of heavy, large, or unmounted materials (like metal parts) by letting gravity hold the surface flat against the stage, eliminating the need for slides and enabling easy analysis of grain structure and defects using reflected light, often with polarization filters.

## APPLICATIONS

- **Metallography:** Studying metal and alloy structures, grain boundaries, phases, and inclusions.
- **Quality Control:** Inspecting components in manufacturing for cracks, porosity, surface finish, and material integrity.
- **Failure Analysis:** Investigating fractures, corrosion, fatigue, and other failures in industrial parts.
- **Surface Coatings:** Evaluating the adhesion, thickness, and uniformity of coatings (electroplating, paints).
- **Materials Science Research:** Developing and analyzing new alloys, composites, ceramics, and polymers.

## SPECIFICATIONS

<b>Magnification</b>	<b>upto 100X</b>
<b>System</b>	<b>Dry and Oil based</b>
<b>Stage</b>	<b>X-Y mechanical adjustment</b>
<b>Lens Types</b>	<b>Plan achromatic, Achromatic, S-Plan achromatic</b>



# Mitsar NVX 52

## INTRODUCTION

*The Mitsar-EEG is intended for acquisition, storage, processing, displaying, and printing out of electroencephalographic and electrocardiographic signals. The EEG system refers to medical measuring instruments class. The EEG system is intended only for medical application and serves for recording and measuring of patient electrical brain activity.*

# WORKING PRINCIPLE

The system is used to measure and record the electrical activity of the patient's brain. Electroencephalographic and polygraph signals are obtained by placing electrodes and enter the multichannel voltage amplifier. The voltage amplifier amplifies the electrical signals up to the level coordinated to the analogue-digital convertor (ADC) range, and the signals come through analog filters. The amplified signals are reduced to common signal by means of the voltage switching unit. This signal is applied to ADC input which converts it to digital form.

## APPLICATIONS

- **Epilepsy and Seizure Monitoring:** It is a key component in long-term, synchronous video-EEG monitoring to classify, localize, and manage seizures. The software includes features for the automatic detection of spikes and spike-waves.
- **Diagnosis of Brain Diseases:** It helps in identifying brain tumors, damage from head injuries, inflammation of the brain (encephalopathy/encephalitis), and stroke.
- **Quantitative EEG (QEEG):** The data can be processed for quantitative analysis, which can help in supporting the diagnosis of neuropsychological disorders like ADHD, Alzheimer's, and schizophrenia by comparing patient data to normative databases.

## SPECIFICATIONS

<b>Channels</b>	<b>21</b>
<b>Bandwidth</b>	<b>0.16 – 70 Hz</b>
<b>Impedance check of electrodes</b>	<b>Yes</b>
<b>Input voltage range</b>	<b>from 10 to 5000 <math>\mu</math>V</b>



# Potentiostat Galvanostat INTRODUCTION

*Potentiostat / Galvanostat contains a digital function generator, data acquisition circuitry, a potentiostat and a galvanostat. With high performance in stability and accuracy with advanced hardware and well-functioned software, it is a comprehensive research platform for corrosion, batteries, electrochemical analysis, sensor, life science and environmental chemistry etc.*

# WORKING PRINCIPLE

A potentiostat works by controlling the voltage between a working electrode (WE) and a reference electrode (RE) while simultaneously measuring the resulting current (I) at the WE, using a counter electrode (CE) for current flow, all within a three-electrode electrochemical cell. It uses an operational amplifier and negative feedback to adjust the voltage on the CE, ensuring the potential difference between the WE and RE remains constant.

A galvanostat is an electronic instrument used in electrochemistry to maintain a constant current flowing through an electrochemical cell, regardless of changes in the cell's resistance, while measuring the resulting potential.

## APPLICATIONS

- **Battery Research:** Testing battery charge/discharge cycles, capacity, and longevity.
- **Corrosion Studies:** Understanding how materials corrode under specific current densities.
- **Electrodeposition:** Controlling the deposition of materials for coatings or nanoparticles.
- **Electrochemical Synthesis & Analysis:** Studying reaction kinetics and producing chemicals.

## SPECIFICATIONS

<b>Potential control range</b>	<b><math>\pm 10V</math></b>
<b>Current control range</b>	<b><math>\pm 2A</math></b>
<b>Potential resolution</b>	<b><math>10\mu V</math></b>
<b>Current resolution</b>	<b><math>1pA</math></b>



# **Tube Furnace** **INTRODUCTION**

*A tube furnace is an electric laboratory device with a cylindrical heating zone, designed for precise, uniform high-temperature processing of materials inside a sealed work tube, allowing for controlled atmospheres (vacuum, inert gas) for applications like chemical synthesis, annealing, purification, and materials testing*

# WORKING PRINCIPLE

A tube furnace works by using electrical resistance elements surrounding a central tube to generate intense, uniform heat via Joule heating, transferring it to samples inside. A control system precisely manages temperature, while an atmosphere system allows for inert gas or vacuum environments, creating a controlled, high-temperature zone for material processing, research, or chemical reactions. Electricity flows through heating elements, generating heat. Heat transfers via radiation and convection to the furnace tube. Materials inside the tube are heated uniformly within the controlled zone. Gas flows or vacuum is applied to create the desired reaction environment. The system maintains exact temperature and atmosphere for processes like annealing, sintering, or thin-film deposition.

## APPLICATIONS

- **Material Synthesis & Processing:** Creating advanced materials like nanoparticles, graphene, and ceramics with uniform structure, plus sintering metals and alloys.
- **Heat Treatment:** Annealing (improving ductility), hardening, tempering, and stress relieving metals and composites for enhanced properties.
- **Ceramics & Glass:** Drying, glazing, sintering, and annealing to create high-quality products.

## SPECIFICATIONS

<b>Maximum Temperature</b>	<b>1300 °C</b>
<b>Operating Temperature</b>	<b>1200 °C</b>
<b>Material Type</b>	<b>Metals and Ceramics</b>



# Air Drying Oven

## INTRODUCTION

*An air drying oven is a heated chamber that uses a fan to circulate hot air for efficiently removing moisture or solvents from materials, common in labs and industries for drying samples, heat treatment, and baking, featuring precise temperature controls*

# WORKING PRINCIPLE

An air drying oven works by using a heating element to warm air, which is then circulated throughout the chamber, causing moisture in items to evaporate; this moist air is then vented and replaced with drier air, continuing the process until the sample reaches the desired dryness, based on principles of heat transfer (convection/conduction) and evaporation.

# APPLICATIONS

- **Laboratories & Research:** Drying glassware, sterilizing instruments, preparing samples, constant temperature environments for experiments, and determining moisture content.
- **Pharmaceuticals:** Drying chemicals, stability testing of products, and sterilizing medical supplies.
- **Electronics:** Drying components, curing PCBs, burn-in testing, and removing moisture from electronic parts.
- **Materials & Manufacturing:** Aging/tempering plastics, metals, and composites; curing paints and coatings; testing heat resistance.

# SPECIFICATIONS

<b>Maximum Temperature</b>	<b>300 °C</b>
<b>Chamber size (mm)</b>	<b>420*350*350</b>
<b>Voltage</b>	<b>220 V</b>

**BIOBASE**

Ultrasonic Cleaner  
DSR 02  
Biochemistry Lab

DIGITAL ULTRASONIC CLEANER

58.88

Set °C Actual °C ON

38.98

ON Minute Second

ADMONIT



TEMP+



TEMP-



ON

# Ultrasonic Bath

## INTRODUCTION

*An ultrasonic bath, or cleaner, uses high-frequency sound waves in a liquid to create microscopic, imploding bubbles that gently but powerfully dislodge dirt, contaminants, and residues from immersed objects, reaching complex shapes, blind holes, and delicate parts without abrasive scrubbing.*

# WORKING PRINCIPLE

An ultrasonic bath cleans using high-frequency sound waves that create millions of microscopic, energetic bubbles in a cleaning liquid, a process called cavitation, which vigorously scrubs surfaces as these bubbles repeatedly form and implode, dislodging dirt, grease, and contaminants even from intricate parts. Transducers convert electrical energy into these high-frequency vibrations, transmitting them into the liquid, causing rapid pressure changes that generate and collapse the bubbles, lifting dirt off objects.

## APPLICATIONS

- Glassware cleaning Removes chemical residues and contaminants from beakers, flasks, pipettes.
- Degassing solutions, dispersing nanoparticles, or lysing cells for DNA extraction.
- Eliminates trapped air in solvents and reagents before chromatography or spectroscopy.
- Delicate tools and metal components without abrasion.
- Medical & Dental Applications
- Scalpels, forceps, dental tools are cleaned of blood, tissue, and other bio-residues.
- PCB (Printed Circuit Board) cleaning – Removes solder flux, dust, and other contaminants safely.

## SPECIFICATIONS

<b>Capacity</b>	<b>5 L</b>
<b>Frequency</b>	<b>40KHz</b>
<b>Temperature</b>	<b>0-80 °C</b>
<b>Timer</b>	<b>0-30 min</b>



# Electro- deposition

## INTRODUCTION

*An electrochemical setup for coating, commonly known as electrodeposition or electroplating, involves using an external power source to drive a reduction-oxidation (redox) reaction, which deposits a material (metal, polymer, or composite) onto a conducting substrate. This process is highly controllable, providing uniform coatings with excellent adhesion.*

# WORKING PRINCIPLE

A typical setup includes the following elements, often assembled in a 2-electrode or 3-electrode configuration, Working Electrode (WE), the substrate or part to be coated (e.g., metal, conductive-coated plastic). It is connected as the cathode in electroplating. Counter Electrode (CE), often made of an inert material (platinum, graphite) or the coating material itself. Reference Electrode (RE), (Used in 3-electrode systems) Such as Ag/AgCl used to control the exact potential applied to the WE. Electrolytic Cell/Bath: A container, often glass, holding the electrolyte solution (e.g., metal salts in water). Power Source (Potentiostat/Galvanostat), a Direct Current (DC) supply that drives the deposition. A 3-electrode system is used for precise control over coating parameters. Auxiliary Equipment, Stirrer (magnetic), heater (thermostat), and gas purger (for oxygen removal).

## APPLICATIONS

- **Corrosion Resistance:** Applying protective coatings to steels or magnesium alloys, such as Ni-GO-TiO<sub>2</sub> nanocomposites or epoxy layers.
- **Functional/Decorative:** Applying nickel, copper, or gold plating.
- **Electronics:** Coating electronic components or creating conductive tracks.

## SPECIFICATIONS

<b>Voltage</b>	<b>600 V</b>
<b>Current</b>	<b>2.6 A</b>
<b>Control Modes</b>	<b>Constant Voltage (CV), Constant Current (CC)</b>
<b>Protection</b>	<b>Over-Voltage Protection (OVP) &amp; Over-Current Protection (OCP) levels.</b>

# PRICE LIST FOR TESTS

S. No.	Characterization Test	*Rates per Sample/Cycle+ (PKR)
1	Qualitative EEG signal mapping	3000
2	Task based QEEG analysis	7000
3	Tensile Strength test	1000
4	Compressive Strength test	1000
5	Material Hardness test	1000
6	Wettability test (Hydrophobic/ Hydrophilic)	1000
7	Surface energy test	1000
8	Metallic microscopy	1000
7	Plasma Electrolyte Oxidation Coatings	4000
8	Electrophoretic Deposition Coatings	4000
9	Ultrasonic Bath+	700
10	Autoclave & Sterilization+	700
11	Tube Furnace+	3000
12	Cyclic Voltammetry	3000
13	Linear Sweep Voltammetry	3000
14	Electrochemical Impedance Spectroscopy	3000
15	Polymer Swelling Analysis	700
16	Polymer Degradation Analysis	700
17	Polymer Moisture Retention Analysis	700
19	3D printed scaffolds+	5000

\* 20% discount will be given to students of NED University of Engineering and Technology upon approval from the Chairperson of the Department of Biomedical Engineering

+ rates given are per cycle/per run



# BME

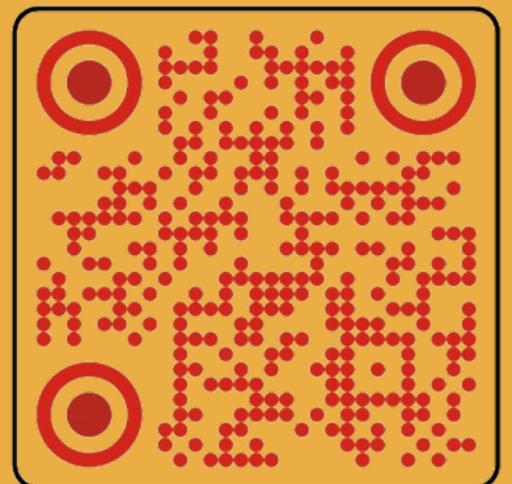
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