BITS Pilani
Pilani Campus

Grants Consultancy & Industrial Research Division

NEWSLETTER

Volume 3 Issue 2, 2024

(October- September, 2023-2024)

FROM THE DESK

Message from the Director

Dear Faculty, Staff, and Students,

Greetings!

At BITS Pilani, we have always been committed to excellence in research and innovation. Our efforts in **grants acquisition**, **consultancy services**, and **industrial collaboration** play a pivotal role in strengthening our research ecosystem and enhancing the impact of our work on society and industry.

I encourage all faculty members and researchers to actively pursue competitive research grants, foster consultancy opportunities, and engage with industry partners. These endeavors not only elevate our institution's profile but also pave the way for groundbreaking discoveries and solutions to real-world problems. As we strive to address contemporary challenges through innovation and collaboration, I am delighted to share some significant updates that reflect our collective progress:

1. **Individual Research Projects**: The Pilani Campus is currently executing numerous ongoing projects with a combined value of **Rs. 69.35 Cr**, showcasing the expertise and dedication of our faculty members.
2. **Department/Institute-Level Projects**: Large projects such as **FIST**, **SATHI**, **BiocyTIH**, **DBT-Builder**, and **PURSE** collectively represent an impressive funding of **Rs. 217.9 Cr**.

These accomplishments underscore the strong foundation we have built for research and our ability to attract significant external funding. To further strengthen this, I encourage you to explore new avenues for sponsored projects, industrial collaboration, and consultancy that align with our mission to deliver meaningful societal impact.

The **Grants, Consultancy, and Industrial Research (GCIR)** division is here to support you in identifying funding opportunities, managing proposals, and facilitating partnerships. Please reach out to the team for assistance with proposal development, budgeting, and compliance with institutional and funding agency guidelines.

Let us continue to work together to elevate BITS Pilani as a global hub for impactful research and innovation. I deeply value your contributions to this shared vision and look forward to seeing even greater milestones in the days to come.

Prof. Sudhirkumar Barai

Director, BITS Pilani, Pilani Campus

Message from Associate Dean, GCIR

Dear Colleagues and Researchers,

Greetings from the Office of **Grants, Consultancy, and Industrial Research (GCIR)!**

We are excited to share the research outcomes and achievements of BITS Pilani, Pilani Campus, for the period of October 2023 to September 2024 in terms of projects and patents.

We have secured substantial research funding from prestigious national and international agencies. Consultancy projects with prominent industry partners have also seen remarkable growth, enabling translational research and impactful collaborations. A significant number of patents have been filed and granted during this period, demonstrating our commitment to innovation and intellectual property generation. These milestones reflect our collective dedication to innovation and excellence in research.

We extend heartfelt congratulations to all faculty, students, and researchers whose relentless efforts have contributed to these accomplishments. Your pursuit of excellence continues to position BITS Pilani as a leading institution in research and innovation.

As we look forward, the GCIR office remains committed to supporting you in securing funding, building industry partnerships, and achieving greater heights in research. Let us keep this momentum going and continue making a difference through our work.

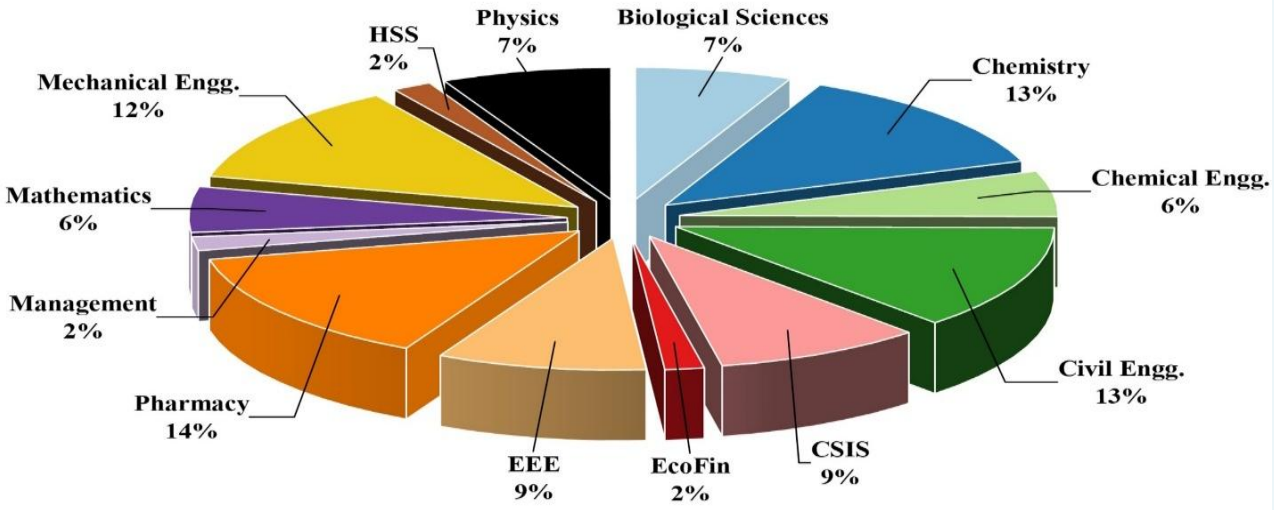
Prof. Raj Kumar Gupta, Professor

Department of Physics, BITS Pilani, Pilani Campus

Department/Institute wide Ongoing Sponsored Research Projects

Institute Wide	**Project title:** National Mission on Interdisciplinary Cyber Physical Systems-NMICPS (BiocyTIH) **Funding Agency: Department of Science and Technology (DST)** **Sanctioned Amount: ₹1250000000**
Institute Wide	**Project title:** DBT-BUILDER -University of Birla Institute of Technology and Science Pilani, Pilani Campus Interdisciplinary Life Science Programme for Advanced Research and Education in Epigenetics and Genome editing **Funding Agency: Department of Biotechnology (DBT)** **Sanctioned Amount: ₹90180320**
Institute Wide	**Project title:** Promotion of University Research and Scientific Excellence (PURSE) **Funding Agency: Department of Science and Technology (DST)** **Sanctioned Amount: ₹117006160**
Institute Wide	**Project title:** Sophisticated Analytical and Technical Help Institutes (SATHI) **Funding Agency: Department of Science and Technology (DST)** **Sanctioned Amount: ₹697000000**
Department Wide	**Project title:** Funds for Improvement in Science and Technology **(**FIST) **Funding Agency: Department of Science and Technology (DST)** **Sanctioned Amount: ₹20300000** **Department:** Pharmacy
Department Wide	**Project title:** Funds for Improvement in Science and Technology **(**FIST) **Funding Agency: Department of Science and Technology (DST)** **Sanctioned Amount: ₹5500000** **Department:** Computer Science and Information Systems

Department wide ongoing projects (in %) as on September 2024



Total Amount of Ongoing Projects: Rs. 287.34 Crore

Government Sponsored Research Projects Sanctioned during October 2023-September 2024

Project Title: ***Investigating membrane degradation and its mitigation for enhancing the performance for green hydrogen powered proton exchange membrane fuel cell (PEMFC)***

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

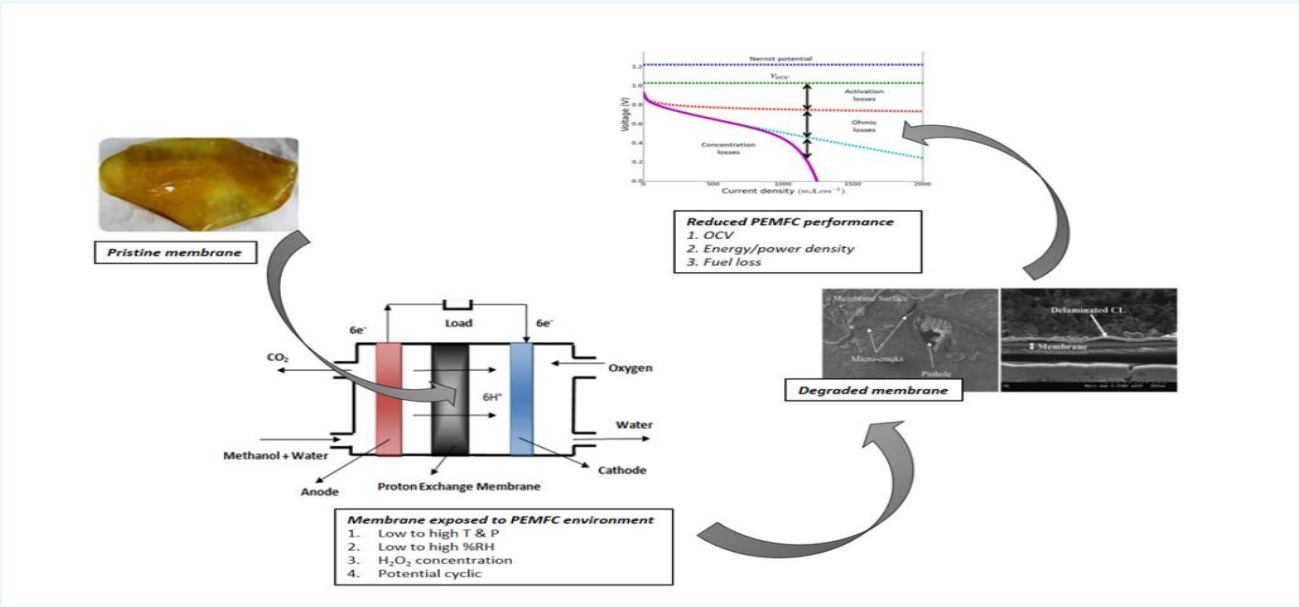
Sanctioned Amount: **₹25,01,860**

Name of PI: ***Prof. JAY PANDEY***

Designation: ***Assistant Professor***

Department: ***Chemical Engineering***

Abstract: In the recent past, due to emergence of clean, green and sustainable electric mobility, there is huge demand of battery electric vehicle (BEV) and fuel cell electric vehicle (FCEV) as an alternative to conventional fuel driven vehicles. FCEV has several advantages over BEV such as lower cost, higher efficiency, easy operability and most importantly high energy density compared to BEV. The proton exchange membrane fuel cell (PEMFC) is the highly preferred fuel cell type used in FCEV. For the last few years, the low temperature proton exchange membrane fuel cell is more in the demand due to large green hydrogen production which is taking quantum leap due to many developments in renewable energy powered water electrolyzer. Still high fuel cell component's cost (bipolar plates, electro-catalysts and membrane), poor durability and lower power densities, the global commercialization of FCEV is being hampered. Fortunately, the component cost is declining due to significant progresses in nano-materials developments (non-PGMs electro-catalysts and non-Nafion based membranes). Despite being all these developments, the degradation of materials (membrane, electro-catalyst and bi-polar plates) is very common and natural under working environments of PEMFC. Proton exchange membrane (PEM), one of the core components in PEMFC, plays a key role in separating both the electrodes (i.e. anode and cathode), allow only protons to pass through and restrict fuel crossover. Unfortunately, the PEM is highly prone to degradation cause fuel crossover, un-desired reactions and mixed potential and thus reducing PEMFC power and energy densities resulting into poor driving mileage and lowered efficiency. The membrane thinning, pin-hole formation, polymer backbone detachment and peroxide radical attacks are some of factors causing membrane degradation and affecting PEMFC performance. Therefore, with present proposed work our key objective is to identify the membrane degradation both ex-situ and ex-situ conditions under PEMFC and its mitigation approach. Our end target with the proposed work is to achieve a stable yet high proton conductive membrane for low temperature PEMFC for power applications.



Project Title: ***Innovative Accelerated Carbonation Process for the Preparation of Ready-mix Recycled Aggregate Concrete***

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

Sanctioned Amount: **₹28,21,770**

Name of PI: ***Prof. Subhasis Pradhan***

Designation: ***Assistant Professor***

Department: ***Civil Engineering***

Name of Co-PI: ***Prof. Mukund Lahoti***

Abstract: The continuous increase in the demand of concrete necessitated the International Energy Agency to project a road map for the concrete industry to reduce its carbon footprint. In this context, the carbon dioxide capture in concrete preparation through the accelerated carbonation technique can contribute to reduce the carbon footprint of construction industry by up to 56%. An innovative accelerated carbonation process is proposed to induce the CO_2 sequestration in ready-mix concrete, which will help to enhance the efficiency of CO_2 sequestration in fresh concrete and overcome the limitations in upscaling the accelerated carbonation process of precast concrete. Dry ice as a source of CO_2 will be added to the saturated aqueous solution of limestone powder to form calcium bicarbonate. Its reaction with calcium hydroxide, calcium silicate hydrate, tricalcium silicate and dicalcium silicate will produce $CaCO_3$ precipitants. The deep-rooted poor performance of recycled aggregate concrete (RAC) due to flawed recycled concrete coarse aggregate can be reduced by forming a dense microstructure through accelerated carbonation. Moreover, for a better packing of aggregates mixture the Particle Packing Method mix design approach will be employed. A three-stage concrete mixing method with a specified mixing time will be designed to form a uniform mix. An accelerated carbonation protocol using the mixture of dry ice and saturated aqueous solution of limestone powder will be determined in this research to prepare ready-mix RAC. The influence of dry ice content in carbonated aqueous solution of limestone powder on induction period and setting time of cement will be studied by analyzing the isothermal calorimetry results. The compressive strength, tensile strength and modulus of elasticity will be evaluated, and the influence of curing period will be studied. The modifications in the microstructural characteristics due to the accelerated carbonation will be analyzed by using X-ray diffraction, scanning electron microscope images and thermogravimetric analysis techniques. The sustainability of RAC, prepared by employing the proposed method will be quantified by conducting a Life Cycle Assessment study. The findings of this research are expected to contribute the current state-of-the-art and eventually encourage the construction industry toward preparing the ready-mix RAC using the proposed accelerated carbonation process.

Project Title: ***A Ga2O3-HEMT Biosensor-based Non-invasive Intelligent and Portable Diagnostic System***

Funding Agency: ***IIT Roorkee***

Sanctioned Amount: **₹ 11,00,000**

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

Designation: ***Assistant Professor***

Department: ***Electrical and Electronics Engineering***

Name of Co-PI: ***Prof. Sandeep Joshi, EEE***

Project Title: ***Phase and Bandgap Engineering of III-Oxides in Quest of Interfacial 2DEG***

Funding Agency: ***Ministry of Education***

Sanctioned Amount: **₹ 89,00,000**

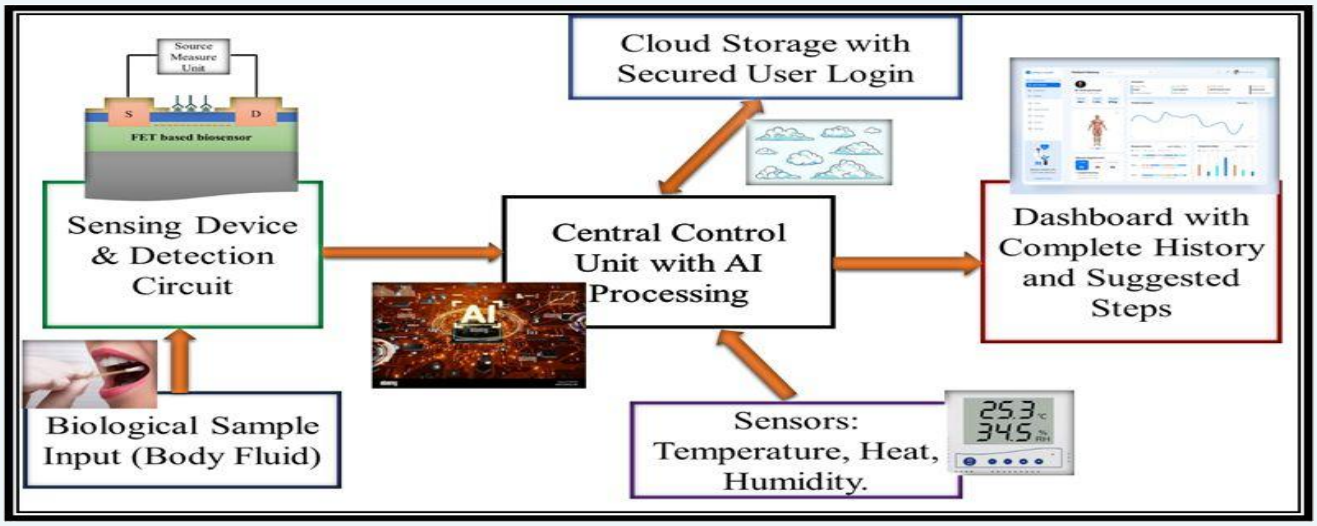
Name of PI: ***Prof. Rahul Kumar***

Designation: ***Assistant Professor***

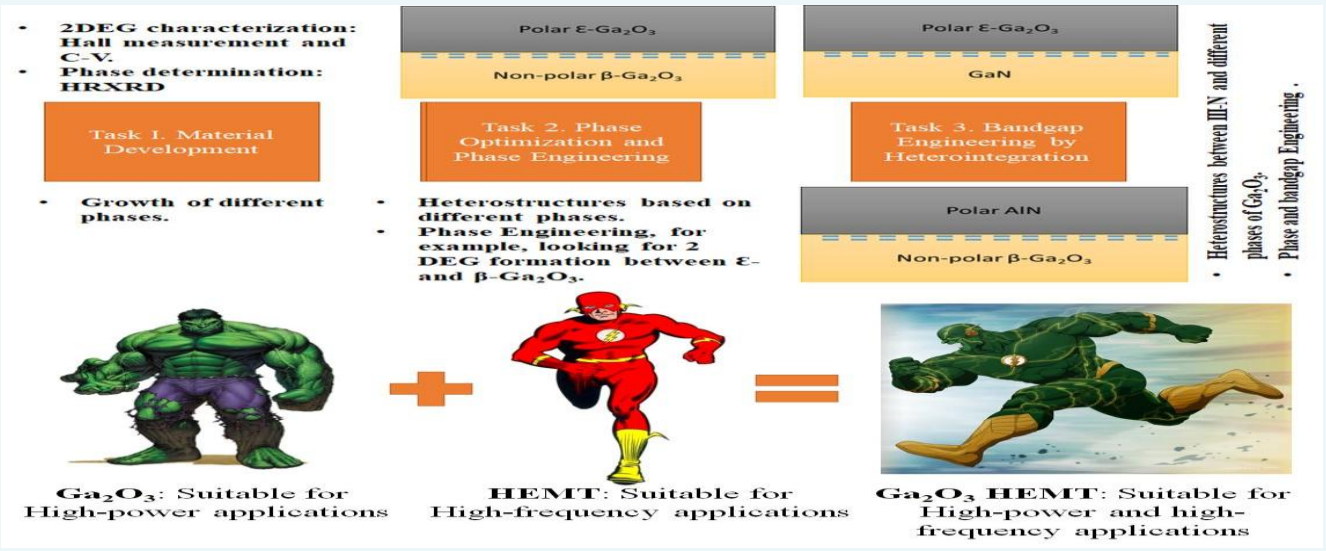
Department: ***Electrical and Electronics Engineering***

Abstract 1: The global point-of-care (PoC) diagnostics market size was valued at USD 37.03 billion in 2021 and is expected to expand at a compound annual growth rate (CAGR) of 6.8% from 2022 to 2030. The preventive health care category in India is still largely untapped and provides a lot of potential for developing cost-effective solutions. Developing a PoC device that essentially detects early signs of disease onset will likely change the overall patient care strategy and disease outcome. In the current proposal, we aim to develop a non-invasive,

intelligent, and portable Ga2O3 HEMT-based PoC diagnostic tool, which will enable fast and cost-effective detection with good sensitivity and accuracy of diagnosis. The diagnosis can be performed with minimum healthcare personnel. A significant effort of this project will be dedicated to developing device-quality Ga2O3 material, fabricating HEMT devices, and developing a working prototype of Ga2O3 HEMT-based biosensor. Finally, this prototype will be used for a smart PoC diagnostic kit.



Abstract 2: Success of AlGaN/GaN technology lies in the excellent property of the two-dimensional electron gas (2DEG) formed at the heterointerface. Gallium oxide (Ga2O3) is a promising and emerging wide bandgap semiconductor (WBGS) for certain classes of high-power electronics, UV-C solar-blind photodetector, different gas sensors, solar cell, and harsh environment electronics. However, there are very few experimental reports showing 2DEG in Ga2O3-based heterostructures. Investigating the feasibility of 2DEG formation and optimisation of 2DEG at interface of Ga2O3 will pave the way for implementation of Ga2O3 HEMT and utilising its true potential for electronic applications. This work will also investigate different Ga2O3 polymorphs which will enable us to understand the physics of group III-oxide material system better and help us to achieve the utilization of this material system on its true potential. Similarly, Monolithic integration of well-established mature technology of III-nitrides with emerging Ga2O3 can have the benefits of both worlds, as proposed here. For example, heterojunctions between these two materials can open new horizons for bandgap engineering and exciting devices utilizing the properties of these two. Besides exploring the fundamentals of these heterostructures, novel and functional devices can be realized.



Project Title: ***Nose-to-brain (N2B) delivery of in-situ gel containing rotigotine-loaded hybrid nanoparticles for Alzheimer's disease***

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

Sanctioned Amount**: ₹ 25,78,010**

Name of PI: ***Prof. Murali Monohar Pandey***

Designation: ***Associate Professor***

Department: ***Pharmacy***

Name of Co-PI: ***Prof. Deepak Chitkara***

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 PI: ***Prof. Rajesh Kumar***

Designation: ***Assistant Professor***

Department: ***Civil Engineering***

Name of Co-PI: ***Prof. Shuvendu Narayan Patel, Civil BITS Pilani***

Project Title: ***Novel non-viral vectors comprising functionalized-lipids and amphiphilic polymers for delivery of mRNA-based Therapeutics***

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

Sanctioned Amount: **₹ 40,25,780**

Name of Investigators: ***Prof. Deepak Chitkara***

Designation: ***Associate Professor***

Department: ***Pharmacy***

Project Title: ***New therapeutic approach for corneal dystrophy via CRISPR mediated SLC4A11 gene correction in an in-vitro and in-vivo system using advanced cRGD decorated lipo-polymeric nanoplexes***

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

Sanctioned Amount: ***₹ 13,64,000***

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

Designation: ***Associate Professor***

Department: ***Pharmacy***

Name of Co-PI: ***L V Prasad, Eye institute Hyderabad***

Project Title: ***Holistic Integration of NTNs for 5G and Beyond Wireless Communications: Connecting Anything, Anytime, Anywhere***.

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

Sanctioned Amount: ***₹ 27,32,708***

Name of PI: ***Prof. Sharda Tripathi***

Designation: ***Assistant Professor***

Department: ***Electrical and Electronics Engineering***

Abstract: The fifth generation (5G) and beyond (B5G) wireless networks aim to deliver peak data rates, ultra-low latency, and ubiquitous connectivity. To achieve these goals efficiently, integrating non-terrestrial networks (NTNs) with 5G terrestrial networks offers a promising solution. NTNs provide extended coverage, particularly in regions with geographical or infrastructural limitations, and can meet the strict quality of service (QoS) requirements of emerging B5G applications. However, end-to-end connectivity in integrated B5G-NTN networks faces challenges due to architectural, protocol, and channel-level issues. Addressing these gaps requires the development of new channel propagation models, considering a wide range of frequencies, and modeling cross-layer dependencies across space, air, and ground segments. This project focuses on four key design aspects to enable seamless and universal connectivity: an analytical framework for physical layer performance, cross-layer optimization for system integration and QoS targets, integrated RAN architecture design, and hardware-software implementation for proof of concept, with particular emphasis on India's technology needs.

Project Title: ***Statistics of Powerful Earthquakes: Formulation and Physical Relevance***

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

Sanctioned Amount: ***₹ 18,88,120***

Name of PI: ***Prof. Sumanta Pasari***

Designation: ***Associate Professor***

Department: ***Mathematics***

Project Title: ***Exploring the Mechanism of Aggregation Induced Emission (AIE) and Aggregation Enhanced Emission (AEE) Phenomena Through DFT and Wave Function Based Methods***

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

Sanctioned Amount: ***₹ 30,18,400***

Name of PI: ***Prof. R K Roy***

Designation: ***Senior Professor***

Department: ***Chemistry***

Project Title: ***Catalytic Reforming of Simulated Bio Oil for Hydrogen Production***

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

Sanctioned Amount: **₹ 15,62,000**

Name of PI: ***Prof. Banasri Roy***

Designation: ***Professor***

Department: ***Chemical Engineering***

Project Title: ***Behavior of SHCC elements under Shear Loading.***

Funding Agency: ***DST-Indo Japan***

Sanctioned Amount: **₹ 8,22,000**

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

Designation: ***Senior Professor***

Department: ***Civil Engineering***

Project Title: ***Classification of m-isometries admitting Wold-type decomposition***

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

Sanctioned Amount: ***₹ 12,68,872***

Name of PI: ***Prof. Shailesh Trivedi***

Designation: ***Assistant Professor***

Department: ***Mathematics***

Abstract: Motivated by J.W. Helton's notion of m-symmetric operators, J. Agler introduced the notion of m-isometry and wrote a series of research papers in which he laid a thorough foundation for the study of m-isometric operators on Hilbert space by beautifully blending the ideas from several areas of analysis. Wold-type decomposition plays a central role in the study of structure theory of m-isometries. Wold-type decomposition of isometries was settled by Beurling, Lax and Halmos [4, 6,12] whereas that of 2-isometries was resolved by Richter [17]. The problem of classification of m-isometries (m > 3) admitting Wold-type decomposition is still open for several decades and this proposal aims to find a solution of this problem.

Project Title: ***Exploring epigenetic regulation of Shelterin proteins and their role in Cardiovascular Diseases***

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

Sanctioned Amount: ***₹ 64,05,303***

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

Designation: ***Associate Professor***

Department: ***Biological Sciences***

Name of Co-PI: ***Prof. Praphulla Chandra Shukla, IIT Kharagpur***

Project Title: ***Elucidating the dynamics of photosynthesis and cell wall remodeling in E salsugineum, an extremophilic plant during abiotic stress and subsequent recovery phases for crop improvement in the scenario of climate change***

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

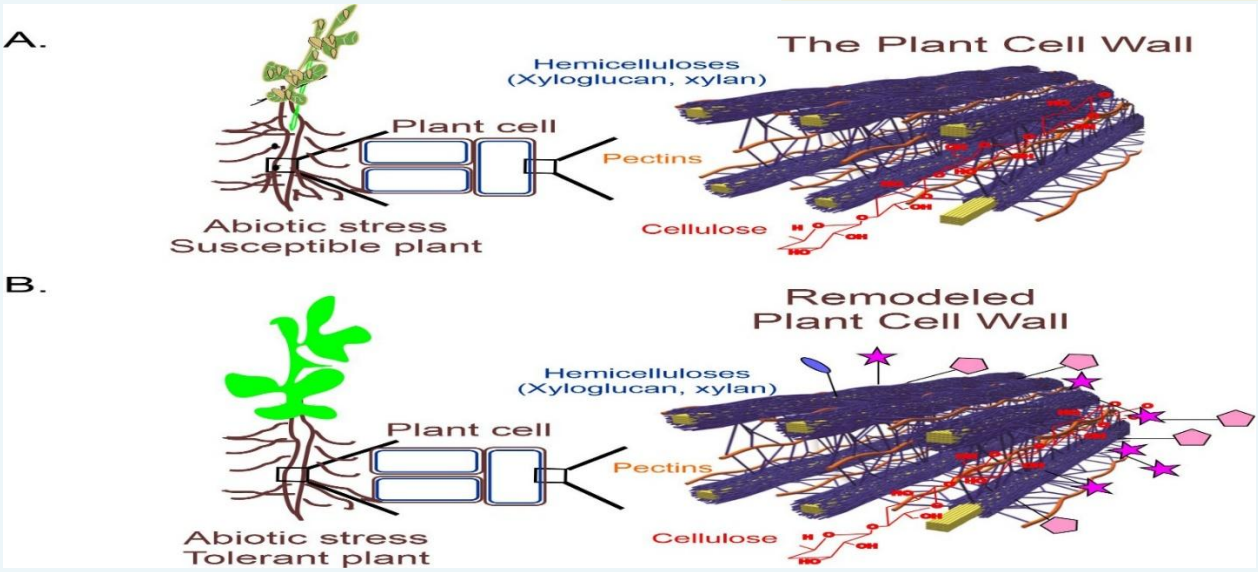
Sanctioned Amount: ***₹ 18,15,000***

Name of PI: ***Prof. Balakumaran Chandrasekar***

Designation: ***Assistant Professor***

Department: ***Biological Sciences***

Abstract: Drought and salinity are the two major abiotic stress factors known to adversely affect plant growth and productivity worldwide. Stress tolerance is a complex mechanism with multiple biochemical pathways and complex regulatory mechanisms involved in regulating the water uptake, maintaining photosynthetic rates and maintaining ionic and redox homeostasis. The focus of the current proposal is on analyzing the gas exchange and chlorophyll fluorescence parameters of the photosynthesis during drought, salt stress and subsequent recovery in A. thaliana and E. salsugineum plants. Further, since cell wall is an important component for maintaining structural integrity during abiotic stress conditions, the structural characterization of cell walls of E. salsugineum and A. thaliana plant cells during salt, drought stress conditions and upon recovery/rehydration along with analysis of expression of the genes encoding proteins localized in cell wall is proposed. This will address the mechanisms employed by salt tolerant E. salsugineum plants for protecting the cell wall from damage during salt or drought stress conditions.



Project Title: ***Design and Synthesis of Supramolecularly- functionalized Porphyrin-based efficient photosensitizers***

Funding Agency: ***Board of Research in Nuclear Sciences (BRNS)***

Sanctioned Amount: ***₹ 33,39,800***

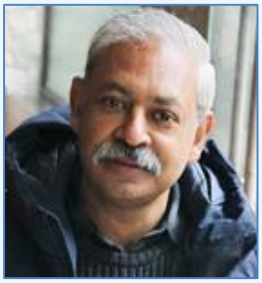
Name of PI: ***Prof. Dalip Kumar***

Designation: ***Senior Professor***

Department: ***Chemistry***

Name of Co-PI: ***Prof. Madhushree Sarkar***

Abstract: Porphyrin photosensitizers play a crucial role in photodynamic therapy. To enhance photodynamic therapy (PDT) efficiency and clinical applications of porphyrin photosensitizers, supramolecular PDT systems achieved through macrocyclic hosts and photosensitizers are found to be quite useful with their relatively high solubility, stability and bioavailability. In recent years, water soluble cucurbiturils have been prominently used as mature hosts to bind various guest molecules into their rigid cavities involving hydrophobic and ion-dipole interactions for PDT applications. The project aims to identify porphyrin-based photosensitizers with enhanced efficiency by the host-guest complexation of structurally diverse porphyrins with cucurbiturils.



Project Title: **Ensuring Food Security through AI and Satellite Imaging Technology Assisted I Agriculture at Scale**

Funding Agency: ***Ministry of Education***

Sanctioned Amount: **₹ 1,98,18,360**

Name of PI: ***Prof. Navneet Goyal***

Designation: ***Senior Professor***

Department: ***Computer Science and Information Systems (CSIS)***

Project Title: ***Novel Pharmacological interventions against chronic kidney disease using clinically approved inodilators, ET-1A antagonists and bisphosphonates: Drug repurposing approach***

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

Sanctioned Amount: ***₹ 36,12,400***

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

Designation: ***Professor***

Department: ***Pharmacy***

Project Title: ***harmacological Intervention using α-Klotho with AT1 Receptor Blocker and Sodium-Glucose Co-Transporter 2 (SGLT-2) Inhibitor against Diabetic Kidney Disease***

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

Sanctioned Amount: **₹ 38,62,000**

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

Designation: ***Professor***

Department: ***Pharmacy***

Abstract 1: Chronic kidney disease (CKD) is considered a pandemic with more than 800 million CKD patients globally. Importantly, 1-13% Indian population is battling with CKD. This increasing prevalence is directly associated with improper treatment options. Moreover, the pathophysiology of CKD is complex and different pathomechanisms are involved in the CKD progression. Decreased renal blood flow, initiates oxidative stress, ischemic injury during the early stages of CKD. Moreover, overactivation of the ET-1A receptor increases low-grade inflammation and affects kidney functions. Meanwhile, kidney fibrosis further initiate vascular calcification, leading to kidney failure. Henceforth, improving renal blood flow, inhibition of ET-1A, and prevention of vascular calcification could be beneficial against CKD. However, available therapeutic options for CKD patients are not uniformly effective. Hence, it is essential to find better treatments that could improve kidney function during the early and later stages of CKD. Intriguingly, repurposing some approved drugs helps reduce the cost and time required for drug development and their known safety profiles make them more suitable to use against CKD. Considering the above-unresolved questions, we intend to evaluate three clinically approved drugs that will act on various pathomechanisms involved in CKD. Inodilators- levosimendan gained much attention in recent years against acute kidney injury. Similarly, emerging ET-1A antagonist- ambrisentan are known for decreasing ET-1A-associated inflammation and fibrosis in pulmonary diseases. Notably, the effect of ET-1A antagonists on kidney fibrosis has not been observed yet. Bisphosphonates- risedronate is known to decrease vascular calcification in osteoporosis. Using bisphosphonates to reduce calcium deposition and kidney-specific vascular calcification could provide beneficial results against CKD. However, the therapeutic potential of these therapies is still not observed against CKD. To achieve this, we will use Wistar rats and NRK52E cells for in vivo and in vitro experiments, respectively. Multiple experiments will be conducted, including biochemical analysis, histology, western blotting, IHC, IF, flow cytometry, and other relevant studies. This project will provide the required preclinical knowledge of these drugs against CKD, which will surely help further clinical studies.

Abstract 2: India is the second home for diabetics and associated comorbidities like diabetic kidney disease (DKD) that progresses to end-stage kidney disease and kidney failure. The chronic use of existing therapies telmisartan, dapagliflozin and others produces life-threatening adverse effects such as angioedema, dry cough, hyperkalemia, hypotension and ketoacidosis, respectively. Hence, there is an urgent need for novel pharmacological intervention, which can be used as a replacement for these regimens or can be given in combination with them to reduce their side effects and improve clinical efficacy. Based on our previous studies and literature, we have encountered promising pharmacological intervention, i.e. α-Klotho, that can be given as monotherapy or in combination to reduce their dosage, side effects and improve clinical efficacy. α-Klotho is a renoprotective protein extensively expressed by the kidney. When given exogenously or restored endogenously by means of any pharmacological intervention, it has shown promising renoprotective effects. In our previous studies (supported by SERB- EEQ/2019/000308), we have studied the diagnostic and therapeutic potential of Klotho in ischemic AKI under diabetic and non-diabetic conditions. However, α-Klotho has not yet been studied in combination with telmisartan and dapagliflozin in preclinical and clinical settings against DKD. The site and mechanisms of action for α-Klotho and these regimes are varied and henceforth can act synergistically against the DKD. Henceforth, α-Klotho will be given as monotherapy and combined with telmisartan and dapagliflozin for the assessment of its therapeutic benefits and synergism. To achieve this, multiple experiments, including, biochemical analysis, histological, western blotting, RT-PCR, IHC, IF, flow cytometry, and other relevant studies,

will be conducted. α-Klotho as a monotherapy or in combination will be useful in refining these regimens' clinical efficacy. This approach will build the foundation for advancing preclinical and clinical findings to translate into more holistic DKD care, promoting general health.

Project Title: ***Development of a resonant glucose sensor prototype using smart hydrogels***.

Funding Agency: ***Department of Biotechnology (DBT)***

Sanctioned Amount: **₹ 14,27,253**

Name of Investigators: ***Prof. Sujan Yenuganti***

Designation: ***Assistant Professor***

Department: ***Electrical and Electronics Engineering***

Name of Co-PI: ***Prof. Pankaj Arora EEE***

Project Title: ***Design, Simulation & Characterization of Logic-In-Memory Computation within SRAM Array using SCL CMOS 180nm process and emerging ferromagnetic devices***

Funding Agency: ***Indian Space Research Organisation (ISRO)***

Sanctioned Amount: **₹ 26,98,000**

Name of PI: ***Prof. Nitin Chaturvedi***

Designation: ***Associate Professor***

Department: ***Electrical and Electronics Engineering***

Name of Co-PI: ***Prof. D Boolchandani, MNIT Jaipur and Prof. Hari Shankar Gupta, SAC ISRO Ahmedabad***

Project Title: ***Investigation on Mechanical, Thermal and Shape Memory Effect Characteristics of Microwave Cast0 Nitinol Shape Memory Alloy for applications in the deployable radiator***

Funding Agency: ***Indian Space Research Organisation (ISRO)***

Sanctioned Amount: **₹ 30,21,260**

Name of PI: ***Prof. Radha Raman Mishra***

Designation: ***Assistant Professor***

Department: ***Mechanical Engineering***

Name of Co-PI: ***Prof. Amar Patnaik, MNIT Jaipur and Shri Surendra Singh Sisodia , SAC ISRO Ahmedabad***

Project Title: ***Experimental and theoritical analysis of 3D Printed Hierarchical structures for Ballistic System***

Funding Agency: ***DRDO-ARMREB***

Sanctioned Amount**: ₹ 91,35,456**

Name of PI: ***Prof. Radha Raman Mishra***

Designation: ***Assistant Professor***

Department: ***Mechanical Engineering***

Name of Co-PI: ***Prof. Gaurav Watts, Mechanical Engineering***

Abstract 1: This proposed work focuses on developing an actuator for the deployable radiator, which is required to dissipate excess heat from a spacecraft during transit. The Nitinol shape memory alloy (SMA) will be used to fabricate the actuator. The major focus of the investigation will be on achieving the desired shape memory effect in a specified range of temperatures. Initially, a setup for the microwave casting process will be developed to achieve the desired shape and sizes of nitinol alloy samples, and process parameters will be optimised. Various samples of the microwave-cast nitinol alloy will be developed with varying compositions of Ni and Ti to study the effect of compositions on the properties of the alloy. The optimized compositions for actuation will be

identified. Further, heat treatment of the nitinol samples will be carried out at different temperatures to achieve the shape memory effect in the targeted temperature zone. Lastly, the mechanical properties of heat-treated nitinol at different temperatures will be estimated.

Abstract 2: The use of rigid ceramics and metals in most of the available ballistic protection systems to avoid damage due to bullet/fragment impact results in too bulky, heavy, and stiff ballistic protection systems. The high stiffness of the ballistic protection systems restricts the fast movement of the soldier and lacks flexibility while hiding themselves in the narrow passages. It provides further scopes to carry research on the development of lighter (10-15 % weight reduction) and flexible ballistic protective equipment. In this proposed work, theoretical and experimental approaches will be explored to realize the bioinspired hierarchical structures for higher flexibility and lightweight ballistic protection systems, which can offer a unique combination of properties. The most appropriate bioinspired hierarchical structure will be modelled to understand its performance against the ballistic impact. The structure realized from the simulation will be 3D printed using a hybrid additive manufacturing approach.

Project Title 1: ***Utilizing the endogenous CRISPR-Cas system as an anti-pathogen strategy against antimicrobial-resistant Enteric pathogens***

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

Sanctioned Amount: ***₹ 32,51,965***

Name of PI: ***Prof. Sandhya Amol Marathe***

Designation: ***Associate Professor***

Department: ***Biological Sciences***

Name of Co-PI: ***Prof. Pankaj Arora***

Project Title 2: ***Repurposing the endogenous CRISPR-Cas system as an anti-Salmonella strategy***

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

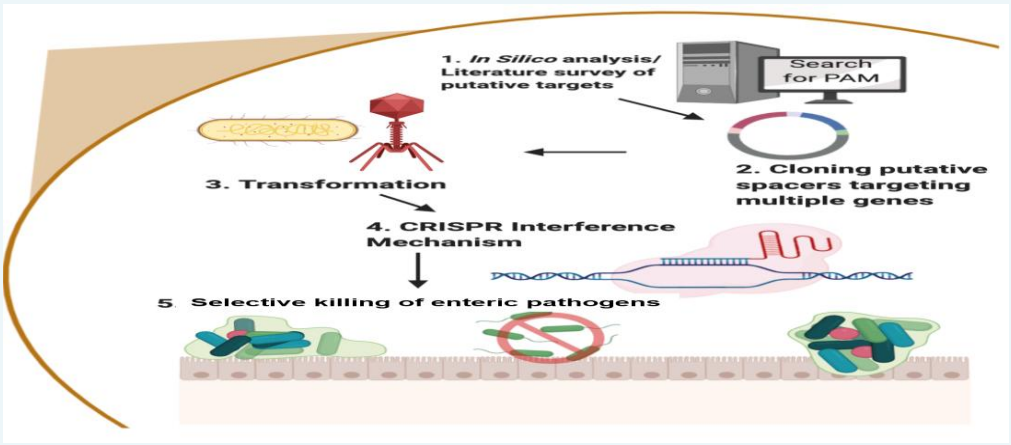
Sanctioned Amount: ***₹ 25,38,360***

Name of PI: ***Prof. Sandhya Amol Marathe***

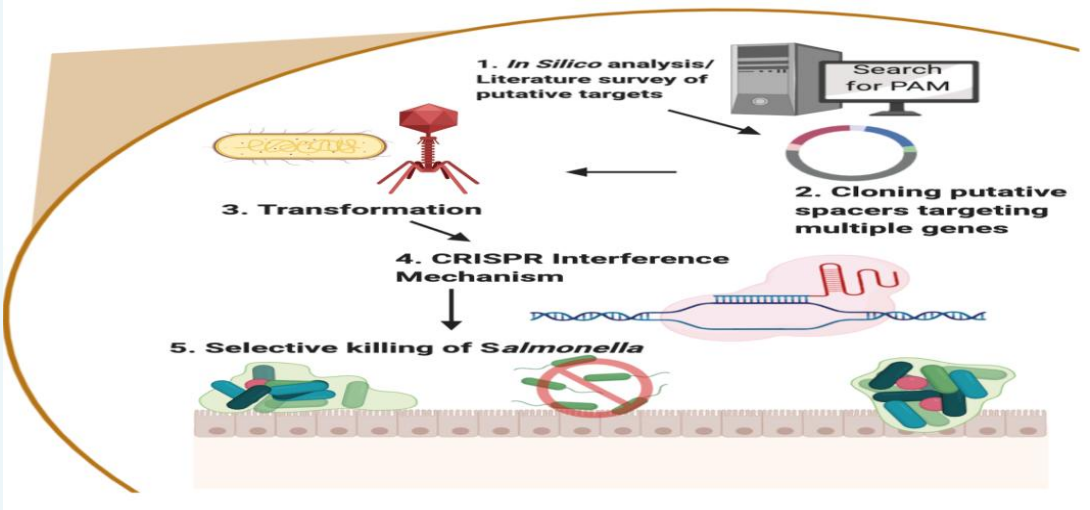
Designation: ***Associate Professor***

Department: ***Biological Sciences***

Abstract 1: Enteric diseases pose a serious risk to humans, and many bacterial pathogens have developed drug resistance. Further, bacterial biofilms are resistant to antimicrobials. This necessitates development of an efficient and unique therapeutic approach. Exogenous CRISPR-Cas9 has recently been investigated as an antimicrobial to sequence-specifically target AMR plasmids and pathogens. However, these strategies have limitations due to technicalities like the large-sized transformation, toxicity of exogenous Cas9, and the frequent emergence of mutants escaping targeted killing. The chief aim of the proposal is to utilize the endogenous CRISPR-Cas3 system of enteric pathogens as sequence-specific anti-microbial. Endogenous CRISPR-Cas3 system offers an advantage over exogenous Cas9 as it significantly reduces the size of DNA to be transferred into the target pathogen and increases target specificity due to the requirement of larger crRNA (32bp for Cas3 versus 20bp for Cas9). As opposed to the frequent emergence of escape mutations with exogenous Cas9, the mutations in the endogenous CRISPR-Cas system are expected to be rare as it governs multiple physiological processes.



Abstract 2: Salmonellosis, a foodborne disease, presents a formidable threat to humans. Salmonella has gained resistance against a wide range of antibiotics while the biofilms formed within the host and in the environment are recalcitrant to treatment. Biofilms formed within the host are responsible for recurrent infections and act as a reservoir for typhoid. In addition, there are no vaccines for nontyphoidal salmonellosis, and typhoidal vaccines are not recommended for toddlers. This demands an effective and alternative therapeutic solution. Recently, exogenous CRISPR-antimicrobial has been explored as a sequence-specific alternative against Salmonella. However, there are limitations to this system owing to technicalities and the frequent emergence of escape mutants. The chief aim of the proposal is to harness the endogenous CRISPR-Cas3 system of Salmonella as an anti-microbial against itself. The endogenous CRISPR-Cas3 system offers an advantage over exogenous Cas9 as it significantly reduces the size of DNA to be transferred into the target pathogen and increases target specificity due to the requirement of larger crRNA (32bp for Cas3 versus 20bp for Cas9). As opposed to the frequent emergence of escape mutations with exogenous Cas9, the mutations in the endogenous CRISPR-Cas system are expected to be rare as it governs multiple physiological processes in Salmonella like biofilm formation and pathogenesis, and for serovar Typhi, Cas3 is also required for growth in LB media. Furthermore, the targeted DNA would have a lower repair probability as Cas3 shreds the DNA while the double-stranded DNA breaks created by Cas9 can be repaired. Thus, the killing efficiency with the endogenous system would be better. To utilize endogenous CRISPR-Cas3 as an anti-microbial, the system would be activated using a transcriptional activator, LeuO, that would be supplied in trans. The functional activation would be assessed using plasmid loss assay in different Salmonella serovars as there exist two distinct cas operon types among the Salmonella serovars. The endogenous system would then be reprogrammed for self-genome degradation.



Project Title: ***Reconfigurable Holographic Surfaces for Wireless Communication: Physical Layer Algorithms and Protocol Design***

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

Sanctioned Amount: ***₹ 23,63,570***

Name of PI: ***Prof. Syed Mohammad Zafaruddin***

Designation: ***Associate Professor***

Department: ***Electrical and Electronics Engineering***

Project Title: ***Multilingual AI for Controlled sensing and Communications***

Funding Agency: ***MHRD (IITKGP***)

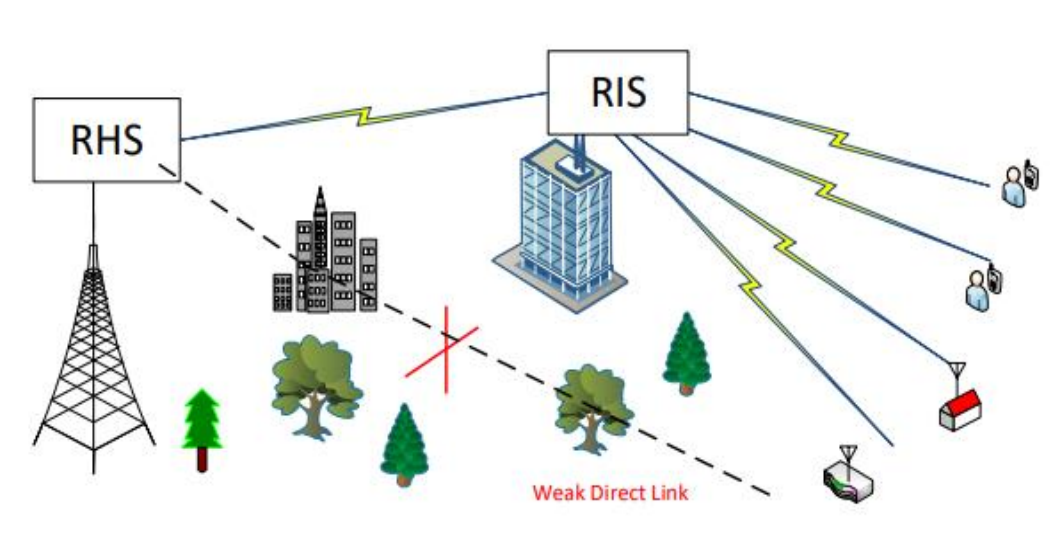
Sanctioned Amount: ₹ 8,34,000

Name of PI: ***Prof. Syed Mohammad Zafaruddin***

Designation: ***Associate Professor***

Department: ***Electrical and Electronics Engineering***

Abstract 1: Massive multiple-input multi-output (mMIMO) technology can enhance network capacity by exploiting spatial diversity through large-scale phased arrays. However, accurate beamforming in mMIMO requires many phase shifters and power amplifiers, resulting in high hardware costs and power consumption during implementation. The reconfigurable holographic surface (RHS) is a promising solution to the limitations of current antenna technologies, consisting of numerous metamaterial radiation elements. In this project, we will address these challenges by developing physical layer algorithms and protocols for RHS-based wireless communication. We will develop a channel model for RHS-based transmission using electromagnetic information theory (EIT) and design low-complexity hybrid beamforming algorithms to optimize sum-rate and energy efficiency. Machine learning will enhance beamforming performance by analyzing training data. Additionally, we will explore networking scenarios using RHS as a transceiver and RIS as a reflector for signal steering in challenging environments. An RHS prototype will be fabricated to validate the algorithms for 6G wireless networks. The proposed research on physical layer algorithms and protocol design is expected to significantly contribute to the ongoing development of RHS-enabled wireless communications for 6G networks.



Abstract 2: The demand for efficient and resilient wireless communication systems in dynamic environments has propelled research into decentralized control strategies. The proposed research project proposes a novel approach leveraging multiagent systems and reinforcement learning techniques to address the complex challenges of controlled sensing and communications. By analyzing single-controller N+1 players in Markov games, we develop algorithms that optimize resource utilization and enhance user experiences in next-generation wireless networks. Our research focuses on a two-time scales model, where the controller's actions evolve slowly while low-level agents engage in repeated games. Agents adapt their behaviors through social contextual learning and reinforcement learning to achieve collaborative outcomes. The proposed fair multiagent algorithms ensure equitable resource allocation, fostering cooperation among distributed networks. This interdisciplinary research effort fosters collaboration among educators, researchers, and practitioners, culminating in high-quality course content and research publications. Our work contributes to fundamental advancements in protocol design, algorithm development, and analysis techniques for decentralized wireless communication systems, paving the way for more efficient and resilient network infrastructures.

Project Title: ***Shock wave governed high velocity forming of tailor welded blanks for automotive applications***

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

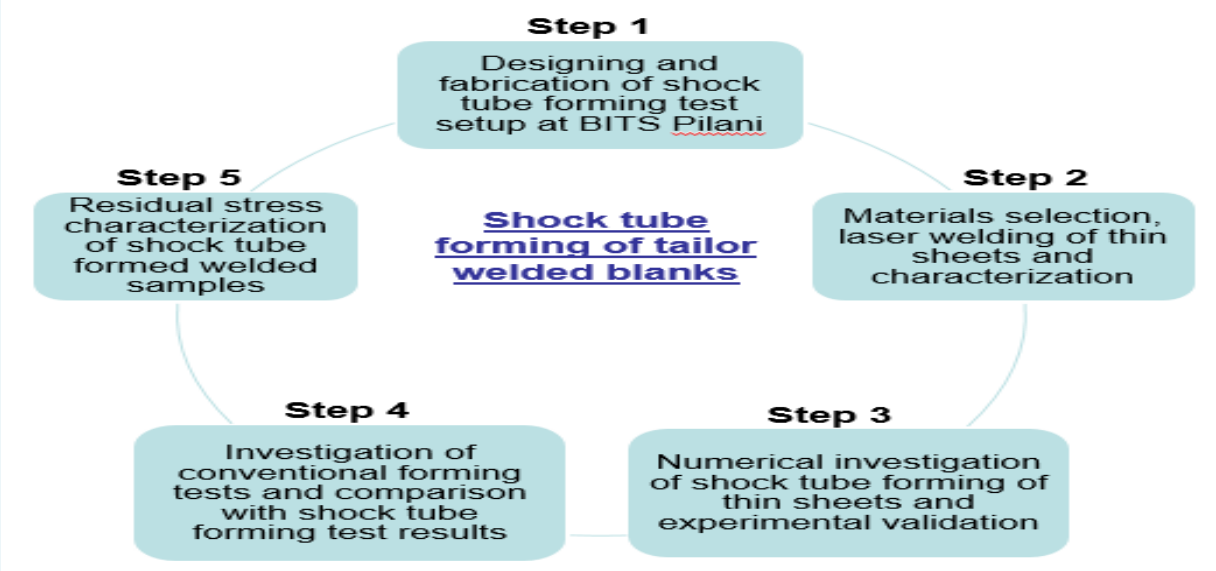
Sanctioned Amount: ***₹ 52,62,400***

Name of PI: ***Prof. Amit Kumar***

Designation: ***Assistant Professor***

Department: ***Mechanical Engineering***

Abstract: Tailor-welded blanks (TWB) have numerous benefits over conventional blanks for manufacturing automobile sheet metal components, including more product design freedom, improved structural rigidity, and crash behaviour. However, one of the biggest issues with TWBs is their low formability in conventional sheet metal forming techniques. Shock tube forming, which uses shockwaves to deform a blank, is one of the possible means for improving TWB's formability. Research project involves designing and fabricating a shock tube facility for evaluating the deformation behavior of TWBs of different thickness combinations under extremely high strain rates. Moreover, a numerical investigation employing various hardening laws and advanced yield criteria will be performed, and comparisons with experimental data shall be done. Conventional experiments shall also be performed in order to compare the output with the outcomes of shock tube forming tests. Finally, numerical prediction of residual stresses shall be performed along with the experimental validation.



Project Title: ***Identification of structural and functional hotspots of Human genome through graph theory and machine learning algorithms***

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

Sanctioned Amount: ***₹ 6,60,000***

Name of PI: ***Prof. Shibasish Chowdhury***

Designation: ***Professor***

Department: ***Biological Sciences***

Abstract: The functions of DNA are entirely dependent on the interaction of DNA molecules with other molecules. In this process, DNA sequence as well as structure plays a key role as the properties and reactivity of nucleotides is solely dependent on how it interacts with other molecules. Graph theory-based interaction network analysis has been used in understanding interaction networks among proteins as well as between DNA and proteins. Residue contact or interaction network reveals the insight of structure–function relationship including various aspects of protein stability, protein dynamics, enzymatic activity, allosteric regulation, signal transduction and protein kinetics. Here, we propose to evaluate the nucleotide interaction network of the genome sequence and map structure-function correlation. Furthermore, the interaction strength of the DNA network of various functionally important genomic regions will be used to develop a machine-learning model to predict the functional hotspots of unannotated genomic regions.

Project Title: ***Design, synthesis, and evaluation of novel dual inhibitors of Angiotensin-II type 1 receptor and Neprilysin for the treatment of diabetic cadiomyopathy***

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

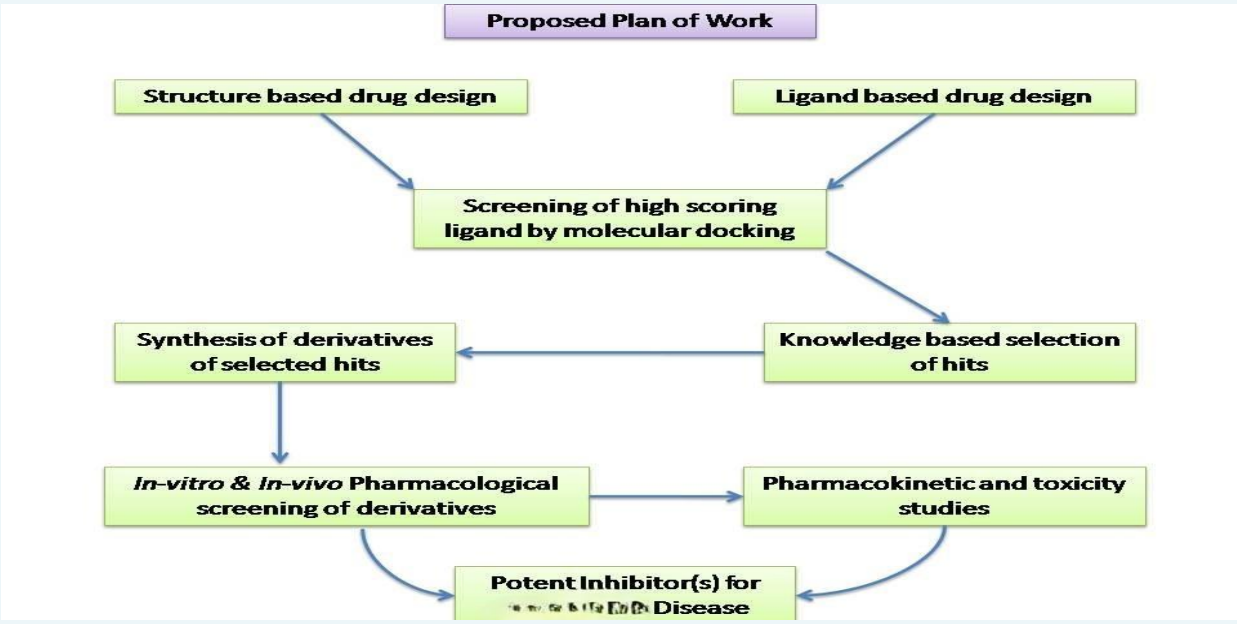
Sanctioned Amount: ***₹ 41,12,085***

Name of PI: ***Prof. Hemant R. Jadhav***

Designation: ***Professor***

Department: ***Pharmacy***

Abstract: Diabetes mellitus is a chronic metabolic disease characterized by elevated levels of blood glucose. DPP4 is a membrane glycoprotein involved in incretin catalytic breakdown and inactivation. Neprilysin (NEP) is a zinc-dependent neutral cell surface endopeptidase that also breaks incretins. Simultaneous inhibition of both DPP4 and NEP increases the plasma concentration of GLP (incretins), which could be an effective strategy for the treatment of Type 2 DM. We have designed new synthetic analogs with essential features of both NEP and DPP4 inhibition with a machine-learning tool and computer-assisted design. These analogs will be synthesized and screened for benefits in Type 2 DM.



Project Title: ***Mathematical multiscale modeling and simulation of the conversion of carbon dioxide (CO2) to methanol in a catalytic mixed matrix membrane reactor for efficient CO2 capture and utilization***

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

Sanctioned Amount: ***₹ 6,60,000***

Name of PI: ***Prof. Bhanuvardhan Reddy Kuncharam***

Designation: ***Associate Professor***

Department: ***Chemical Engineering***

Abstract: The project develops a multiscale mathematical model for converting carbon dioxide (CO2) to methanol or liquid fuel in a membrane reactor. The model will be used to explore the various aspects of catalytic CO2 conversion, including catalyst deactivation, membrane selective removal of the reaction product to enhance conversion, cost analysis, and simulation of the scale-up and techno-economic analysis using process simulation software.

Project Title: ***Smart Crop Planning: AI (Artificial Intelligence) based Decision Support System for Crop Diversification***

Funding Agency: ***Indian Space Research Organisation (ISRO)***

Sanctioned Amount: ***₹ 18,53,000***

Name of PI: ***Prof. R Srinivas***

Designation: ***Assistant Professor***

Department: ***Civil Engineering***

Name of Co-PI: ***Prof. G S Sesha Challapathi EEE, Prof. Amit R Singh Mechanical Engineering***

Abstract: The project has been awarded by Indian Space Research Organization (ISRO) Yukti Sanchita Scheme. The investigators of the project are Prof. Rallapalli Srinivas (CE-PI), Prof. GSS Chalapathi (EEE-Co-PI), Prof. Amit Singh (ME-Co-PI), Prof. Yashwant Katpatal (CE-Co-PI, VNIT Nagpur), Prof. Suresh Kumar (mentor, IIRS, Dehradun), Prof. Sreenivas K (co-mentor, NRSC, Hyderabad). The overall goal of the project is to develop an AI-enabled decision support system that can assist the farmers in diversified agriculture and soil management in a cost-effective manner. The objectives of the project include: (i) Generation of Geospatial database of farm and farming system at block level/ region through Krishi Vigyana Kendra (KVK), deploying sensors, UAV and interaction with farmers (Geo-Farm); (ii) Developing Smart Soil Management System for assessing Soil Fertility and Crop Productivity Potential using soil sensors and Machine Learning/AI (Geo-Smart Soil); (iii) Developing a cost-effective Smart Diversified Crop Planning System using Decision Criterion Method under different cropping seasons (Geo-Crop Diversification); (iv) Multiple stakeholder (farmers, KVK team, ICAR team, etc.) interaction and periodic monitoring of agricultural farms through wireless sensor networks and notifying the farmers through a mobile application about the cost-effective Best Management Practices (BMPs) (On-ground implementation). This project is directly linked to the National Natural Resources Management System architecture. It deals with crops and soil resources. Statistics on these items are crucial for the government to plan for the storage of agricultural produce, its distribution, pricing, and procurement strategy. Geospatial data can be used for estimating crop yield, the area under cultivation, soil fertility information, and even cropping system followed by farmers in different regions. ISRO has been working on this application area since the eighties and the Crop Acreage and Production Estimation (CAPE) project is an example of its success. The Forecasting Agricultural Output using Space, Agro-meteorology and Land-based Observations (FASAL) project is also closely related to this project proposal. The existing projects have made use of geospatial data for estimation and analysis. This project aims to take it a step further and provide intelligent decisions to farmers based on data-driven AI models.

Project Title: ***Studies of optoelectronic properties in new electroluminescent organic/inorganic materials for flexible organic light emitting devices***

Funding Agency: ***Board of Research in Nuclear Sciences (BRNS)***

Sanctioned Amount: **₹ 34,82,550**

Name of PI: ***Prof. Sindhu S***

Designation: ***Senior Professor***

Department: ***Physics***

Project Title: ***Design and Fabrication of Miniaturized Ultra Wide band (UWB) Flexible and Wearable Antenna for Breast Cancer Detection: A Non-invasive, Reliable and Low-Cost Approach***

Funding Agency: ***Department of Biotechnology (DBT)***

Sanctioned Amount: **₹ 34,38,780**

Name of PI: ***Prof. Navneet Gupta***

Designation: ***Professor***

Department: ***Electrical and Electronics Engineering***

Name of Co-PI: ***Prof. P R Deepa***

Project Title: ***One-step stretchable PES laser scribed graphene IDEs for ultrasensitive non-enzymatic electrochemical sweat glucose detection***

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

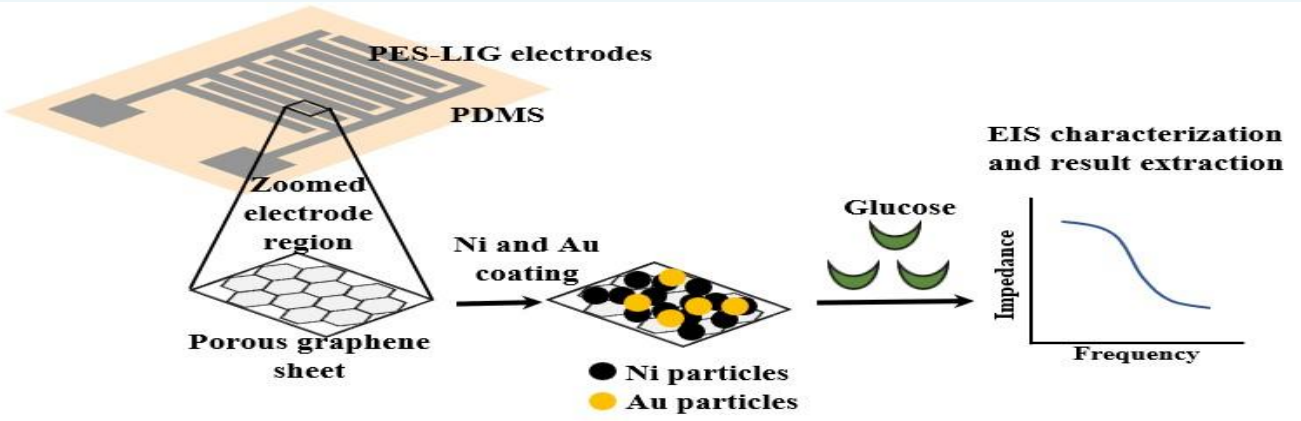
Sanctioned Amount: ***₹ 28,82,299***

Name of PI: ***Prof. Geeta Bhatt***

Designation: ***Assistant Professor***

Department: ***Mechanical Engineering***

Abstract: Glucose sensing is a very demanding field due to the alarming increase in diabetic cases and recently sweat-based electrochemical impedance glucose detection methods are being adapted fastly due to the highly integrable and miniaturizable nature of this painless detection method as compared to blood glucose detection. In this line, the present research proposal proposes an ultrasensitive sweat glucose detection using biodegradable Laser-induced graphene (LIG) electrodes. The single-step stretchable LIG interdigitated electrodes (IDEs) would be fabricated using poly(ether sulfone) (PES) membrane and would be further decorated with nickel and gold monolayers to cater highly sensitive glucose sensing scheme. This deposition would be primarily electroless to not distort the fabricated platform's configuration but still observe a similar level of efficacy in it. Additionally, this monolayer deposition would help obtain a high signal-to-noise ratio and thus highly obtain improved detection sensitivity of the devised sensing platform.



Project Title: ***Implications of Inelastic Scattering and Spin Dephasing Mechanisms in Graphene Nano Ribbon-Based Spintronics***

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

Sanctioned Amount: **₹ 20,91,650**

Name of PI: ***Prof. Niladri Sarkar***

Designation: ***Professor***

Department: ***Physics***

Name of Co-PI: ***Prof. Navneet Gupta EEE BITS Pilani***

Abstract: The project aims to investigate the inelastic scattering and dephasing mechanisms in graphene nanoribbon-based spintronic devices. Due to the scaling down of the device channel lengths to the nanometer regime, issues like short channel effects, limitations in the gate dielectric thickness, and several quantum effects begin to dominate that may compromise the device performance. Because of such challenging issues, a new class of devices based on spintronic transport is realized in the present context which is not constrained by the scaling down issues of electronics-based devices. The outcome of this project can be utilized to assess the power losses in realistic MLG-based nanoscale spintronic devices. Also, a complete mathematical framework for the modeling of such devices will be obtained. This will help understand the Physics and the Modeling of Nanoscale spintronic devices. This will help the experimentalists in designing generic MLG-based spintronic devices and also the understanding the issues of energy losses and quantum dephasing.

Project Title: ***Synthesis and Development of Efficient Single Atom Catalysts (SACs) for Energy Conversion***

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

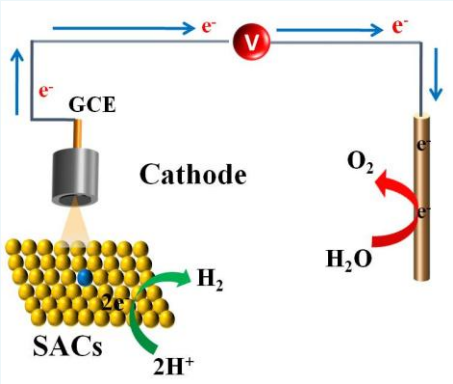
Sanctioned Amount: **₹ 33,13,200**

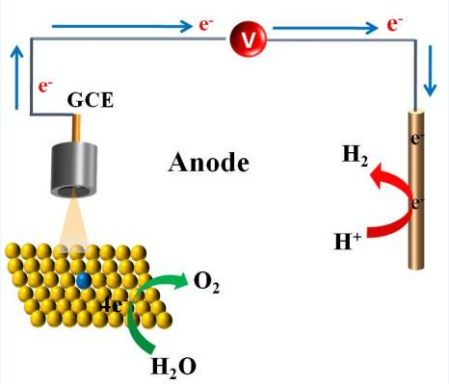
Name of PI: ***Prof. Surojit Pande***

Designation: ***Professor***

Department: Chemistry

Abstract: Presently, as a primary energy source, fossil fuels are getting used enormously to fulfill the energy requirement per day globally. Now, it become a crucial time for all of us for a transition from nonrenewable to renewable energy sources because of high energy security and environmental issues. H2 can be considered as alternative fuel because of its high energy density and the ability to power fuel cells in zero-emission electric vehicles. It becomes more and more essential to unveil alternative electrocatalyst composed of non-precious metals or earth-abundant elements with high efficiency and stability to accomplish water electrolysis in large scale. Higher efficiency and longer stability can be attained, if we can focus for the development of single atom catalysts (SACs).





Project Title: **All-solid-state supercapacitors using Li+ ion garnet-polymer hybrid composites**

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

Sanctioned Amount: **₹ 37,21,014**

Name of PI: ***Prof. Anshuman Dalvi***

Designation: ***Professor***

Department: ***Physics***

Project Title: ***Interaction of ultrathin films of functionalized graphene with proteins at air-water and solid-water interfaces***

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

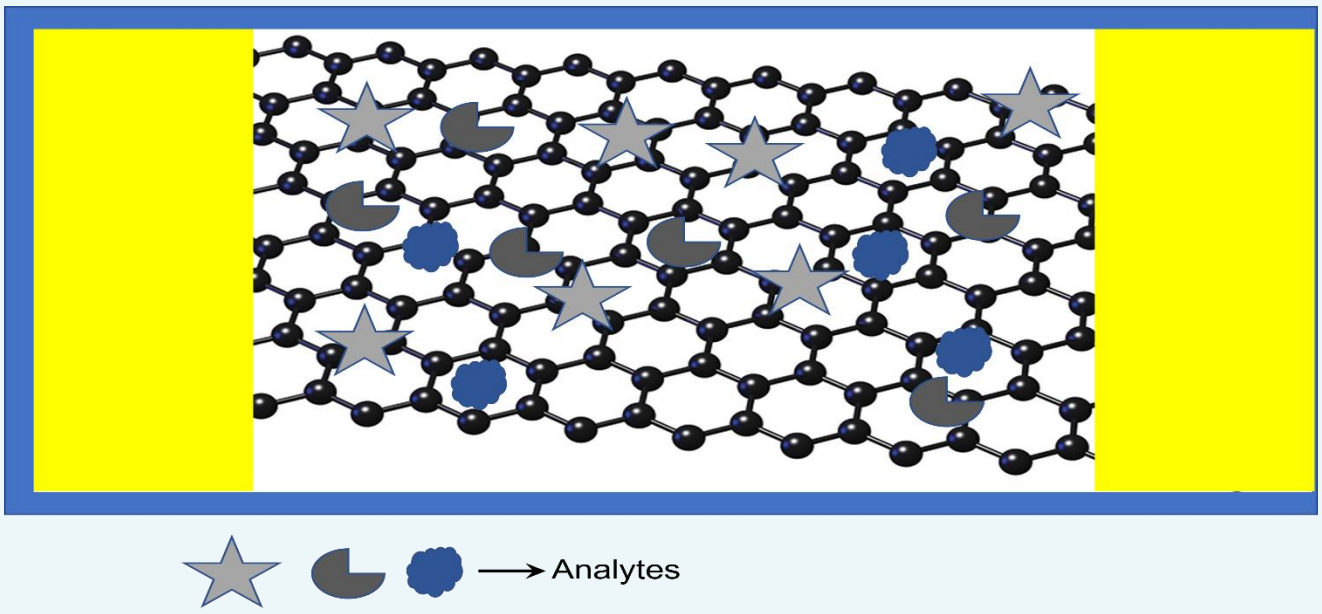
Sanctioned Amount: **₹ 42,45,422**

Name of PI: ***Prof. Raj Kumar Gupta***

Designation: ***Professor***

Department: ***Physics***

Abstract: In this project proposal, we aim to investigate the interaction of protein molecules with the functionalized graphene viz. ODA-Gr and COOH-Gr at the air-water (A/W) and solid-water (S/W) interfaces. The Langmuir monolayer (LM) of the ODA-Gr and COOH-Gr will be formed at the A/W interface. This study will provide insight on the stability of the film and surface phases exhibited by LM at the A/W interface. The protein molecules of different species will be injected into the aqueous medium and its interaction with the interfacial ODA-Gr/COOH-Gr in terms of kinetic parameters will be estimated. The ultrathin Langmuir-Blodgett (LB) films of ODA-Gr and COOH-Gr will be transferred onto the solid substrates and the morphology, ordering, structure, and thickness will be estimated using several microscopic, XRay diffraction and spectroscopic techniques. The ultrathin LB film of ODA-Gr and COOH-Gr will be deposited onto the quartz wafers for piezoelectric and electrochemical measurements using electrochemical quartz crystal microbalance (eQCM). The protein molecules will be dispensed into the aqueous medium and its interaction with the functional graphene over the quartz wafers will be studied by recording piezoelectric and electrochemical responses in static and dynamic modes of operation of the eQCM. This investigation is very useful in the design and development of bio-sensors.



Ultrathin films of Graphene for sensing applications

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Project Title: ***Encapsulated PCM-Based Magnetic nanoparticles and AI Applications for Optimising Separation of Carcinogenic Industrial Solvents Using solar Energy: Shaping Towards Sustainable Development***

Funding Agency: ***MHRD (IITKGP)***

Sanctioned Amount: **₹ 73,20,000**

Name of PI: ***Prof. Suvanjan Bhattacharyya***

Designation: ***Assistant Professor***

Department: ***Mechanical Engineering***

Project Title: ***Understanding the therapeutic potential of modulating endoplasmic reticulum er stress and autophagy in human brain cancer cells undergoing epithelial to mesenchymal transition emt***

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

Sanctioned Amount: **₹ 26,57,241**

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

Designation: ***Associate Professor***

Department: ***Biological Sciences***

Project Title: ***Synthesis and Characterization of Stimuli Responsive Molecular Scaffolds for Bio-analyse Sensing and Cancer Diagnostics***

Funding Agency: ***Board of Research in Nuclear Sciences (BRNS)***

Sanctioned Amount: **₹ 29,58,550**

Name of PI: ***Prof. Partha Saratha Addy***

Designation: ***Assistant Professor***

Department: ***Chemistry***

Name of Co-PI: ***Prof. Rajdeep Chowdhury***

Industrial/Consultancy Sponsored Projects October 2023- September 2024

Project Title: ***Sustainable development of Honey industry: A Value chain based study of select districts in Rajasthan***

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

Sanctioned amount: ***₹ 7,75,000***

Name of PI: ***Prof. Mohammad Faraz Naim***

Designation: ***Assistant Professor***

Department: ***Management***

Abstract: This research project is primarily aimed at investigating the value chain of honey industry in Rajasthan region of India. Moreover, value chain analysis will also help identify the challenges and opportunities of honey value chain. Primary data were collected using a cross-sectional survey from 51 beekeepers and 18 traders operating in districts of Kota, Bundi Alwar, Tijara, Jaipur, Bharatpur, Kotputali-Behror, and adjoining areas. A structured questionnaire was designed used to measure study variables. It is followed by descriptive analysis and exploratory analysis to determine the key bottlenecks plaguing the honey value chain in the region. Results suggest that the main actors of honey value chain in the region includes input suppliers, beekeepers or producers, traders, wholesalers, processors, retailers, and end customers. Findings revealed that there are different types of challenges experienced by beekeepers and traders. The study's findings will lead to an advanced awareness about these factors create hurdles in the honey value chain.

Project Title: ***Value Chain Analysis of Isabgol in select districts of Rajasthan***

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

Sanctioned Amount: ***₹ 7,31,000***

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

Designation: ***Associate Professor***

Department: ***Management***

Name of Co-PI: ***Prof. Udayan Chanda, Department of Management, BITS Pilani***

Project Title: ***Design and evaluation of sustained release tablets of herbal extract***

Funding Agency: ***Emami Limited***

Sanctioned Amount: ***₹ 2,00,000***

Name of PI: ***Prof. Gautam Singhvi***

Designation: ***Associate Professor***

Department: ***Pharmacy***

Abstract: This project deals with the design, characterization, and evaluation of sustained-release solid oral formulation for herbal extract. The project is associated with the challenges of analytical method development, selection of suitable release retardent, optimization of formulation composition and in-vitro release characterization of the finished formulation. The designed product is expected to provide improved therapeutic efficacy compared to its conventional formulation.

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: ***Jindal Steel***

Sanctioned Amount: ***₹ 10,00,000***

Name of PI: ***Prof. Anupam Singhal***

Designation: ***Professor***

Department: ***Civil Engineering***

Abstract: Prior to plating operation, the surface cleaning of stainless steel is done under highly corrosive environment. The process generates huge quantity of spent pickle liquor containing valuable metals like Ni, Mn, Cr, Cu, Zn etc. The liquor is categorized as highly hazardous and it goes for safe paid disposal after neutralization. In the process, it not only consumes precious land area but also lose huge quantity of valuable metals. Therefore, the main objectives of the of the proposed project are to develop an economic and ecofriendly process for stainless steel pickle liquor through recovery of valuable metals and stabilization of toxic residue effluent, design and development of a process flow-sheet to recover valuable metals such as nickel / manganese and chromium from the spent liquor, process validation through up-scaling of the developed flow-sheet, development of value added products from the residuals after recovery of metals and assessment of environmental impact using life cycle assessment approach and zero waste business sustainability model using techno- feasibility study.

Project Title: ***Building a nature intelligence platform, a respiratory of novel species of microbes found in the extreme climatic regions through the application of novel biotechnogical tools***

Funding Agency: ***Xenesis***

Sanctioned Amount: **₹ 8,00,000**

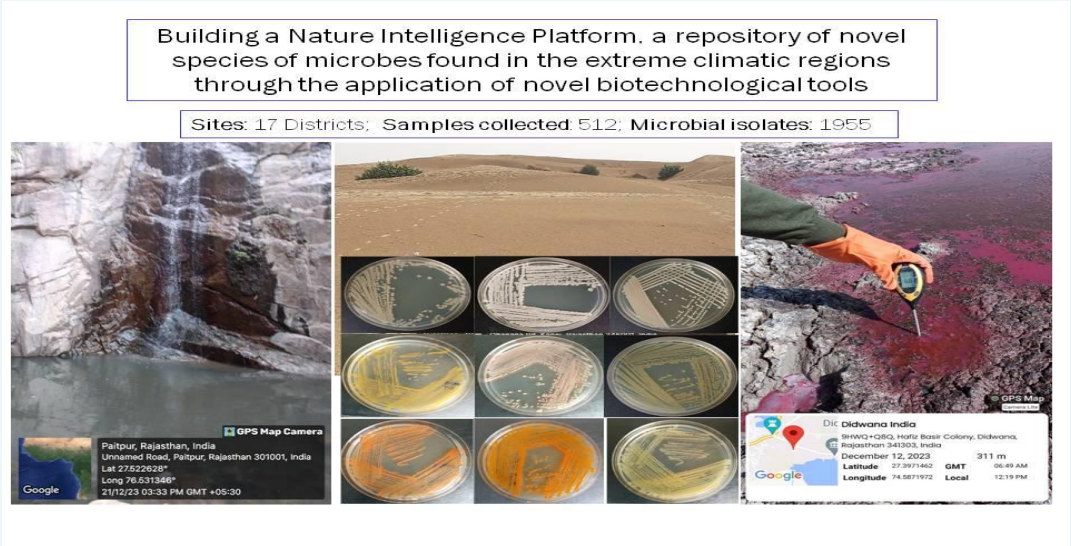
Name of PI: ***Prof. Paul Atish Tulshiram***

Designation: ***Associate Professor***

Department: ***Pharmacy***

Name of Co-PI: ***Prof. P N Jha***

Abstract: Rajasthan is the largest state (by area) of India that is located in the northwest direction. Most of western Rajasthan experiences an arid climatic regime. During winters, temperatures in some areas can drop below freezing temperature due to waves of cold air from Central Asia while in summers it may go up to 50°C. These extreme climatic conditions imparts unique potential for finding microbes in the soil and water of Rajasthan that can be further explored for research. In the project sanctioned by Absolute Ltd (Gurugram), a total of 512 sample collections [soil/water/sludge/plant parts/algae/duckweed] were done from different sites of 17 districts of Rajasthan. A total of 1955 bacteria were isolated from the collected samples. The isolated bacteria were thermophiles, halophiles, and actinomycetes. These isolates can be further explored for drug discovery programme and other industrial applications.



Project Title: ***Development of IR Compatible Radar Stealth Coatings for Camouflage***
Funding Agency: ***Hyper Stealth Technologies Pvt Ltd***
Sanctioned amount: ***₹ 17,74,956***
Name of PI: ***Prof. Etika Krishna Chaitanya***
Designation: ***Associate Professor***
Department: ***Chemical Engineering***

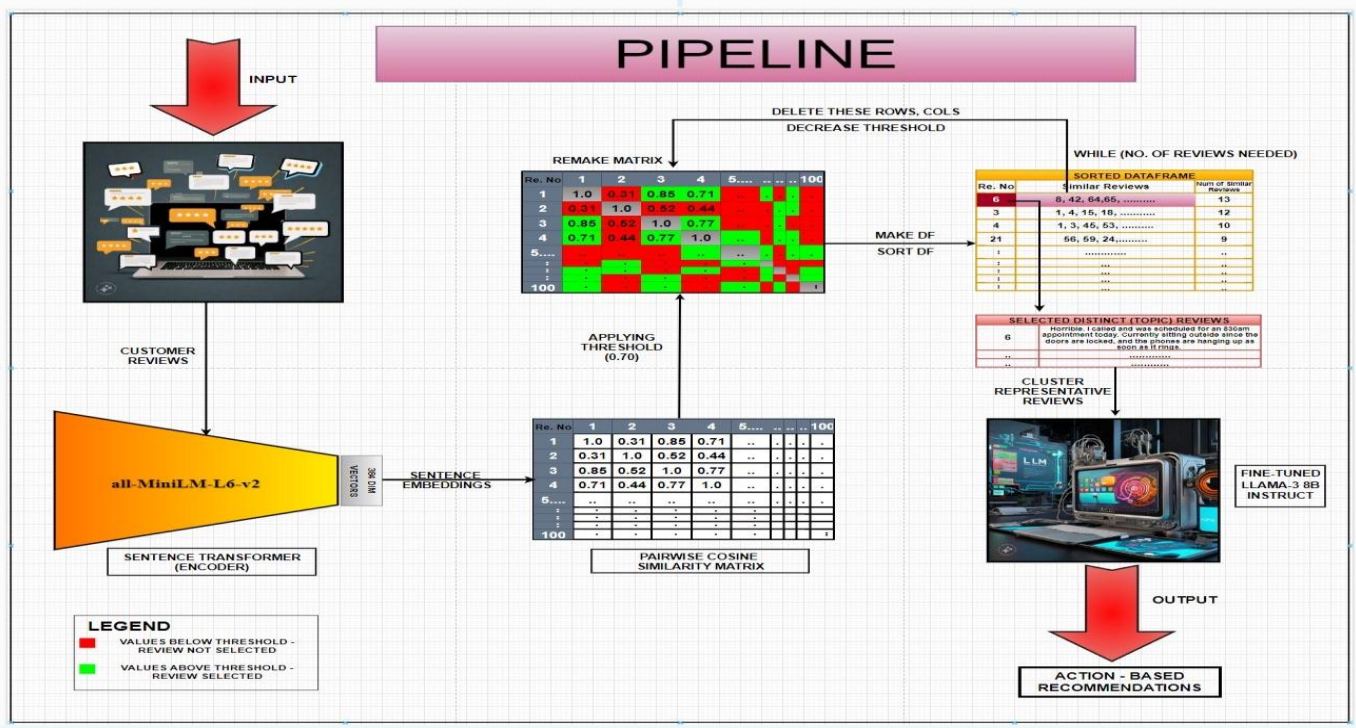
Project Title: ***Non Invasive Intoxication Detection through Computer vision & AI***
Funding Agency: ***WAISL Ltd***
Sanctioned Amount: ***₹ 25,70,040***
Name of PI: ***Prof. Kamlesh Tiwari***
Designation: ***Associate Professor***
Department: ***Computer Science and Information Systems (CSIS)***
Name of Co-PI: ***Prof. Ashutosh Bhatia***

Project Title: ***Heat transfer characterization of enhanced condenser tubes for a typical two-phase immersion cooling system***
Funding Agency: ***DroneVionics Pvt. Ltd***
Sanctioned Amount: **₹ 5,14,000**
Name of PI: ***Prof. Aneesh A M***
Designation: ***Assistant Professor***
Department: ***Mechanical Engineering***

Project Title:
Funding Agency: ***CYSD (Centre for Youth and Social Development) Bhubaneswar, Odisha***
Sanctioned Amount: **₹ 1,25,000**
Name of PI: ***Prof. Balakrushna Padhi***
Designation: ***Assistant Professor***
Department: ***Economics & Finances***

Project Title: ***Sentiment-based Business Recommendations using Large-Language Models***
Funding Agency: ***Birdeye***
Sanctioned Amount: **₹ 80,00,000**
Name of PI: ***Prof. Pratik Narang***
Designation: ***Associate Professor***
Department: ***Computer Sciences & Information Systems***

Abstract: In today's highly competitive business landscape, understanding customer sentiment and leveraging it to drive actionable insights is paramount for success to a business. This collaborative project with Birdeye aims to develop a robust recommendation model using LLMs that utilizes Birdeye businesses' review data and sentiment analysis to provide personalized, actionable business recommendations.



Project Title: ***Copper Cathode Quality Improvement & Reduction in Bleed to ETP***

Funding Agency: ***Hindalco Industries***

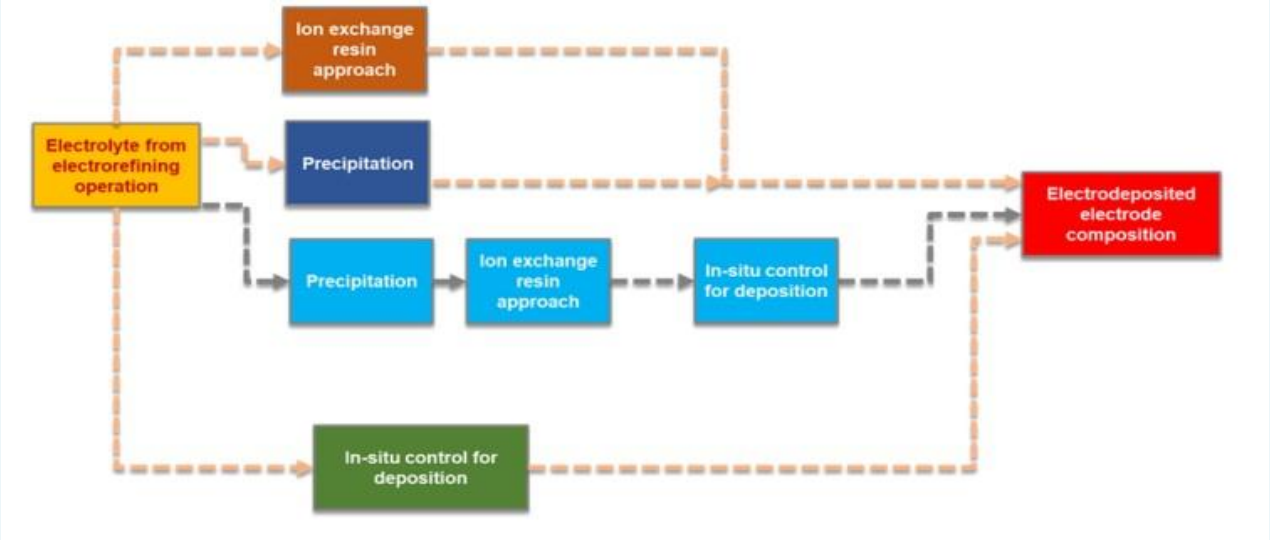
Sanctioned Amount: **₹ 6,22,974**

Name of PI: ***Prof. Jay Pandey***

Designation: ***Assistant Professor***

Department: ***Chemical Engineering***

Abstract: Birla Copper is an ISA process-licensed copper refinery located in Dahej, Bharuch, India. Copper electrorefining (ER) is an essential process widely used in industry to produce high-purity Copper. In electro-refining of Copper, impure Copper (~99.5%) is used as an anode and a Stainless-Steel plate is used as the cathode. A solution of copper sulphate and Sulphuric acid is used as an electrolyte. Different grain refining reagents are added to the electrolyte in a systematic manner. The copper electrorefining process has hundreds of cells each containing dozens of anodes and cathodes alternately aligned in the electrolyte. Copper is dissolved from the anode plate into the electrolyte and deposits onto the opposing cathode which is mother blank (stainless steel sheet) utilizing the passage of electrical current between the electrode plates. The primary purpose of ongoing research is to obtain pure Copper and separate valuable impurities (i.e., gold and silver/selenium) from the anode slime. In addition, the primary objective of this project proposal is to reduce the concentration of Arsenic (As), Antimony (Sb) and Bismuth (Bi) in electrorefining copper. Currently, a bleed stream from the bulk of the electrolyte is used to reduce the accumulation of contaminants in the electrolyte system.



Project Title: ***Copper Cathode Quality Improvement & Reduction in Bleed to ETP***

Funding Agency: ***Hindalco Industries***

Sanctioned Amount: **₹ 6,06,474**

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

Designation: ***Assistant Professor***

Department: ***Chemistry***

Project Title: ***Designing AI-empowered IoT Framework for Oil & Gas Operation and Maintenance Management***

Funding Agency: ***E73 AI Innovations Pvt Ltd***

Sanctioned Amount: **₹ 10,00,000**

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

Designation: ***Associate Professor***

Department: ***Electrical and Electronics Engineering***

Project Title: ***Enhancing Generative AI-based Creativity using Multi-Modal Input for Better Output Generation***

Funding Agency: ***RITVITECH & CO, Bengaluru***

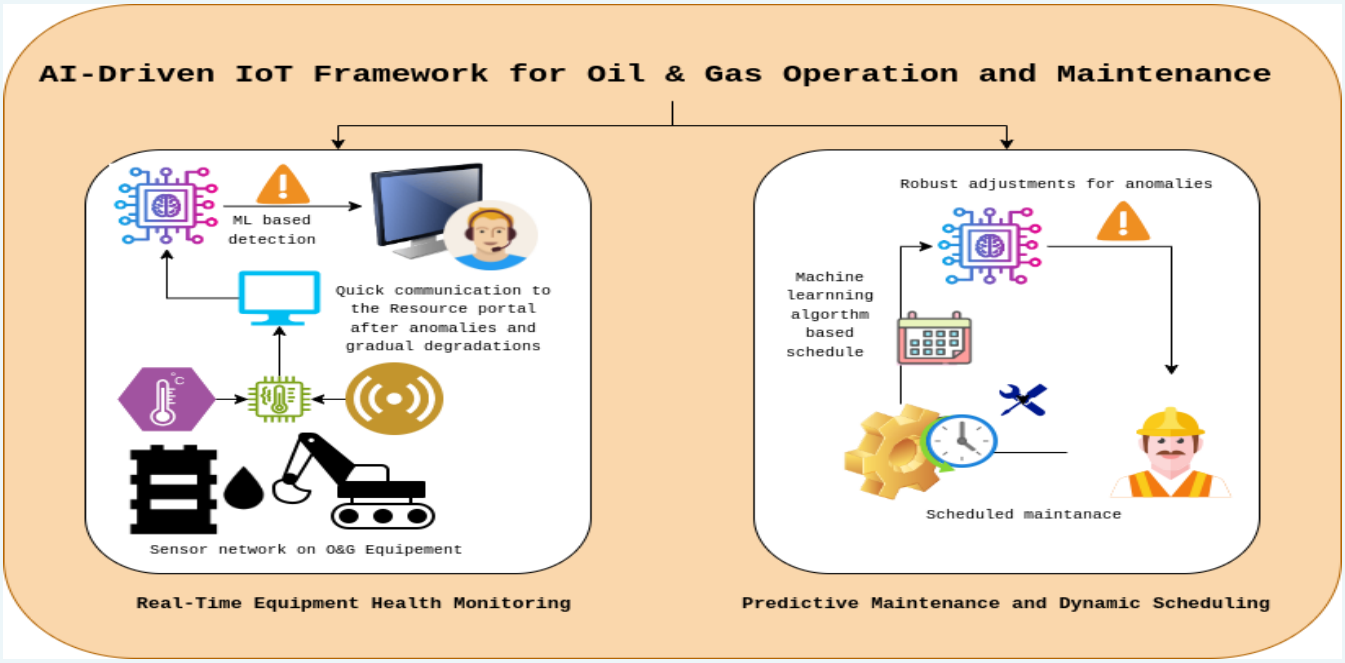
Sanctioned Amount: **₹ 10,00,000**

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

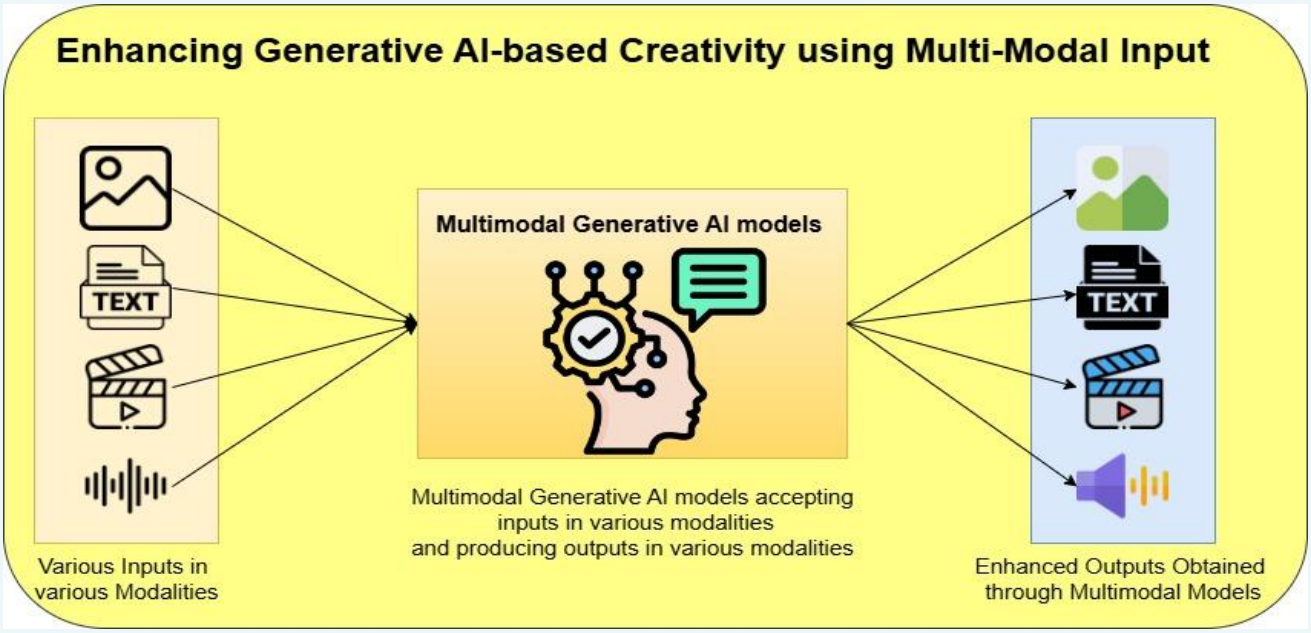
Designation: ***Associate Professor***

Department: ***Electrical and Electronics Engineering***

Abstract 1: This research project, in collaboration with E73 AI Innovations Pvt. Ltd., focuses on developing an AI-driven IoT framework to improve operation and maintenance in the oil and gas industry. The project is centered on building a system for real-time health monitoring and predictive maintenance of oil extraction equipment, using IoT technology to boost reliability and efficiency. Additionally, it involves machine learning algorithms for dynamic scheduling and adaptive workflow management, supporting quick responses in emergency situations. By addressing key challenges in oil extraction, this framework aims to enhance operational efficiency, safety, and resource management, contributing practical advancements for smarter management in the oil and gas sector.



Abstract 2: This project aims to enhance generative AI models in fostering creativity across diverse modalities and structured output generation. It focuses on two key objectives: improving cross-modal generation by creating coherent content across different mediums and advancing structured output generation for specific creative applications. By integrating deep learning and natural language processing techniques, the research seeks to produce more diverse and semantically consistent outputs, such as generating images from text descriptions and vice versa. Through empirical evaluation, this work aims to expand the capabilities of generative AI and facilitate innovative applications in creative industries and human-computer interaction.



Project Title: ***Multisensor Fusion Toolbox for Edge- AI, computing to support IoT and MIoT driven building automation and management applications***

Funding Agency: ***TIH-IIT Bombay***

Sanctioned Amount: ***₹ 45,74,152***

Name of PI: ***Prof. Meetha V Shenoy***

Designation: ***Assistant Professor***

Department: ***Electrical and Electronics Engineering***

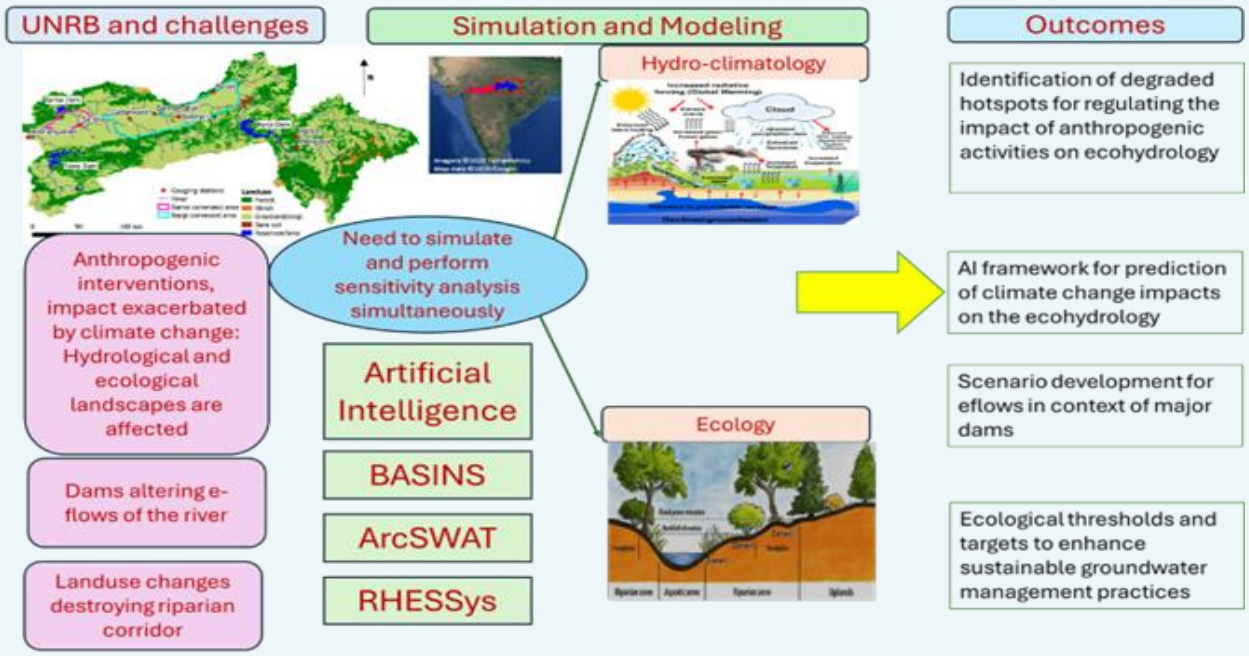
Name of Co-PI: ***Prof. Kamlesh Tiwari, Dr Ashutosh Bhatia***

Abstract: This project aims to design and develop a multi-sensor toolbox to support designers and practitioners in deploying multi-sensor fusion-based IoT solutions for intelligent building automation and management. The toolbox offers guidance on optimal sensor selection, communication protocols, placement, and fusion techniques, all tailored to the building's layout. Additionally, it includes visualization tools to interpret results and provides recommendations for scaling distributed edge solutions across different deployment levels. Offered as a standalone application, the toolbox enables informed decision-making on cost, performance, and scalability tradeoffs, ultimately reducing both design and deployment costs. The toolbox will be demonstrated in Smart Building Management use cases, contributing to sustainable building management practices.

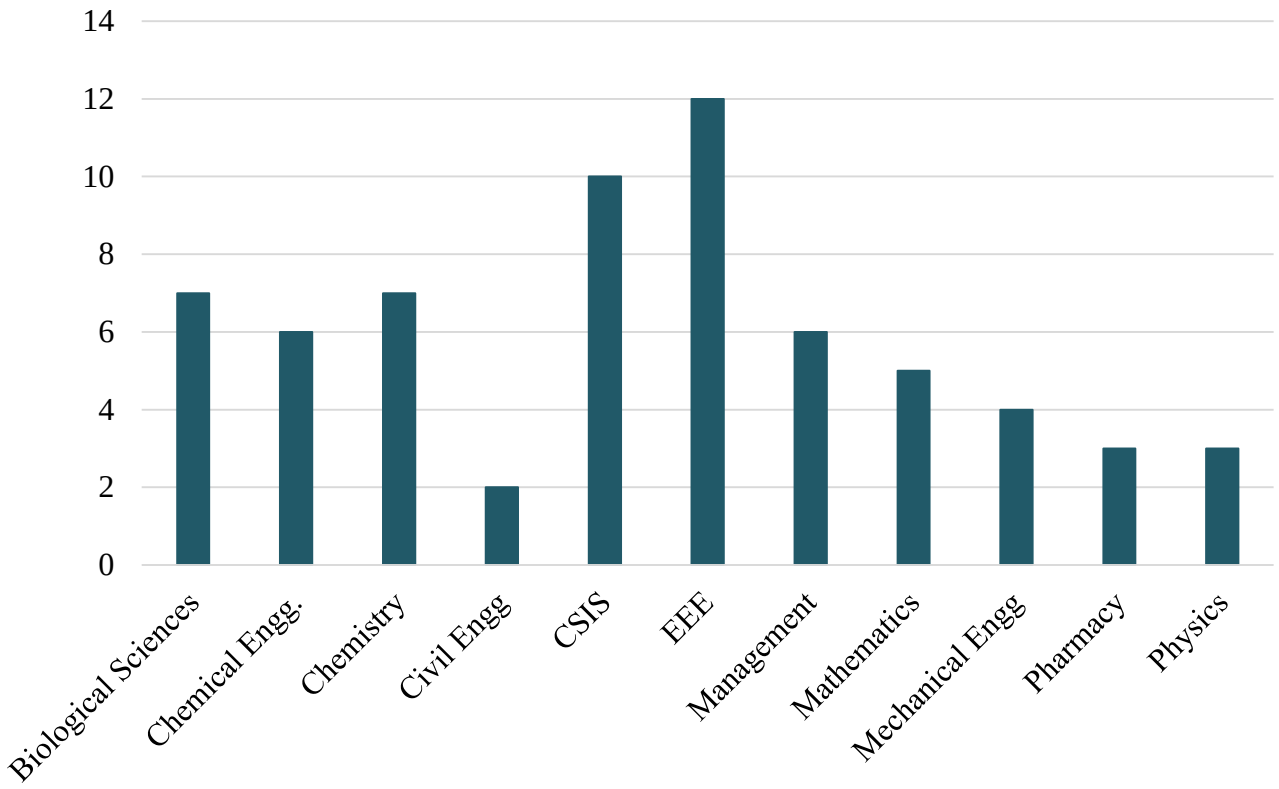
International Research Projects October 2023- September 2024

Project Title: ***Develop an eco-hydro-climatological modelling framework***
Funding Agency: ***The Nature Conservancy***
Sanctioned Amount: **₹ 20,85,400**
Name of PI: ***Prof. R Srinivas***
Designation: ***Assistant Professor***
Department: ***Civil Engineering***
Name of Co-PI: ***Prof. Dhruv Kumar, CSIS Dept***

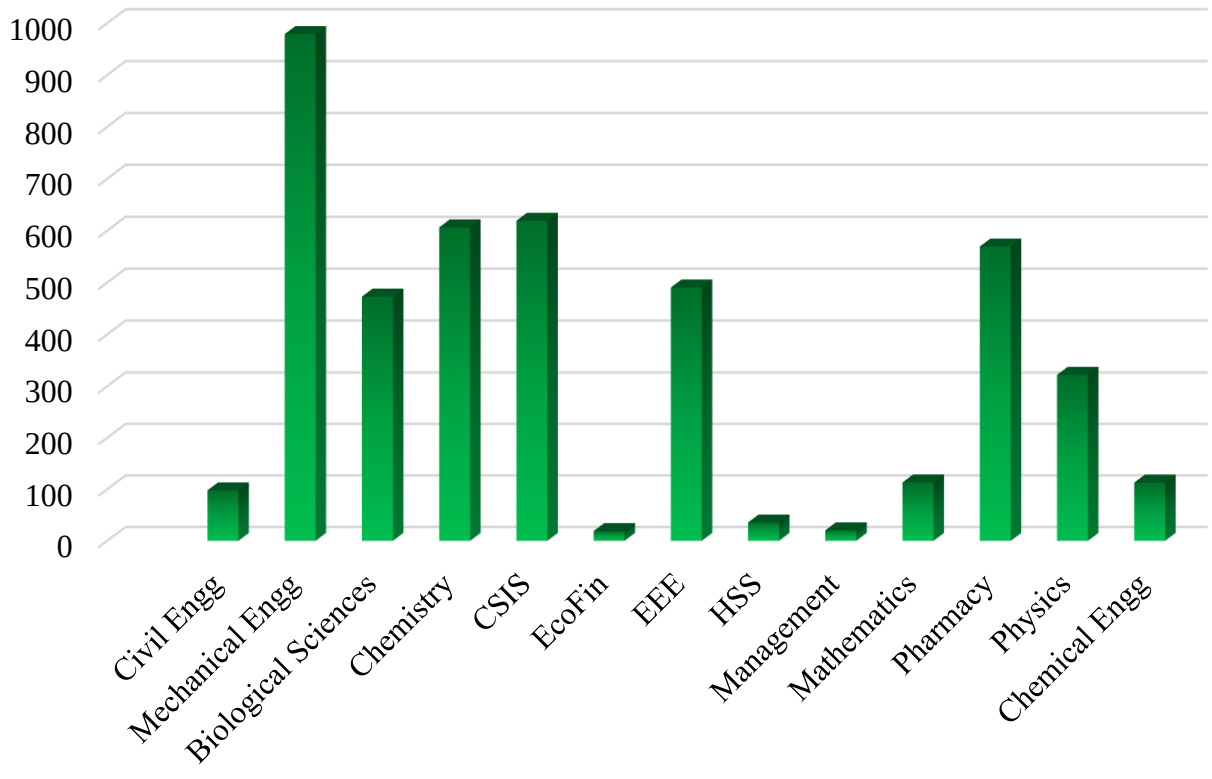
Abstract: The project aims to quantify and assess the impacts of human activities on the eco-hydro-climatological systems of the upper Narmada River basin while identifying degraded hotspots that require intervention. Expected outcomes include the creation of an open-source geospatial database repository for the basin, providing valuable spatial data for researchers and policymakers. An artificial intelligence framework will be developed to analyze historical fluvial morphological trends—such as water quality, stream discharge, and land use—and their relationship with climate change. This will help in understanding past and present changes in the river system. The project will delineate degraded hotspots to regulate the impact of anthropogenic activities on ecohydrology effectively. It also involves developing environmental flow (e-flow) scenarios considering major dam infrastructures to ensure sustainable water flow regimes. Lastly, ecological thresholds and targets will be established to enhance sustainable groundwater management practices. Collectively, these outcomes aim to support sustainable management and conservation efforts for the upper Narmada River basin.



Department wide completed projects (September- October2024)



Department wide sanctioned amount (in lakhs) for ongoing projects as on September 2024



Patents Granted

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 201911006301
Title: Synthesis of New Triazolyl Linked Bile Acid Aryl Ketones
Date of Grant: 05/10/2023
Inventors Name: Rajeev Sakhuja / Devesh S. Agarwal / Samrat Mazumdar/Prof.Deepak Chitkara

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 201911045423
Title: Ecofriendly Water Storage Container
Date of Grant: 16/10/2023
Inventors Name: Rajiv Gupta / Kar Soumya / Raya Raghvendra Kumar

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 202011016007
Title: One Part Geopolymer Composition And Process Thereof
Date of Grant: 06/11/2023
Inventors Name: Anshuman Srivastava / Rishabh Bajpai

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 201711010510
Title: A Liquid-Cooled Hybrid Solar Energy Collector
Date of Grant: 29/11/2023
Inventors Name: Manoj Kumar Soni / Nikhil Gakkhar / Sanjeev Jakhar

Patentee: Birla Institute of Technology and Science, Pilani
Application No.:202011049372
Title: Thiazolidineodine - Indole Compounds
Date of Grant: 11/12/2023
Inventors Name: Paul Atish Tulsiram/ Genson George/ Pracheta Sengupta / Prashant Auti

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 201811035517
Title: Formulation For Wound Healing
Date of Grant: 05/01/2024
Inventors Name: Aniruddha Roy / Swati Sharma

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 400419-001
Title: Designing of modified Donor-Immersed Franz Diffusion Cell
Date of Grant: 05/01/2024
Inventors Name: Gautam Singhvi / Priya Sakshi

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 201911011318
Title: A Lyotropic Liquid Crystalline Nanoparticles Based Hydrogel Of Voriconazole For Topical Application
Date of Grant: 11/01/2024
Inventors Name: Singhvi Gautam / Girdhar Vishal / Patil Shalini / Rapalli Vamshi Krishna / Dubey Sunil Kumar / Saha Ranendra Narayan

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 201711014300
Title: System and Method Of Reinforcement Of Masonry Structures With Frp Laminates
Date of Grant: 19/01/2024
Inventors Name: Samsher Bahadur Singh / Pankaj Munjal

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 202011041936
Title: A Power Sharing System and Method Thereof
Date of Grant: 14/02/2024
Inventors Name: H. D. Mathur/ Utkarsh Tripathi / Dhananjay Kumar

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 201711014301
Title: System and Method Of Reinforcement Of Masonry Structures With Dfrcc Sheets
Date of Grant: 01/03/2024
Inventors Name: Samsher Bahadur Singh / Pankaj Munjal

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 201911050058
Title: A Porous Scaffold Composition For Tissue Regeneration And Method Of Preparing The Same
Date of Grant: 14/03/2024
Inventors Name: Aniruddha Roy / Swati Sharma

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 201911050058
Title: A Loading Test Apparatus And Method Thereof
Date of Grant: 14/03/2024
Inventors Name: Samsher Singh Bahadur / Himanshu Chawla / Sudhir Vummadisetti

Patentee: Birla Institute of Technology and Science, Pilani
Application No.: 202011016005
Title: System For Water Storage With Heat Exchange For Treating Ambient Air
Date of Grant: 22/03/2024
Inventors Name: Rajiv Gupta / Harish Puppala

Patentee: Birla Institute of Technology and Science, Pilani

Application No.: 202011016481

Title: Orally Administrable Thermosensitive Liposome For Encapsulating A Molecule

Date of Grant: 15/05/2024

Inventors Name: Gautam Singhvi / Sunil Kumar Dubey/ Ranendra Narayan Saha / Krishan Venkata Kowthavarapu

Patentee: Birla Institute of Technology and Science, Pilani

Application No.: 202111026751

Title: Preparation Method Of In-Situ Synthesized Cu-Ni-Graphene Nanocomposite

Date of Grant: 09/08/2024

Inventors Name: Sachin Belgamwar / Rathore, Jitendra Singh / Owhal, Ayush / Pingale, Ajay Dadabhau

Patentee: Birla Institute of Technology and Science, Pilani

Application No.: 202111035889

Title: Device For Detecting Methanol Concentration In Alcoholic Beverages

Date of Grant: 25/10/2024

Inventors Name: Arnab Hazra / Prateek Bindra

Useful links of GCIR

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

R&I Intranet - Pilani campus

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

Link to access e-copy of the SOP 2024

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

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