A TECHNICAL REPORT ON

Power Engineering

&

Renewable Resources

in

UIT RGPV, SHIVPURI

From 23rd Feb 2024 to 27th Feb 2024

With

29 Students

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA
माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
A GOVT. AIDED UGC AUTONOMOUS & NAAC ACCREDITED INSTITUTE, AFFILIATED TO R.G.P.V. BHOPAL (M.P.), INDIA

NAAC Accredited A++

Website: http://web.mitsgwalior.in/

List of students who participated in this program:

Sr. No.	Name	Branch	Enrollment Number	Year	Semester
1	Sonu Kumar	EE	0901EE221082	2	4
2	Sneha Sharma	EE	0901EE221081	2	4
3	Sangram Singh Baghel	EE	0901EE221069	2	4
4	Shivam Patidar	EE	0901EE221075	2	4
5	Tarun Bohare	EE	0901EE221089	2	4
6	Dinesh Sutrakar	EE	0901EE221104	2	4
7	Srashti Vyas	EE	0901EE221085	2	4
8	Om Prakash Gadge	EE	0901EE221053	2	4
9	Sumit Singh	EE	0901EE221088	2	4
10	Rajat Khare	EE	0901EE221062	2	4
11	Khushi Khandelwal	EE	0901EE221041	2	4
12	Bal Kishan Kushwaha	EE	0901EE233D01	2	4
13	Aman Sharma	EE	0901EE221016	2	4
14	Abhishek Pawar	EE	0901EE233D01	2	4
15	Aditya Singh Tomar	EE	0901EE221103	2	4
16	Hemant Singh Dhakad	EE	0901EE233D05	2	4
17	Avishi Asati	EE	0901EE221025	2	4
18	Rishi Patel	EE	0901EE221066	2	4
19	Avinash Kumar	EE	0901EE221024	2	4
20	Naitik Singhal	EE-IOT	0901EO221041	2	4
21	Tejaswa Karodi	EE-IOT	0901EO221066	2	4
22	Riyu Shrivastava	EE-IOT	0901EO221052	2	4
23	Rakhi Yadav	EE-IOT	0901EO221049	2	4
24	Divyansh Jha	EE-IOT	0901EO221023	2	4
25	Avnish jha	EE-IOT	0901EO221016	2	4
26	Raj Kamal	EE-IOT	0901EO221047	2	4
27	Palak Chandel	EE-IOT	0901EO221042	2	4
28	Dhruv	EE-IOT	0901EO221021	2	4
29	Anurag Mishra	EE-IOT	0901EO221011	2	4

Table of Contents

Acknowledgement

We are writing to express our profound gratitude for the exceptional 5-day training program on Power Engineering and Renewable Resources held at the University Institute of Technology RGPV Shivpuri (UIT RGPV Shivpuri). This program has been nothing short of transformative and enlightening, and we wish to convey our deepest appreciation for the unwavering support and invaluable guidance you provided throughout.

We would also like to extend our sincere thanks to our college's esteemed Dr .R.K Pandit (Director, MITS)for playing an instrumental role in facilitating our application for this training program at UIT RGPV, Shivpuri. His encouragement and support have been pivotal in enabling us to participate and derive maximum benefit from this enriching opportunity.

The comprehensive training program significantly deepened our understanding of power generation technologies, shedding light on their crucial relevance in the dynamic energy sector and acquainting us with the latest advancements in the field. Under your exemplary leadership, we had the privilege of learning from distinguished experts and gaining practical insights that will undoubtedly shape our future endeavours in the industry.

To address this challenge, a groundbreaking government-funded training program has been organized, spanning five intensive days, to empower individuals and professionals in the domains of power transmission, smart grid technology, power generation, and fuel cell applications.

This training initiative represents a significant step forward in nurturing the talents and skills essential for the growth and sustainability of the energy industry. Throughout these five days, participants will gain invaluable insights into the latest developments, technologies, and strategies that will drive the power sector into a smarter, more efficient, and environmentally friendly future.

This program not only demonstrates a commitment to fostering innovation but also a dedication to the welfare and progress of society, as we collectively embark on a journey toward a more sustainable and energy efficient world.

About UIT RGPV

UIT-RGPV is one of the premier engineering institutions in Central India. The Institution was established in the year 1986, by the Government of Madhya Pradesh, as the Government Engineering College (GEC), Bhopal. In 1998 the Government of Madhya Pradesh declared this Institute autonomous and named it as Bhopal Engineering College. This Institute was renamed University Institute of Technology-RGPV (Technological University of the State of Madhya Pradesh) w.e.f. from July 2002 by an order of Govt. of Madhya Pradesh. It is currently known as University Institute of Technology-RGPV, Bhopal or UIT-RGPV.

The Institution is situated in Bhopal, a city well known for its natural beauty & lakes. The city is well connected to the other parts of the country, by air, rail, and road. The large number of industries situated in and around Bhopal, provide excellent training opportunities to the students and staff.

The UIT-RGPV is governed by the rules and regulations of RGPV, and its councils of governance and management. The Vice Chancellor of RGPV is the nominal head of all management committees of the UIT-RGPV. The Institute has academic autonomy and therefore has freedom to adopt its own scheme and syllabus.

About UIT RGPV,Shivpuri

1.Picturesque Campus:

- UIT Shivpuri's campus spans 15 acres in the suburbs of the Tourist Hub.

- Nestled amidst a picturesque landscape, it provides an ideal setting for education and learning.

2. Convenient Location:

- Strategically located on National Highways NH3, A.B Road, around 100 km from Gwalior towards Indore Highways.

- Situated 19 km before Shivpuri railway station and bus stand for easy accessibility.

3. Nearby Attractions

-Participants have access to nearby attractions, including Madhav National Park, Bhadaiya Kund, TatyA Tope Memorial Park, Sindhia Chhatri, Shivpuri Museum, Sankhya Sagar, waterfalls, etc.

4. Training Focus:

-Simulators are used for both initial and retraining of control room operators, operation supervisors, and plant equipment operators.

- Training covers plant system understanding, specific operating procedures, and the handling of abnormal and emergency events.

5. Commitment to Excellence:

- UIT Shivpuri's investment in advanced simulators underscores its commitment to providing cutting-edge training facilities. Aims to foster skilled and knowledgeable professionals in the dynamic field of power generation technologies.

1.Introduction about program

The Sustenance program at UIT RGPV, Shivpuri stands out as a noteworthy initiative, focusing on the intricacies of Operation and Maintenance (O&M) in the realm of Power engineering and Renewable Resources UIT, renowned for its excellence in power sector training in India, extends its commitment to specialized education through this program. By seamlessly integrating theoretical knowledge with hands-on experiences, the program ensures that students are not only well-versed in the theoretical aspects but also possess practical skills essential for navigating the dynamic challenges of the power industry.

In an era marked by unprecedented technological advancements, the power sector plays a pivotal role in shaping the world's future. With an ever-increasing demand for reliable and sustainable energy sources, governments across the globe are recognizing the urgent need to invest in cutting-edge training and education.

Covering diverse topics such as grid management, equipment maintenance, and fault diagnosis, the program incorporates the latest technological advancements to keep participants abreast of industry trends. Through this initiative, UIT RGPV ,Shivpuri plays a pivotal role in nurturing a cadre of skilled professionals, contributing significantly to the growth and sustainability of the

power sector in India. Graduates from the Sustenance program emerge not only with technical expertise but also with a profound understanding of operational and maintenance challenges, positioning them as valuable contributors to the ongoing development of transmission and distribution networks in the country. This program stands as a beacon for quality education, fostering a skilled workforce for the evolving needs of the power industry.

2.Objective of the Training

- Technical Mastery: Equip participants with in-depth technical knowledge related to the O&M of transmission and distribution networks.
- Practical Application: Provide hands-on experiences to translate theoretical knowledge into practical skills for real-world scenarios.
- Safety and Compliance: Emphasize adherence to safety protocols and regulatory compliance in power sector operations.
- Problem-Solving Skills: Develop the ability to analyze and solve complex issues encountered in operational settings.
- Adaptability to Technology: Keep participants updated on the latest technological advancements in the power sector for adaptability.
- Team Collaboration: Cultivate effective communication and collaboration skills for seamless teamwork.
- Resource Management: Train in efficient management of both human and technical resources for optimal network performance.

- Continuous Improvement: Foster a culture of continuous learning, encouraging ongoing professional development throughout careers.

3. Topics majorly covered in 5 days training program:

- POWER TRANSMISSION
- SMART GRID
- PROFESSIONAL PHOTOVOLTAICS
- WIND POWER PLANT
- FUEL CELLS
- HYDRO POWER PLANT

First day 23.02.2024

On the first day of the training program's inauguration, honoured by the presence of Mr. Priyank Lohiya (Course Coordinator), participants were introduced to the Sankalp program. By Mr. Priyank Lohiya and Prof. Sanjeev Gupta(HOD OF EE DEPARTMENT,UIT RGPV SHIVPURI) emphasized the significance of skill development and lifelong learning. The event included participant registration, distribution of program materials, and interactive sessions aimed at fostering a sense of community. This successful inauguration marked the beginning of an empowering journey for participants under the Sankalp program, equipping them with essential skills for a brighter future. We learned about the Sankalp program, which is a special plan to help young people who need help with their education and skills. The program wants to make sure everyone can learn and find good jobs.

Session 1:(10.00 AM-01:00 PM)

Lecture: Power Transmission

Speaker: Mrs. Shweta Gupta

Mrs. Shweta Gupta, a seasoned expert in the field of power generation technologies, graced the symposium with an insightful lecture on the diverse landscape of power generation. The session covered a broad spectrum of technologies, ranging from traditional to cutting-edge, shedding light on the evolving nature of the energy sector.

She wonderfully explained the following:

- Reciprocating engines: Similar to car engines, these engines can burn a variety of fuels

- Steam turbines: Use steam to produce electricity
- Gas turbines: Generate less emissions and are more efficient than most steam turbine-based power plants
- Hydroelectric turbines: Extract the potential energy of dammed water or the kinetic energy of rivers.

Session 2: (2:00 PM-5:00PM)

Practical: Overview of Power Transmission

Speaker: Mr. Amit Kumar

Understanding Power Transmission Systems: Participants learn the fundamental principles and components of power transmission systems, including substations, transformers, high-voltage lines, and distribution networks.

Operation and Control: They gain insights into how these systems are operated, controlled, and managed to ensure efficient electricity distribution, including load balancing, voltage regulation, and fault detection.

Safety Protocols: Training covers essential safety protocols and procedures to minimize risks associated with working in high-voltage environments and emergency response techniques. Troubleshooting Skills: Simulators enable participants to develop troubleshooting skills, helping them identify and rectify issues within the power transmission system effectively

Environmental Impact: Trainees may explore the environmental aspects of power transmission, including reducing environmental impact through efficient transmission and distribution practices.

Adaptive Decision-Making: The dynamic nature of simulations fosters adaptive decision-making, helping participants make informed choices in rapidly changing conditions. Regulatory Compliance: Participants may gain insights into regulatory requirements and compliance in the power transmission sector.

Energy Efficiency: Training may emphasize energy efficiency strategies and techniques to minimize losses during power transmission. Data Analysis: Participants can learn how to analyze data from the transmission system, enabling them to make data-driven decisions and optimize network performance.

Preventive Maintenance: Understanding maintenance procedures and schedules helps maintain the integrity and reliability of transmission equipment

Second day 24.02.2024

Session 1: (10.00 AM-01:00 PM)

Lecture: Smart Grid

Speaker: Dr. A. K. Tiwari

Learning about smart grids through simulators offers a comprehensive understanding of this transformative technology and its impact on the energy sector.

Renewable Energy Integration: The training program demonstrates how smart grids facilitate the integration of renewable energy sources, such as solar and wind, into the existing grid infrastructure. Participants understand the challenges and solutions related to intermittent power generation.

Energy Management: Simulators allow trainees to experiment with energy management systems, which enable consumers to optimize their energy consumption and reduce costs.

Demand Response Programs: Participants can simulate demand response scenarios, learning how smart grids enable utilities to incentivize customers to reduce energy usage during peak periods, ultimately contributing to grid stability.

Cybersecurity: Understanding the importance of cybersecurity in protecting smart grid infrastructure is a key component of the training. Participants explore potential threats and security measures to safeguard the grid.

Data Analytics: Trainees develop skills in data analytics, which are essential for making informed decisions within a smart grid environment. They learn to process, analyze, and interpret data for improved grid management.

Efficiency and Reliability: Participants learn how smart grids optimize energy distribution, reduce energy losses, and improve the reliability of the electrical grid.

Sustainability: The program covers the environmental benefits of smart grids, including reduced carbon emissions, efficient energy utilization, and support for sustainable energy practices.

Session 2:(2:00 PM-5:00PM)

Lecture: Electrolysis of Water and Fuel cells

Practical: Smart Grid

Speaker: Mr. Amit Kumar

Smart Grid Fundamentals: Participants gain a deep understanding of smart grid principles, components, and concepts, including advanced metering infrastructure (AMI), distribution automation, and demand response

Grid Operations: Trainees learn how smart grids enhance the monitoring and control of the electrical grid. They explore real-time data collection and analysis, grid balancing, and load management.

Renewable Energy Integration: The training program demonstrates how smart grids facilitate the integration of renewable energy sources, such as solar and wind, into the existing grid infrastructure. Participants understand the challenges and solutions related to intermittent power generation.

Demand Response Programs: Participants can simulate demand response scenarios, learning how smart grids enable utilities to incentivize customers to reduce energy usage during peak periods, ultimately contributing to grid stability.

Cybersecurity: Understanding the importance of cybersecurity in protecting smart grid infrastructure is a key component of the training. Participants explore potential threats and security measures to safeguard the grid.

Grid Resilience: The training program addresses grid resilience and how smart grid technologies enhance the ability to respond to disruptions and recover quickly from outages, ensuring uninterrupted power supply.

Third day 25.02.2024

Session 1: (10.00 AM-01:00 PM)

Lecture: Professional Photovoltaic

Speaker: Mrs. Monika Khatri

Basic: Solid understanding of semiconductors. Study solid state, pn junction, and band theory of carrier generation and recombination in solar cells. This foundation is important for understanding how photovoltaic devices convert sunlight into electricity. Solar Cell Physics Learn more about the different types of solar cells (crystalline silicon, thin film, etc.) and how they work. Explore topics such as Shockley-Keisser limits, current-voltage (I-V) characteristics, and efficiency factors.

Solar radiation and resource assessment: understand the characteristics of solar radiation (spectrum, intensity, etc.) and how it affects PV system performance. Learn about tools and methods to evaluate solar resources in a specific region.

Additional Topics:

Maximum Power Point Tracking (MPPT): Learn about the different MPPT algorithms and their role in maximizing the solar system's energy output.

Balance of System Components (BOS): Study the various components that make up a solar power system, including inverters, charge controllers, and batteries, and

their functions. Solar Power System Design Learn about various aspects of grid-tied and off-grid solar power system design, including system sizing, shading analysis, and energy storage requirements.

Additional Tips:

Stay informed: The solar industry is constantly evolving. Regularly access industry publications, attend seminars and conferences, and engage with online communities to stay informed of the latest developments.

Software Tools: Explore software tools used in photovoltaic system design and simulation. These tools can help you optimize system design, predict performance, and troubleshoot potential problems.

Practical Experience: If possible, look for opportunities to gain hands-on experience with solar systems through internships, lab work, or volunteering with solar installation companies. By focusing on these theoretical aspects and complementing them with practical experience, you can build a solid foundation for a successful career in professional solar power.

Session 2: (2:00 PM-5:00PM)

Practical: Professional Photovoltaic

Speaker: Mr. Amit Kumar

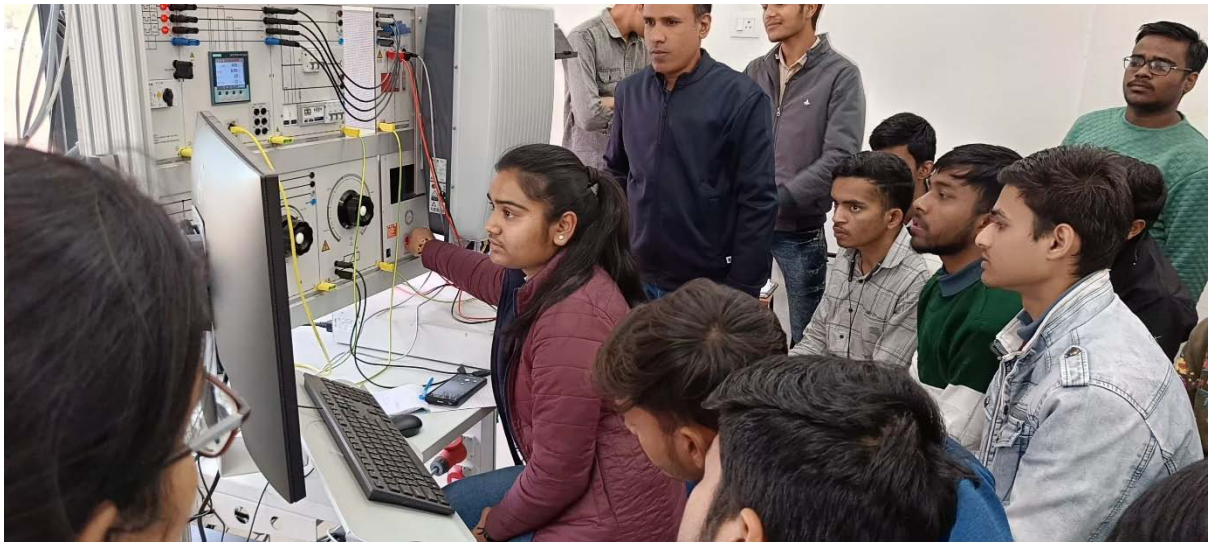
Professionals in the photovoltaic (PV) sector can benefit from the following useful advice:

Technical Knowledge:

Keep yourself updated: Keeping up with the most recent standards, laws, and technology is essential since the solar sector is always changing. Engage in industry gatherings such as webinars, workshops, and events, and purchase appropriate magazines.
Acquire the basics: Possess a solid grasp of the components, installation methods, troubleshooting procedures, and design of PV systems. You can guarantee the best possible functioning of PV systems and address issues with the aid of this information base.
Look for certifications: Obtaining credentials recognized by the industry might improve your chances of landing a job by proving your expertise. Take into account obtaining required credentials from your local solar group or the NABCEP (North American Board of Certified Energy Practitioners).

Industrial Advancement:

Network actively: Form connections with other industry experts in the solar sector. Participate in industry gatherings, affiliate with trade associations, and establish connections with peers via social media sites such as LinkedIn. This network may be a great place to get information, work together, and maybe find employment.
Develop effective communication abilities: It is crucial to be able to communicate intricate technical ideas to stakeholders, coworkers, and clients in an understandable manner. Develop your communication and presenting abilities to interact and transmit information effectively.
Pay attention to client service: Success in the solar sector is largely dependent on establishing trust and offering top-notch customer service. Engage in active listening to client demands, respond quickly to issues, and provide excellent work to guarantee happy clients who will recommend you to others and become repeat customers.



Fourth day 26.02.2024

Session 1: (10.00 AM-01:00 PM)

Lecture: Wind Power Plant

Speaker: Mr. Sanjeev Verma

Learning about wind turbines through simulators provides a comprehensive understanding of these renewable energy technologies and their applications. Here's what they told us that we can learn from a training program using simulators for wind turbines

Wind Energy Fundamentals: The program covers the fundamentals of wind energy, explaining how wind turbines convert kinetic energy from the wind into electrical power.

Wind Turbine Types: Participants learn about different types of wind turbines, including horizontal axis and vertical-axis turbines, and understand their design principles and applications.

Wind Resource Assessment: Simulators allow trainees to assess wind resources at potential wind farm locations, taking into account factors such as wind speed, direction, and variability.

Wind Turbine Operation: Participants have the opportunity to operate wind turbines in a virtual environment, adjusting turbine settings to optimize energy generation and respond to changing wind conditions.

Economic Analysis: Trainees can perform economic analyses, including calculating the cost of energy produced by wind turbines, return on investment, and project financing.

Session 2: (2:00 PM-5:00PM)

Practical: Wind Power Generation

Speaker: Mr. Amit Kumar

Wind Turbine Types: Participants learn about different types of wind turbines, including horizontal axis and vertical-axis turbines, and understand their design principles and applications.

Wind Resource Assessment: Simulators allow trainees to assess wind resources at potential wind farm locations, taking into account factors such as wind speed, direction, and variability.

Turbine Siting and Design: Trainees explore the siting and design considerations for wind turbines, including tower height, blade design, and environmental impacts.

Grid Integration: Understanding how wind energy is integrated into the electrical grid is essential. The program covers grid connection, energy storage options, and the role of wind energy in grid stability.

Wind Turbine Operation: Participants have the opportunity to operate wind turbines in a virtual environment, adjusting turbine settings to optimize energy generation and respond to changing wind conditions.

Maintenance and Troubleshooting: The training program includes maintenance and troubleshooting exercises for wind turbines, ensuring that participants can keep these systems operating efficiently.

Economic Analysis: Trainees can perform economic analyses, including calculating the cost of energy produced by wind turbines, return on investment, and project financing.

Fifth day 27.02.2024

VISIT TO MADIKHEDA DAM

On the specified date showcased the dam's role in water resource management, irrigation, power generation, and environmental preservation. Participants observed the dam's reservoir, hydroelectric facilities, and infrastructure, gaining insights into its multifaceted contributions to the region's water security and sustainability.

About Madikheda Dam

- Hydroelectric Project Name – Madikheda Dam Power Plant
- Approved Capacity in MW – 60 MW
- Installed Capacity in MW – 60 MW
- Type of Project – Major (>25 MW)
- Water Source – Sindh River
- Hydroelectric Basin – Ganga Basin

- Hydroelectric Region – Western Hydroelectric Region
- Hydroelectric Development Type – Storage
- Number of Turbines – 3
- Capacity per Turbine – 20 MW
- Type of Turbine – Francis
- Unit Sizes – 60 MW (3 unit x 20 MW)
- Total Units – 3

Evaluation/Feedback & CertificateDistribution

As a symbol of their successful completion of the training program, certificates were distributed to all participants The certificates recognized their efforts and achievements, affirming their commitment to skill development and knowledge enhancement.

Certificate distribution Was done in presence of Dr. Rakesh Singhai (Director) and Mr. Priyank Lohiya (Incharge head of COE PERE Lab).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