CENTRAL RESEARCH HUB

FUNDED BY MHRD, GOVERNMENT OF INDIA UNDER TEQIP-III

Building S&T research communities to develop innovative and sustainable solutions for development

Assam Science and Technology University

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Foreword

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There is no lack of talented students in the northeastern region of India. However, due to lack of suitable facilities and opportunities, students often migrate to other regions of the country to quench their thirst for high quality research and finding answers to the questions that intrigue them. Assam Science and Technology University (ASTU) has set up the Central Research Hub (CRH) with the primary aim of nurturing scientific temperament and research culture among the budding young minds of the region. The state of the art research labs at ASTU are equipped with cutting edge technologies and equipment. The group of experienced faculties at the university carefully guide the students at every step of their journey till they find their own path. Students and faculties of all the colleges/institutions affiliated to ASTU can avail all the facilities at a moment's notice. Also, numerous other students from the region have availed the facilities at ASTU for their internships as well as research purposes.

ASTU strives to lead this effort to achieve national and international level of research in near future.

(Prof. Dhiraj Bora)

ABOUT ASTU

The Assam Science and Technology University was established by Government of Assam under Assam Science & Technology University Act 2009. It aims to provide education and research in the field of science & technology and other professional courses in Assam. ASTU is the only premier technical university in the North East region of India. The university is responsible for overseeing all the undergraduate and post-graduate programs in engineering, science, management, pharmaceutical sciences and a few professional courses. ASTU also conducts an inhouse post-graduate course in Energy Engineering. Since its inception, ASTU has been undertaking high quality teaching and research in frontier areas of science & technology and continuously upgrading the syllabi and creating environment for international standard research thus bridging the ancient wisdom of the region with modern technology.

ASTU CENTRAL RESEARCH HUB (CRH)

The ASTU Central Research Hub (CRH) was initiated in 2018 under the TEQIP-III, MHRD. It aims to create the best possible environment with state-of-the-art facilities for research and innovation to flourish within the region. ASTU will also harness the expertise of leading researchers across the country and the globe to focus on challenge-led, disciplinary and inter-disciplinary research thus strengthening the capability for research along with innovation and knowledge exchange. The Phase-I of ASTU CRH was established in 2019 with the following four laboratories:

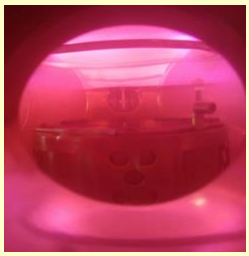
- Multi-disciplinary Experimental & Testing Accessible Laboratory (METAL)
- Energy Research Laboratory (EEL)
- Material Science Research Laboratory (MSRL)
- Tribology Laboratory (TL)

There are also two other facility under CRH, which are:

- Internal Combustion Engine Research Laboratory
- Computational Research Laboratory

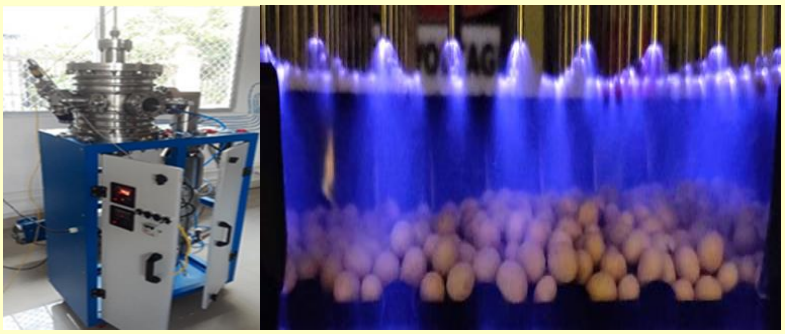
Multidisciplinary Experimental and Testing Accessible Laboratory (METAL)

Objective: *To carry out high end research activities in the field of plasma technology, the available facilities at METAL can be used for (i) Development of novel coating (polymer to metal coating) using Ionized Physical Vapour Deposition (iPVD) technique, (ii) Development of Si photovoltaics, (iii) Improve the seed germination, production yield of different seeds using cold air plasma technology, (iv) Synthesis of graphene using chemical process, (v) Basics experiments related to plasma technology.*



iPVD reactor: This state of the art technology allows the deposition of metals, alloys, ceramic, and polymer thin films onto a wide range of substrate materials. It can drastically improve the film quality with enhanced properties such as density and adhesion, especially for substrates with complex shape. It can also control the reactivity, extend the metallic sputtering mode regime, decrease the deposition temperature and guide the deposition material on to the desired areas of the substrate. The iPVD reactor can also be used for development of Si Photovoltaics, Nanotechnology etc.

EGDR: The Experimental Glow Discharge Reactor is used to study the effect of air plasma on seed germination and production yield of different variety of seeds. It can also be used for plasma nitriding to improve the hardness of metals and basic plasma experiment as well.



Other faicilities: High resolution spectrometer, Digital Flow Controllers, High vacuum pumping system, Magnetic Stirrer, Ultra Sonicator, Centrifuge, High voltage power supplies (DC &RF), Heating controller & monitoring system, Langmuir probe etc.

For more details, contact Dr. Bharat Kakati. META LAB, ASTU. Email: bkakati.astu@gmail.co

Energy Research Laboratory (ERL)

Objective: *To carry out research activities that aids the development of renewable energy and energy efficiency. The research focuses on clean energy science and technology innovation in areas such as solar, wind, biomass, clean fuels, advanced vehicles, and building energy efficiency. The core areas of research are (i) Bioenergy Technology (ii) Combustion Technology (iii) Alternate fuel for transportation (iv)Thermo photovoltaic Technology (v) Energy Efficient Materials.*

TGA: Thermo gravimetric analysis (TGA) is a very useful analytical technique for determining weight loss of a sample under air or inert atmosphere. The amount of moisture or any other volatiles, plasticizers, filler etc. in sample can also be determined with the help of TGA. The thermogram is obtained by recording the change of weight of the sample with respect to increasing temperature in a pre-determined rate and also tells us about various chemical and physical phenomenon.

DSC: Differential Scanning Calorimetry (DSC) is another thermo-analytical technique that is used to measure the change of specific heat capacity of a sample with respect to a standard reference. The reference have a well-defined heat capacity over the range of temperatures to be scanned. The sample is then compared with the reference and DSC curve is obtained that gives the necessary data about enthalpies of transition.

Rheometer: A rheometer is used to study the viscosity or shear stress of a fluid as a function of temperature. The Rheometer present in the EEL lab can study the aforementioned properties.

Other facilities: Computerized VCR, Downdraft Gasifier, 10kW, Bomb Calorimeter (Digital), Flash and fire point apparatus (Digital), Five sensor flue gas analyzer, Ash fusion Analyzer, Cloud point and pour point Apparatus, Rotary Vacuum Evaporator, FTIR etc.

For more details, contact Mr. Nabajit Deb Choudhdury. ERL, ASTU. Email: nabajit.astu.2017@gmail.com

Material Science Research Laboratory (MSRL)

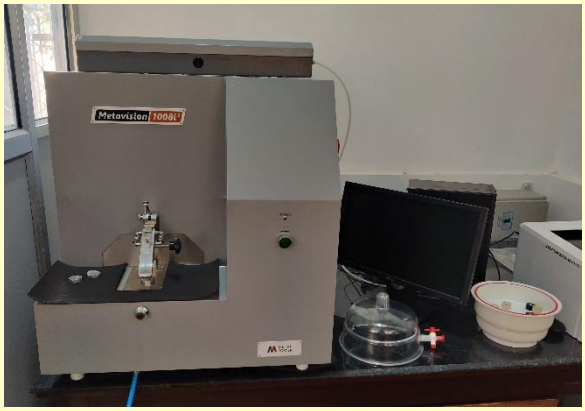
Objective: *To carry out high quality research that aids in the production and study of high-performing materials which have vast industrial applications. The core areas of research are (i) Development of High Strength Steel (ii) Al-Mg-Sc Alloy Systems (iii) Ti Alloys (iv) Development of novel vibration damping materials.*

Automatic Polishing Machine: Polishing is an essential part of research in the field of material science. A steel wheel, that can be rotated up to 6000 rpm, maybe covered with cloth of an abrasive grid according to the type polishing required.

Optical Microscope: An optical microscope uses the visible light and a series of lenses to magnify a surface. A charge-coupled device or CCD camera captures digital image that can be viewed in a monitor. In the field of material science, the optical microscope is used to study the micro properties of a surface such as roughness ,imperfections and phase hardness. The Metatech built optical microscope in the MSRL has up to 100x magnification.

Micro Vickers Hardness Tester: This apparatus is used to determine the Vickers hardness or Knop hardness of a material. A diamond indenter is used that can apply force ranging from 10 gram-force to 1 kilogram-force. The hardness of any material can be determined using the Metatech built F.Auto II Vickers hardness testing apparatus in the MSRL.

Optical Emission Spectrometer: Optical Spectroscopy is used to analyze the elemental composition of a wide range of metal. A spark is generated which is then compared against a database that has the characteristic wavelengths of different metals in the visible wavelength range of light.



Other Facilities: Stir casting furnace, Diamond Sectioning Machine, Muffle furnace, Hot air oven, Hot mounting press, Cold mounting press, Rockwell hardness tester.

For more details, contact Mr. Monoj Baruah. MSRL, ASTU. Email: monoj_baruah@rediffmail.com

Tribology Laboratory (TL)

Objective: *To carry out research with the aim to reduce wear and tear and loss of energy between bodies under relative motion. This lab also provides the fundamental research infrastructure to faculties and students of affiliated institutions of ASTU and other institutes of the state in tribological aspects to accelerate the research in this field. The core research areas are (i) Tribological characterization of bio fuel and lubricants (ii) Characterization of Journal Bearings (iii) Metal Characterization.*

Four Ball Tester: This apparatus is used to determine load carrying capacity of lubricants or grease, co-efficient of friction of lubricants, anti-wear properties of lubricating oils and grease, life due to shear stability of lubricants and thrust washer testing. The setup has four balls. The top ball rotates under load against three fixed balls that presses against each other within a ball pot in the presence of a sample to be evaluated. Tests can be performed till the temperature range (ambient) of 200^{0}C. To carry a test at temperature above 120^{0}C, a chiller is used to maintain the selected temperature.

Pin/Ball on Disc tribometer: It is used for tribological characterization of metals, coating and lubricants. In the tribometer, a pin or a spherical ball is attached to a stiff elastic arm and the sample is rotated at a selected speed. Different parameters such speed, contact pressure and time can be controlled. The optimum environment in the chamber ensures controlling and measuring the effect of humidity, temperature and atmospheric composition on the sample. Tests can also be conducted under vacuum.

Journal Bearing Tester: This apparatus is used for acquiring data related to oil film thickness, oil film pressure, radial load, friction torque, shaft speed and oil flow rate to check the bearing design as per the service requirements.

For more details, contact Mr. Nabajit Deb Choudhdury. TL, ASTU. Email: nabajit.astu.2017@gmail.com

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