



CSR Opportunities

at IIT Indore



Proposal No. 1

Focus area of Research: Health care & sanitation

Project Title: Slip and fall based accident prevention through intervention in concrete floors

Kind of Project: Health care intervention through innovative building materials

Duration: 01 Year and 00 Months

Total Cost (Rs.): 12,60,000

Principal Investigator: Professor Sandeep Chaudhary

Project Details:

World Health Organization (WHO) estimates that each year globally 37.3 million severe slip and fall based accidents occur which require medical attention, in addition to 684,000 deaths from fall-based accidents, second highest cause of death. This issue is particularly severe in South East Asia and elderly above the age of 60 years. Even in case of non-fatal accidents, slip and fall results in loss of 38 million disability-adjusted life years. Fall triangle suggests that risk is based on three factors fall, force and fragility. While, fragility depends on individual body structure, the project focuses on fall and force to prevent slip and fall related accidents. The high probability of slip and fall and resulting severity of injury highlights the need for this project.

Proposal No. 2

Focus area of Research: Sustainable building materials

Project Title: Substituting decorative polished stones with naturally colored functional geopolymers

Kind of Project: Development of an eco-friendly and economical product

Duration: 01 Year and 00 Months

Total Cost (Rs.): 8,94,000

Principal Investigator: Professor Sandeep Chaudhary

Project Details:

Decorative polished stones like Kota stone and Makrana marble have a high demand in Indian construction industry, due to their color and surface texture. In case of decorative polished stones nearly 70% of stone is lost as waste from mine to polishing, and results in high economic and environmental costs. This prompts the need for reduction in stone wastes. The project will present an economical alternative to decorative polished stones through reuse of stone wastes, and help in environment sustainability through reduce and recycle principles of waste management. The project proposes the recycling of waste generated from polished stone industry into naturally colored functional geopolymer. Naturally colored functional geopolymer is expected to provide color and surface texture similar to polished stones, at a substantially lower economic and environmental costs.

Proposal No. 3

Focus area of Research: Energy

Project Title: Design and Fabrication of solar cells using lead-free Perovskite-Inspired Materials for Renewable and Sustainable Energy Generation

Kind of Project: Greener, Renewable and Sustainable Energy Generation

Duration: 03 Years and 00 Months

Total Cost (Rs.): 74,66,800

Principal Investigator: Dr. Shaikh M. Mobin

Project Details:

The world needs cheap and abundant sources of energy. To date around 85% of the world's energy requirements is being fulfilled by the combustion of oil, natural gas and coal, which causing increment global warming and has inimical effects on environment. Photovoltaic (PV) is considered as an ideal candidate for energy conversion that may fulfill this requirement and will power the world in future. Due to industrialization and growing population the planet required additional 15 terawatt of energy by 2050. Solar cells based on crystalline silicon, silicon wafers and other semiconductors exhibited power conversion efficiencies (PCEs) of more than 20%, but due to the requirement of large scale area for module and tedious processing condition, which may escalate its payback time.

Proposal No. 4

Focus area of Research: Light weight metal alloys

Project Title: Development of non-rare earth ductile magnesium alloy sheets for automobile and aerospace applications

Kind of Project: Metallurgical Engineering related project

Duration: 03 Years and 00 Months

Total Cost (Rs.): 29,19,000

Principal Investigator: Dr. Dudekula Althaf Basha

Project Details:

It is important to minimize the consumption of natural fuel resources for the welfare of future generations by developing light-weight materials with desired properties in automotive and aerospace fields. The proposed work will be focused on the topic “Enhancing the room temperature ductility of rare earth free ultrafine grained magnesium alloys by grain boundary sliding phenomenon”. Grain boundary sliding mechanism can be further improved by grain boundary engineering, diffusion and segregation phenomenon in magnesium alloys. Careful selection of suitable non-rare earth solutes can significantly affect the stability of grain boundaries.

Proposal No. 5

Focus area of Research: TMDC-based wearable optoelectronic device for dosimetry application

Project Title: Cost effective wearable dosimeter for mitigating risk of skin ailment

Kind of Project: Health Care

Duration: 02 Years and 00 Months

Total Cost (Rs.): 35,74,400

Principal Investigator: Professor Shaibal Mukherjee

Project Details:

With this research, the adverse effect of excessive exposure to harmful radiation on human health (skin cancer) is brought into consideration. An analysis conducted by the Indian Institute of Tropical Meteorology (IITM) found that Mumbai is the topmost UV exposed city of the India, followed by Delhi and Pune. As a person having science background we already know that, a reduction in the thickness of the atmospheric ozone layer would lead to increased levels of ultraviolet (UV) radiation at ground level, resulting in higher population exposure to UV and subsequent harm, especially a rise in skin cancer. From a survey conducted by Skin Cancer Foundation, 33% of the total cancer diagnosed cases is skin cancer. Also, one in every five Americans will develop skin cancer in their lifetime.

Proposal No. 6

Focus area of Research: Power Electronics, Electrical Vehicle

Project Title: Active Learning in Power Converter for Transportation

Kind of Project: Environmental Sustainability and Skill Development

Duration: 02 Years and 00 Months

Total Cost (Rs.): 51,40,000

Principal Investigator: Professor Shaibal Mukherjee

Project Details:

The economic progress of any country majorly relies on energy, which can be regarded as the key input for development. The rapid growth of industries, vehicles, and domestic users led to the consumption of energy on a large scale. Fossil fuels are depleting day by day and the pollution caused to the atmosphere, an increase of the global temperature are considered to be the dominant challenges to protect the environment. According to a report by the European Union, the transport sector is responsible for nearly 28% of the total carbon dioxide (CO₂) emissions, while road transport is accountable for over 70% of the transport sector emissions.

Proposal No. 7

Focus area of Research: Diagnosis (Human Healthcare)

Project Title: Rapid Detection of COVID via Memristive On-chip System (RaDeCoM)

Kind of Project: Diagnosis Prototype

Duration: 02 Years and 00 Months

Total Cost (Rs.): 44,74,400

Principal Investigator: Professor Shaibal Mukherjee

Project Details:

Past more than two years, the effective analysis of the biomedical images (MRI and CT scan) to identify the COVID infection in human lungs is very critical process. However, the currently used detection techniques such as real-time reverse transcription-polymerase chain reaction (RT-PCR) which takes more time (10-15 hours) to provide the accurate results and rapid antigen/antibody diagnostic test (RDT) which shows the low reliable output.

Proposal No. 8

Focus area of Research: Irrigation, Agriculture, and Energy

Project Title: Solar Powered Smart Irrigation System (SPSIS)

Kind of Project: Designing, implementation, and skill training

Duration: 02 Years and 00 Months

Total Cost (Rs.): 30,74,400

Principal Investigator: Professor Shaibal Mukherjee

Project Details:

The Indian economy which is one of the largest developing economies of the world has been heavily dependent on the agricultural sector. There is an immediate need for the up-gradation of various agriculture techniques that are being used today to achieve maximum utilization of manpower and to increase farmers' income. And, in the field of agriculture, the use of a proper method of irrigation is important because maintaining an optimum amount of water level in the soil is one of the requirements to harvest a good crop that can be a source of various types of nutrients whether micro or macro for their proper growth.

Proposal No. 9

Focus area of Research: Irrigation water quality analysis in Madhya Pradesh, Drinking Water Analysis

Project Title: IoT-enabled Water Quality Analysis in Madhya Pradesh

Kind of Project: Water monitoring sensor prototype

Duration: 02 Years and 00 Months

Total Cost (Rs.): 36,74,400

Principal Investigator: Professor Shaibal Mukherjee

Project Details:

It is well documented in the scientific literature that water bodies contain heavy metal ions, which are harmful and toxic in nature and consumed by living beings day by day in daily routine activities through direct and indirect means. Various studies have shown that long-term irrigation with wastewater builds up heavy metals in the soil, even at low concentrations in the wastewater. This, in turn leads to phytotoxicity and food contamination. Metals also accumulate in the body and increase in concentrations over time, which can lead to cancer, genetic mutations, and malnutrition.

Proposal No. 10

Focus area of Research: Self-sustainable WWTPs

Project Title: Energy production from waste water treatment

Kind of Project: Energy Source

Duration: 02 Years and 00 Months

Total Cost (Rs.): 29,74,400

Principal Investigator: Professor Shaibal Mukherjee

Project Details:

The problem addressed by this study is that the operation and maintenance of a municipal wastewater treatment plant is complex, technical, and consequently costly. The WWTPs in general are not set financially to generate cash profits and therefore there is no financial incentive for establishing a WWTP other than for environmental regulations. As such some WWTPs may tend to fall into disrepair or may not be able to treat wastewater properly due to having to depend upon limited resources for funding. Therefore, to make WWTPs self-sustainable is need of an hour.

Proposal No. 11

Focus area of Research: Oral infectious disease control, Systemic infection control, Alternative medicine

Project Title: Development of mouthwash as adjunctive therapy for various oral and systemic infections

Kind of Project: Product development

Duration: 02 Years and 06 Months

Total Cost (Rs.): 20,00,000

Principal Investigator: Dr. Hem Chandra Jha

Project Details:

- * Consumables for final product and testing on various cellular subjects
- * Collection of bacterial samples from the oral cavity
- * Culturing oral bacteria from dental plaque samples
- * Confirmation and characterization of isolated strains of bacteria
- * Amplification of specific pathogen targets
- * Use of various available chemical plaque control agents for the treatment of bacteria
- * Formulation of new oral rinse (Chemical and/ or herbal)
- * Characterization of pathogens by High throughput sequencing

Proposal No. 12

Focus area of Research: Agri/bio-waste processing

Project Title: Agri/bio-waste derived carbon for energy storage devices

Kind of Project: Agri/Bio waste for energy storage systems

Duration: 03 Years and 00 Months

Total Cost (Rs.): 49,59,680

Principal Investigator: Dr. Rupesh S. Devan

Project Details:

India is an agricultural country. Every year, farmers burn the Agri-wastes, which actually convert into carbon and simultaneously cause environmental pollution. These Agri-wastes can be scientifically processed to convert in conducting carbon material through proper processing. Through this process, we can control environmental pollution and produce cost-effective, quality carbon material useful for the fabrication of electrodes in energy storage devices like supercapacitors and batteries.

Proposal No. 13

Focus area of Research: Healthcare of farmers

Project Title: Development of Anti-pesticide Hydrogels to Protect Farmers from Organophosphate Poisoning

Kind of Project: Societal, product development

Duration: 03 Years and 00 Months

Total Cost (Rs.): 15,00,000

Principal Investigator: Professor Apurba Kumar Das

Project Details:

According to World Health Organization (WHO), Class I and II organophosphorus pesticides cause most deaths in rural Asia. Over 50% of India's workforce is driven by agriculture and contributes more than 15% of India's GDP. Officially, India has anywhere from 9 crore to almost 15 crore farmers. Farmers and farmworkers get exposed to a number of biological, neuronal dysfunction, environmental and safety issues related to chemicals and highly-hazardous pesticides due to the use of hand-held manual devices. Spraying pesticides using manual hand-held devices cause self-poisoning which accounts for 14-20% of global suicides, an estimated 1,10,000-1,68,000 deaths each year.

Proposal No. 14

Focus area of Research: Structural Engineering

Project Title: A geometrically nonlinear finite element model to predict impact response of laminated composite, stiffened, doubly curved shell panels

Kind of Project: Computational Project

Duration: 03 Years and 36 Months

Total Cost (Rs.): 18,16,800

Principal Investigator: Dr. Kaustav Bakshi

Project Details:

One of the important applications of laminated composite shells in civil engineering is to build roofs. The doubly curved surfaces are stiffer and aesthetically more appealing than flat plates and singly curved ones. The laminated composite panels are lighter in weight compared to the reinforced concrete ones. The lesser dead weight results in smaller foundations and mass induced seismic forces in case of the composite panels. The doubly curved surfaces allow natural ventilation. Thus, the medicine, food processing, automobile industries prefer the doubly curved composite surfaces to cover large unsupported spaces.

Proposal No. 14

Focus area of Research: Structural Engineering

Project Title: A geometrically nonlinear finite element model to predict impact response of laminated composite, stiffened, doubly curved shell panels

Kind of Project: Computational Project

Duration: 03 Years and 36 Months

Total Cost (Rs.): 18,16,800

Principal Investigator: Dr. Kaustav Bakshi

Project Details:

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Proposal No. 15

Focus area of Research: Promoting technical skills in the rural youths

Project Title: Promoting skill development in the areas of metal fabrications, welding, casting and mechanical testing

Kind of Project: Skill development

Duration: 02 Years and 00 Months

Total Cost (Rs.): 19,00,000

Principal Investigator: Dr. Jayaprakash Murugesan

Project Details:

To promote the skilled manpower in the rural areas of India and thereby enhancing the employment opportunity among youths. To train the people particularly in rural areas to develop few technical skills like welding, fabrication works, metal casting, various mechanical testing of materials, skills for basic repairing of agricultural equipments, repairing own electrical machineries and etc. With the developed skills the youths can explore and identify self-employment opportunities like making wooden furniture, metal structure fabrication, civil construction, toy making and etc. based on the developed skills and also they can explore the opportunity to work in nearby factories.

Proposal No. 16

Focus area of Research: Clean water

Project Title: Design, development and demonstration of hybrid capacitive desalination reactor using porous graphene-based nanocomposites

Kind of Project: Desalination

Duration: 03 Years and 00 Months

Total Cost (Rs.): 40,23,244

Principal Investigator: Dr. Dharendra Kumar Rai

Project Details:

Rapid urbanization has led to the depletion of groundwater and shrinkage of surface freshwater reserves, which eventually has caused two-thirds of the global population to face severe water scarcity for at least one month of the year. To address the current water crisis, it is imperative to develop cost-effective and sustainable desalination technologies to extract clean water from seawater and brackish water.

Particularly in India, deriving clean water from brackish and seawater from desalination is most suitable as the country has a long coastal line. Capacitive desalination (CDI) is one of the most effective desalination techniques.

Proposal No. 17

Focus area of Research: Skill Development

Project Title: Training program on using Unmanned Aerial Vehicles (UAV) and data processing

Kind of Project: The project aims at teaching the farmers of villages to use drones and simple Geographical Information systems (GIS).

Duration: 03 Years and 00 Months

Total Cost (Rs.): 45,00,000

Principal Investigator: Professor Neelima Satyam

Project Details:

The training on drone flying and the basics of GIS has been launched to increase young employment from rural India and boost the employability of technology graduates. Drone technology is highly futuristic technology and is rapidly expanding worldwide, with extensive applications. Drone uses are becoming more widely recognized, focusing on agricultural, infrastructural, disaster management and safety applications. The increased use of small unmanned aerial vehicles (UAVs) for agriculture is one of the most recent advancements. Drones are unmanned aircraft that are operated remotely rather than by a human pilot.

Proposal No. 18

Focus area of Research: Environmental sustainability

Project Title: Modeling of Toxic Heavy Metal and Microbially induced Calcite Precipitation Interactions for Ground Improvement

Kind of Project: Advanced ground improvement techniques for sustainable environment .

Duration: 03 Years and 00 Months

Total Cost (Rs.): 45,00,000

Principal Investigator: Professor Neelima Satyam

Project Details:

Generally, Engineers design Foundation and other structures based on soil investigation. If soil is good at lesser depth shallow foundation can be laid, if hard stratum is available at higher depth, Deep foundation can be laid. In some cases, Deep foundation becomes uneconomical, it becomes a problem practically. So, there need arises to improve the ground conditions by ground improvement. Ground improvement is rapidly developing filed because good sites for construction are limited. So, improving characteristics of soil at site, that consists of increasing shear strength, decreasing compressibility of soil.

Proposal No. 19

Focus area of Research: Rural Health Care

Project Title: IoT-Enabled Ancillary Support for Rural Health-Center

Kind of Project: Research and Development Project

Duration: 03 Years and 00 Months

Total Cost (Rs.): 37,68,288

Principal Investigator: Dr. Somnath Dey

Project Details:

The Internet of Things (IoT) is a network of connected computing devices with unique identifiers (UIDs) that can send information across the internet without the need for human-to-human or human-to-computer contact. The Internet of Medical Things (IoMT) uses sensor nodes and clinical innovations in real-time in health care. The IoT makes it easier for medical devices and apps to send information to a distant location. Collecting data in real-time also makes it easier for doctors to understand a patient's clinical records before a review. The IoMT presents a significant way to look at essential patient data. People in critical conditions have a hard time getting into specialist and senior care facilities.

Proposal No. 20

Project Title: Biodiesel Pilot Plant from Plant Seed and Waste Cooking Oils Using Metal Oxides Nanocatalysts

Duration: 00 Years and 00 Months

Total Cost (Rs.): 79,02,128

Principal Investigator: Dr. Chelvam Venkatesh

Project Details:

Gas Authority of India Limited (GAIL) is India's largest state-owned natural gas processing and distribution company. GAIL played a key role as a gas market developer in India for decades providing major products like natural gas, petrochemicals, liquid hydrocarbons, liquefied petroleum gas which are non-renewable energy resources obtained generally from the basins of Cambay, Arakan, Mahanadi, Krishna, Godavari and Cauvery. These non-renewable energy resources will be exhausted soon. Some reports claim that oil and gas reserves will be depleted between 41-63 years if the consumption remains constant at the current pace. According to the International Energy Agency (IEA) report, the world will require 50% more energy in 2030 of which 45% will be consumed by China and India. Biodiesel, an alternative and clean renewable fuel, has recently been considered the best candidate for the non-renewable energy source. At IIT Indore we have developed new nanocatalysts that can be used for the transesterification of oils derived from plant seeds or waste cooking oils for obtaining high-quality biodiesel. With this technology, the project will contribute to IIT Indore to secure mainstream business in India as well as overseas in the forthcoming years.

Proposal No. 21

Project Title: An integrated approach for production of biopolymer from wastewater

Duration: 00 18 Months

Total Cost (Rs.): 25,00,000

Principal Investigator: Dr. Kiran Bala

Project Details:

Researchers have been working on the production of biopolymer for more than years and still not able to compete with the fossil-based plastic due to high production cost.

Commercialization is still not feasible for the production of biopolymers which still remain a bottleneck. The major cost involved in the scale-up process is cost of raw material, and maintenance of aseptic conditions. Owing to these conditions the unit cost of the biopolymer is increased drastically which hampers with the economic viability of the project. Use of wastewater as a raw material and use of mixed culture can triumph over these bottlenecks and pave a way to commercialization of biopolymer. Wastewater from several industries like, dairy, sugar, starch etc. contains a lot of organic acids and carbon which are favored by microbes for the accumulation of biopolymers due to high carbon and nitrogen ratio. Acidified wastewaters are rich in volatile fatty acids (VFAs) that acts as the precursor for the biopolymer accumulation pathways in microbes.

Proposal No. 22

Project Title: Development of a compact bioreactor to generate biogas at the household level

Duration: 12 Months

Total Cost (Rs.): 10,00,000

Principal Investigator: Dr. Mayur Shirish Jain

Project Details:

Development of a household-level bioreactor to valorize agro-wastes to produce biogas for cooking. 2. Streamlining a standard operating procedure for pre-digestion and proportional feeding. This proposal is the first attempt to aim SDG-6,7,11 and 12 together, respectively, in line with creating independence among the farmers of Simrol for adopting a sustainable lifestyle in

Proposal No. 23

Project Title: Establishing surface water circular economy through Constructed Wetlands

Duration: 06 Months

Total Cost (Rs.): 6,00,000

Principal Investigator: Dr. Mayur Shirish Jain

Project Details:

To develop a constructed wetland surface system to provide good water quality. B. Establishing a circular economy w.r.t water quality improvement using CW and promoting sustainability. The study area would be restricted to Deendayal Upadhyay Jheel in Simrol. Here we would be testing samples for various parameters: pH, turbidity, TDS, TSS, BOD, DO, COD, EC, Chlorine, Nitrates, Metals, and nitrogen and phosphorus. The design for the laboratory-based CW reactors would be created depending on the results, followed by establishing these reactors. The testing will be done using locally found macrophytes, soil, and gravel from Simrol itself. We would be creating variation by employing different kinds of macrophytes and by adding locally-made biochar to it. Biochar is a splendid adsorbent that removes various pollutants and heavy metals from degraded water. Finally, testing for the same parameters will be done on the resultant water that CW treats. Along with this, we will establish a Circular economy within the village and develop sustainability lessons.

The image features a light gray gradient background with several realistic water droplets of various sizes scattered in the corners. The droplets have highlights and shadows, giving them a three-dimensional appearance. The text 'Thank You' is centered in a bold, blue, serif font.

Thank You