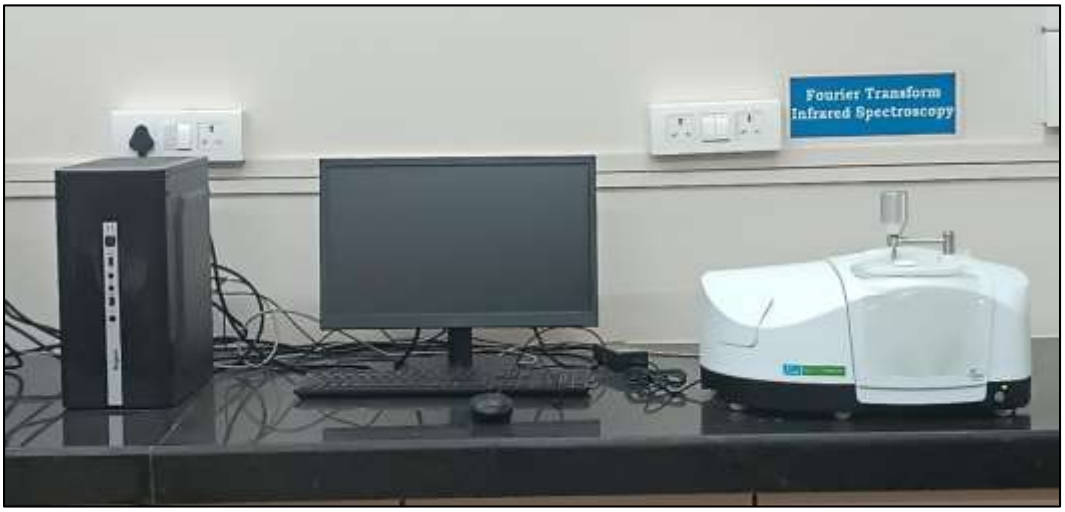
Instruments in Central Research Facility

1. Fourier Transform Infrared Spectroscopy (FTIR)

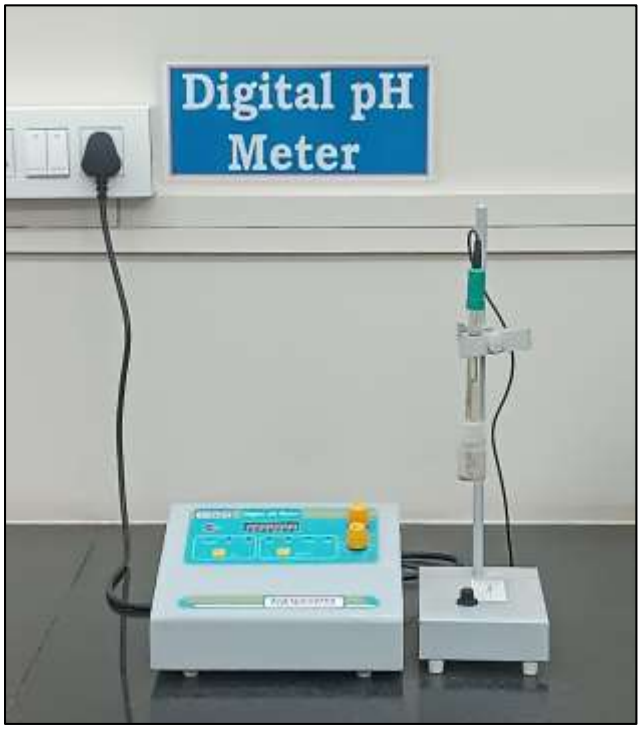
Fourier Transform Infrared Spectroscopy (FTIR) is a powerful analytical technique used to identify and analyze the chemical composition of a sample. In FTIR, a beam of infrared radiation is passed through the sample, and the molecules in the sample absorb some of the infrared radiation. The remaining radiation is then detected and analyzed to generate a spectrum, which shows the characteristic absorption pattern of the sample. Each chemical bond in a molecule absorbs infrared radiation at a unique frequency, so FTIR can be used to identify the functional groups and chemical bonds present in a sample. FTIR has many applications in various fields, such as in analyzing chemical compounds in food and beverages, such as detecting adulterants, preservatives, and contaminants; Quality control and analysis of pharmaceutical products, including raw materials, intermediates, and finished products; Identification of unknown organic and inorganic compounds in environmental and forensic samples; Analysis of biological samples, including proteins, nucleic acids, and carbohydrates, for drug discovery and disease diagnosis; Analysis of oils and fuels, including monitoring fuel quality and detecting contaminants; Monitoring chemical reactions and kinetics in real-time; Quantitative analysis of mixtures and concentrations of compounds; Analysis of gas phase molecules and determining molecular concentrations in the atmosphere.



Name of instrument: PerkinElmer L160000A Spectrum two FT-IR System

2. Digital pH meter

A pH meter is a scientific instrument used to measure the acidity or alkalinity (pH) of a solution. It consists of a sensitive glass electrode and a reference electrode, both immersed in the solution being measured. The glass electrode is made of a special type of glass that is sensitive to hydrogen ions in the solution. When the electrode is immersed in a solution, the hydrogen ions interact with the glass, creating a voltage difference that is measured by the pH meter. The reference electrode, usually a silver/silver chloride electrode or a Calomel electrode, is used as a reference point to determine the pH value of the solution. pH meters are widely used in many fields, including chemistry, biology, agriculture, environmental science, and food and beverage processing. They are essential for maintaining the quality and safety of many products, such as drinking water, pharmaceuticals, and food products.



Name of instrument: Analab Scientific Digital pH/mV meter

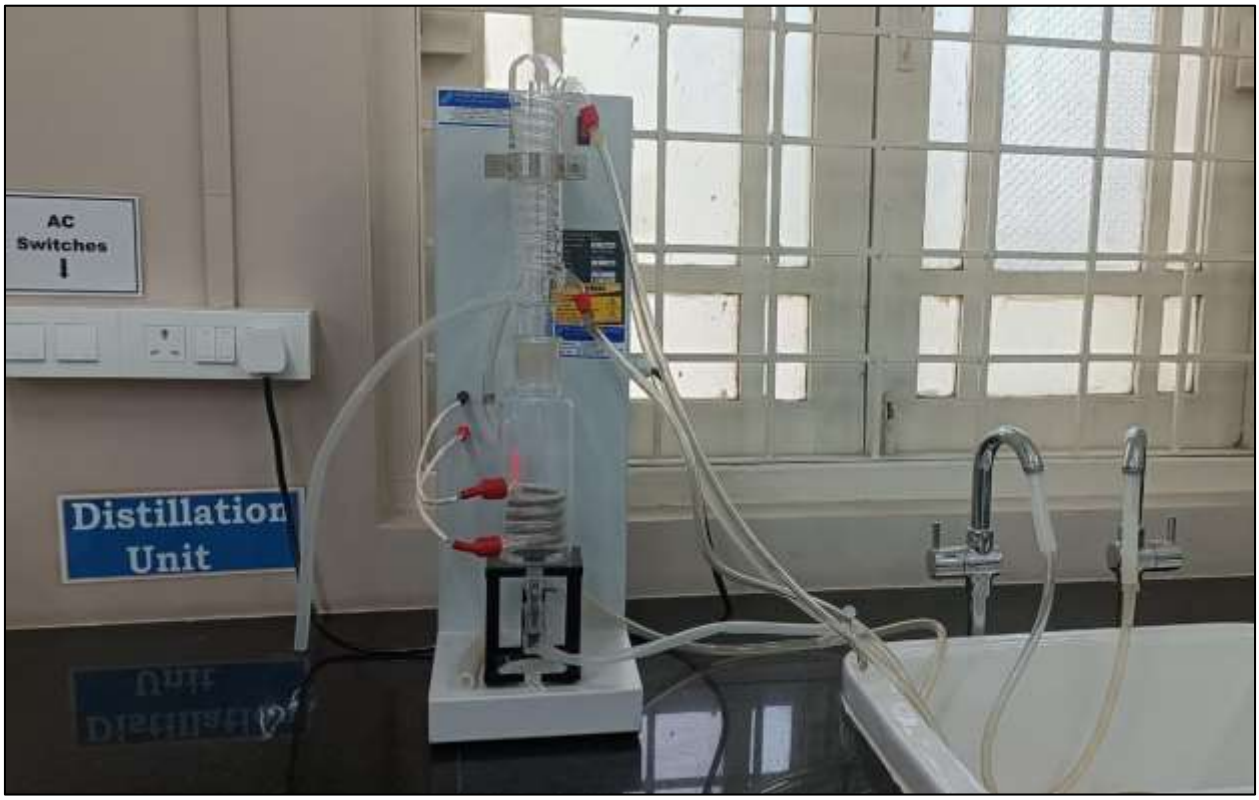
3. Refrigerator Centrifuge

A refrigerator centrifuge is a laboratory instrument used to separate components of a liquid mixture by spinning it at high speeds. It works on the principle of centrifugal force, which causes denser components to move outward and settle at the bottom of a tube or a container. A refrigerator centrifuge, as the name suggests, is designed to maintain a low temperature during the separation process. This is achieved by using a refrigeration unit to cool the rotor, which holds the tubes containing the sample. This prevents the sample from heating up due to friction during the spinning process, which could damage the sample or alter its properties. Refrigerator centrifuges are commonly used in biological and biochemical research, such as separating cellular components, DNA, RNA, and proteins. The low temperature helps to prevent denaturation or degradation of the biological molecules during the separation process. They are also used in the medical field for diagnostic tests and in pharmaceutical development for drug discovery and formulation.

Name of instrument: REMI C-24 PLUS Refrigerator centrifuge

4. Distillation unit

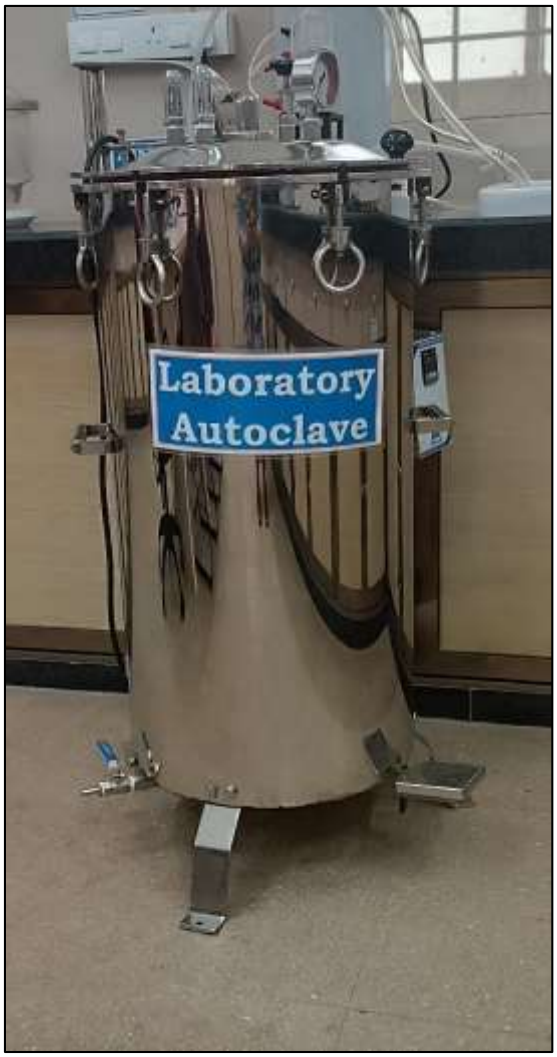
A water distillation unit is a laboratory instrument used to purify water by removing impurities through the process of distillation. Distillation is a process where water is boiled, and the resulting steam is captured and condensed into pure water. A typical water distillation unit consists of a heating element to boil the water, a condenser to cool and condense the steam into pure water, and a collection container to store the purified water. The impurities in the water, such as minerals, salts, and other contaminants, are left behind in the boiling flask, while the pure water vapor is condensed and collected in the collection container. Water distillation units are commonly used in laboratory and industrial settings to produce high-quality, pure water for experiments, chemical reactions, and manufacturing processes. They can also be used in medical facilities to produce sterile water for injection or other medical procedures.



Name of instrument: Riviera Distillation unit.

5. Laboratory Autoclave

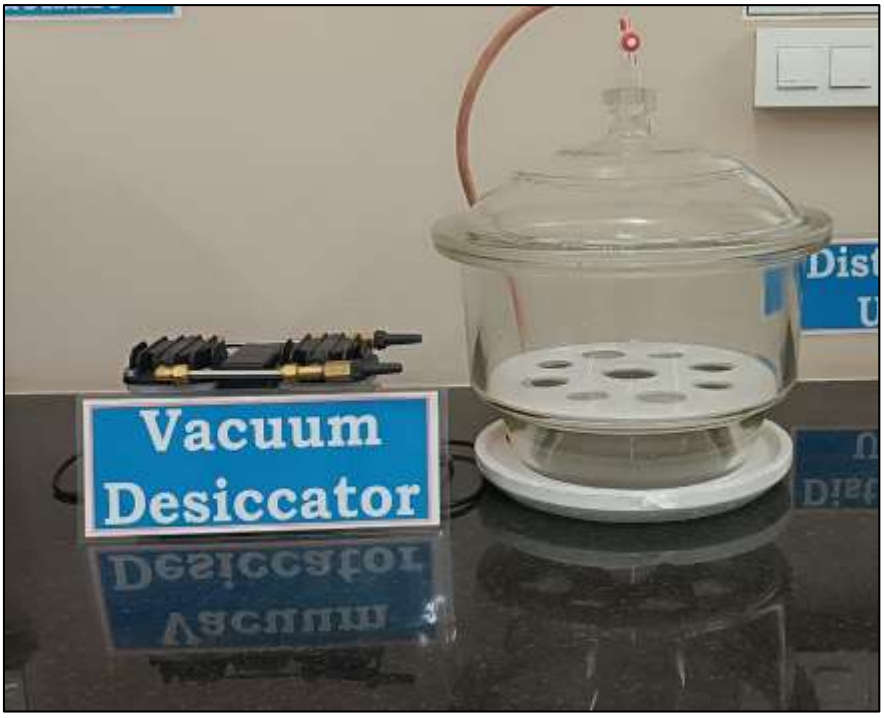
An autoclave is a device used in many industries to sterilize equipment and materials using high-pressure saturated steam. Autoclaves work by heating water to produce steam, which is then pressurized to create a high-temperature, high-pressure environment that kills microorganisms and other pathogens. Autoclaves are commonly used in medical facilities to sterilize surgical instruments, laboratory equipment, and other materials that need to be free of contaminants. They are also used in the food industry to sterilize food products and packaging materials.



Name of instrument: Meta-lab fully automatic Laboratory Autoclave

6. Vacuum Desiccator

A vacuum desiccator is a laboratory instrument that is used to remove moisture from a sample. It consists of a sealed container that is connected to a vacuum pump and contains a drying agent, such as silica gel or anhydrous calcium sulfate, to absorb moisture from the sample. The vacuum desiccator works by creating a vacuum inside the container, which lowers the pressure and causes the water in the sample to evaporate. The drying agent in the container then absorbs the evaporated moisture, leaving the sample dry. Vacuum desiccators are commonly used in chemical and biological laboratories to dry and preserve samples that are sensitive to moisture. They are particularly useful for storing materials that are hygroscopic, or tend to absorb moisture from the environment, such as electronic components, pharmaceuticals, and biological samples. Vacuum desiccators are available in different sizes and configurations to meet the needs of different applications. They may be made of glass, plastic, or metal, and may have additional features such as digital displays, automatic pressure regulation, and built-in humidity sensors.



Name of instrument: Rivotek Vacuum pump compressor with Desiccator

7. Spin coater

A spin coater, also known as a spin processor or spin casting instrument, is a laboratory instrument used to apply thin films or coatings to substrates, such as semiconductor wafers, optical fibers, or flat panel displays. A typical spin coater consists of a rotating platform, called a chuck, which holds the substrate, and a motor that rotates the chuck at high speeds, typically in the range of 1000 to 10,000 revolutions per minute. The coating material, which is usually a liquid or a solution, is dispensed onto the center of the substrate while the chuck is spinning. The centrifugal force generated by the spinning causes the coating material to spread uniformly across the substrate surface, forming a thin film with controlled thickness.

Spin coaters are used in a wide range of applications, including semiconductor fabrication, photolithography, MEMS (microelectromechanical systems) manufacturing, and optical coatings. They are especially useful for depositing uniform films with controlled thickness, which is important for many semiconductor and MEMS applications.

Name of instrument: Milman Table Top Spin Coater

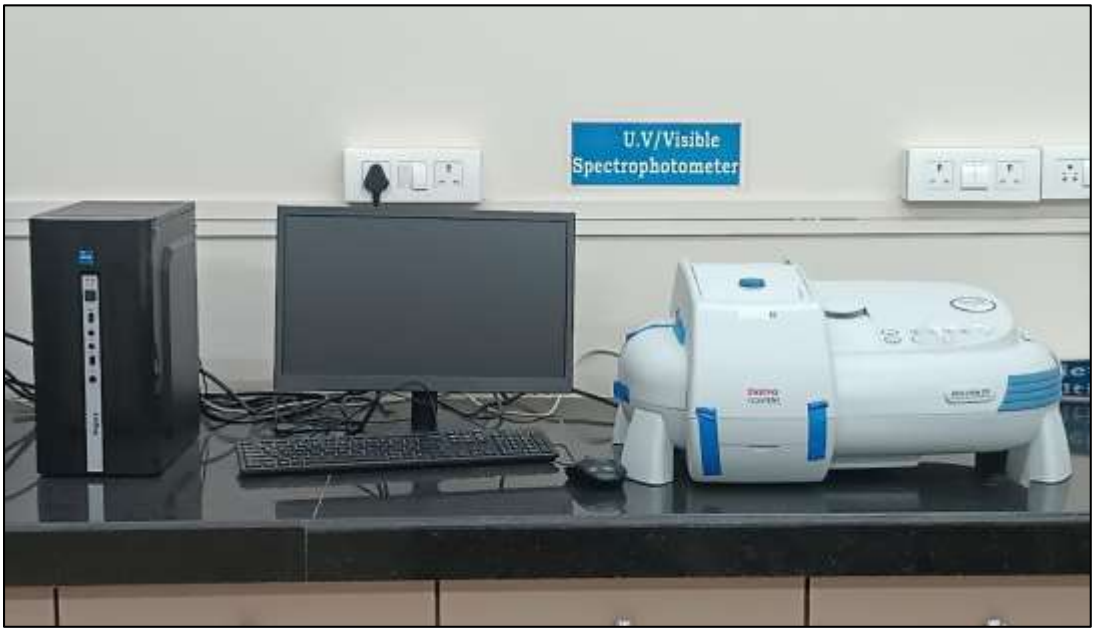
8. Hot air oven

A hot air oven, also known as a hot air sterilizer, is a laboratory instrument used for dry heat sterilization. It is used to sterilize laboratory equipment, glassware, and other materials that are heat resistant. Hot air ovens work by using hot air to sterilize the materials inside the oven. The oven typically consists of a chamber that is heated by an electric heating element or a gas burner. The temperature inside the oven is controlled by a thermostat, which can be adjusted to the desired temperature. The materials to be sterilized are placed inside the oven and heated for a specified period of time, typically between 30 minutes to several hours depending on the temperature and the type of material. The high temperature in the oven kills bacteria, viruses, and other microorganisms that may be present on the materials. Hot air ovens are commonly used in microbiology, pharmaceutical, and medical laboratories, as well as in the food industry. They are preferred over other sterilization methods, such as autoclaving, when the materials cannot be exposed to moisture or steam. They are also used for drying materials that are heat resistant, such as glassware.

Name of instrument: Meta- Lab Hot air oven

9. UV - Visible spectrophotometer

A UV-visible spectrophotometer is a laboratory instrument used to measure the absorption, transmission, and reflection of light by a sample in the ultraviolet (UV) and visible (Vis) regions of the electromagnetic spectrum. It is commonly used in chemical and biological research to determine the concentration of a sample, identify the presence of certain compounds, and study the properties of materials. A typical UV-visible spectrophotometer consists of a light source, a monochromator, a sample holder, a detector, and a computer interface. The light source produces a broad spectrum of light, which is then filtered by the monochromator to isolate a specific wavelength range. The sample is placed in the sample holder, and the amount of light transmitted through or absorbed by the sample is measured by the detector. The computer interface displays and records the results, which can then be analyzed to determine the concentration or properties of the sample. UV-visible spectrophotometers are commonly used in analytical chemistry, biochemistry, molecular biology, and environmental science. They are used for a wide range of applications, including protein and nucleic acid quantification, enzyme kinetics, drug analysis, and water quality testing. UV-visible spectrophotometers are available in different configurations and capabilities to meet the needs of different applications.



Name of instrument: Thermo Scientific UV-Visible Spectrophotometer

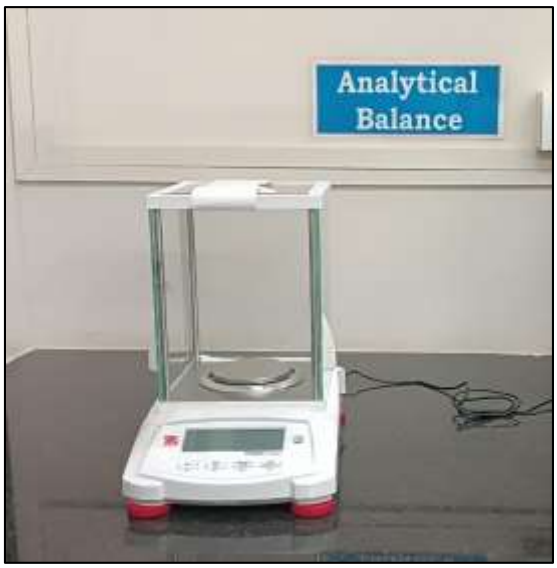
10. Orbital Shaking Incubator

An orbital shaking incubator is a laboratory instrument that is used to grow and maintain biological samples, such as cell cultures, at a controlled temperature while simultaneously providing agitation or shaking. The shaking motion of the incubator helps to improve the mixing and oxygenation of the samples, which can enhance their growth and viability. Shaking incubators typically consist of a temperature-controlled chamber that can be set to a specific temperature range, usually between 5°C above ambient temperature and 60°C. The samples are placed inside the chamber, and a mechanism inside the incubator provides shaking or agitation to the samples. Shaking incubators are commonly used in biological and medical research, microbiology, and biotechnology applications. They are especially useful for growing and maintaining cell cultures, which require constant agitation to ensure proper growth and differentiation.

Name of instrument: REMI CIS- 18 PLUS orbital shaking incubator

11. Analytical Balance

An analytical balance is a laboratory instrument used to measure the mass of a sample with high precision and accuracy. It is commonly used in chemical, biological, and pharmaceutical research, as well as in quality control and testing in various industries. An analytical balance typically consists of a weighing pan, a weighing chamber, a weighing mechanism, and a digital display. The weighing pan is where the sample is placed, and the weighing chamber provides a stable and controlled environment for accurate measurements. The weighing mechanism is typically based on a electromagnetic force restoration system that balances the force of gravity acting on the sample. The digital display shows the weight of the sample in units of grams, milligrams, or micrograms, depending on the precision of the balance. Analytical balances are designed to measure small amounts of mass with high precision and accuracy, typically up to four decimal places (0.0001 g). They are used for a wide range of applications, including chemical analysis, quality control, formulation development, and research in various fields. They are commonly used to measure the weight of reagents, chemicals, and samples in small quantities. Analytical balances are sensitive instruments that require proper handling and maintenance to ensure accurate measurements. They should be operated in a controlled environment with minimal air currents and vibrations and calibrated regularly with standard weights.



Name of instrument: Ohaus PX series Analytical balance