



# RESEARCH CENTRE FOR SUSTAINABLE INNOVATION

BRIDGING TECHNOLOGY  
AND ECOLOGY

# Two Research Centres

The Veer Bahadur Singh Purvanchal University has three Research Centres inside its campus at the Prof. Rajendra Singh (Rajju Bhैया) Institute of Physical Sciences for Study and Research. All three Centres are directly working towards solving various issues related to sustainability and renewable energy. The centres are -

A) The Centre for Renewable Energy

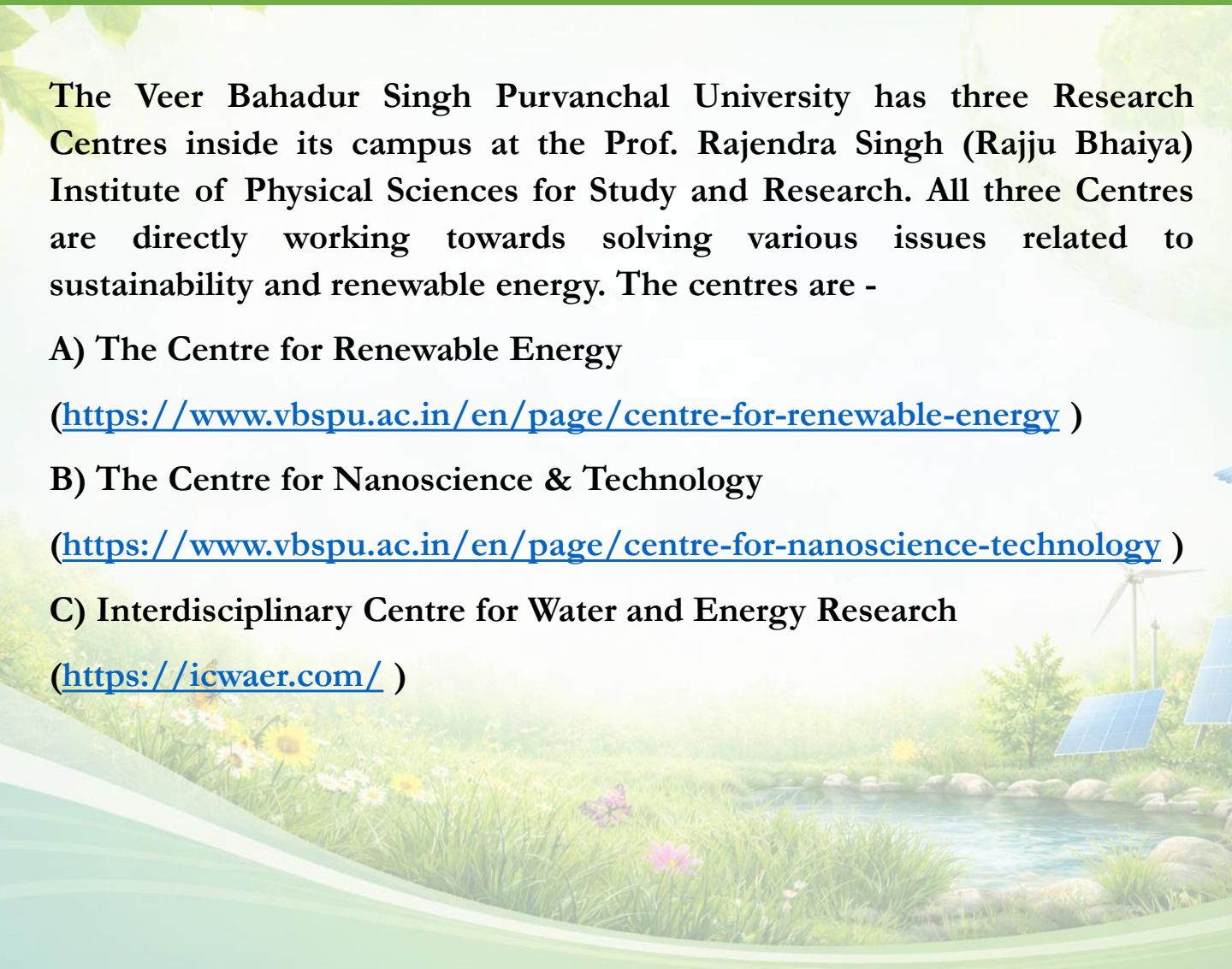
(<https://www.vbspu.ac.in/en/page/centre-for-renewable-energy> )


B) The Centre for Nanoscience & Technology

(<https://www.vbspu.ac.in/en/page/centre-for-nanoscience-technology> )

C) Interdisciplinary Centre for Water and Energy Research

(<https://icwaer.com/> )



The background of the slide is a lush, green landscape. In the top right corner, a large, glowing green globe is partially visible. In the bottom right, there are blue solar panels and a white wind turbine. A small pond with blue water and rocks is in the lower right. The foreground is filled with green grass, yellow daisies, and pink flowers. A yellow butterfly is on the left, and a purple butterfly is in the center. The overall scene is bright and sunny, with a soft green glow.

# Centre for Renewable Energy

# About the Centre....

Centre for Renewable Energy (CRE) has a special mission to foster collaborative, interdisciplinary research and education in the science and technology for development of cost effective and sustainable energy alternatives. Faculties of CRE are exploring many topics of National interest such as alternative cost-effective solar energy technology to resolve energy crisis, development of nanomaterials for energy conversion and storage devices, fabrication of thermoelectric devices for waste heat energy management. In Indian context Solar energy is one of the most suitable renewable energy sources due to its geographical location. India is a tropical country and it receives solar radiation almost throughout the year, which amounts to 3,000 hours of sunshine. This is equal to more than 5000 trillion kWh. Almost all parts of India receive 4-7 kWh of solar radiation/m<sup>2</sup>. This is equivalent to 2300–3200 sunshine hours per year. Hence research activities of CRE are more concentrate on the development of solar energy materials and their devices as well as development of thermoelectric devices for waste energy harvesting to contribute in National efforts. Centre is well equipped with world-class research facilities and infrastructure for the contemporary and advance research. These not only facilitate researchers for their research but also encourage and motivate our Bachelor's and Master's students for their higher study in the Field of Science. Also, research facilities available in the centre are open for external researchers for collaborative research work.

# Academic Programs running at the Centre

## The Centre conducts the following academic programs

### ➤ **Doctoral programme/Ph.D**

Admission process: The admission process and its corresponding rules and regulations will be governed by the Ph.D ordinance of V.B.S. Purvanchal University. Admission to the Ph. D. programme of the department shall be made through Purvanchal University Combined Research Entrance Test (PUCRET). Candidates qualified in National level exams such as National Eligibility Test (NET), Graduate aptitude test (GATE) etc. shall be exempted from the PUCRET exam. Aspiring students are instructed to keep visiting the University website <https://www.vbspu.ac.in> for any update/information regarding admission to the Ph.D programme.

### ➤ **M. Tech in Material Science & Technology**

Eligibility: B.E. / B. Tech (Mechanical Engineering/Electrical Engineering/Electronics Engineering and other relevant subjects) or M.Sc (Physics/Chemistry/Material Science/Nanoscience & Technology/other relevant subjects)

For more details, please visit <https://www.vbspu.ac.in/en/page/course-cnt>

# Full time Staff

The Centre has the following full-time faculty



## **Dr. Dharendra K. Chaudhary**

Responsibilities:

- Supervises Doctoral and Masters students,
- Teaches in M. Tech Material Science & Technology, B.Sc and Polytechnique diploma courses

For more information, please visit

<https://www.vbspu.ac.in/en/page/faculty-cre>

# Sponsored Research Projects at the Centre related to Sustainability

## 1. **Synthesis and Characterization of Lead (Pb) free Perovskite Materials for Solar cell devices**

**Sponsor: CST-UP**

**Scheme: Research Grant**

**Current Status: Completed**

**Brief description:** This project aimed to develop lead free perovskite solar cell devices. Cost-effective Pb free perovskite solar cell device is important for sustainable next generation devices.

## 2. **Investigations on Ion migration driven degradation in Perovskite solar cell devices**

**Sponsor: UGC-DAE**

**Scheme: Collaborative Research Scheme**

**Current Status: Ongoing**

**Brief description:** This project aims to design and develop Pb-free perovskite single crystal/thin film for solar cell devices. The outcome of this project will be able to provide Pb-free single crystal perovskites for developing different types of optoelectronic devices.

*Contd.*

# Sponsored Research Projects at the Centre related to Sustainability

## 3. Tailoring the thermal conductivity of all-inorganic perovskite materials for thermoelectric devices

Sponsor: UGC

Scheme: Start-up Research Grant

Current Status: Completed

Brief description: This project aims to design and develop Pb-free perovskite single crystal/thin film for solar cell devices. The outcome of this project will be able to provide Pb-free single crystal perovskites for developing different types of optoelectronic devices.

## 4. Monolithic Growth of Organohalide Perovskite Single Crystals for Efficient and Stable Solar Cell Devices via Space Confined Method

Sponsor: UPSCHE

Scheme: Centre of Excellence Research Grant

Current Status: Ongoing

Brief description: This project aimed to grow organohalide perovskite single crystal for efficient and stable solar cell devices. The outcome of this project shall contribute significantly towards the development of perovskite solar cell.

*Contd.*

# Sponsored Research Projects at the Centre related to Sustainability

## 5. **Tuning the Work Function of Transparent Conducting Oxides via Ion Implantation Technique for Perovskite Solar Cell Devices**

**Sponsor: IUAC**

**Scheme: Beam Time**

**Current Status: Completed**

**Brief description:** This project aimed to tune the work function of transparent conducting oxides (TCOs) via ion implantation technique. The outcome of this project contributed significantly towards the development of perovskite solar cell devices.

## 6. **Monolithic Growth of Lead-Free Perovskite Single-Crystal Thin Films for Solar Cell Devices**

**Sponsor: SERB**

**Scheme: SERB-SIRE Fellowship for Visit to Germany**

**Current Status: Completed**


**Brief description:** This project aimed to grow Lead-free Perovskite single-crystal thin films. The outcome of this project provided new insights into the monolithic growth of perovskite single crystal.


The background of the slide is a lush, green landscape. In the top right corner, a large, glowing green globe is partially visible. In the bottom right, there are blue solar panels and a white wind turbine. A small pond with blue water and rocks is in the lower right. The foreground is filled with green grass, yellow daisies, and pink flowers. Several butterflies are fluttering around. The overall scene is bright and sunny, with a soft green glow.

# **Centre for Nanoscience & Technology**

# About the Centre.....

The Centre for Nanoscience & Technology was established in 2018 with an eye towards conducting advanced-level research and scientific investigations in the field of nanoscience; to be carried out by the scientists/faculties and research scholars associated with it. Nanotechnology is a rapidly emerging and evolving interdisciplinary branch of science & technology that derives its fundamental concepts from various core branches of science such as physics, chemistry, bioscience, and mathematics among others. It has a wide range of existing and potential applications in myriad fields ranging from material science, medicine, drug delivery, energy storage and renewable energy, electronics, agriculture, catalysis, green hydrogen, environment etc. It is widely expected to contribute significantly towards the economic and scientific growth of our country in the coming years.

 The centre envisions to establish itself as a world-class research center that utilizes the concepts and opportunities provided by nanoscience & technology to further understanding in fundamental science and to address various challenges in the fields of energy, medicine, electronics, environment and agriculture.

 Its ongoing research areas include catalysts for green hydrogen and water splitting reactions, ionic liquids, rechargeable batteries, gas and humidity and soil moisture sensors, antibacterial application of nanomaterials, biosensors etc.

# Academic Programs running at the Centre

## The Centre conducts two academic programs

### ➤ **Doctoral programme/Ph.D**

Admission process: The admission process and its corresponding rules and regulations will be governed by the Ph.D ordinance of V.B.S. Purvanchal University. Admission to the Ph. D. programme of the department shall be made through Purvanchal University Combined Research Entrance Test (PUCRET). Candidates qualified in National level exams such as National Eligibility Test (NET), Graduate aptitude test (GATE) etc. shall be exempted from the PUCRET exam. Aspiring students are instructed to keep visiting the University website <https://www.vbspu.ac.in> for any update/information regarding admission to the Ph.D programme.

### ➤ **M. Tech in Material Science & Technology**

Eligibility: B.E. / B. Tech (Mechanical Engineering/Electrical Engineering/Electronics Engineering and other relevant subjects) or M.Sc (Physics/Chemistry/Material Science/Nanoscience & Technology/other relevant subjects)

For more details, please visit <https://www.vbspu.ac.in/en/page/course-cnt>

# Full time Staff

The Centre has two full-time faculty members



**Dr. Kajal Kumar Dey**

- Supervises doctoral and masters students,
- Teaches in M. Tech Material Science & Technology, M.Sc Chemistry, B.Sc and Polytechnique diploma courses



**Dr. Sujeet Kumar Chaurasia**

- Supervises doctoral and masters students,
- Teaches in M. Tech Material Science & Technology, B.Sc and Polytechnique diploma courses

For more details, please visit <https://www.vbspu.ac.in/en/page/faculty-cnt>

# Ongoing Sponsored Research Projects at the Centre related to Sustainability

## 1. **Development and optimization of 2-D nanomaterials for soil moisture sensing**

**Sponsor: UPSCHE**

**Scheme: Research & Development Grant**

**Current Status: Ongoing**

**Brief description:** This research project aims to develop suitable 2-D nanomaterials that can perform extremely well as sensor material in soil moisture sensing devices. Any innovation here would aid in the agricultural sustainability as a part of enhanced understanding in the soil properties.

## 2. **Development of high-performance electrocatalysts for hydrogen evolution reaction (HER) based on vanadium chalcogenide nanostructures**

**Sponsor: ANRF**

**Scheme: Start-up Research Grant**

**Current Status: Ongoing**

**Brief description:** This research project aims to develop vanadium oxide based nanostructures for enhanced capability as electrocatalyst in hydrogen evolution reaction. This project aims to find alternate catalyst to generate green hydrogen fuels.

*Contd.*

# Ongoing Sponsored Research Projects at the Centre Related to Sustainability

## 3. Optimization of Charge transfer and charge separation in co-doped metal oxide nanomaterial for green hydrogen generation via photo-electrochemical water splitting

**Sponsor: UPSCHE**

**Scheme: Centre of Excellence Research Grant**

**Current Status: Ongoing**

**Brief description:** This research project aims to investigate the effect of co-doping in nanophotocatalyst materials on the charge separation and charge transfer properties. The outcomes are likely to provide better insight in the photoelectrochemical activity for green hydrogen generation.

## 4. Fabrication of Biomass-derived Bifunctional Water Splitting Electrocatalysts for Green Hydrogen Generation

**Sponsor: CST-UP**

**Scheme: Research Grant**

**Current Status: Ongoing**

**Brief description:** This research project aims to develop bi-functional electrocatalyst materials from biomass derived nanostructures for enhanced capability as electrocatalyst in hydrogen evolution reaction. This project aims to find alternate catalyst to generate green hydrogen fuels.

*Contd.*

# Ongoing Sponsored Research Projects at the Centre Related to Sustainability

- 5. Development and characterization of flexible quasi-solid supercapacitors using ionic liquid based polymeric electrolytes and biomass derived mesoporous carbonaceous electrodes**

**Sponsor: CST-UP**

**Scheme: Research Grant**

**Current Status: Completed**

**Brief description:** Quasi-solid state flexible supercapacitor has been developed using solid state electrolytes and nanocarbon electrodes. Outcomes of this project help in environmental remediation through reducing CO<sub>2</sub> emission.

- 6. Development and performance optimization of quasi solid-state flexible polymer-silica nanostructured hybrid electrolytes for application in sodium ion rechargeable battery**

**Sponsor: UGC**

**Scheme: Start-up Research Grant**

**Current Status: Completed**

**Brief description:** This project aimed to develop high-capacity rechargeable sodium-ion battery for automotive applications. Outcomes from this project provided insight into alternative energy storage mechanism.

*Contd.*

# Ongoing Sponsored Research Projects at the Centre Related to Sustainability

- 7. Development of suitable electrode–electrolyte material for high-capacity sodium ion rechargeable battery.**

**Sponsor: UPSCHE**

**Scheme: Centre of Excellence Grant**

**Current Status: Ongoing**

**Brief description:** This project aimed to develop high-capacity rechargeable sodium-ion battery for automotive applications. Outcomes from this project provided insight into alternative energy storage mechanism.

*Contd.*





**Interdisciplinary  
Centre for Water  
and Energy  
Research**

# About the Centre.....

The Interdisciplinary Centre for Water and Energy Research (ICWaER), established under the PM-USHA scheme, is dedicated to advancing scientific research and innovation in the fields of water and energy. The center aims to explore sustainable solutions through cutting-edge research in solar energy—particularly Perovskite Solar Cells—hydrogen energy, battery technologies, and thermoelectric devices. By integrating state-of-the-art equipment and fostering interdisciplinary collaboration, ICWaER seeks to drive breakthroughs that contribute to renewable energy advancements and environmental sustainability. Beyond research, ICWaER is committed to nurturing the next generation of scientists and engineers through hands-on training and educational programs, equipping them with the skills to address pressing global challenges. Additionally, the center actively promotes academia-industry partnerships, ensuring that its research findings translate into real-world applications benefiting society, industry, and national development. Serving as a bridge between academic research, rural development, and industrial progress, ICWaER aspires to be a cornerstone of sustainable innovation and technological transformation.

For more details please visit: <https://icwaer.com/>

The End

