Grants Consultancy & Industrial Research Division

Newsletter

BITS Pilani
Pilani Campus

Vol:03 **Issue: 01** **April to September(2023-2024)**

FROM THE DESK OF ASSOCIATE DEAN, GCIR

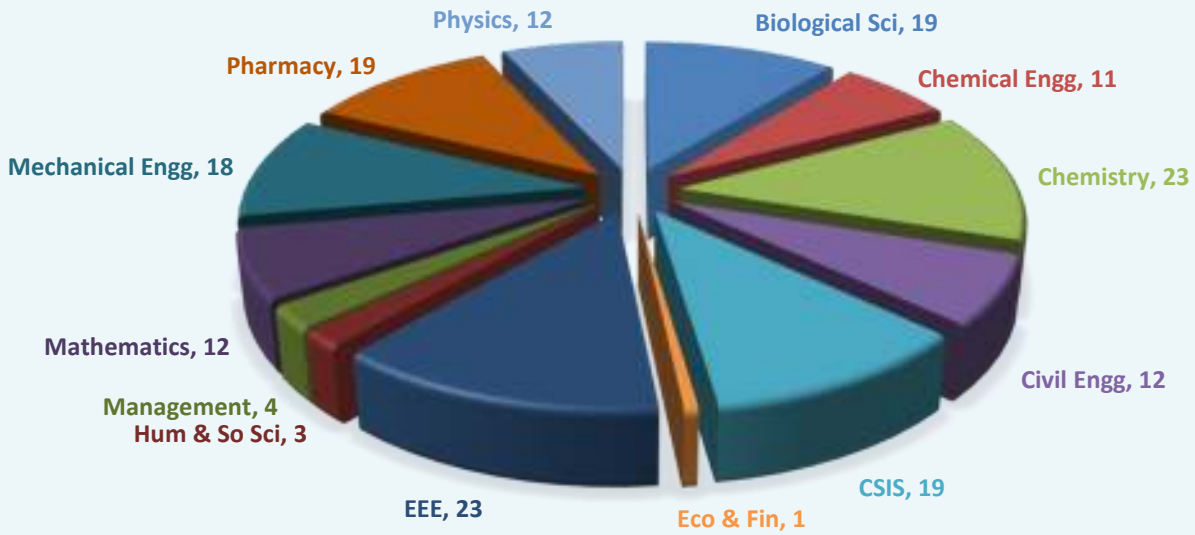
Welcome to this Issue of the Newsletter from Grant Consultancy and Industrial Research Division, BITS Pilani, Pilani Campus which highlights the achievements during the first half of the financial year 2023-2024 of Pilani Campus. The Newsletter presents a brief detail of the projects received, projects completed, Patents granted and department-wise summary of the ongoing projects.

We welcome your feedback/suggestions.

Thank you.

Prof. Raj Kumar Gupta

DEPARTMENT WISE ONGOING PROJECT AS ON SEPTEMBER 2023

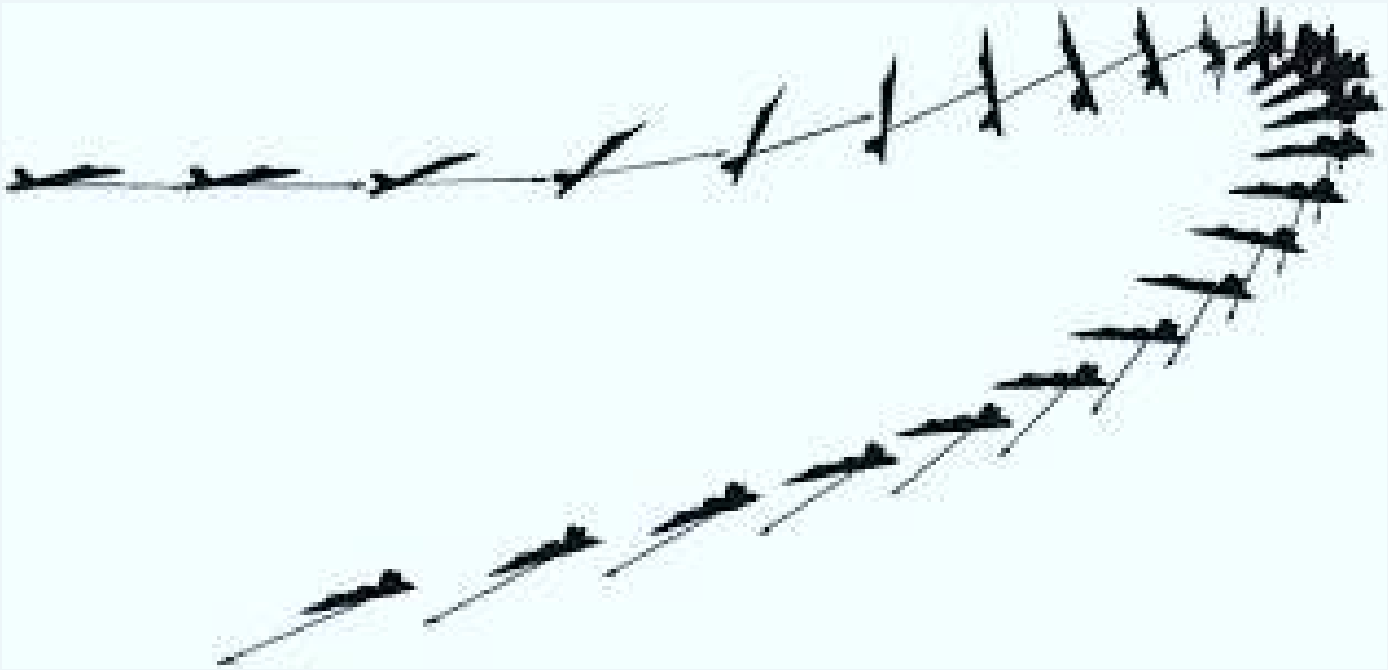


Total Amount of Ongoing Projects: Rs. 78.65 Crore

Sponsored Research Projects Sanctioned during April-23 to Sept-23

Project Title: ***Bifurcation Analysis and Reconfigurable Control Design for Autonomous Maneuvering with an Asymmetric Aircraft***
Funding Agency: ***Defence Research and Development Organisation(DRDO)***
Sanctioned Amount: **₹15,03,800**
Name of PI: ***Dr. Bijoy Krishna Mukherjee***
Designation: ***Assistant Professor***
Department: ***Electrical & Electronics Engineering***
Name of Co-PI: ***Dr. Soumyajit Roy, Assistant Professor Department of Mechanical Engineering***

Abstract: Modern fighter aircraft are usually made unstable to enhance their effectiveness in dogfight scenarios. Controlling such an unstable vehicle becomes further challenging when it is forced to operate in high angles of attack due to maneuver demands. At high angles of attack, along with pronounced aerodynamic nonlinearity, the aircraft has significant uncertainties arising from flow separation. This already challenging scenario becomes even more challenging under lateral center of gravity movements caused by asymmetric loading/release of stores and/or partial wing damage causing further nonlinearity because of breaking of the symmetry. Therefore, for better safety and survivability of the vehicle and the pilot, the flight controller needs to be either highly robust or adapt to the variation online while performing the maneuvers autonomously. It is also worthwhile to investigate the nonlinear dynamic properties of such an asymmetric aircraft especially at high angles of attack since a beforehand knowledge of occurrence of drastic divergent modes will help the pilot evade them. The present project aims to study the global nonlinear dynamic behaviour and design robust and adaptive nonlinear control to execute fast autonomous maneuvers under the above mentioned scenario.



Project Title: ***Social Media Socialization and Self-engagement: A Qualitative Study of Online Identity Reconstruction***
Funding Agency: ***Indian Council of Social Science Research (ICSSR)***
Sanctioned Amount: **₹10,75,000**
Name of PI: ***Dr. Anupam Yadav***
Designation: ***Assistant Professor***
Department: ***Humanities and Social Sciences***

Abstract: Technological availability and autonomy of creating contents on social media allows people to reconstruct their online identities in myriad ways. This phenomenon is driven by self-conscious motivations as well as an unconscious behaviour of virtual socialization. The research aims to study motivations, effectiveness and the impact of this behaviour. The proposed qualitative study adopts sociological and philosophical theories to understand the concept of identity in social complexity of self and other relation.

Project Title: ***MeDiKiT: Medical Data Integration Toolkit – A Pilot Implementation of Medical Data Sharing Software Systems for Future Medicine to Enable Big Data & AI Applications in Medicine***

Funding Agency: ***Indian Council of Medical Research (ICMR)***

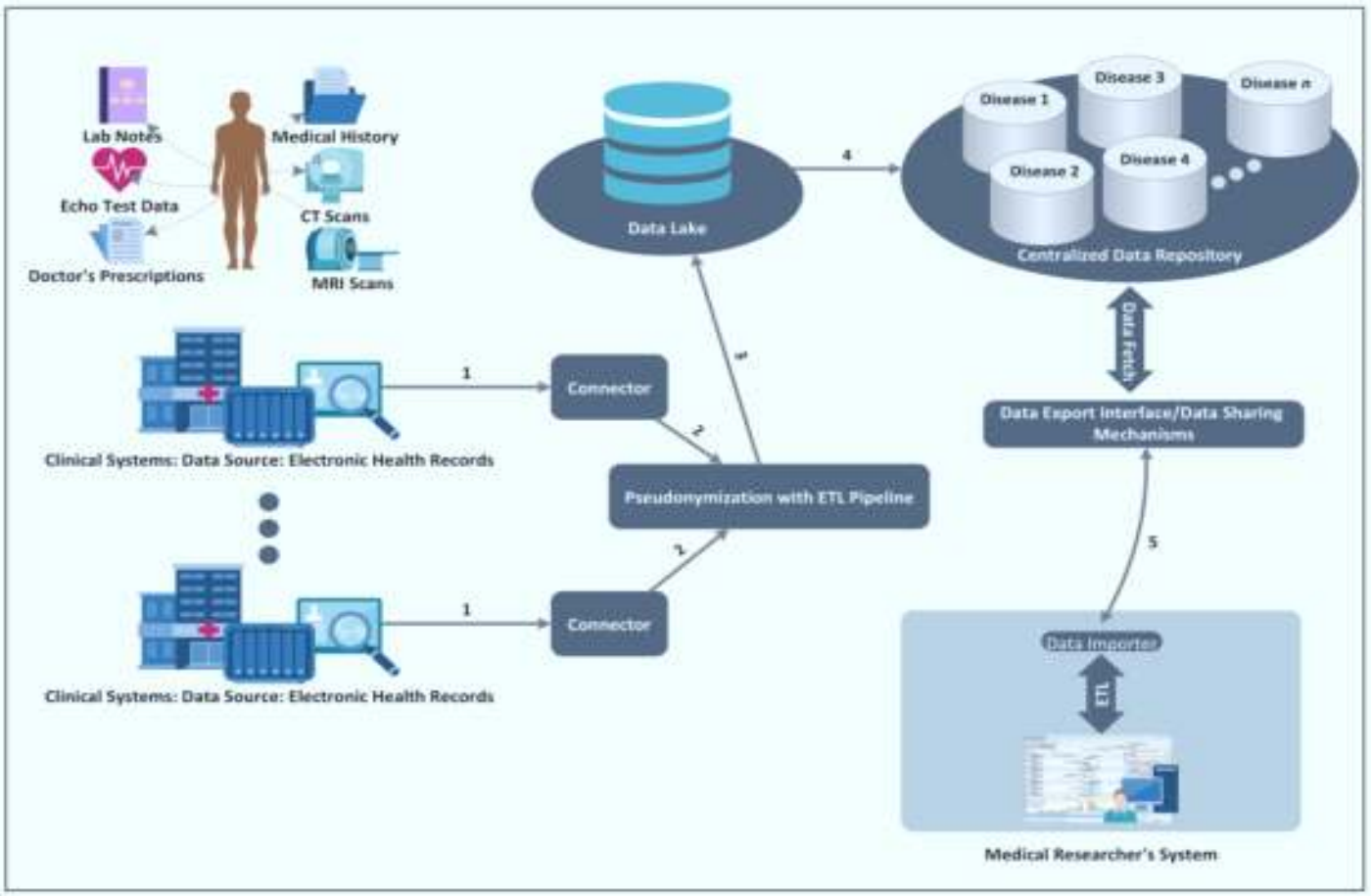
Sanctioned Amount: **₹ 61,57,208**

Name of PI: ***Dr. Tanmaya Mahapatra***

Designation: ***Assistant Professor***

Department: ***Computer Science & Information Systems***

Abstract:



Project Title: ***Identification and characterization of novel long non-coding RNAs in AKI-to-CKD transition using CRISPR/Cas9-based epigenome editing: Revealing the potential of the long non-coding RNAs as a biomarker and therapeutic strategy***

Funding Agency: ***Indian Council of Medical Research (ICMR)***

Sanctioned Amount**: ₹ 41,85,000**

Name of PI: ***Dr. Gaikwad Anil Bhanudas***

Designation: ***Professor***

Department: ***Pharmacy***

Abstract: The proposal will identify and validate lncRNAs as a novel biomarker to identify the progression from AKI to CKD. Also, the knowledge behind the underlying molecular mechanisms behind this transition is also scarce. Through this study we will use an emerging tool in the form of CRISPR/Cas9 to edit the dysregulated lncRNA. CRISPR/Cas9 itself is a novel and emerging technique to precisely edit the targets thus providing with maximum therapeutic efficacy with minimum off-target effects. The study will also reveal the effect of lncRNA editing on pathways vital to AKI-to-CKD transition, i.e., endoplasmic reticulum stress and autophagy. The role of these pathways is still unexplored, and we believe that lncRNAs may regulate the process of progression to CKD from AKI by modulating these mechanisms.

Project Title: ***Study of Structural Behavior and Failure Characteristics of FRP-Concrete Composite***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: **₹24,42,000**

Name of PI: ***Dr. S B Singh***

Designation: ***Senior Professor***

Department: ***Civil Engineering***

Abstract: This proeject deals with the study of structural behavior and failure characteristics of FRP-Concrete composite beams. When employed in the form of thin-walled flexure elements, the mechanics associated with FRP laminates makes these structures suffer from some inherent discrepancies such as lateral instability, high deformability, and brittle failure, to name a few. Such discrepancies can be minimized to a certain extent, and the design can be made much more efficient by combining the advanced composite materials with conventional construction materials like concrete in the form of an FRP-concrete composite section. However, the flexural response of such a section is not well understood due to the complex nature of the interfacial shear transfer mechanism. This has led to a complete absence of design guidelines/manuals, analytical equations, and codal provisions that could assist the structural designer in analyzing and designing FRP-concrete composite structures. Aim of work the proposed study will focus on studying the effects of different design parameters such as the shape and composite layup of the FRP profile, the geometry and concrete type of the slab, type of shear connection and interaction, etc. on the composite action through a series of experimental investigations and numerical simulations. The various findings will then be used to work out the design recommendations and analysis procedures. Major objectives of the proposal are 1. To develop an efficient shear transfer medium and mechanism, by investigating the combined effect of the shear connector's stiffness and strength on the composite action between the FRP beam and the concrete slab in the push-out tests. 2. To study the degree of interdependencies among the various design parameters and their effect on the flexural response of the composite beam, such as the effect of replacing the normal strength concrete in the slab with advanced concretes like, ductile engineered cementitious concrete, functionally graded concrete; the effect of composite layup, etc. 3. To develop a refined numerical model that can closely resemble the structural response of the composite beam in terms of the material constitutive laws and failure criterion. 4. To investigate the influence of location, size, and shape of the cutouts provided in the webs and flanges for services on the flexural response of the composite beam. 5. To work out the design recommendations in the form of load-slip relations, design equations, and analysis procedures.

Project Title: ***Molecular dissection of small RNAbiogenesis machinery regulating male fertility and reproductive stage stress tolerance in Sorghum***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: **₹ 38,40,000**

Name of Investigators: ***Dr. Rita Sharma***

Designation: ***Associate Professor***

Department: ***Biological Sciences***

Abstract: Sorghum is a multipurpose crop used for food, fodder, forage and biofuels. The spikes in temperature and drought during gametogenesis and early seed development stages in sorghum pose serious threat to the plant fertility and productivity. By collating the transcriptomic data generated in our lab from anther and pistil development stages and from stress treatments available in the public domain, we have identified 47 small RNA machinery genes out of which three exhibit preferential/specific accumulation in male meiosis and early seed development in sorghum. These genes also exhibit induction in response to drought stress in both pre-flowering and post flowering stages of two varieties of sorghum. Our hypothesis is that mutating these genes using CRISPR/Cas technology would severely impact biogenesis of specialized small RNAs involved in male meiosis and/or early seed development especially under high temperature and/or drought conditions. The precise impact on sRNAs would be evaluated by sequencing mRNA, small RNA and degradome population of edited lines with expected phenotype. The outcome of the study will not only provide environment-induced male sterile lines to strengthen the hybrid breeding in sorghum but will also guide future strategies to mitigate impact of climate change on crop productivity.

Project Title: ***Assessing the impact of environmental education on Pro-environmental behavior among the students of Higher Education Institutions in India.***

Funding Agency: ***Indian Council of Social Science Research (ICSSR)***

Sanctioned Amount: **₹ 5,00,000**

Name of PI: ***Dr. Praveen Goyal***

Designation: ***Associate Professor***

Department: ***Management***

Abstract: Increasing concerns regarding global environmental challenges have led to a widespread recognition that environmental moral education can profoundly influence the pro-environmental behavior exhibited by students. Education plays a crucial role in influencing and altering the behavior of individuals. There are studies in the literature focused on assessing the impact of environmental education on pro-environmental behaviour mainly in different context. The present study aims to assess the environmental awareness among the students in Indian higher education institutions and to assess the role of environmental education in developing pro-environmental behaviour among the students in Indian higher education institutions.

Project Title: ***Design and development of crop residue-based roof insulation with Phase Change Materials for livestock rearing shelters: An environment friendly business model for doubling farmer women's income in Arid and Semi-Arid zones.***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: **₹40,08,400**

Name of PI: ***Dr. Srinivasan Periaswamy***

Designation: ***Professor***

Department: ***Mechanical Engineering***

Name of Co-PI: ***Dr. Srikanta Routroy, Professor Department of Mechanical Engineering***

Abstract: Arid zone of India is known for the extreme climatic conditions and the livstocks are subjected to harsh environment leading to low productivity and high mortality rate. On the other hand lot of agricultural residues are wasted or burnt to dispose of it leading to pollution. This project aims to develop shelter for the livestock by using agricultural waste and phase change materials as a cost effective solution to improve the living conditions of the livestock towards increased productivity leading to enhanced income for the farmers.

Project Title: ***Study of intermolecular S centered chalcogen bonding (S•••X, X = O, N, S) interaction in cryo-matrix using FTIR spectroscopy.***

Funding Agency: ***Department of Science and Technology (DST)***

Sanctioned amount: ***₹30,37,622***

Name of PI: ***Dr. Amrita Chakraborty***

Designation: ***Woman Scientist***

Department: ***Chemistry***

Name of Co-PI: ***Dr. Shamik Chakraborty, Professor Department of Chemistry***

Abstract: Chalcogen bonding (ChB) is the interaction between the positive region of electrostatic potential (ESP) on chalcogen atom (Group 16) and negatively charged region over nucleophiles. S---O/S---N/S---S/S---Se, ChB interactions play crucial role in biochemical processes, such as, protein folding and drug designing. The aim of the present proposal is to investigate the intermolecular S---X type of ChB interaction between S-containing bio-mimicking model systems of aliphatic/aromatic ring/heterocyclic ligands that found in small-molecule drugs, and Lewis bases/nucleophiles (X = O, N, S) present in different protein backbones. The intension of this study is to elucidate the protein-ligand interaction in terms of small bio-mimickbe performed to support the experimental findings. The nature and origin of S---X ChB interaction will be investigated by changing the atom/substituents on ChB donor and acceptor moieties. Results obtained from experiment and theory will be analyzed along with the protein structure obtained from the PDB to provide valuable information towaring systems. Matrix isolation FTIR technique will be used at low temperature (~10K) for spectroscopic characterisation. Moreover, quantum chemical calculations will ds drug designing.

Project Title: ***Understanding the role of nuclear membrane associated proteins under differential flow dynamics driving EMT and survival of tumor cells***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: ***₹ 40,41,400***

Name of PI: ***Dr. Sudeshna Mukherjee***

Designation: ***Associate Professor***

Department: ***Biological Sciences***

Name of Co-PI: ***Dr. Venkatesh K P Rao, Dr. Suvanjan Bhattacharyya Assistant Professor Department of Mechanical Engineering***

Abstract: An integrated approach to understand how cytoskeleton communicates with nucleus regulating context specific gene expression in tumor cells experiencing hemodynamic stress can provide a strong base for future establishment of novel diagnostic and therapeutic opportunities. Our study thus involves designing a microfludic device simulating blood flow through which we are flowing cancer cells to understand how changes in haemodyanamic stress is associated with changes in cellular physiology facilitating metastasis.

Project Title: ***Understanding hyperglycemia induced metabolic alterations in pancreatic cancer cells and its regulation by specific long non coding RNAs***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: ***₹ 43,74,120***

Name of PI: ***Dr. Rajdeep Chowdhury***

Designation: ***Professor***

Department: ***Biological Sciences***

Name of Co-PI: ***Dr. Shibasish Chowdhury, Professor Department of Biological Sciences***

Abstract: During the time of diagnosis a vast majority of pancreatic cancer (PC) patients have diabetes. Existing data provides hints towards altered metabolism fueling PC progression; however, the preferential dependence of PC cells on specific substrates and corresponding pathways to meet their bio-energetic needs under HG is poorly understood. We hypothesize that the long non-coding RNA YIYA acts as a key regulatory molecule controlling PC metabolic dependency under high glucose. However, the molecular mechanism of action of YIYA, and how it integrates with autophagy, glucose/glutamine metabolism and redox homeostasis, regulating the bioenergetic needs of PC cells under HG is unexplored. This project therefore plans to experimentally validate the metabolic dependencies of PC cells under HG and thereafter characterize the role of YIYA in regulating the same. Given that PC is an aggressive malignancy that can utilize unorthodox strategies for energy acquisition, understanding the unique metabolic arrangements and its control can provide novel therapeutic avenues.

Project Title: ***Synthesis of Porphyrin Arrays and Their Roles in Singlet Fission (SF)***

Funding Agency: ***Department of Sciences and Technology(DST)***

Sanctioned Amount: ***₹ 35,00,000***

Name of PI: ***Dr. Nitika Grover***

Designation: ***Assistant Professor***

Department: ***Chemistry***

Abstract: The synthesis of molecules that convert sunlight into electric current is a challenging area of chemistry research. Solar cell efficiency currently stands at 32%, due to the loss of absorbed photons as heat. A creative strategy is needed to increase efficiency by 50% through molecular architectures capable of generating singlet fission. Pentacene dimers are an important model for singlet fission, but molecules with fast SF and electronic decay are difficult to monitor. Exploration of NC derivatives like adamantane, cubane, or BCP-linked chromophores is needed. To this end, we will be synthesizing porphyrin arrays consisting of the rigid linker(s) and porphyrin unit to investigate singlet fission phenomenon.

Project Title: ***Development of graphene/graphite encapsulated high thermal conductivity heat sinks.***
Funding Agency: ***Defence Research and Development Organisation(DRDO)***
Sanctioned Amount: ***₹ 32,39,962***
Name of PI: ***Dr. Chennu Ranganayakulu***
Designation: ***Visiting Professor***
Department: ***Mechanical Engineering***
Name of Co-PI: ***Dr. Sachin Belgamwar, Associate Professor, Dr. A R Harikrishnan Assistant Professor Department of Mechanical Engineering***

Abstract: Aim to achieve enhanced thermal conductivity in graphene /graphite-based thermal plates and identify a suitable process to fabricate the graphite/graphene-based thermal plate. Once the required thermal conductivity is achieved, then will establish the process parameters for the fabricated composite.

Project Title: ***Eco-Friendly Solution with Metal Recovery and Value Added Products from Stainless Steel Spent Pickle Liquor: A Zero Waste Business Model.***
Funding Agency: ***Ministry of Steel, Government of India***
Sanctioned Amount: ***₹ 1,25,16,400***
Name of PI: ***Dr. Anupam Singhal***
Designation: ***Professor***
Department: ***Civil Engineering***
Name of Co-PI: ***Dr. Srikanta Routroy, Professor, Department of Mechanical Engineering***
Collaborative Institute : ***NML Jamshedpur***

Abstract: The main objective of the proposed project is to develop an economic and eco-friendly process for stainless steel pickle liquor through recovery of valuable metals and stabilization of toxic residue effluent. Value added products will be developed from the residue after recovery of valuable metals. Assessment of environmental impact using Life Cycle Assessment approach and zero waste business sustainability model using techno-feasibility study will be done.

Project Title: ***Design, synthesis, and evaluation of novel dual inhibitors of Angiotensin-II type 1 receptor and Neprilysin for the treatment of diabetic cardiomyopathy***
Funding Agency: ***Science and Engineering Research Board(SERB)***
Sanctioned Amount: ***₹ 33,02,330***
Name of PI: ***Dr. Hemant Jadhav***
Designation: ***Professor***
Department: Pharmacy
Name of Co-PI: ***Dr. Gaikwad Anil Bhanudas, Professor, Department of Pharmacy***

Abstract: Diabetic cardiomyopathy (DCM) is the existence of abnormal myocardial structure and performance in absence of other cardiac risk factors. It is one of the leading causes of death in diabetics, at 2–5 times higher risk, and presents global burden on health and economics. Currently, along with glycemic control, Angiotensin Converting Enzyme (ACE) inhibitors, Angiotensin Receptor Blockers (ARBs) and renin inhibitors are used but they do not significantly stop the disease progression. A constant increase in the cases of end stage cardiovascular disease (ESCD) in diabetic patients regardless of the availability symptomatic treatment underlines the need of a novel approach. An emerging approach, currently in focus of researchers and pharmaceutical industries alike, is to counter different pathways using dual inhibitors, i.e. to develop a novel agent that interferes with different pathophysiological pathways to slow the development of DCM. It resulted in Angiotensin II type 1 receptor (AT1R) – neprilysin (NEP) inhibitors (ARNi), which counteract the effects of angiotensin and also increase the activity of natriuretic peptides (NPs). In July 2015, US FDA approved the first ARNi - valsartan/sacubitril - for the treatment of heart failure with reduced ejection fraction. ARNi are postulated to take centre stage in treatment of not only DCM but also heart failure. Using the knowledge gained from our previous studies and literature, we hypothesize that merging the pharmacophores of AT1R and NEP inhibitors would yield a dual inhibitor, which could be a better option for the treatment of DCM. These dual inhibitors will not only be effective against DCM but also against other diabetic complications such as diabetic kidney disease, in general. It is proposed to design new chemical entities (NCEs) by combining the pharmacophores of US-FDA approved drugs (Losartan and Thiorphan) using in silico approach. The designed compounds would then be screened in silico for potential inhibitory activity against AT1R and NEP as well as for their pharmacokinetic properties. The selected compounds would then be synthesized using conventional or green chemistry approaches. Finally, synthesized compounds will be evaluated their AT1R and NEP inhibitor potential in vitro first and then in vivo, as proof of concept. These studies will result in the development of newer lead candidates to inhibit DCM progression and offer a promise of better management of diabetic complications.

Project Title: ***Development of a tumor-microenvironment responsive, cancer theranostic nanodots for photodynamic-immunotherapy***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: ***₹ 49,28,856***

Name of PI: ***Dr. Aniruddha Roy***

Designation: ***Associate Professor***

Department: ***Pharmacy***

Name of Co-PI: ***Dr. I R Laskar, Professor, Department of Chemistry***

Abstract: Photodynamic therapy (PDT) is a promising cancer treatment. However, existing photosensitizers have limitations such as aggregation-caused quenching (ACQ) and reduced production of reactive oxygen species (ROS). To address this, we propose developing a new AIE-active, near-infrared emissive PS for better PDT therapy. This PS will allow for deep penetration of light and overcome ACQ. Additionally, we will integrate functionalities for targeting specific organelles. Developing this PS will pave the way for simultaneous therapy and diagnosis applications. PDT therapy leads to immunogenic cell death (ICD), making it ideal for combining with immunotherapy. We propose evaluating the efficacy of a combined photodynamic-immunotherapeutic modality using the AIEgens and a TLR7+8 agonist R848. We also propose developing a tumor microenvironment-responsive nanoformulation for synchronized tumor-targeted drug delivery. This multi-dimensional therapeutic modality can significantly improve current treatment strategies.

Project Title: ***Discovery and Biological Evaluation of Novel Dual Inhibitors of DprE1 and InhA as Potential Anti Tubercular Agents***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: ***₹ 6,05,000***

Name of Co-PI: ***Dr. S Murugesan***

Designation: ***Professor***

Department: ***Pharmacy***

Abstract: The present study would involve, for the first time, the design of newer leads based on dual inhibition of mycobacterial enzymes DprE1 and InhA, a NADH-dependent enoyl-acyl carrier protein reductase. The compounds are designed based on thorough structure activity relationship studies of the existing DprE1 and InhA inhibitors. The present study would involve design of novel compounds employing structure-based drug design and molecular hybridization approach using available leads and evaluating the derivatives for the biological activity. Several compounds are designed hybridizing various scaffolds and docking studies were also performed to the DprE1 and InhA active site to identify the correct combination of heterocycles giving dual inhibition. Three synthetic schemes are proposed to synthesize the identified compounds exhibiting dual inhibition. Once the compounds are well characterized through various spectroscopic techniques, the novel compounds will be evaluated for anti-TB activity and their InhA and DprE1 inhibition. Cytotoxicity studies of the most active compounds will be performed and selectivity index will also be determined. Structure activity relationship studies will be carried out and one lead compound will be identified from the studies for further development.

Project Title: ***Construction of p-n Junction Photoelectrodes for Promoted Photoelectrochemical Performance***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: ***₹ 28,78,832***

Name of PI: ***Dr. Mrinmoyee Basu***

Designation: ***Assistant Professor***

Department: ***Chemistry***

Project Title: ***Development of Low-Cost Federated Learning Empowered Digital Twin Framework for Structural Health Monitoring (SHM) of Roads and Bridges built under PMGSY***

Funding Agency: ***I-DAPT HUB Foundation, IIT BHU, Varanasi***

Sanctioned Amount: **₹11,88,000**

Name of PI: ***Dr. Shashank Gupta***

Designation: ***Assistant Professor***

Department: ***Computer Science & Information Systems***

Name of Co-PI: ***Dr. S.N. Patel, Associate Professor, Department of Civil Engineering and Dr. Gourav Watts, Assistant Professor, Department of Mechanical Engineering***

Abstract: The project broadly focusses on the development of a cost-effective wireless SHM sensor board unit equipped with MEMS sensors and uses the NB-IoT protocol for establishing the long-range communication with the infrastructure support of 4G networks. Subsequently, a digital twin-based framework based on federated learning will also be developed for SHM in order to effectively perform real-time proactive monitoring and maintenance of critical infrastructure of roads and bridges constructed under PMGSY. In addition, the data communication among the physical twin, digital twin, and human will be utilized by exploiting edge computing infrastructure and a user-friendly web-based dashboard controller.

Project Title: ***Development of Semi-Analytical Methodology as a Design Aid for Small-Scale Structures using Non-Classical Continuum Mechanics***.

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: **₹ 14,78,400**

Name of Investigators: ***Dr. Rajesh Kumar***

Designation: ***Assistant Professor***

Department: ***Civil Engineering***

Abstract: Small-scale structures are utilized increasingly as electrochemical devices, field emission devices, sensors, and probes. These high-precision applications take advantage of the exceptional characteristics of microstructures, such as their high fundamental frequency, ultralow power consumption, great force and displacement sensitivity, and huge quality factors. Parametric excitations are used by parametric bandwidth filters to filter frequencies. A parametric oscillator uses parametric resonance for mass sensing and parametric amplification. The cantilevers of the Atomic Force Microscope are designed in such a way that stress-concentrated regions are developed, to increase the sensitivity of the piezo resistors. Organic solar cells operate in complicated environments withstanding temperature loads. The MEMS/NEMS devices are subjected to electrical, magnetic, thermal, and mechanical loadings based on their application in real-life situations. Thus, precise knowledge of these structures' resonance frequency, nonlinear stability, and responses under various loading conditions becomes crucial. However, these structures cannot be studied with classical continuum mechanics since their behaviour deviates from that of macro-/nano structures as a result of the amplification of small-scale effects. It is possible to do analysis using experimentation and molecular dynamics (MD), although doing so is time-consuming and costly. In this context, the non-classical continuum theories can be used to capture the small-scale effects. In this project, the sem-analytical methodology will be developed utilizing non-classical continuum theories for the studying of non-linear static, and dynamic behaviour of small-scale (micro/nano) structures (plates and shell panels) under localized thermal and mechanical loadings. The small-scale effects of the small-scale structures will be incorporated by using the nonlocal strain gradient theory. In this theory, both the material length scale and nonlocal parameters are calibrated using MD simulations by comparing the natural frequencies of small-scale structures. Due to the localized loadings, the analytical expressions of in-plane stresses within the small-scale structures will be derived by solving the elasticity problems. Using both analytical expressions of in-plane stresses and a developed semi-analytical methodology, the non-linear stability, vibration, and responses of the small-scale structure will be investigated.

Project Title: ***Design and synthesis of self-immolative molecular scaffolds to develop stimuli responsive materials.***

Funding Agency: ***Council of Scientific & Industrial Research (CSIR)***

Sanctioned Amount: **₹ 12,14,000**

Name of PI: ***Dr. Partha Sarathi Addy***

Designation: ***Assistant Professor***

Department: ***Chemistry***

Abstract: Autonomous regulation via molecular recognition induced multiple chemical events (in a synchronized fashion) is a great challenge of chemistry. To address this, issue fundamental development and optimization of structural and functional factors at molecular level are the essential criteria. Self- immolative chemistry involves an external stimulus induced multiple chemical events results in disassembly of a molecular structure to release a reporter (drug or fluorophore) molecule (**Figure 1**). Hence, these self-immolative molecules have great opportunity to meet the requirement for the development of autonomous molecular systems. These autonomous decision-making molecules can be used to design sensors, prodrugs, drug delivery system, molecular amplifiers and stimuli responsive materials. *In this regard our proposed work involves development of efficient self-immolative molecular scaffolds. We will also find out the rate and mechanistic details of the self-immolation processes for the proposed structures*

Figure 1: Analyte induced response of self-immolative molecular scaffold.

Project Title: ***2D Nanosheet Materials of Metal Chalcogenides as a Potential SERS Active Substrate for Chemical and Biochemical Sensing.***

Funding Agency: ***Council of Scientific & Industrial Research (CSIR)***

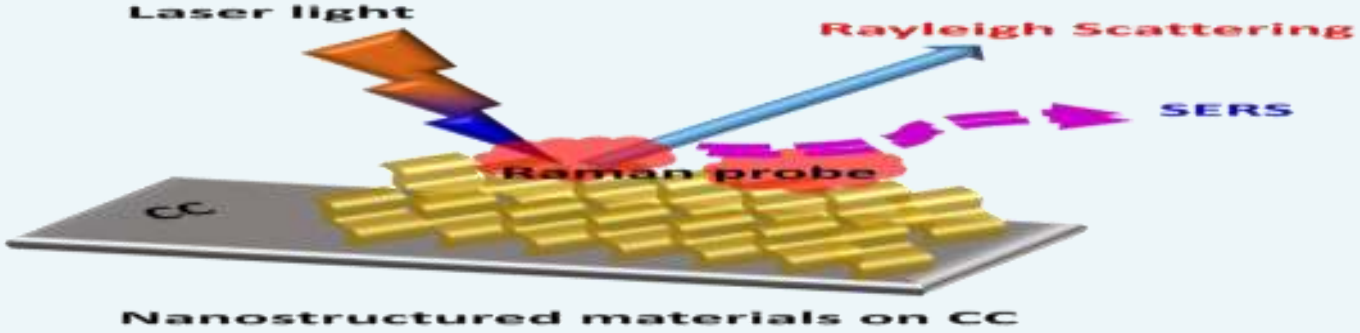
Sanctioned Amount: **₹16,42,200**

Name of PI: ***Dr. Surojit Pande***

Designation: ***Associate Professor***

Department: ***Chemistry***

Abstract: The occurrence of Raman scattering may be easily understood in terms of interaction between matter with electromagnetic radiation resulting in the change of frequency of the incident radiation. However, as a surface sensitive technique when the molecule adsorbed on a rough surface it gives significantly enhanced Raman signal, leading to the occurrence of surface-enhanced Raman scattering (SERS). As an interdisciplinary research field, SERS connect with physics and chemistry interfaces. SERS covers in studying the vibrational signatures of ions or molecules down to lower concentrations as well as in estimating their possible molecular orientations on the nanomaterial surfaces. For an ideal SERS active platform few essential requirements rest on the fabrication of substrates with 2D materials that produce high enhancement, stable shelf-life, uniform response, and reproducible. Fabrication of 2D vertically grown nanosheet materials on a conducting substrate using bottom-up approaches remain challenging. However, electrodeposition, hydrothermal, solvothermal, and precipitation fabrication routes are known to produce vertically grown 2D all-dielectric materials. SERS signal enhancement significantly depends on size, shape, morphology, porosity, and orientation of the nanostructured substrate.



Project Title: ***Understanding Vir Genes: Potential Mediators of Cyto- Adherence in Severe Malaria from Plasmodium vivax.***

Funding Agency: ***Indian Council of Medical Research (ICMR)***

Sanctioned amount: ***₹ 1,20,00,000***

Name of PI: ***Dr. Ashis Kumar Das***

Designation: ***Senior Professor***

Department: ***Biological Sciences***

Name of Co-PI: ***Dr. Shilpi Garg, Associate Professor, Dr. Balakumar Chandrasekar, Assistant Professor, Department of Biological Sciences, Dr. Sanjay Kochar, S.P. Medical College Bikaner***

Abstract: The reason for disease severity in some P. vivax infected patients, is not well understood. While performing global P. vivax transcriptomics, we have observed the upregulation of 'manifestation specific' vir genes in parasites from patients showing severe disease. The fact that one of the upregulated genes (vir 14 C) has earlier been shown to bind to ICAM-1 in-vitro increases the likelihood of the other upregulated genes mentioned to exhibit binding to host receptors like ICAM-1, CD36 and VCAM.

This is the first study investigating the binding potential of products of vir genes which have shown upregulated transcript expression in severe disease. This experimentation would provide insights into the possible mechanisms responsible for severe disease caused by P. vivax and help us identify the key molecules involved in the same, allowing us to investigate in later studies small molecule inhibitors against the vir genes preventing binding of these to host receptors

Project Title: ***Probing compact objects with gravitational waves***

Funding Agency: ***Department of Science & Technology (DST)- INSPIRE Scheme***

Sanctioned Amount: ***₹ 35,00,000***

Name of PI: ***Dr. Sajal Mukherjee***

Designation: ***Assistant Professor***

Department: ***Physics***

Abstract: In recent times, the scientific community has witnessed an enormous achievement in the field of gravitational wave (GW) astronomy. Since the first detection of binary black hole merger (GW2015), LIGO-Virgo-KAGRA collaboration continues to observe multiple merger events, including neutron star-neutron star, and black hole-neutron star merger. With the upgraded version of GW detectors (e.g. LIGO Voyager and LIGO A+), and future detectors (ground based – Einstein Telescope (ET), Cosmic Explorer (CE), LIGO-India; space-based – Laser Interferometric Space Antenna (LISA), and DECi-hertz Interferometer Gravitational wave Observatory (DECIGO)), it may be possible to detect new sources in the Universe (e.g. supernovae, mili-second pulsars, different stochastic background). Moreover, it seems likely to detect known sources (e.g. compact object binaries) with different orbital configurations, such as highly eccentric, and hyperbolic (also known as unbound or scattering) orbits, and intermediate/extreme mass ratio inspiral (IMRI/EMRI). Given that the gravitational wave astronomy is relatively nascent field, there are considerable scope to contribute in the frontier part. Moreover, when it comes to detecting signal from IMRI/EMRI, the adjacent field seems to be extremely dynamic. During my tenure as an Inspire Faculty Fellow, I am interested to study GWs from a broader perspective, with an emphasis on the detectability of EMRI/IMRIs.

Project Title: ***Modeling Travel Time for Two-lane Highways***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: ***₹ 27,19,990***

Name of PI: ***Dr. Durgesh Vikram***

Designation: ***Assistant Professor***

Department: ***Civil Engineering***

Abstract: It is observed that the travel time of cars in a two-lane highway depends on the percentage of trucks in the intended direction and also on the flow rate of the oncoming traffic. At first, this project aims at developing a deterministic model of travel time as a function of oncoming traffic flow rate and the percentage of trucks in the intended direction. To the best of investigator's knowledge, such a model will be developed for the first time. In general, arrival of vehicles is a random process and not a deterministic one. Therefore, the developed model will be extended to incorporate the stochastic nature of arrival of oncoming vehicles.

Project Title: ***Excited state (anti)aromaticity-guided charge transfer fluorophore research for biological imaging***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: ***₹ 27,96,140***

Name of PI: ***Dr. Avik Kumar Pati***

Designation: ***Assistant Professor***

Department: ***Chemistry***

Abstract: Advancements of fluorescence imaging technologies demand specialized fluorescent tools that have the power of capturing biological information as needed. Continued rational molecular engineering of fluorophores based on thorough investigations of their underlying mechanisms of action are crucial to produce smart fluorophores with superior output. In this project, we aim to study and tune traditional dyes' excited state (anti)aromaticity, which is an old theoretical concept and has re-emerged to be extremely powerful in comprehending photophysical and photochemical processes in recent years enlightening a plethora of photophysical phenomena for targeted applications.

Project Title: ***Blast Response of Functionally Graded Auxetic Sandwich Structures with Tunable Material Properties***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: ***₹ 17,30,880***

Name of PI: ***Dr. Gaurav Watts***

Designation: ***Assistant Professor***

Department: ***Mechanical Engineering***

Abstract: The design of robust, lightweight, protective structures against blast loading is a primary area of research focus in defence, aerospace, marine industries, and nuclear power plants. The monolithic metal or ceramic sheets that are generally used for such applications have very low strength-to-weight ratios. Sandwich structures with a high energy absorbing core offer high strength-to-weight ratios and improve energy absorption capacity for protection against shock loads. The auxetic metamaterials, which possess a counterintuitive behaviour, have a negative Poisson's ratio and have been proved to have better energy absorption capacity than conventional honeycomb cores. The recent research efforts on developing newer auxetic metastructures using topology optimization and machine learning approaches have paved the way for developing a new class of sandwich structures with tunable material properties. Most of the pertinent investigations on static/dynamic behaviour of sandwich structures with auxetic core have employed the auxetic materials possessing auxeticity in either tension or compression. The influence of dual mechanism cores having tunable thermal expansion coefficients and Poisson's ratios on the mechanical behaviour of sandwich structures is not yet fully understood. Furthermore, the influence of nonlinear temperature distribution and arbitrary geometrical shapes was also not thoroughly investigated in the studies available in the literature. The recent advancements in computer technology have reduced the computational time for FE simulations. However, the meshing of complicated domains is a time-consuming process, and there is a need to reduce bottlenecks in the process of modelling-to-meshing-to-solution. The isogeometric approach involves the use of non-unform rational B-Splines (NURBS) for approximation of both geometrical and solutions, thereby offering a strong integration between modelling and analysis. The present work proposes to employ an isogeometric approach for investigating the influence of core auxeticity on sandwich structures' static and dynamic behaviour against blast loading conditions. A comparative analysis of the performance of sandwich structures with honeycomb cores and different types of auxetic cores will be done to better understand the influence of core configuration on the blast performance of protective structures. The thermomechanical postbuckling behaviour of sandwich plates and shell panels with auxetic cores will also be compared for different types of cores with tunable Poisson's ratio and thermal expansion coefficients. The proposed work will result in benchmark solutions for the design of protective sandwich structures. The in-house code to be developed for the proposed work will also contribute to developing an indigenous platform for the design of sandwich structures.

Project Title: ***Experimental and Numerical Study of Saltwater Intrusion Control Measures under Tidal Influence***.

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: ***₹ 25,78,400***

Name of PI: ***Dr. Selva Balaji***

Designation: ***Assistant Professor***

Department: ***Civil Engineering***

Abstract: India has 7500 km length coastal boundary. The water table of the coastal aquifers are decreasing rapidly to induce further saltwater intrusion. The current situation makes it important to study effective control measures of saltwater intrusion to manage the freshwater needs with impending sea level rise due to climate change. The influence of tidal conditions on the comparison of Strack's solution with the density dependent flow solution needs to be analysed further for designing pumping well locations for coastal aquifers with significant tidal influence. Moreover, the conditions for instabilities in the upper saline plume needs to be analysed. The understanding of interactions between pumping well and upper saline plume and its instabilities would help in improving the prediction of contaminant transport pathways in coastal aquifers. Understanding contaminant transport is gaining importance for the following reasons: desalination plants could use coastal aquifers for disposal the brine waste, use of freshwater and saltwater from either side of saltwater in coastal aquifer for desalination purpose, and disposal of other contaminants. The proposed project would study the interactions between pumping well and instabilities in upper saline plume both in laboratory scale experimental setup and numerical modelling. Field scale numerical modelling would be performed to quantify the scale effects of the parameters (pumping rate, well distance from seaside boundary, distance of well from saltwater wedge, and distance of well from upper saline plume) identified from the laboratory scale analysis..

Project Title: ***On ϕ-rings.***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: ***₹ 17,97,400***

Name of PI: ***Dr. Rahul Kumar***

Designation: ***Assistant Professor***

Department: ***Mathematics***

The theory of ϕ-rings and maximal non-P-subrings of an integral domain is well established in commutative ring theory. There are several researchers who have found many vital results on these two topics which helped them to study multiplicative ideal theory. This proposal is motivated by all the works on ϕ-rings and maximal non-P-subrings of a domain. Our proposal will link ϕ-rings and maximal non-P-subrings of an integral domain and will help the researchers to find new ring extensions where the intermediate rings are not domains; however each intermediate ring satisfies a fixed ring theoretic property. In this proposal, we propose to do research on maximal non-ϕ-subrings of a ring in class H which will join these two works and fill the gap between these two concepts. We will try to find relations between maximal non-ϕ-subrings of a ring in class H and maximal non-P-subrings of an integral domain. This will help other area researchers to study generalizations of integral domains via ϕ-rings.

International Research Projects Sanctioned during April-23 to Sept 23

Project Title: ***Western Australia Transforming Community Health (WATCH) Pilot Study***

Funding Agency: ***The State of Western Australia acting through the Department of Health***

Sanctioned Amount: **₹6,75,997**

Name of PI: ***Dr. Vinti Agarwal***

Designation: ***Assistant Professor***

Department: ***Computer Science & Information Systems***

Abstract: In the UK, evidence-based decision-making has been greatly assisted through the Big Data collection named 'Fingertips' (https://fingertips.phe.org.uk/), which is organised into themed profiles. While these issues are progressively resolved in consultation with appropriate stakeholders, the concept can be developed and validated with publicly available data (even if it's only a subset and some of it is outdated). For instance, the Perth Crime Map and the Health Datasets - data.wa.gov.au could be useful starting points, along with relevant information from the Australian Bureau of Statistics' Australian Census. The initial emphasis is, therefore, on developing and validating the software algorithm which will be developed, underpinned by graph theory and machine learning, and which will differentiate WATCH from Fingertips.

Project Title: ***Future Medicine: Contactless Health Vitals Measurement -- A Pilot Implementation and Evaluation of a Contactless Health Vital Measurement System along with a Federated Data Infrastructure in the Context of Telemedicine.***

Funding Agency: ***ToHealth Gmbh Berlin, Germany***

Sanctioned Amount: ***₹ 1,19,46,000***

Name of PI: ***Dr. Tanmaya Mahapatra***

Designation: ***Assistant Professor***

Department: ***Computer Science & Information Systems***

Name of Co-PI: ***Dr. M M Pandey, Associate Professor, Department of Pharmacy***

Abstract: Breathing rate and blood pressure are among the most commonly used health vitals measured in many diseases. The current approaches rely on physical contact with patients, which is inconvenient and demands the presence of a trained expert to carry out the procedure. Moreover, capturing the health vitals becomes a hassle in case of pandemics. In the context of ML, the development of contactless health vital measurement paradigms has taken precedence. Many research institutes are looking into devising solutions using ML to develop contactless algorithms for capturing the health vitals like breathing rate and blood pressure, among others from the video of a patient. toHealth GmbH has developed a contactless health vital measurement system (CHVM).Nevertheless, the system is not yet stable, and the desired accuracy has not been attained. Therefore, it has not been certified to be used in clinical practice. The goal of this project is further refinement of CHVM to improve its prediction accuracy design and develop associated software systems to make it a scalable, reliable and mass-deployable product in clinical practice.

Industry & Consultancy Projects Sanctioned during April-23 to Sept.-24

Project Title: ***Improvement of selected formulations for topical, oral delivery and development of patch.***

Funding Agency: ***S N PANDIT AYURVEDIC Co PVT Ltd***

Sanctioned Amount: ***₹ 11,40,000***

Name of PI: ***Dr. Deepak Chitkara***

Designation: ***Associate Professor***

Department: ***Pharmacy***

Name of Co-PI: ***Dr. M M Pandey, Associate Professor, Department of Pharmacy***

Abstract: The projects aims at the development and characterization of nano-based formulations of ayurvedic products for delviery via topical and oral route o0f administration. The developed formualtions will have improved patient compliance and efficacy profile.

Project Title: ***Use of distillery and domestic wastewater to generate hydrogen and development of a prototype thereof***

Funding Agency: ***LIGHTATOM Electrolyzer Pvt. Ltd.***

Sanctioned Amount: ***₹ 15,95,000***

Name of PI: ***Dr. Somak Chatterjee***

Designation: ***Assistant Professor***

Department: ***Chemical Engineering***

Name of Co-PI: ***Dr. Surojit Pande, Professor, Department of Chemistry***

Abstract: The current project aims at development of a module to produce purified stream from distillery and domestic wastewater and using the same for generation of hydrogen. The project is divided into two parts, the first being the production of purified water stream in alkaline range from the said type of wastewater. The second part being the development of a novel electrode material, made of fibrous carbon cloth, in which catalyst, such as, MOF will be deposited. This electrode will be used to study the generation of hydrogen from the purified stream. Finally, a functional prototype will be assembled, based on the experiments.

Project Title: ***Development of new symmetrical phthalonitrile resins as high performance thermosets***

Funding Agency: ***Fine finish organics Pvt. Ltd***

Sanctioned Amount: ***₹ 10,00,000***

Name of PI: ***Dr. Indersh Kumar***

Designation: ***Professor***

Department: ***Chemistry***

Abstract: The main focus of this proposed work is to design and develop a new type of symmetrical phthalonitrile resins to reduce costs and labor associated with coating maintenance for off-shore applications, where inspection and maintenance are complex due to the location of the asset. To initiate this collaborative work with Fine Finish Organics Pvt. Ltd., we propose two tasks to develop a new type of symmetrical phthalonitrile resins that can be cured later with an amine so a novel cross-linked phthalonitrile thermosets that may find various applications.

Project Title: ***Pharmacokinetic & Pharmacodynamic Evaluation of gamma oryzanol from different sources /origin on STZ -HFD induced cardiac and metabolic impairments in the rat model.***

Funding Agency: ***Zeoric Nutrition LLP***

Sanctioned Amount: ***₹ 7,50,000***

Name of PI: ***Dr. Rajeev Taliyan***

Designation: ***Professor***

Department: ***Pharmacy***

Project Title: ***3D CFD simulations on Hydrogen gas storage Type 4 cylinder***

Funding Agency: ***DroneVionics Pvt. Ltd***

Sanctioned Amount: ***₹ 70,800***

Name of PI: ***Dr. Aneesh A M***

Designation: ***Assistant Professor***

Department: ***MechanicalEngineering***

Project Title: ***Biomass pellets/ Briquattes Assessment in GuJarat & Maharashtra States***

Funding Agency: ***Sardar Patel Renewable Energy Research Institute, Anand Gujrat***

Sanctioned Amount: ***₹ 12,49,500***

Name of PI: ***Dr. Pratik N Sheth***

Designation: ***Professor***

Department: ***Chemical Engineering***

Abstract: The National Mission on using biomass in thermal power plants suggests the cofiring of agrowaste based pellets with coal. The objective is to increase the level of co-firing from the present 5% to higher levels to have a larger share of carbon-neutral power generation from the thermal power plants. Hence, the manufacturing of Biomass pellets and briquettes has recently grown, and many new plants arecoming up. This project is taken to overcome the constraints in the supply chain of biomass pellets and agro-residue and its transport up to the power plants. The project work involves extensive fieldwork and visits to all manufacturing plants to gather data such as plant capacity, biomass source, pricing, etc. The team of engineers are visiting the plants located in Gujarat and Maharashtra collecting the required data and geotagging the plant. The envisaged outcome is to develop a supply chain model catering to the needs of biomass pellets/briqueettes at thermal power plants or community boilers.

Research Projects Completed during April-23 to Sept.-24

Project Title: ***A Study on the problems and prospects of Agro-tourism in Rajasthan State***

Funding Agency: ***Ch. Charan Singh National Institute of Agricultural Marketing***

Sanctioned Amount: **₹5,00,000**

Name of PI: ***Dr. Praveen Goyal***

Designation: ***Associate Professor***

Department: ***Management***

Name of Co-PI: ***Dr. Saurabh Chadha, Assistant Professor Department of Management***

Abstract: Agro-tourism educates and trains rural people to create alternative income streams and preserve cultural traditions. The study aimed to assess the problems and prospects of agro-tourism in Rajasthan. This study thoroughly reviewed the state-of-the-art literature on agro-tourism, published from different perspectives and related to different cultural, social, and geographical contexts. This study collected data from current and prospective agro-tourism service providers and consumers using interviews and structured questionnaire methods. In order to prioritize the problems of agro-tourism in the state, the Analytical Hierarchy process technique was applied. This process helped identify the key issues that may be considered on a priority by the policymakers and practitioners. The policy-related problems are identified as critical problems followed by firm-level problems, climatic and regional problems, and other problems. This weightage indicates that effective policy development may help foster agro-tourism growth in Rajasthan.

Further, data was collected using a structured questionnaire to understand the customer's perspective of agro-tourism and their issues. In the last, we presented how S-D logic may help effectively involve agro-tourism customers. We also suggest that agro-tourism sites adopt a collaborative framework with government and non-government entities to develop and run these sites. The government must also provide them with the required support and training to diversify the state's existing tourism framework.

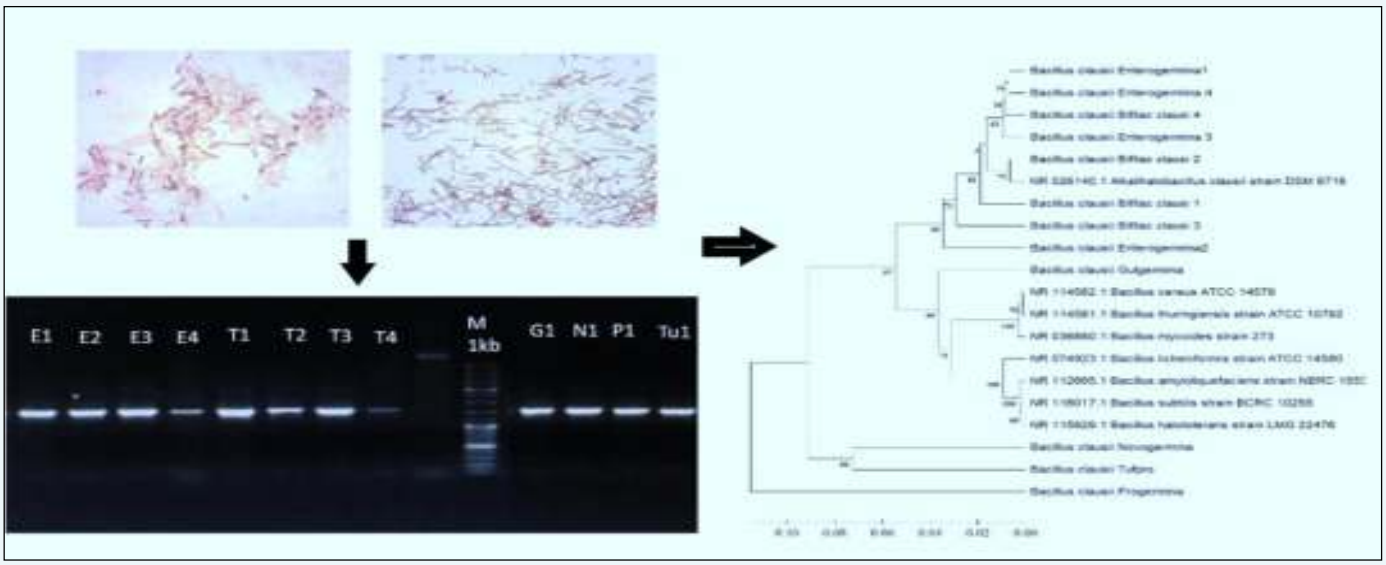
Project Title: ***Five years of the e-NAM platform: examining factors influencing its adoption and primary usage across product categories and states***
Funding Agency: ***Ch. Charan Singh National Institute of Agricultural Marketing***
Sanctioned Amount: **₹5,00,000**
Name of PI: ***Dr. Nirankush Dutta***
Designation: ***Assistant Professor***
Department: ***Management***
Name of Co-PI: ***Dr. Udayan Chanda, Associate Professor Department of Management***

Abstract: The study was an attempt to understand the e-NAM system better and find out the factors which could facilitate or inhibit its adoption and usage. Farmers growing different types of crops in the states of Rajasthan, Haryana and Uttarakhand were surveyed to understand their attitude toward the adoption of the e-NAM portal / app. A comparative analysis was conducted to explore the underlying reasons behind differences in attitude toward the adoption of e-NAM in these states. The project covered different mandis across these three states. The findings are of national importance which can help in the economic development of the country, especially the farmer community.

Project Title: ***Li+ NASICON-Polymer hybrid composites for solid state supercapcitor applications***
Funding Agency: ***Science and Engineering Research Board(SERB)***
Sanctioned Amount: **₹ 43,97,391**
Name of PI: ***Dr. Anshuman Dalvi***
Designation: ***Professor***
Department: ***Physics***

Project Title: ***A comparative study of BIFILAC CLAUSI Vs Enterogermina and other selected brands of Bacillus clausii for Pro-Bio similarity***
Funding Agency: ***TABLETS(INDIA) LTD. Chennai***
Sanctioned Amount**: ₹ 10,08,000**
Name of PI: ***Dr. Paul Atish Tulshiram***
Designation: ***Associate Professor***
Department: ***Mechanical Engineering***
Name of Co-PI: ***Dr. Prabhat Nath Jha, Professor Department of Biological Sciences***

Abstract: The human gut microbiome is made up of complex and diverse microbial communities that are associated with human intestinal health. Hence, the clinical use of probiotics both for prevention and treatment of the various diseases is a popular strategy. There are many types of probiotics available in the market. Studies of commercial product containing *Bacillus Clausii* that are sold in India and Pakistan has indicated that mismatch with the label claims. Thus the present project aimed at evaluating pro-biosimilarity of *B. clausii* product to that of the International reference product Enterogermina. *B. clausii* product was found to exhibit similarity to the International reference product in terms of (i) quantitative assay (CFU count) (ii) same number of strains (iii) taxonomical similarity based on 16S rDNA sequence analysis (iv) resistant/sensitivity pattern to the commonly used antibiotics (v) pH and suspension clarity.

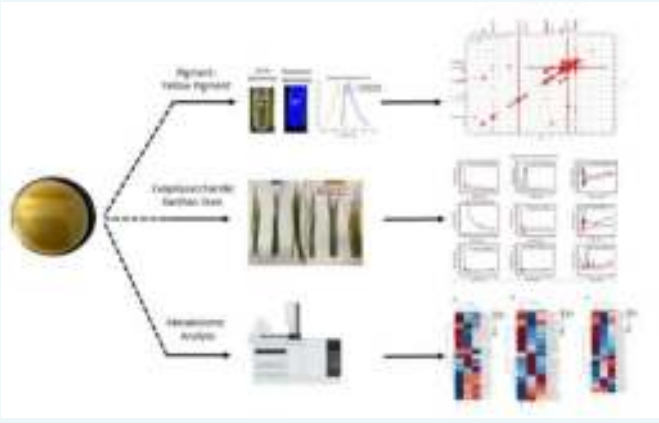


Project Title: ***Analysis, Design and Development of low cost cold storage for selected agricultural products based fully on solar and geothermal energy***
Funding Agency: ***Department of Science & Technology (DST)***
Sanctioned Amount: ***₹ 47,03,400***
Name of PI: ***Dr. Mani Sankar Dasgupta***
Designation: ***Senior Professor***
Department: ***Mechanical Engineering***

Abstract: The project aims to advance SDG 2 (End hunger), 7 (Ensure access to affordable and clean energy), and 13 (Take action on climate change). The results include the construction of a 5-metric-ton cold storage facility specifically for farmers who need to rely upon renewable energy sources like solar and geothermal energy. Geothermal energy has been used as a passive mechanism to reduce cooling requirements within the carbon-neutral vapor absorption system, which is a ground-breaking and economical method for preserving horticulture harvests.

Project Title: ***Development of sensors for blast and blight diseases and stomatal activity measurement in rice.***
Funding Agency: ***Indian Council of Agricultural Research (ICAR)***
Sanctioned Amount: **₹ 23,94,830**
Name of PI: ***Dr. Prabhat Nath Jha***
Designation: ***Professor***
Department: ***Biological Sciences***

Abstract: A yellow coloured, blue fluorescing compound was purified from Xanthomonas oryae causing blight disease in rice plants and characterized. FTIR and NMR data suggests that this compound is a long chain, alkane structure with some degree of saturation and has carbonyl and phosphorous group(s). With the achieved level of purified compound and its optical properties, this compound can be used for its validation as a target molecule for biosensors. Xanthan gum, a signature exopolysaccharide of X. oryzae with unique rheological properties, was extracted to be used as a ligand for biosensor development. The rheometric analysis of infected (control) and non-infected rice leaf (treated) samples showed the difference in shear rate v/s viscosity of control and treated samples (25 °C) with slight increase in the conductivity of the infected rice plant samples. These results indicate that xanthan gum, can be used as a potential analyte for biosensor development. Further, Signature metabolites of three Indian races of X. oryzae (UK, PB, and UP) of pathogenicity level VI were used for comparative metabolomics analysis to identify abundantly produced metabolites. 1-Monopalmitin, Glycerol monostearate, and glycerol were found to be produced by all the races. If the given metabolites are found to be exclusively produced in infection studies by the given species, they can be used as target molecules for sensor development in future studies and can be validated for early detection during pathogenesis process of X. oryzae pv. oryzae.



Project Title: ***Enhancer of Zeste Homolog-2 role in Glomerular endothelial Dysfunction during Diabetic nephropathy***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: **₹ 39,71,000**

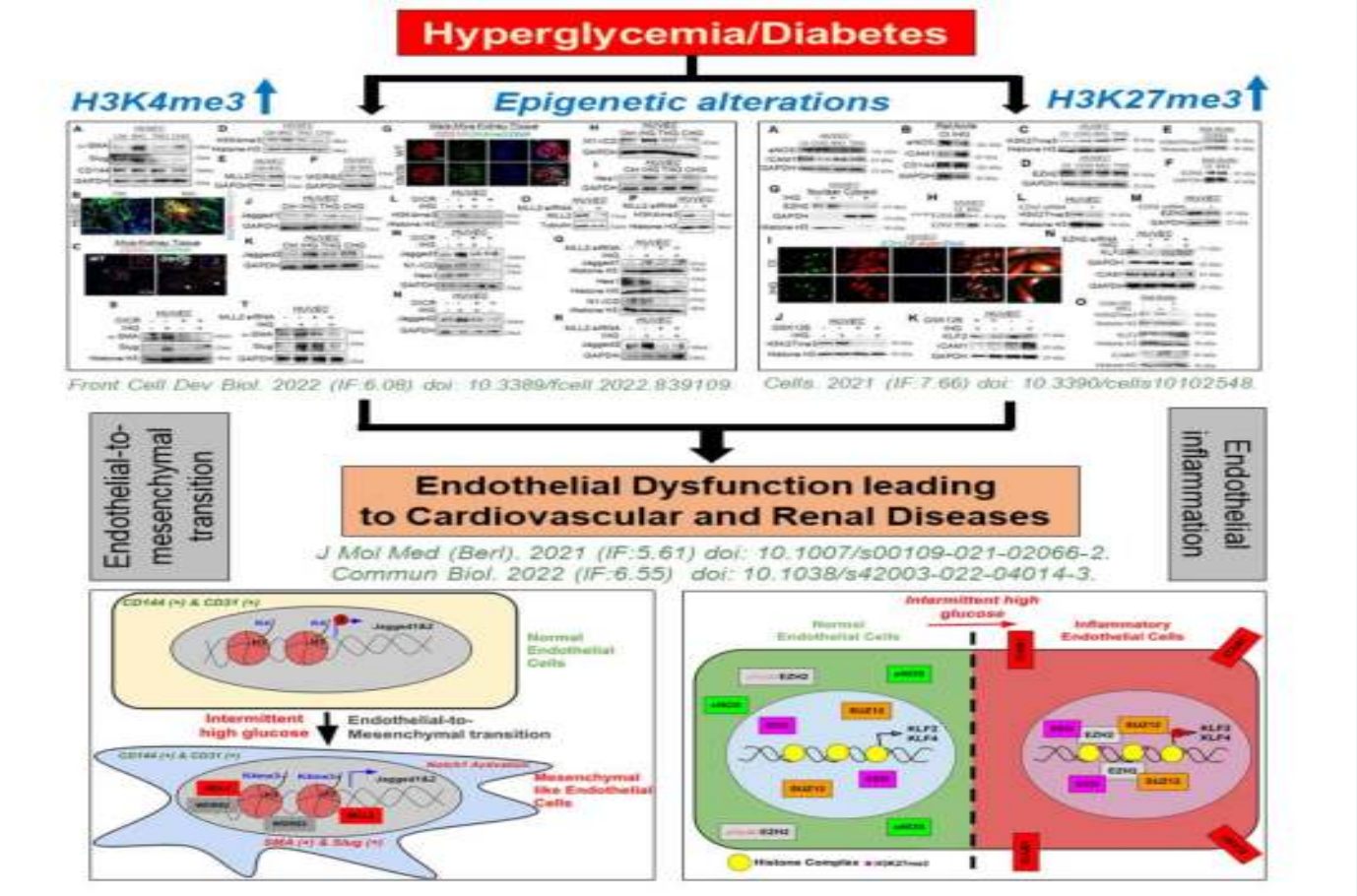
Name of PI: ***Dr. Syamantak Majumder***

Designation: ***Associate Professor***

Department: ***Biological Sciences***

Name of Co-PI: ***Dr. Shibasish Chowdhury, Professor Department of Biological Sciences***

Abstract: Vascular endothelium maintains homeostasis by acting as a cellular lining of the circulatory system. Endothelial dysfunction is a common finding among patients affected by diabetes. Hyperglycemic conditions in type 2 diabetes have been shown to cause epigenetic disturbances in many tissue types. Epigenetic mechanisms have emerged as one of the key pathways promoting diabetes-associated cardiovascular and renal complications. Herein, we explored the role of histone 3 lysine 27 trimethylation (H3K27me3) and histone 3 lysine 4 tri-methylation (H3K4me3) in high glucose-mediated endothelial dysfunction. The study identified a crucial role of histone methylation in the hyperglycemia-dependent reprogramming of endothelial cells to undergo mesenchymal transition and indicated that epigenetic pathways contribute to diabetes-associated cardiovascular and renal complications.



Project Title: ***Investigating the correlation between thermodynamic and kinetic parameters through density functional reactivity theory (DFRT) based approach***

Funding Agency: ***Science and Engineering Research Board(SERB)***

Sanctioned Amount: **₹ 41,28,885**

Name of PI: ***Dr. Ram Kinkar Roy***

Designation: ***Professor***

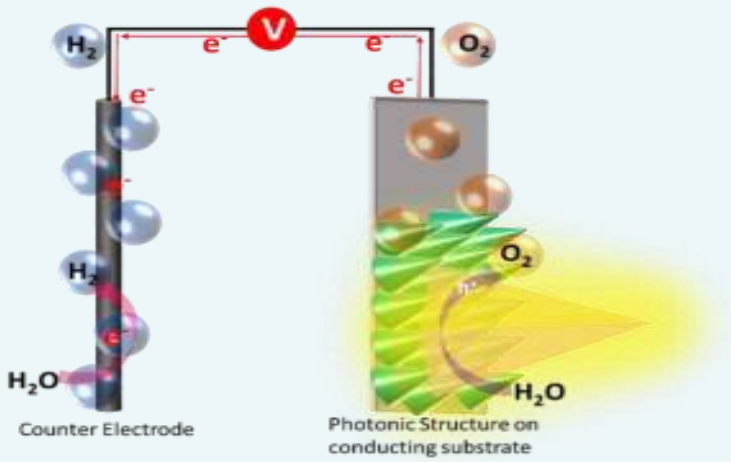
Department: Chemistry

Abstract: This project dealt with the convergence analysis of a finite volume scheme for solving coupled non-linear aggregation and linear breakage problems with singular kernels. The result was established in a weighted L 1 space by using the idea of Dunford Pettis theorem. In addition to this, several semi-analytic schemes were explored to find the analytic approximate solutions to the problems.

Project Title: Photoelectrochemical Water Splitting of Photonic Nanostructure
Funding Agency: ***Science and Engineering Research Board(SERB)***
Sanctioned Amount: **₹ 46,00,000**
Name of PI: ***Dr. Mrinmoyee Basu***
Designation: Assistant ***Professor***
Department: ***Chemistry***

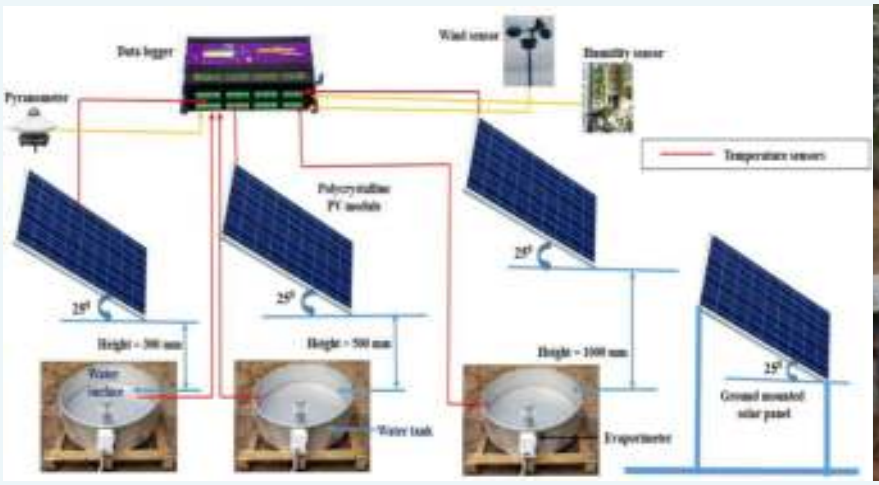
Abstract:

Photonic nanostructure of various visible light active semiconductors like In_2S_3/In_2O_3, $CdIn_2S_4$, $AgIn_2S_4$ and $CuInS_2$ are developed following chemical method. After synthesis of those materials, they are well characterized with the help of different physical techniques. Finally, the developed materials are applied in PEC water splitting reaction either as anode or cathode, depending on the property of the material. It is established that the developed photonic structures help to have maximum light absorbance to increase the PEC efficiency at the same time help to increase charge carrier separation and transportation.



Project Title: ***Design and devleopment of fixed and floating solar PV installation for water management infrastructures***
Funding Agency: ***First Green Conulting Pvt. Ltd***
Sanctioned Amount: **₹ 20,47,000**
Name of PI: ***Dr. Ravi Kant Mittal***
Designation: ***Professor***
Department: ***Civil Engineering***
Name of Co-PI: ***Dr. Manoj Kumar Soni, Professor Department of Mechanical Engineering, Dr. Shibani Khanra Jha, Associate Professor , Department of Civil Engineering***

Abstract: An experimental setup of the FSPV system has been developed which consists of solar panels operating at different heights above the water surface. The findings indicate that FSPV modules can reduce the module temperature by 4˚C to 7˚C. FSPV at optimum height can increase power output by 2 to 4%. FSPV installation reduces evaporation losses which varies with height of panel above water. More than 24 % evaporation reduction achieved with panel height 300 mm above water surface.

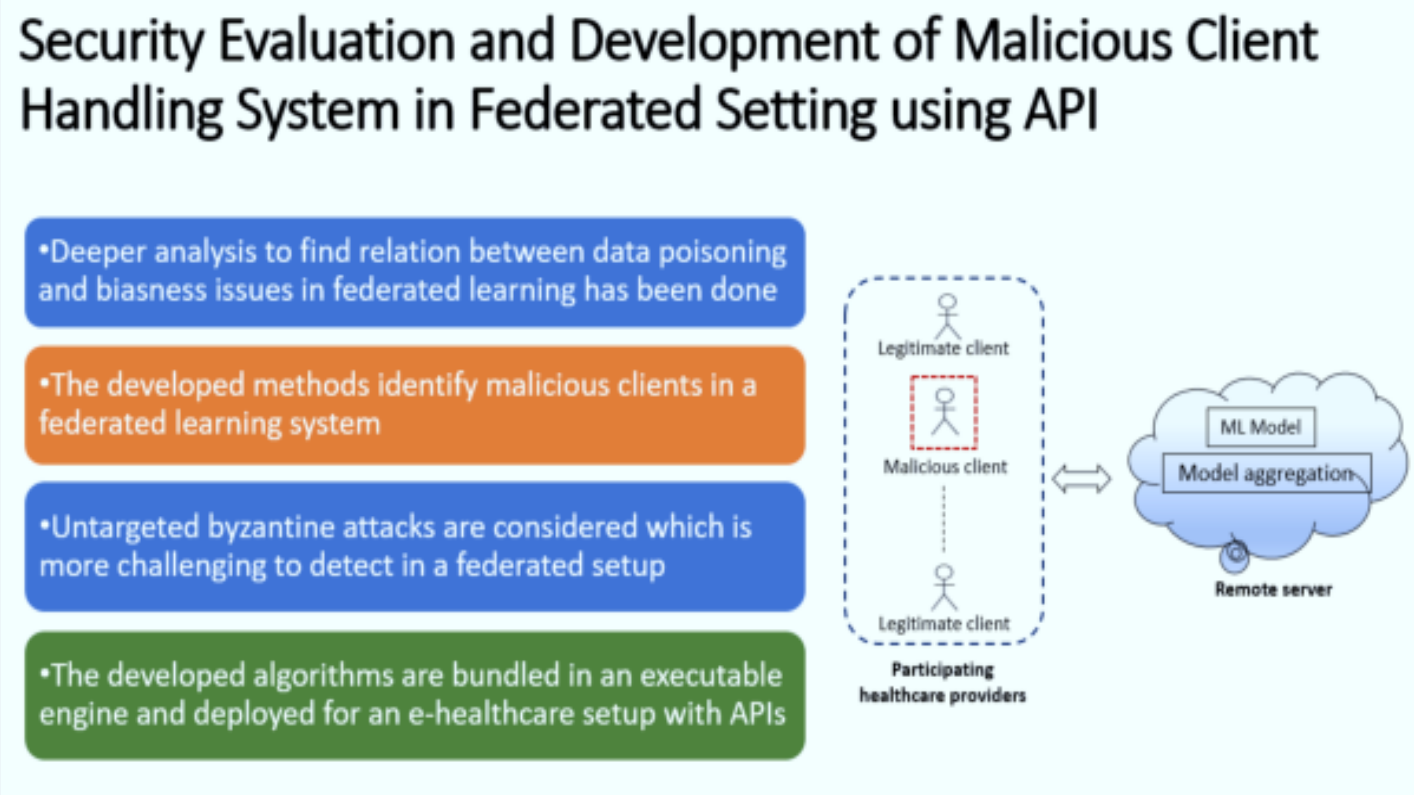


Project Title: ***Sustainable impact on education through Blockchain technology***
Funding Agency: ***CoinDCX***
Sanctioned Amount: **₹ 10,00,000**
Name of PI: ***Dr. Amit Dua***
Designation: ***Associate Professor***
Department: ***Computer Sciences & Information Systems***

Abstract: Blockchain and Web3 technologies have emerged as the forerunners in the ever-evolving landscape of technological advancements. Recognizing this gap between the potential of these technologies and the current blockchain literacy rate among students, CoinDCX took a commendable initiative in February 2022. With funding of 10 Lakhs INR, the project worked to bridge this divide by educating and training over 100 students in Blockchain Technology in the past year

Project Title: ***Security Evaluation and Development of Malicious Client Handling System in Federated Setting using API***
Funding Agency: ***Data Security Council of India (DSCI)***
Sanctioned Amount: **₹ 4,75,000**
Name of PI: ***Dr. Amitesh Singh Rajput***
Designation: ***Assistant Professor***
Department: ***Computer Science & Information Systems***
Name of Co-PI: ***Dr. Tanmaya Mahapatra, Assistant Professor Department of Computer Science & Information Systems***

Abstract:



Project Title: ***Arfificial Intellegence Enabled security provisioning and vehicular vision innovations for autonomous vehicles***

Funding Agency: ***Shastri Indo Canadian Institute(SICRG)***

Sanctioned Amount: **₹ 10,00,000**

Name of PI: ***Dr. Vinay Chamola***

Designation: ***Associate Professor***

Department: Electrical & Electronics Engineering

Abstract: The need for social / physical distancing in the current COVID-19 pandemic has, perhaps, reinforced the importance of autonomous cabs (also referred to as taxis). Deploying such services demands a robust and secure communication backbone along with excellent self-driving capabilities. These services are usually deployed on a VANET based multi-tier network composed of two sides: a user-side network and a vehicle side system. In this project, we use supervised and unsupervised deep learning techniques to identify anomalous cab behavior as well as known security attacks, to ensure security on the vehicle-side of the VANET-supported autonomous cab network, which has not received much attention in contemporary research. While the latest electric vehicles on the market come equipped with self-driving capabilities, their reliability in adverse weather conditions such as rain, fog, low-light, snow, haze etc., is very poor. Autonomous cabs would have to be equipped with robust video processing systems to improve their video feed in such weather conditions for safe, reliable, and uninterrupted autonomous cab services. In this project, we would also develop two end-to-end deep learning based video enhancing systems: one optimized for Canadian road and weather conditions, and the other for India. Our systems would be capable of identifying adverse weather conditions and then improving the video feed accordingly, without employing any intermediate transmission maps or physical weather models, to achieve fast and lightweight processing, with minimal power and memory consumption.

Project Title: Skin permeations study (3-way) of test and reference formulations

Funding Agency: ***Alkem Laboratories Mumbai***

Sanctioned Amount: **₹ 4,10,000**

Name of PI: ***Dr. M M Pandey***

Designation: ***Associate Professor***

Department: ***Pharmacy***

Project Title: ***Development of a complete skin substitute by autologous cell grafting using an in-situ forming bioactive scaffold for burn wound healing***

Funding Agency: ***INTAS Pharmaceuticals Ltd., Ahmedabad***

Sanctioned Amount: **₹ 10,00,000**

Name of PI: ***Dr. Aniruddha Roy***

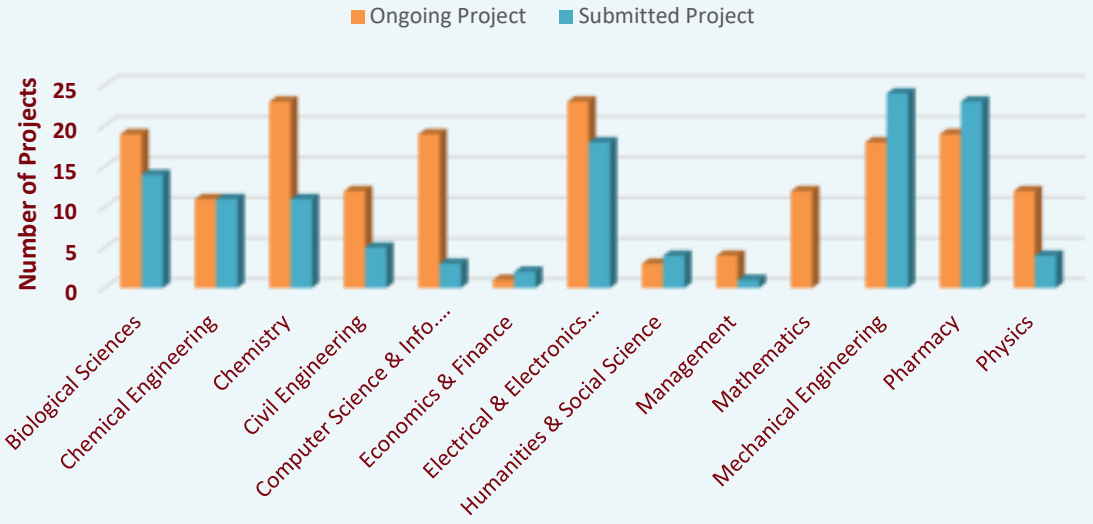
Designation: ***Associate Professor***

Department: ***Pharmacy***

Name of Co-PI: ***Dr. Sushil Kumar Yadav, Senior Veterinary, In charge, Animal House***

Abstract: There are many drug molecules that does not get absorbed through GI tract very efficiently and due to that they exhibit very low bioavailability. Many of these drugs are given only through parenteral route to improve bioavailability. It would be highly beneficial if using nano-formulation approach the oral bioavailability of such drugs can be improved.

Department wise Ongoing & Submitted Projects During April 2023 to Sept. 2023



Department wise Sanction Amount (in Lakhs) for Ongoing Projects as on September 2023

Department wise Proposed amount (in Lakhs) for Submitted Projects During April 2023 to Sept.-2023

Patents Granted

Patentee: Birla Institute of Technology and Science, Pilani

Patent No.: 434275

Application No.: 201911016252

Date of Filing: April 24th 2019

Title: ***PROLYOTROPIC LIQUID CRYSTALS AND METHOD FOR PREPARING THE SAME***

Date of Grant: June 6th, 2023

Inventors Name: Gautam Singhvi / Vamsi Krishna Rapalli / Sunil Kumar Dubey / R.N. Saha / Tejashree Waghule / Srividya Gorantala / Vishal Girdhar

Patentee: Birla Institute of Technology and Science, Pilani

Patent No.: 448589

Application No.: 202011006183

Date of Filing: February 2nd 2020

Title: ***A LIPID-BASED FOAM NANO EMULGEL COMPOSITION FOR TOPICAL APPLICATION***

Date of Grant: August 31st , 2023

Inventors Name: Gautam Singhvi / Vamsi Krishna Rapalli / Sunil Kumar Dubey / R.N. Saha / Tejashree Waghule / Srividya Gorantala / Vishal Girdhar

Patentee: Birla Institute of Technology and Science, Pilani

Patent No.: 455632

Application No.: 3944/DEL/2012

Date of Filing: December 20th 2012

Title: ***OLIGONUCLEOTIDES FOR THE DETECTION OF PLASMODIAL SP AND AN ASSAY THEREOF***

Date of Grant: September 29th, 2023

Inventors Name: Ashis Kumar Das / Deepal Pakalapati

Patentee: Birla Institute of Technology and Science, Pilani

Patent No.: 452717

Application No.: 2644/DEL/2014

Date of Filing: September 15th 2014

Title: ***A SYSTEM AND METHOD FOR MEASURING SURFACE PLASMOM RESONANCE OF A SENSING ELEMENT***

Date of Grant: September 19th, 2023

Inventors Name: Raj Kumar Gupta / Vaddakedath Purshothaman / Manjuladevi V

Patentee: Birla Institute of Technology and Science, Pilani

Patent No.: 430017

Application No.: 201711024371

Date of Filing: July 11th 2017

Title: ***ARSENIC DETECTION SYSTEM, METHOD, AND TEST KIT THEREOF***

Date of Grant: April 26th, 2023

Inventors Name: S.K. Verma / V.K. Chaubey/ Subash Chandra Bose / G. Rajahari

Patentee: Birla Institute of Technology and Science, Pilani

Patent No.: 455508

Application No.: 202111022556

Date of Filing: May 20th 2021

Title: ***NANOPARTICLES REINFORCED HYDROGEL COMPOSITE***

Date of Grant: September 28th , 2023

Inventors Name: Sachin Belgamwar / Bhakat, Tamalika / Agarwal, Ajay

Useful links of GCIR

Link to apply for New Project Proposal to Government/Industry Funding Agencies

New Proposal Submission

Link to take Administrative Approval for procurement (Equipment, Consumables Etc.)

Online Approval System

Link to Access e-copy of the Newsletters

https://www.bits-pilani.ac.in/pilani/srcd/newsletter

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Home Page: https://www.bits-pilani.ac.in/pilani/sponsored-research-and-consultancy-srcd/