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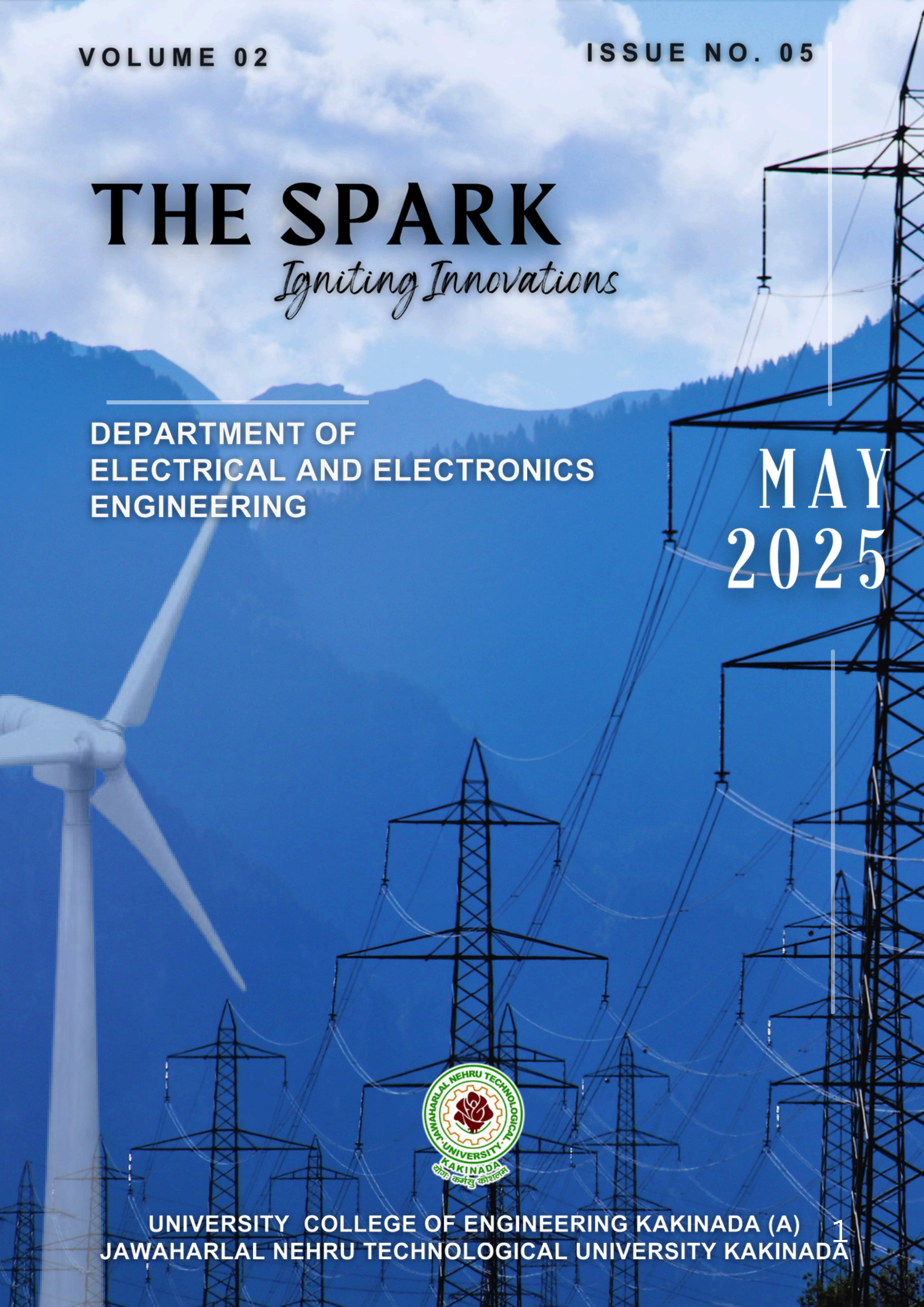
THE SPARK

Igniting Innovations

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MAY 2025



UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

Inside

ACHIEVEMENTS

Dr. Shanmukha Naga Raju Vonteddu
Assistant Professor (C)

Dr. Shanmukha Naga Raju Vonteddu , Assistant Professor (C) of EEE dept., University College of Engineering Kakinada (A), JNTUK, successfully completed Ph.D. from the University of Petroleum and Energy Studies (UPES), Dehradun, on 21st May 2025 with doctoral research, titled "Optimized Control Strategies for Hybrid Energy Storage and ANN-Based Driving Prediction Techniques for Energy Management System in Electric Vehicles," under the guidance of Dr. Prasanthi Kumari Nunna and Dr. Ravindra Kollu.

Heartfelt congratulations for successfully completing Ph.D., marking a remarkable milestone of dedication and academic excellence.

INTERNSHIPS

We are proud to announce that the students from IV B.Tech have been completed industrial internships in various companies. This achievement marks a significant milestone in their professional journey and a step toward a bright future!

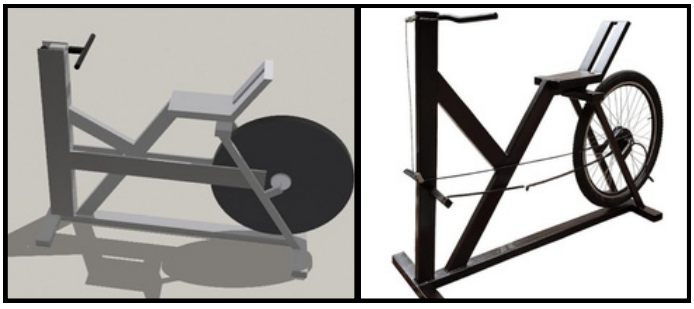
- **4 students** from IV B.Tech have completed their **four months** internship at **TATA Institute of Fundamental Research Balloon** facility at **Hyderabad.**
- **14 students** from IV B.Tech have completed their **four months** internship at **Bharat Heavy Electricals Limited (BHEL)**, **Visakhapatnam**.
- **1 student** from IV B.tech has completed internship at **TATA ADVANCED SYSTEMS** , **Bangalore.**
- **9 students** from IV B.Tech have completed their **four months** internship at **South Central Railway**, **Vijayawada**.
- **2 students** from IV B.Tech have completed their **four months** internship at APOLLO TYRES, **Tirupathi**.
- **3 students** from IV B.Tech have completed their **four months** internship at **Galaxe Solutions** .
- **5 students** from IV B.Tech have completed their **four months** internship at **Avishkaran Industries Private Limited**, **Hyderbad**.
- **15 students** from IV year B.Tech have completed their **four months** internship at **Trontech Labs Private Limited**.
- **1 student**IV B.Tech has completed internship at **Sandhya Aqua Exports Private Limited, Kakinada**.

"Congratulations to our IV BTech students for completing their internships, marking a remarkable step towards a bright future!"

REGENERATIVE ROWING MACHINE

In an effort to integrate physical activity with electrical energy generation, our team of three students from the Department of Electrical and Electronics Engineering, JNTU Kakinada, has designed and fabricated a Regenerative Rowing Machine. This project aims to harness human mechanical effort, specifically rowing motion, to generate electricity using a simple yet effective energy conversion mechanism. The project revolved around creating a durable, functional, and efficient machine capable of converting linear motion into rotational motion to drive a generator.

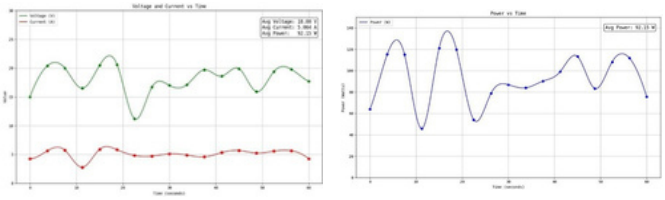
This setup serves as a fitness tool. The handle-pulling motion provides a form of upper body exercise, engaging muscles in the arms, shoulders, and back. It offers a low- impact workout that can benefit users by promoting physical activity while simultaneously generating useful electricity. This dual-purpose design makes it especially useful in home gyms or rehabilitation centers. The machine was initially conceptualized through detailed CAD models, focusing on both structural integrity and mechanical transmission efficiency. The frame of the machine was fabricated using Galvanized Iron (GI) pipes, selected for their strength and cost-effectiveness. The design included a flat seating arrangement, a backrest, a pulling handle, and a system of pulleys and chains designed to transfer motion.



During initial testing, we encountered challenges with alignment and structural balance. These issues led to multiple design iterations, after which we re-fabricated the frame to improve stability and ensure better mechanical response to user inputs.

The core of the machine's functionality lies in the conversion mechanism. When the user pulls the handle, a steel cable connected to it transmits the motion through a pair of pulleys. The linear motion is then converted into rotational motion using a chain and sprocket system, which is attached to a bicycle wheel integrated with a 250W BLDC hub motor. This motor, typically used in electric bicycles, operates in reverse as a generator when the wheel rotates. A flywheel is connected to the system to maintain smooth and consistent rotational momentum, helping stabilize power output during each stroke of the rowing motion.

The entire system was tested with various users under controlled conditions. The performance was recorded over multiple trials to ensure repeatability and accuracy. The average electrical output measured was 63.76 watts over a 30-minute rowing session. This performance validated the effectiveness of the mechanical-to-electrical energy conversion and confirmed the capability of the machine to maintain consistent output under moderate physical activity.



This project offers an excellent opportunity for students to engage in practical, hands-on learning. By building or operating the cycle generator, students can directly observe how mechanical energy is transformed into electrical energy. It provides a fun and interactive way to understand core concepts in physics and engineering such as torque, rotational motion, and electromagnetic induction. Teachers can use the system to demonstrate these principles in real-time, making abstract ideas more tangible. Additionally, the setup can be used for classroom experiments, science fair projects, or group competitions, where students try to generate the highest voltage or most power. Such activities not only enhance technical understanding but also promote teamwork, creativity, and innovation among students. The project emphasized precision in fabrication and iterative improvements based on physical testing and user feedback.The result is a reliable and efficient prototype that demonstrates the practicality of energy generation through exercise, achieved with minimal complexity and maximum efficiency in design.

The final average voltage is **15.693V**, average current is **3.998A** and averagepower is **63.764W**.

This project is completed by
U.V.S.S.S Srivatsa, IV BTech
K.Chaitra Lahari, IV BTech
P.Mohan Vamsi , IV BTech

REGENERATIVE ARM WHEEL

In recent years, the demand for energy-efficient and sustainable technologies has grown rapidly across multiple sectors. Simultaneously, there has been a heightened awareness of physical well-being, leading to the exploration of systems that merge fitness with energy harvesting. In response to these evolving needs, a team of final-year B .Tech students from the Electrical and Electronics Engineering Department at JNTU Kakinada have developed an innovative solution: the Regenerative Arm Wheel Mechanism. This project is a novel approach to converting manual upper- body motion into electrical energy, offering a unique combination of exercise, rehabilitation, and renewable power generation. While traditional pedal-based systems focus on leg movement, this mechanism is designed specifically for arm-driven operation, making it inclusive and accessible for a broader range of users, including those with lower-body mobility limitations. Unlike cycle-based generators that rely on modifying existing bicycles, this system was built entirely from scratch. The design process focused on structural strength, ergonomic comfort, and energy efficiency. The entire frame is constructed using Mild Steel (MS) angles, chosen for their strength, availability, and cost-effectiveness. The vertical orientation of the setup supports a dual-chain transmission system, ensuring smooth power transfer between the arm handles and the power-generating unit. At the core of the system lies a 250W BLDC hub motor, typically used in electric bicycles, repurposed here as a generator. The motor is connected through a bidirectional gear assembly—a significant innovation in this design. This configuration enables the system to generate electricity in both clockwise and counter clockwise rotations, ensuring uninterrupted power output during operation. The user rotates a handle mounted at the top of the frame, and mechanical energy is transmitted through gears and chains to the hub motor mounted at the bottom.

The mechanism is ergonomically engineered to support smooth and consistent rotation. Proper alignment of sprockets, chains, and gears ensures minimal mechanical losses and vibration, even at higher RPMs. The system is capable of delivering power suitable for charging batteries, lighting LEDs, and powering small DC appliances. It is also well-suited for use in rural areas, gyms, or emergency situations where access to electricity is limited.The complete frame constructed using MS angles and a dual-chain drive system. The long vertical frame is ergonomically designed to support comfortable arm operation while maintaining balance and stability during high-speed rotation.

The mechanical components are carefully aligned to minimize losses and maximize power output.

AVERAGE OUTPUT POWER:

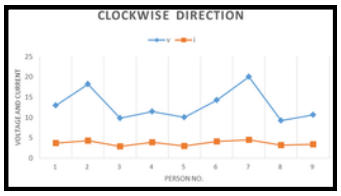
he experimental analysis of the Regenerative Arm Wheel Mechanism was conducted with nine users performing manual arm rotations in both clockwise and anti-clockwise directions.

The generated voltage, current, and corresponding power output wererecordedandanalyzed toassessthe system's energy conversion efficiency.

In Clockwise Direction

n the clockwise mode, the average mechanical input from users resulted in a consistent and higher electrical output. The system recorded a maximum power output of 90 W and a minimum of 28.71 W, with an overall average output of 50.2 W. This direction showed better performance, attributed to smoother gear engagement and natural ease of rotation for most users.

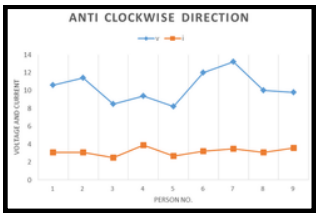
Average Output Power(p) =50.2W



In Anti clock-wise Direction:

The anti-clockwise operation yielded a lower average power output of 33.83 W, with a maximum power of 46.2 W and a minimum of 21.24 W. While the output was relatively lower compared to clockwise rotation, it still demonstrated the system's capability to function in both directions, validating the effectiveness of the bidirectional gear mechanism.

Average Output Power (p) = 33.83W



The Regenerative Arm Wheel Mechanism project was undertaken as a part of the Student Activity Centre (SAC) initiative of the Electrical and Electronics Engineering Department, with the full support and guidance of the college administration. This project was not just an academic requirement—it became an opportunity to apply theoretical knowledge to a meaningful, hands-on innovation that merges fitness, sustainability, and real-world engineering.Throughout the design and development process, students integrated concepts from electrical machines, power generation, mechanical transmission systems, material engineering, and manual fabrication techniques. The project challenged the team to solve practical design issues such as gear alignment, power output optimization, and frame stability—all without reliance on high-end automation or simulation software.The successful working prototype stands as a testament to interdisciplinary learning, teamwork, and the power of applying core engineering principles to address real-world needs. This project encourages future students to think creatively, work collaboratively, and build solutions that are not only technically sound but also socially relevant and environmentally conscious.

This project is completed by
V.L.Prasanna, IV BTech
B.Satyavathi, IV BTech
A.Bindu, IV BTech

REGENERATIVE SPIN BIKE

Energy is a driving force of both social progress and economic growth. Historically, the world has relied on both renewable and non-renewable energy sources to meet its power needs. However, with the exponential increase in electricity demand, rising fuel prices, and growing awareness about climate change, there is an urgent need to transition toward more sustainable and innovative energy solutions. At the same time, the last decade has seen a significant rise in health consciousness and fitness awareness, leading to a rapid expansion of gyms and personal fitness equipment globally. This creates an opportunity, what if the energy expended during workouts could be converted into usable electricity.

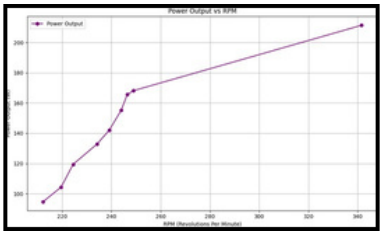
In this project, the energy-generation concept deals with gym equipment designed to convert human physical energy into usable electrical energy. The major aim of this project "Design and Development of Regenerative Spin Bike System for Sustainable Power" is to tap energy generation along with workouts so that the machines in the gym may be modified to become small-scale power producers. Until now, gyms have only been used for physical fitness thereby, the kinetic energy during workouts has been put to waste, which can be harvested for energy generation.

At its core, the concept revolves around generating power through pedaling. But rather than modifying an existing cycle, the entire frame and system were built from the ground up with a focus on stability, usability, and performance. The structural design process began with tools like AutoCAD and Shapr3D to ensure high precision in measurements and load distribution. After several iterations, an I-shaped frame (akin to a rotated 'H') was finalized for its ability to reduce vibrations and dampen oscillations, especially during high- speed pedaling.

To validate the structural integrity, simulations were conducted using ANSYS (Student Edition). These simulations analyzed stress distribution, deformation, and vibration response under various loading conditions. The results guided crucial design refinements aimed at improving durability and rider comfort. Fabrication of the frame involved precise cutting and joining of GI pipes based on the CAD model. Interestingly, the frame had to be rebuilt after the initial version fell short of performance expectations—a valuable lesson in the importance of iteration and real-world testing. For power generation, a 250W BLDC hub motor was utilized, producing three-phase AC power through pedaling.This output was then rectified to DC, making it suitable for powering small appliances or charging batteries. Under regular pedaling conditions, the system can produce approximately 100 watts of usable power— making it a viable setup for homes or fitness centers interested in energy harvesting.

The bike can comfortably accommodate users of different heights, thanks to clamp-based adjustments for both the seat and the handlebar. This makes it more inclusive than conventional gym bikes, which are often built for fixed body types. One of the main challenges encountered was adapting the structure to house the larger 27.5-inch motorized wheel— significantly bigger than those used in typical exercise bikes. With no reference models available, the team developed a custom frame geometry tailored to the system's specific needs.

The graph illustrating the relationship between power output (W) and rotational speed (RPM) reveals a clear and consistent upward trend, indicating a strong positive correlation between pedaling speed and energy generation. As the motor RPM increases, the power output rises proportionally, demonstrating the system's efficient energy conversion capability. The peak average power output of approximately 211 W was recorded at observed speed of 340 RPM, while the minimum power output of 94 W occurred at 87 RPM.



These findings confirm that higher mechanical input achieved through increased pedaling speed directly enhances the electrical output. This establishes RPM as a critical factor in optimizing the performance and effectiveness of the regenerative spin bike system for sustainable energy harvesting.

The project is the part of Student Activity Centre of EEE Department which is supported by the administration. It integrated knowledge from multiple domains, including mechanical design, electrical systems, material science, simulation tools, and hands-on fabrication. It became more than just an academic task it was an opportunity to bring together health, sustainability, and engineering innovation in one real-world solution.The Regenerative Spin Bike stands as a working prototype and a testament to the power of interdisciplinary learning and collaborative effort. It is hoped that this initiative will inspire future students to pursue bold, practical solutions to real-world challenges using solid engineering foundations.

This project is completed by
K.Iswarya Sai, IV BTech
S.Sathish Kumar, IV BTech
M.Soma Sundari, IV BTech

EVENTS AND WORKSHOPS

COMMUNITY SERVICE PROJECT

II B.Tech II sem students had done summer community service project at the **INDIAN RED CROSS SOCIETY** started on May 13. Different experienced people shared their experiences and gave lectures about different aspects.

G. Bhavitha (23021A0211) II B.Tech II Sem has done her Community service project at the SOCIAL ACTIVITIES FOR RURAL DEVELOPMENT SOCIEY (SARDS),ONGOLE by visiting diferent fields giving awareness about different social sins.

WORLD MENSTRUAL HYGIENE DAY

While II B.Tech II sem students are doing their community service project in INDIAN RED CROSS SOCIETY KAKINADA, on 28th May on the occasion of WORLD MENSTRUAL HYGIENE DAY, the girl students were addressed by Smt Bhanumathi garu, women empowerment activist along with Smt. Sathyavathi garu, Gynaecologist about menstruation and its hygiene. They told them about how to keep themselves hygienic during periods and clarified their myths and assumptions about periods. Later in the session, jute bags and a book briefing about 'menstrual health and hygiene' were given.

A 5-day offline faculty development program on "IOT AND ITS APPLICATIONS IN ELECTRICAL ENGINEERING"

This workshop was conducted from 19th-23rd May 2025 at PACEITS, ONGOLE, organized by Dept.of EEE, UCEK(A), JNTUK, KAKINADA in association with Dept of EEE, PACEITS, ONGOLE. This workshop was coordinated by Dr. K. Venkata Reddy, professor, Dept. of EEE, UCEk(A), JNTUK, KAKINADA and co-coordinated by Mr. B. Nagaraju, Assistsant proffessor, Dept. of EEE, PACE ITS, Ongole.

Dr. K. Venkata Reddy, Professor, Dept. of EEE, UCEK(A), JNTUK, Kakinada was honoured for coordinating the workshop.

PHOTOGRAPHY

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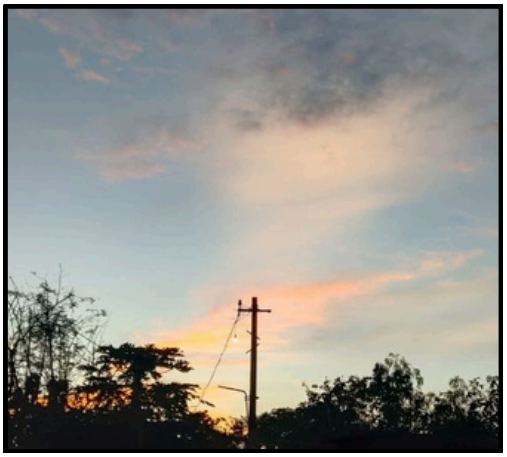

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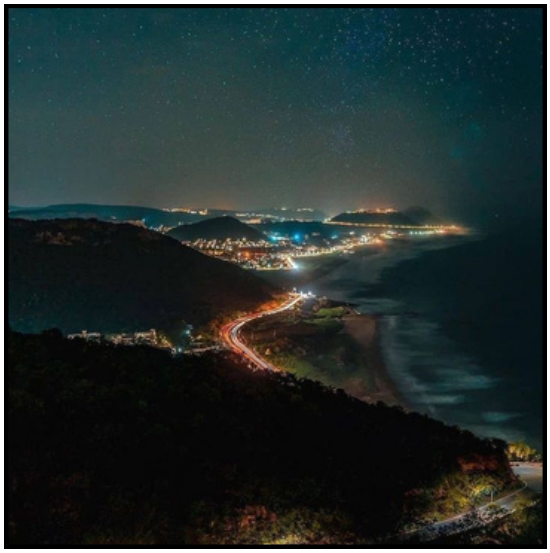

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