



WARM WELCOME in Head-Talk series on

Progress in Teaching and Research in
the Department of EEE, BIT, Mesra



Department of Electrical and Electronics Engineering
Birla Institute of Technology, Mesra,
Ranchi-835215

Prof. S. Chakraborty and Team of EEE Department, Mesra

Achievements

Departmental Highlights

- One of the vital Departments right from the inception of the Institute in 1955
 - Academic excellence of EEE Department is reflected through the achievement as the only department in the institute to have 5 Years accreditation in one of the PG programs, and to secure 764/1000 score for UG (eligible for 5 Years accreditation), awarded A grade during first accreditation.
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- Research Excellence of the EEE department is reflected through publications in high impact factor reputed journals such as IEEE, IET, Elsevier etc. and in reputed IEEE Conferences; sponsored projects; National and International collaborations, patents, students Research awards such as POSOCO etc.
 - Only department to obtain proposal grant of 8000 USD under GIAN (Global initiative of academic networks) from MHRD for 'Synchronized Phasor Measurement for Situation Awareness in Smart Grids'
 - Successful revamping of the power distribution system from 11kV (which was existing since the inception of the institute in the year 1955) to 33kV, a project of worth 25 crores despite the prevailing pandemic situation without any escalation of cost.
 - This upgradation can cater to load which is almost 10 times the existing load (3MVA with additional capacity of 1000kWp green energy) and can be carried to next 30 years keeping in view of the future expansion of the Institute.

Departmental Highlights

- Successful integration of **1MWp Solar Roof Top PV based Green Power** for the BIT Campus Power Distribution System
- **Unique upgraded Campus Distribution system in the state with state-of-the art technology such as Gas Insulated Switchgear (GIS), Supervisory Control and Data acquisition (SCADA), 11 KV Ring Main Unit (RMU) to provide students an industrial environment in our campus itself contributing towards industry ready graduates.**
- On 24th March 2021, the project was inaugurated by our dynamic & visionary Vice-Chancellor Prof. I. Manna. MECON Ltd. is the consultant and M/s SIEMENS is the contractor in the project.

The project started in 2018 under the Chairmanship of Prof. P.R.Thakura, Prof. D.K. Mahanta, & Prof. Avinash Prasad.
- HoD, being the Member of Jharkhand Electricity Regulatory Commission, contributes towards state policy making in power sector.
- MoU with Govt. of Jharkhand for designing the solar Lamp for Villagers at Rs.100/- per lamp.
- TEAM AVEON RACING of EEE Dept was awarded overall 5th position in MAHINDRA E-BAJA 2019.
- International conference on Emerging Trends for Smart-Grid Automation and Industry 4.0, 5th-7th December 2019, Springer.

Awards

Dr. Vijaya Laxmi was awarded two-year **UGC Research Award** in 2014.

Dr. Sarbani Chakraborty was awarded **Young Woman in Engineering** by IETE in 2015.

Dr. Deepak Kumar received **POSOCO** award in 2016. He also received **DST INSPIRE Fellowship Award** Jan 2012-June 2015.

One scholar and one PG student have received **POSOCO award**, Govt. of India award in 2017 and 2019 respectively,.

Dr. Debomita Ghosh was awarded **HIL 402 REAL TIME EMULATOR** lifelong software license of valuation **20 Lakhs** in February 2019.

Various Departmental Responsibilities

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graph TD; A[Various Departmental Responsibilities] --> B[Academics]; A --> C[Energy Management]; A --> D[UPS and Battery Maintenance and Repair]; A --> E[Instrument Maintenance and Repair];
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Academics

**Energy
Management**

**UPS and Battery
Maintenance
and
Repair**

**Instrument
Maintenance and
Repair**

Department Vision

To become an internationally recognized centre of excellence in academics, research and technological services in the area of Electrical and Electronics Engineering and related inter- disciplinary fields.

Department Mission

M1

Imparting strong fundamental concepts to students and motivate them to find innovative solutions to engineering problems independently.

M2

Developing engineers with managerial attributes capable of applying appropriate technology with responsibility.

M3

Creation of congenial atmosphere and ample research facilities for undertaking quality research to achieve national and international recognition by faculty and students.

M4

To strive for internationally recognized publication of research papers, books and to obtain patent and copyrights.

M5

To provide excellent technological services to industry for the benefit of society.

Academics

Overview of the Courses

Programme	Initial Intake	In Year	Increased to	In Year	Status	Year of last NBA Accreditation
B.Tech.	45	1955	60	2002	Accredited	2017
M. Tech. (Power System)	6	1964	12	2003	Accredited	2018
M. Tech. (Control System)	6	1964	12	2003	Accredited	2018
M. Tech. (Power Electronics)	18	2009			Accredited	2018
PhD		2021	36			



Dr. Sarbani Chakraborty
Professor and Head



Dr. Tirthadip Ghose
Professor



Dr. D. K. Mohanta
Professor



Dr. Vijaya Laxmi
Professor



Mr. Prem Prakash
Assistant Professor



Dr. Prabhat Kr. Upadhyay
Assistant Professor



Dr. Surendra Kumar
Assistant Professor



Dr. Debomita Ghosh
Assistant Professor



Dr. Sudhansu Kr. Mishra
Assistant Professor



Dr. G. S. Gupta
Assistant Professor



Dr. Pankaj Mishra
Assistant Professor



Dr. Deepak Kumar
Assistant Professor



Dr. Aftab Alam
Assistant Professor



Dr. S. Shiva Kumar
Assistant Professor



Dr. Sushma Kamlu
Assistant Professor



Mr. Subrat Kumar Swain
Assistant Professor



Mr. B. M. Prasad
Assistant Professor



Research Areas:

Distribution system Planning and Operation
Micro-Grid operation and control
Demand Response
Renewable Integration

Dr. T. Ghose
Professor

Publications:

Journals: 21
Conferences: 10
Projects: 1

Research Areas:

Measurement and Instrumentation,
Optical Sensor System Design,
Linear and Nonlinear Dynamics
and Control

Publications:

Journals: 16
Conferences: 24
Book Chapters: 4
Project: 1



Dr. Sarbani Chakraborty
Professor and Head



Research Areas:

Power System Planning & Reliability
DSP applications for Digital Relaying
Phasor Measurement Unit(PMU)
Soft Computing Technique Applications

Dr. D. K. Mohanta
Professor

Publications:

Journals: 47
Conferences: 41
Patents: 2



Dr. Vijaya Laxmi
Professor

Research Areas:

- Robotics
- Image Processing
- Control System

Publications:

Journals: 6
Conferences: 16
Book chapter: 3
Project: 1



Research Areas:
Power System,
High Voltage Engineering

Publications:

Journals: 5
Conferences: 8
Book chapter: 1
Project: 1

Mr. Prem Prakash
Assistant Professor



Research Areas:

- Wide Area Measurement System
- Smart Grid
- Phasor Measurement Units
- Reliability Analysis of Power System Network
- Demand Response

Publications:

Journals: 13
Conferences: 24
Book chapters: 4

Dr. Debomita Ghosh
Assistant Professor



Research Areas:
Bio-signal Processing

Publications:

Journals: 4
Conferences: 15
Book chapter: 3

Dr. Surendra Kumar
Assistant Professor



Research Areas:

- Biomedical Signal analysis
- Brain Signals
- Biomedical Physics
- Cloud Computing
- Neuro-Fuzzy Adaptive Systems

Publications:

Journals: 20
Conferences: 12
Book chapter: 21

Dr. Prabhat Kr. Upadhyay
Assistant Professor



Dr. Sudhansu Kr. Mishra
Assistant Professor

Research Areas:

- Signal, Image and Video Processing
- Control System
- Bio-Medical Image Processing
- Computational Finance
- Soft and Evolutionary Computing

Publications:

Journals: 39

Conferences: 62

Book chapter: 15



Dr. Pankaj Mishra
Assistant Professor

Research Areas:

- Power System
- Reactive Power Management and Pricing
- Voltage Stability
- Microgrid

Publications:

Journals: 2

Conferences: 6

Book chapter: 1



Dr. G. S. Gupta
Assistant Professor

Research Areas:

- Digital Signal Processing
- Control Engineering
- Soft Computing Techniques

Publications:

Journals: 6

Conferences: 6



Dr. S. Shiva Kumar
Assistant Professor

Research Areas:

- ZVT-ZCT PWM Synchronous Converters
- Converter Design for EV
- Soft switching of converters

Publications:

Journals: 11

Conferences: 4



Dr. Deepak Kumar
Assistant Professor

Research Areas:

- Microgrid planning, Demand Side Management,
- Energy Management System,
- Hybrid energy storage system with EV and TCL operation,
- Application of smart AI techniques in Power

Systems, etc.

Publications:

Journals: 16

Conferences: 24

Book chapter: 2

Research Areas:

- IoT and Cloud applications in Smart Grid
- AI-based Supervisory Algorithm
- Renewable Energy Integration with Grid
- Microgrid, Power Electronics
- Adaptive Electrical Drives
- Battery Management System
- EV to Grid and Grid to EV Power Transfer
- Electromagnetic Interference in Power Converters

Publications:

Journals: 3

Conferences: 10



Dr. Sushma Kamlu
Assistant Professor

Research Areas:

- Soft computing,
- Control System
- Industrial drives and Control
- Optimal Control System

Publications:

Journals: 3

Conferences: 8

Book chapter: 1



Dr. Aftab Alam
Assistant Professor

Research Areas:

- Control Systems and Applications.
- Design of Fractional order controllers for multivariable processes.
- Controller design using soft computing techniques.

Publications:

Journals: 7

Conferences: 7



Mr. Subrat Kr. Swain
Assistant Professor

CARRIER PROFILE OF NEW FACULTY MEMBERS



Dr. Soumya Chatterjee
Assistant Professor

Research Areas:

Condition monitoring
Insulation diagnosis
Signal processing and machine learning applications
Complex networks and graph theory

Publication:

Peer-reviewed Journal Publications: 21
Publications in Conference Proceedings: 32
Book Chapters: 04



Dr. Debasmita Mondal
Assistant Professor

Research Areas:

Sensors and Instrumentation – Electrochemical Biosensors,
Chemical sensors
Fractional order elements – Design and application in circuits and
systems

Publication:

Peer-reviewed Journal Publications: 7
Publications in Conference Proceedings: 3
Book Chapters: 01

CARRIER PROFILE OF NEW FACULTY MEMBERS



Dr. Ajay Kumar
Assistant Professor

Research Areas:

Power Electronic Interface for Non-conventional Energy Sources
Power Quality Issues: Static VAR Compensation, Active Filters,
DSTATCOM

Power Conversion and Management
Control of DC and AC Micro grid Systems
Grid-interactive Converters and their Control

Publication:

Peer-reviewed Journal Publications: 15
Publications in Conference Proceedings: 8
Book Chapters: 04



Dr. Soumya Samanta
Assistant Professor

Research Areas:

Power and Energy Systems Engineering
Microgrid Control

Publication:

Peer-reviewed Journal Publications: 11
Publications in Conference Proceedings: 3

Research Project [Rs. 9,47,000]

“Inertia Emulation in a DC Microgrid”,
Collaborative Research Scheme (CRS) under
TEQIP-III, hosted by AICTE and funded by NPIU



Dr. Surya Prakash
Assistant Professor

CARRIER PROFILE OF NEW FACULTY MEMBERS

Research Areas:

Dynamic and Steady State based study of Wind Park with various degrees of penetration into the Transmission system

Analysis of different control strategies of Wind/PV Park concerning different grid codes.

Industrial Experience

Design Engineer in Bharat Heavy Electricals Limited (BHEL), Bhopal, India

Publication:

Peer-reviewed Journal Publications: 7

Publications in Conference Proceedings: 8

Patent: 3

PROFILE OF PROF. GOSHIDAS RAY



Prof. Goshaidas Ray
Former - Professor,
EE Dept. IIT Kharagpur

Research Interest

- Decentralized state and parameter estimation of large-scale system
- Stability and stabilization of expanded systems
- Set of stabilizing PID controller
- Sliding mode controller for multi-link robotic manipulator
- Application of intelligent controllers in physical systems
- Design of robust H_∞ controllers for uncertain dynamic system
- Stability analysis and stabilization of time- delay systems
- Network control systems

Teaching Experience

More than 34 years

Publications

National Journals: **9**
International Journals: **78**
National Conferences: **6**
International Conferences: **43**
Books: **1**

Guidance

Doctoral Level: **8**
Master Level: **38**

MS Projects Supervised

2

Consultancy and Sponsored Project

7

PROFILE OF Dr. SUBHASHISH CHOWDHARY



Dr. Subhashish Chowdhary
SAIL R&D

Research Interest	Non-conventional Energy and Power System Instrumentation
Publications/Presentation	Publication: 25 Presentation: 34
Patents	Granted: 17, Applied for: 7
Copyrights	Granted: 11, Applied for: 1
Experience Industry and Academic Institution	Industry: Worked in Research & development Centre for Iron and Steel, Steel Authority of India Limited, Ranchi for more than 35 years in Applied Research Teaching: 3+ years in Engineering Institute
Major Award Received	<ul style="list-style-type: none">•National Research Development Corporation (NRDC), Government of India Innovation Award, August, 1997•2011 ISA Transactions, Elsevier Science Best Paper Award for the paper published in ISA Transactions in 2010•2012 IIM-Steel Eighties Award by Indian Institute of Metals
Membership of Professional Bodies	<ul style="list-style-type: none">•Fellow of Institution of Engineers (India)•Member of Computer Society of India•Member of Indian Institute of Metals•Chartered Engineer (India)

Technical Assistants



Mr. R. P. Rai
Office Assistant



Mr. Sujit Chatteraj



Mr. Ram K. Mahto



Mr. Kamal Oraon



Mr. Prashant Pandey



Mr. Sidhart Kumar

Technical Assistants for Battery Maintenance and Repair



Mr. N. K. Singh



Mr. Shiv Shanker Mahto

Technical Assistants for Instrument Maintenance and Repair



Mr. Arun Kumar



Mr. B. Murda

Supporting Staff



Mr. Raju Mahto



Mr. Kaleshwar Mahto



Mr. Jaga Bhokta



Mr. Abinath Mahto



Mr. Mahesh Mahto



Mr. Shanker Mahto

Laboratory facilities

Basic Electrical Engineering Laboratory

Measurement and Electronic Instrumentation Laboratory

Electrical Machine Laboratory

Power System Laboratory

Power Electronics Laboratory

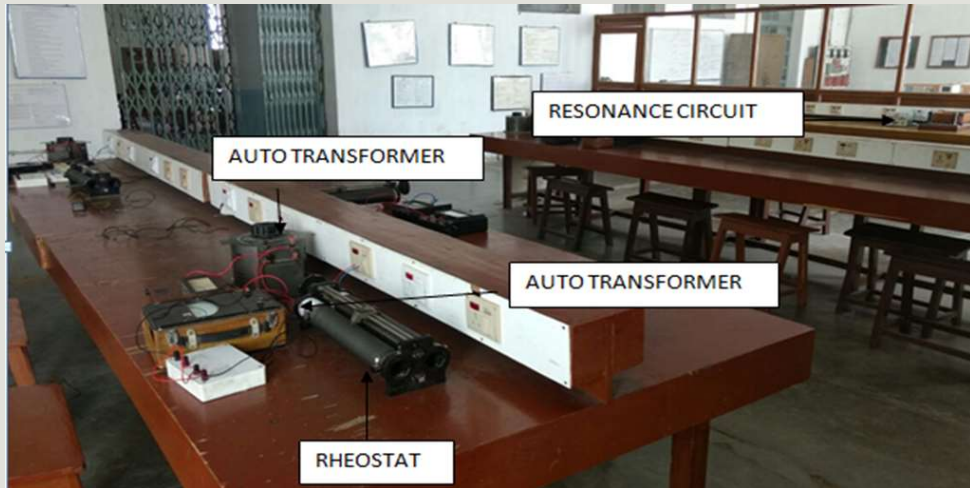
Control System Laboratory

Virtual Instrumentation and Signal Processing Laboratory

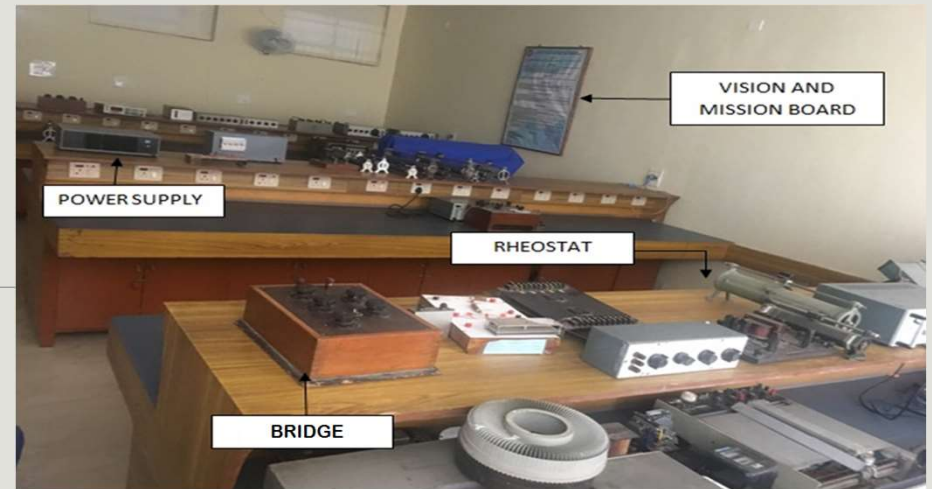
Soft computing Lab

Electrical Workshop

Smart Grid Laboratory



Basic Electrical Engineering Lab.



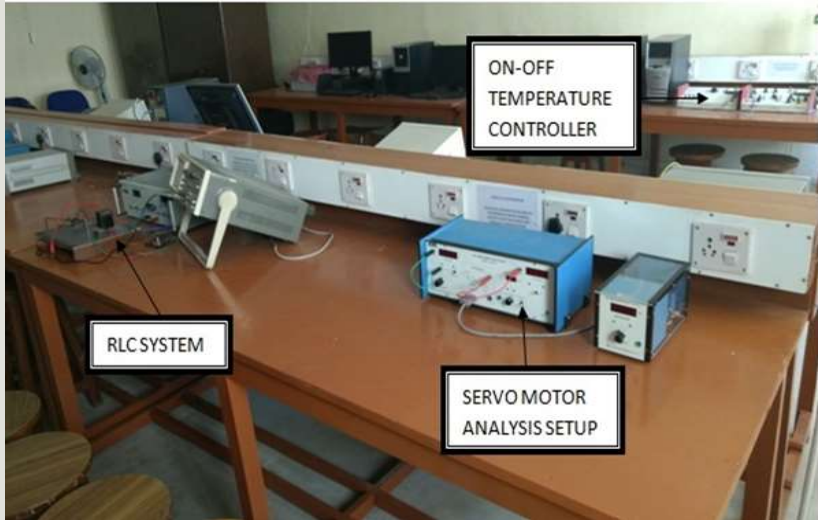
Measurement and Instrumentation Lab.



Electrical Machine Lab.



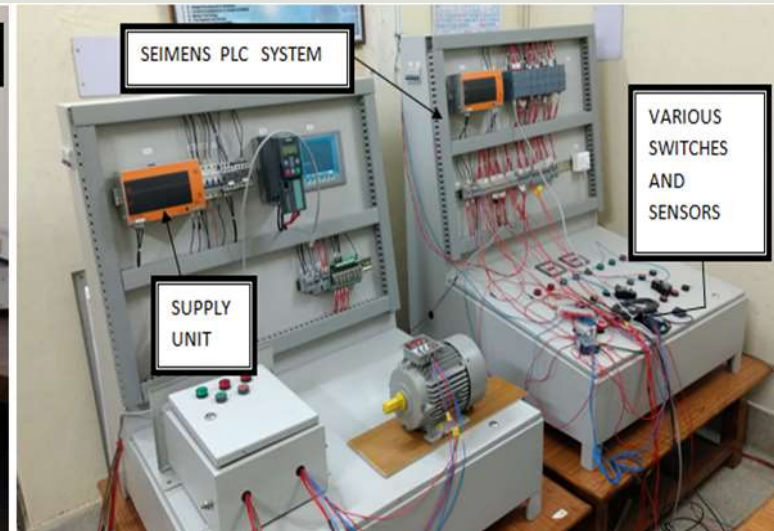
Power System Lab.

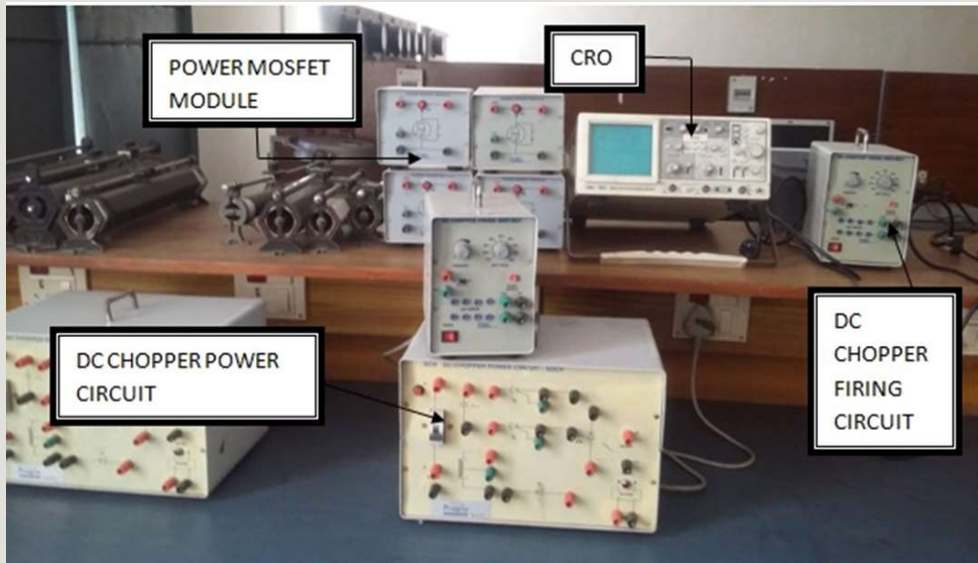


Control System Lab.

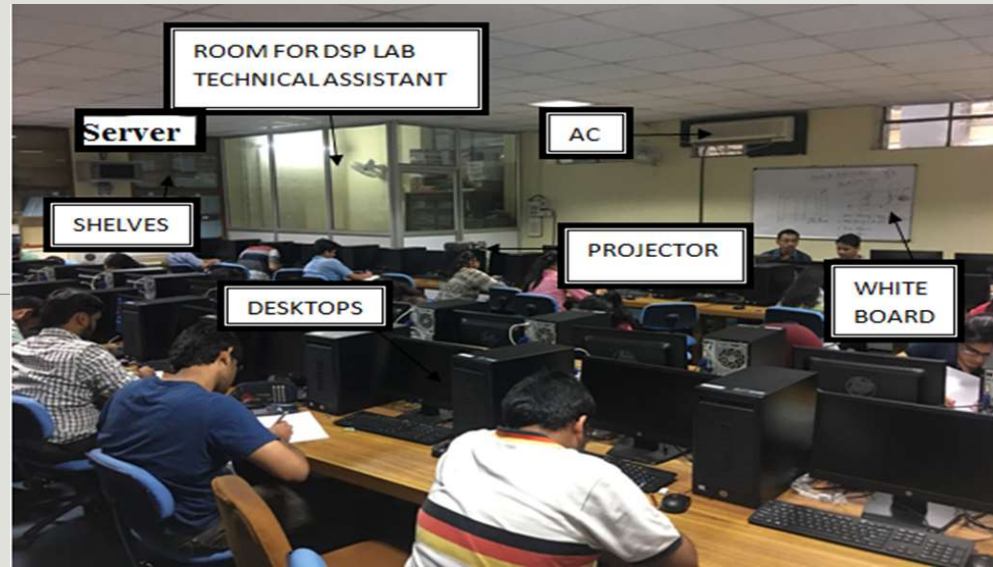


Electrical Workshop





Power Electronics Lab.



Soft Computing and Signal Processing Lab

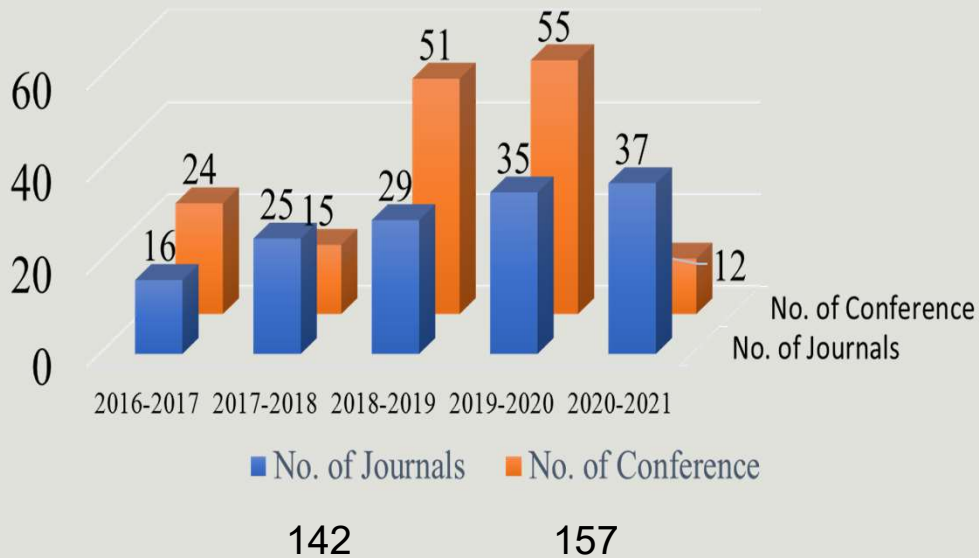


Smart Grid Lab

Research

Departmental Publications

Journals & conferences



- IEEE Transaction On Industrial Informatics
- IEEE Transaction On Control System Technology
- IEEE Transaction On Industrial Electronics
- IEEE Transaction On Electromagnetic Compatibility
- IEEE Systems Journal
- IEEE Potentials
- IEEE Transactions on Dielectrics and Electrical Insulation
- IET Publications
- International Journal of Electrical Power and Energy Systems (Elsevier)
- Australian Journal of Multi Disciplinary Engineering (Taylor & Francis Online)
- Journal of Optics, Springer Publication
- Swarm and Evolutionary Computing, Elsevier
- Applied Computational Intelligence and Soft Computing, Hindawi Publishing Corporation
- IETE Journal of Research (Taylor & Francis Online)
- Optical Engineering, SPIE
- IET Generation, Transmission & Distribution
- International Journal on Engineering Science and Technology (Elsevier)
- Electric Power Components & Systems (Taylor & Francis Publications)
- And many more.....

Departmental Projects

Funding Agencies	Total funding (in lakh)
DST New Delhi	25.98
DST FIST (GOI)	58.0
DST Govt. of Jharkhand	75.0
UGC	85.5
SERB DST	38.70
AICTE	19.70
SKY MAP Global	7.5
Total	310.38

LIST OF ALL R & D PROJECTS

S. No.	Project Title	PI/CoPI/Collaborator	Funding Agency	Date of Sanction	Sanctioned Amount in (Lakhs)	Duration of Project
1	Design and Development of Lightning Prediction & Protection System	Dr. B. M. Karan (PI) Mr. P. Prakash	DST, Govt. Of Jharkhand	8 May 2009	75.00	6 Years (2009-20015)
2	Design, development and characterization of magneto optic material based current sensor for Industrial application	Dr. Sarbani Chakraborty	DST, New Delhi	24 November 2009	25.98	2 Years (2009-2011)
3	Hardware Development and implementation of Microcontroller Based Boost Converter For Hybrid Electric Vehicle	Dr. P. R. Thakura	UGC (MRP)	23 July 2012	12.61	3 Years (2012-2015)
4	Development of Vehicle License Prediction & Protection System	Dr. Vijaya Laxmi	UGC (Research Award)	10 July 2014	11.89	2 Years (2014-2016)
5	Design of IoT Based Energy Management System Using Cloud Computing Platform	Dr. Aftab Alam	SERB-DST	1 May 2019	38.70	3 Years (2019-2022)
6	Analysis, Design and Verification of coordinated control for laboratory prototype hybrid AC-DC microgrid with IoT based cloud computation platform	Dr. T. Ghose	RPS-AICTE	1 November 2019	10.50	3 Years (2019-2022)
7	SMG-BIT (SKYMAP GLOBAL sponsored R&D project-Birla Institute of Technology), Agriculture Research Project.	Dr. S. K. Mishra	SKY Map Global	22 February 2019	7.5	1.5 Years (2019-2020)

LIST OF SPONSORED PROJECTS

S. No.	Project Title	PI/Co-PI/Collaborator	Funding Agency	Date of Sanction	Sanctioned Amount in (Lakhs)	Duration of Project
1	MODROB Grant for Process Control Lab	Dr. T. Ghose	AICTE	1 March 2012	9.20	1 Year (2012-2013)
2	FIST Grant for doing research on Smart Grid and Drive Hybrid Electric Vehicle	Dr. T. Ghose	DST(FIST), GOI	27 September 2012	58.00	3 Years (2012-2015)
3	Application of Power Electronics in Power System and Electrical Drive	Dr. T. Ghose, Dr. P. R. Thakura	UGC (SAP)	1 October 2012	61.00	5 Years (2012-2017)

Proposed projects under scrutiny

S. No.	Project Title	Funding Bodies	Amount in Lakh
1	Block-chain based Cyber Physical System for Optimal Operation of Microgrid Considering Demand Side Management Capability	DST-SERB	24.25
2	Three Class Brain Signal based Three-Degree Control of Robotic Arm Movement	SONY (FOCUSED RESEARCH AWARD)	32.1
3	Reliable and Sustainable Energy Integrated Electric Vehicle Charge Management System	JHARKHAND RENEWABLE ENERGY DEVELOPMENT AGENCY	26.1
4	Adaptive Irrigation Management System using Sustainable Energy	CCL CSR	20
5	Smart Garbage Collection & Management System using Sustainable Energy	CCL CSR	17
6	A Discrete Dynamic Programming and Artificial Intelligence-Based Approach for Decision Making in Pollution Treatment to Meet the Emission Regulation Standards in Coal Mines	S&T GRANT OF MoC	13.72
7	IoT Based Resilient Microgrid Energy Management Incorporating Network Reconfiguration	DST-SERB	38.96

S. No.	Project Title	Funding Agency	Amount in Lakh
8.	Swarm Intelligence based Adaptive Neural based Fuzzy Inference System (ANFIS) Model as a Complementary Mathematical Model for Electrical Load Forecasting	DST-SERB	6
9.	Implementation of Solar Powered Autonomous Ground Vehicles Incorporating IoT and Machine Intelligence	DST-SERB	32
10.	Advanced Image Processing Techniques	ISRO	20
11.	Computer-Aided Diagnosis (CAD) System for Malignant Melanoma Detection in Dermoscopy Images	ICMR	25
12.	Design and Implementation Artificial Intelligence and IoT based Solar Powered Autonomous Ground Vehicles.	DST-NM-ICPS	28
13.	Use of Artificial Intelligence (AI)/Expert Systems (ES)/Machine Learning (ML) in Mission Operations	ISRO (Respond)	27
14.	Development of GIS based Online Vehicle Health Monitoring System using Internet of Things	EMEQ, SERB	36.98
15.	Scientific Study of Mantra Chanting with Therapeutic Applications	Sony Research	74.55
16.	Investigation on Electrochemical Performance of Conventional Batteries to Enhance Cycling Stability: An Alternative to Li-ion Battery	DST-SERB	45.55
Total in lakh			467.21

Projects under scrutiny (cumulative)

FUNDING AGENCIES	Rs. In Lacs
DST-SERB+EMEQ, SERB	211.74
SONY (FOCUSED RESEARCH AWARD)	106.65
JHARKHAND RENEWABLE ENERGY DEVELOPMENT AGENCY	26.1
CCL CSR	37
S&T GRANT OF MoC	13.72
ISRO	47
ICMR	25

Total Rs. 467.21 Lacs

Research Areas for Different Field of Specialization

- Smart Grid
- AC-DC Microgrid
- AC Microgrid Analysis
- Power Trading
- Energy Harvesting from DERs
- Grid Synchronization
- Phasor Measurement Unit (PMU)
- Energy Management System
- Nonlinear Control
- Fractional Order Control
- Signal Processing
- Image Processing
- Electrical Drives
- Battery management system
- Optical Sensors
- Hybrid Electric Vehicles
- Sensors, Instrumentation and Control

Research Scholars:

Total number of scholars: **36: 28(FT) and 8(PT) with 18 IRF**

(Almost all the faculties are allotted with IRF candidates)

In 2021, 4 scholars have been awarded with Ph.D. degree and 3 more scholars have submitted.

Research in the Area of Power System



LIST OF FACULTY MEMBERS



Mr. Prem Prakash
Assistant Professor



Dr. Tirthadip Ghose
Professor



Dr. D. K. Mohanta
Professor

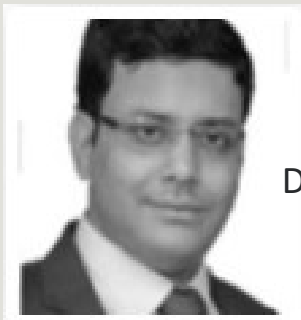


Dr. Debomita Ghosh
Assistant Professor



Dr. Deepak Kumar
Assistant Professor

Power Systems Group



Dr. Soumya Chatterjee
Assistant Professor



Dr. Surya Prakash
Assistant Professor



Dr. Pankaj Mishra
Assistant Professor

Smart Grid Laboratory (Facilities)

- This is a hardware and system-oriented laboratory providing state-of-the-art infrastructure for performing experiments and carrying out R&D.
- The ongoing developments in the laboratory will enable the department to test the smart grids of tomorrow.
- The laboratory has provision to integrate wind emulator having capacity 5kVA, solar energy system having capacity 8kW, 110Ah BESS with grid simulator having capacity 13kVA
- SCADA controlled and IoT enabled real-time simulations for analysis, which is the specific feature of the laboratory.

Application areas for Smart Grid

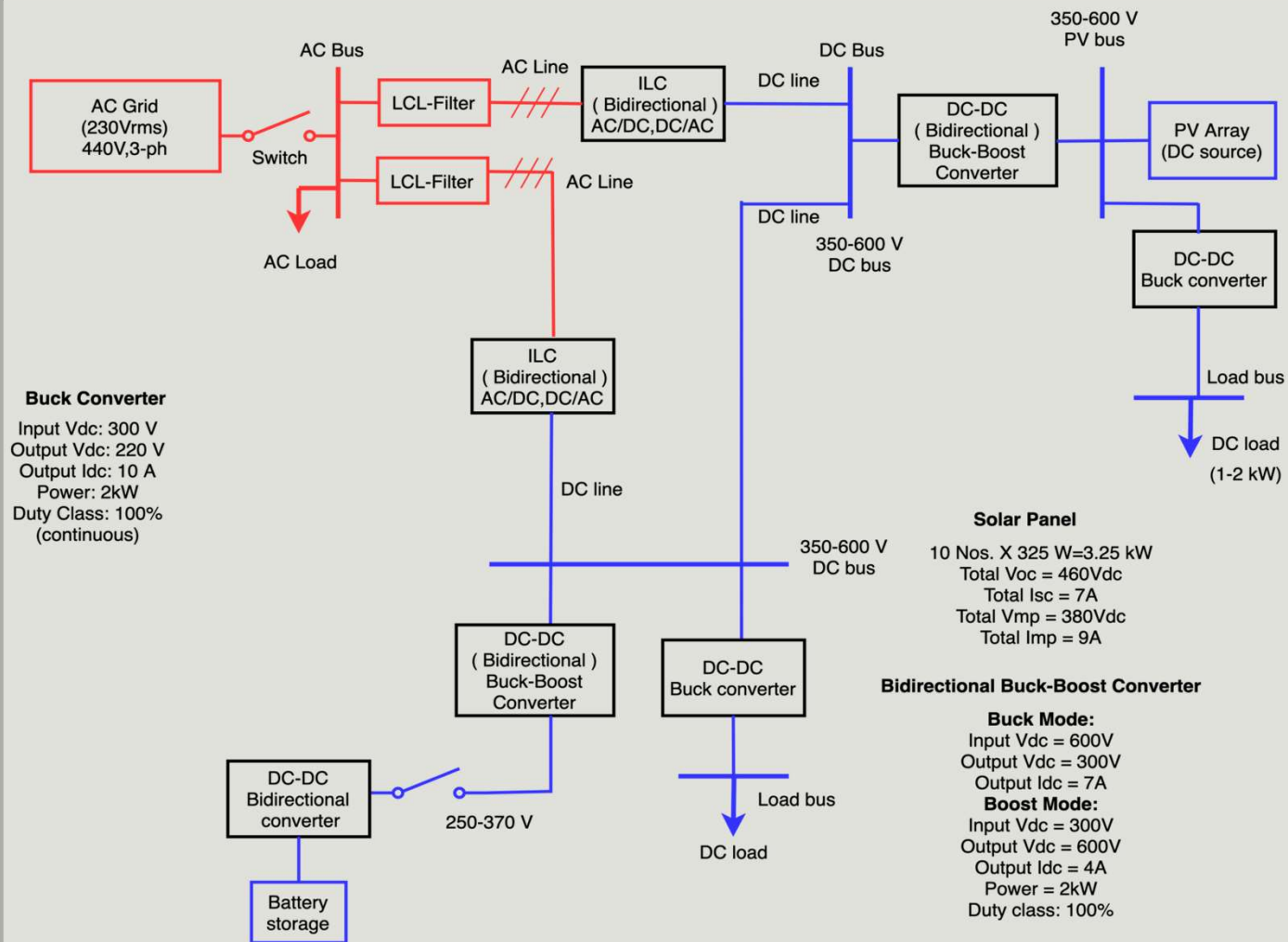
- IoT enabled smart transmission grids
- Integration of renewables (wind emulator and solar energy system)
- Smart electricity use (electrical load controlled with SCADA)
- Energy storage in Smart Grids
- Power system stability in Smart Grids
- Monitoring, control, and automation in Smart Grids
- Communication technologies for Smart Grids
- Cloud based big data management and analytics in Smart Grids

On-going research on AC-DC microgrid

- Development of AC-DC network is in progress
- Analyses on AC-DC network is in progress

Works done so far

- Modelling in steady-state
- AC-DC load flow analysis
- AC-DC contingency analysis



On-going research AC Microgrid analysis

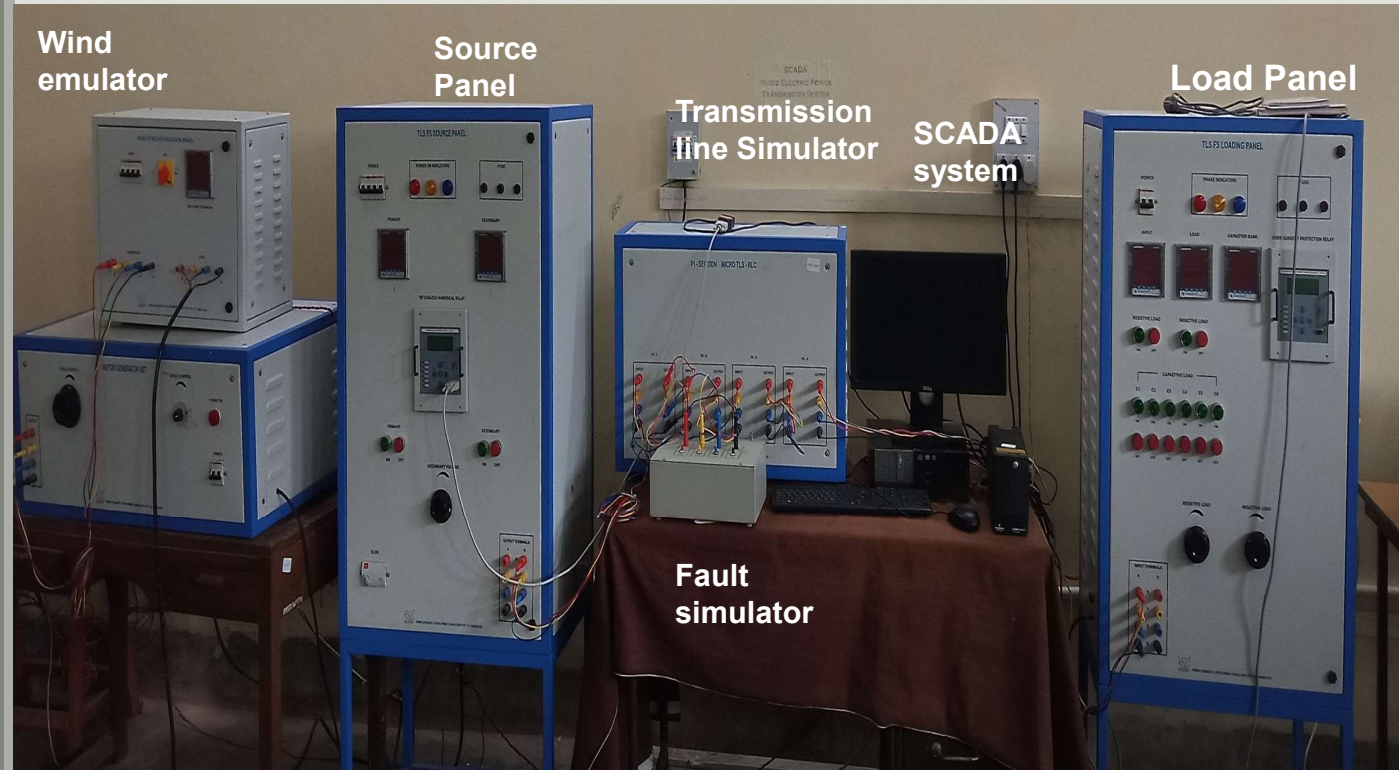
- AC Microgrid Analysis through communication via MOD bus and TCP/IP
- Design of Demand Response Programs and real time implementation
- Risk Analysis of RESs in power market

Work done so far:

- Laboratory prototype model
- Data communication through TCP/IP Mod bus mode



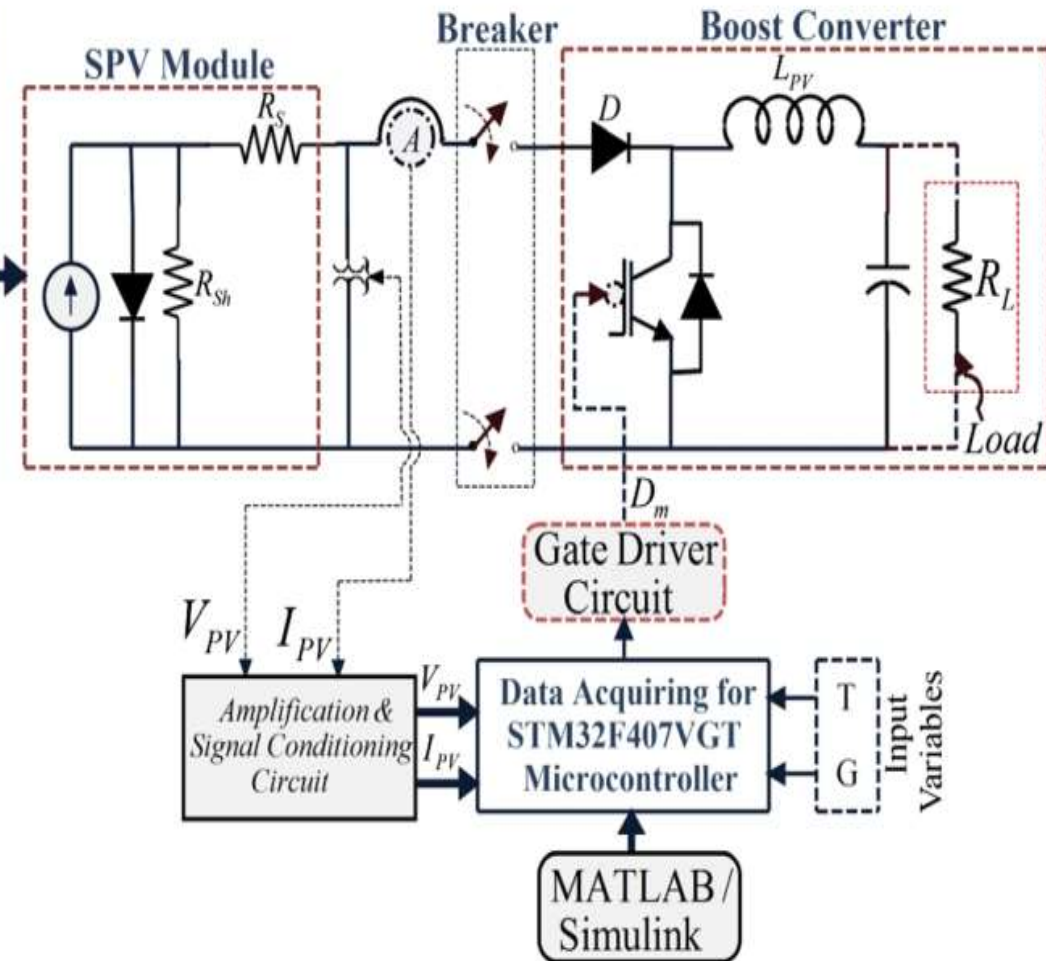
Transmission Line Simulator integrated with conventional and non-conventional source monitored through SCADA



Energy Harvesting from Rooftop Solar PV System, 5kWp

Work done so far:

- All the component have been procured
- Development of grid-tied system is in progress



Phasor Measurement Unit

Research Focus:

- Wide area monitoring of phasors using PMU
- System integrity protection using PMU
- Optimal location of PMU
- Reliability and resilience assessment of power system using PMU data
- Wide Area Generator Coherency Detection Using Synchro phasor Measurements

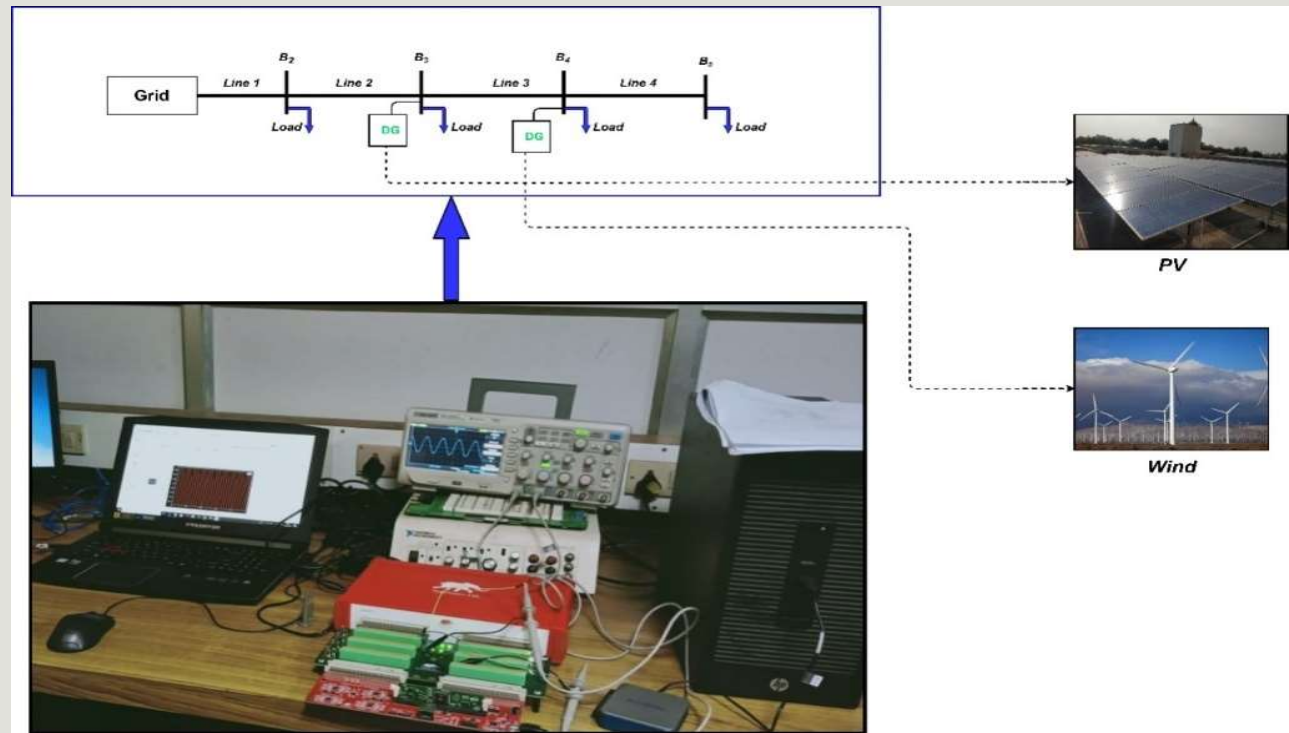


HIL Model for possible integration of renewable sources in Typhoon HIL real time environment

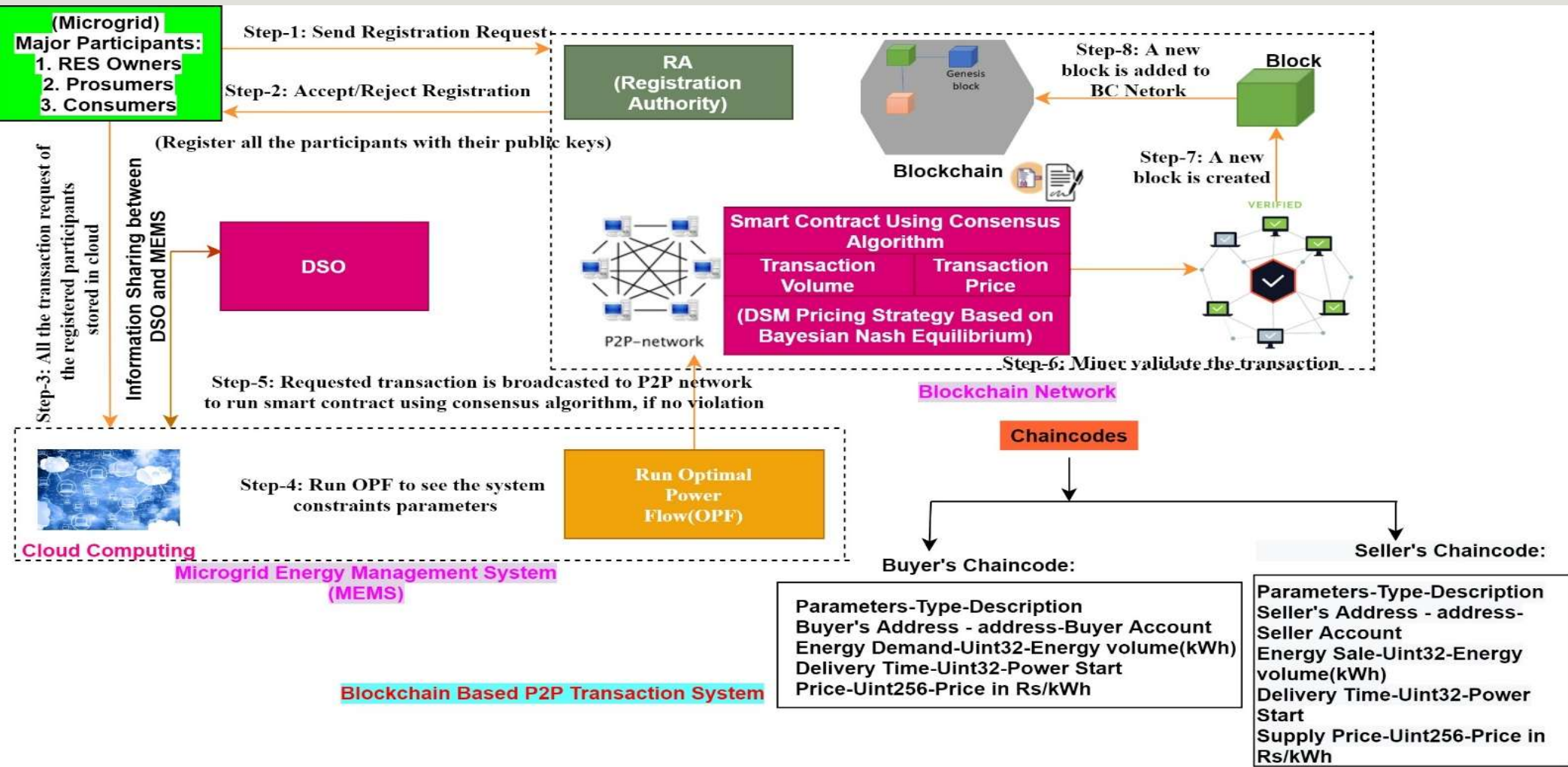
Research Focus:

- Energy management
- Demand Side management
- Hosting capacity assessment and enhancement

Typhoon HIL real time emulator 402



On-going research on Power Trading Model With Blockchain Technology



In the Area of Control System

LIST OF FACULTY MEMBERS



Dr. Sudhansu Kr. Mishra
Assistant Professor



Dr. Sarbani Chakraborty
Professor and Head



Dr. Vijaya Laxmi
Professor



Dr. Prabhat Kr. Upadhyay
Assistant Professor



Dr. Sushma Kamlu
Assistant Professor



Dr. G. S. Gupta
Assistant Professor

Control Systems and Instrumentation Group



Dr. Debasmita Mondal
Assistant Professor

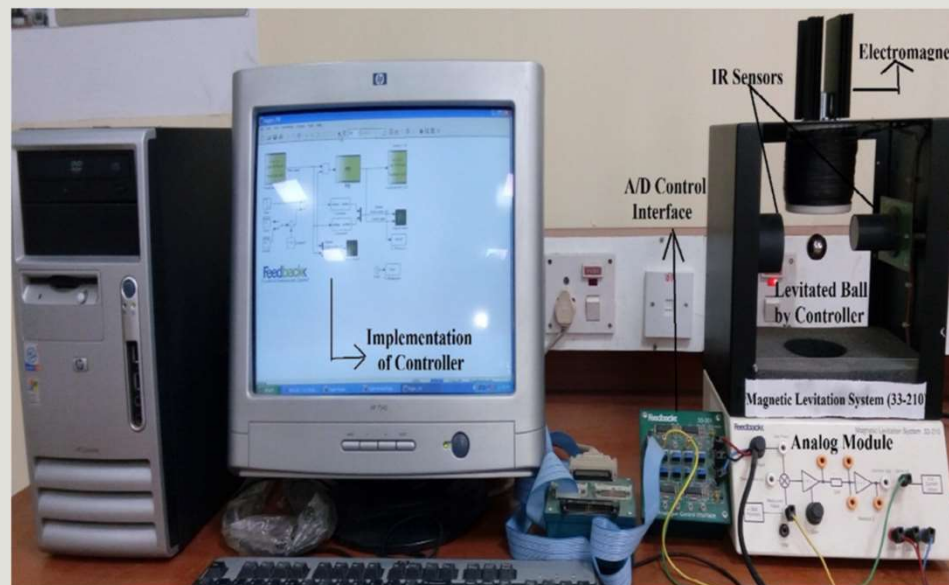
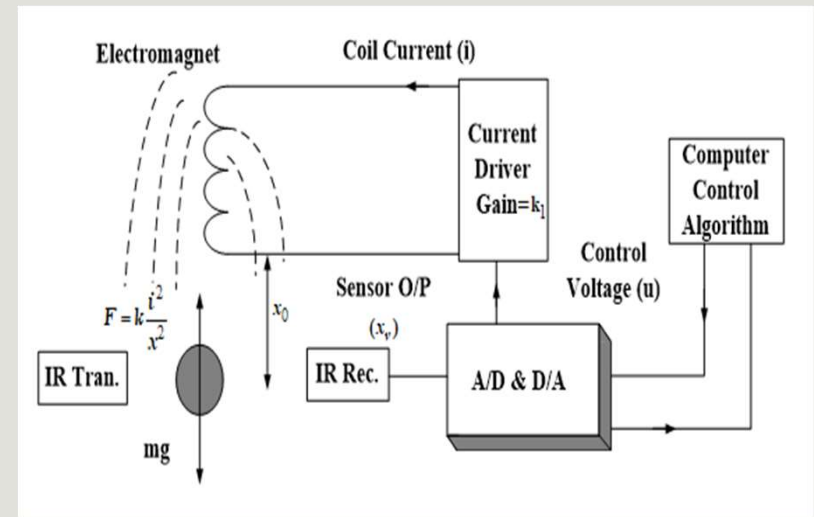


Dr. Surendra Kumar
Assistant Professor



Mr. Subrat Kumar Swain
Assistant Professor

Basic block diagram of maglev plant and the maglev plant Laboratory Setup



Autonomous Hybrid Electric Vehicle

Research Focus:

- Robotics
- Design of model predictive controller algorithm based on energy management and safety of Autonomous Hybrid Electric Vehicle (AHEV).
- Implementation of IoT and AI based architecture using model free adaptive controller.
- Development of AI and IoT based techniques for obstacle avoidance in Mobile Robot/ Autonomous Ground Vehicles (AGV) and TETRIX Rover vehicles through path planning.

Development of IoT based model predictive controller for autonomous hybrid electric vehicle using artificial intelligence techniques

Activities

- Implementation of IoT and AI based architecture using Model Predictive Controller (MPC) to make hybrid electric vehicle autonomous.

Impact

- Autonomous hybrid electric vehicle (AHEV) acts as a cleaner and quicker source of transport. AI based MPC enhances safety, path tracking capability, energy consumption.



Outcome

- Development of bidirectional converter.
- Design of hardware model based on IoT.
- Development of AI based Model Predictive Controller (MPC).

Development of AI based techniques for Obstacle Avoidance in Mobile Robot/ Autonomous Ground Vehicles (AGV)

Activities:

- Design of NodeMCU Adaptive Controller for autonomous decision-making capability.
- Development of programming codes on Arduino UNO platform. Performance both on hardware experiments and Simulink model is being compared for the developed model

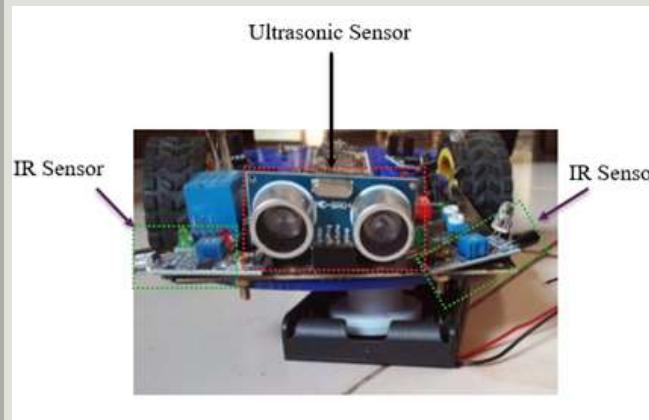


Outcome:

- AGV can be implemented on static and dynamic obstacles avoidance and for irregular path tracking.
- Internet of Things (IoT) can be applied by considering different shape of sizes of obstacles.

Impact:

- AGV vehicles may be applied for picking and placing objects and multi operations for smart manufacturing systems applications.
- Communication technologies such as, 4G and 5G can be incorporated .



Obstacle Avoidance and Path planning for TETRIX Rover vehicles

Activities:

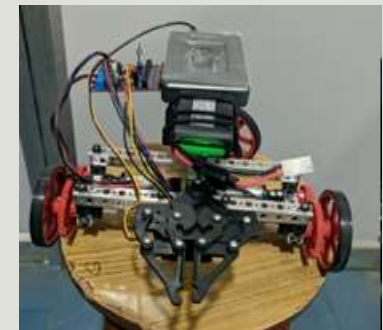
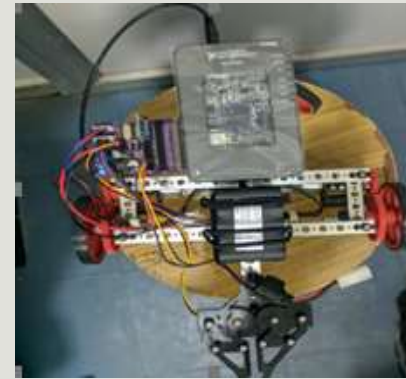
- Development of programming codes on myRio in LabVIEW platform and hardware implementation of Rover vehicle.
- Automatic operation of TETRIX Rover vehicle through WIFI network.

Outcome:

- Development of AI based intelligent position tracking control algorithm for TETRIX Rover vehicles for avoiding static and dynamic obstacles. Gripper arm can be connected on the top of vehicle applied for picking and placing objects.
- TETRIX Rover vehicle can be implemented on any type of road conditions such as clean, mild-wild, and heavy-wild.

Impact:

- TETRIX Rover vehicle applied for smart manufacturing systems.
- Communication technologies such as 4G and 5G can be implemented on TETRIX Rover vehicle.



Sensors, Instrumentation and Control

- Magneto-optics
- Magnetic Levitation System
- Artificial Intelligence (AI) based Robust Shared Lateral and Longitudinal Controller for an Autonomous Vehicle

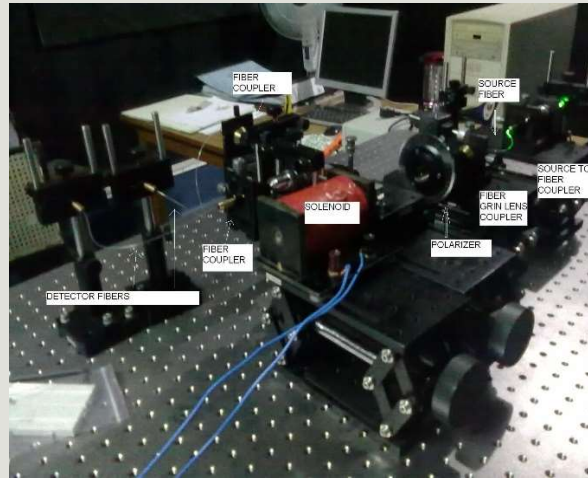


Fig: Experimental setup for magneto-optic current sensing

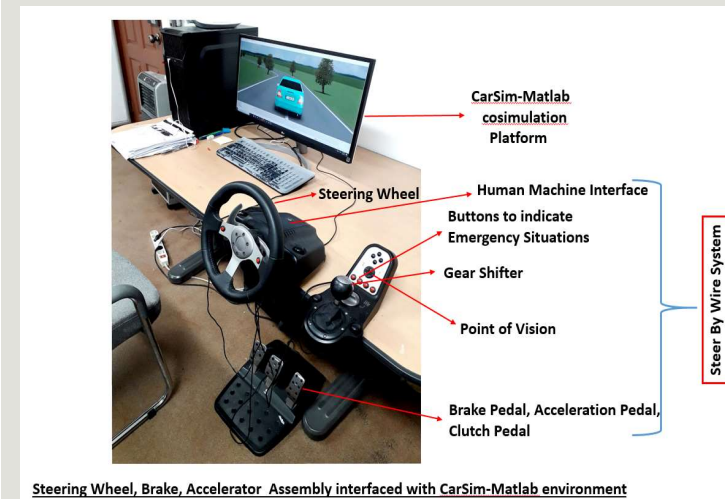
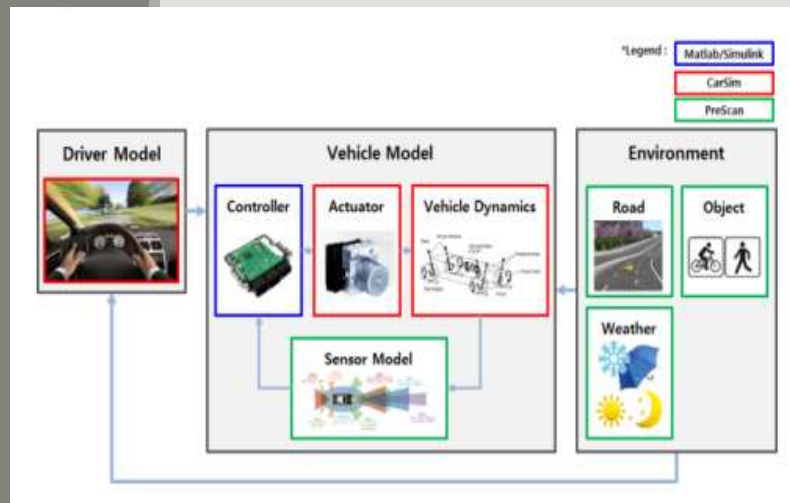


Fig: Layout for robust controller design for semi autonomous vehicles and Experimental setup for Future Research

Sensors, Instrumentation and Control: Future directions

Magneto-optic sensors for healthcare domain (non-invasive monitoring of blood glucose)

Fractional order elements for sensing and control applications

Electrochemical sensors for battery health monitoring of Electric vehicles as well as applications in chemical and biomedical sectors

Brain signal analysis

Bio-medical instrumentation

In the Area of Power Electronics

LIST OF FACULTY MEMBERS



Mr. B. M. Prasad
Assistant Professor



Dr. Aftab Alam
Assistant Professor



Dr. S. Shiva Kumar
Assistant Professor

Power Electronics Group

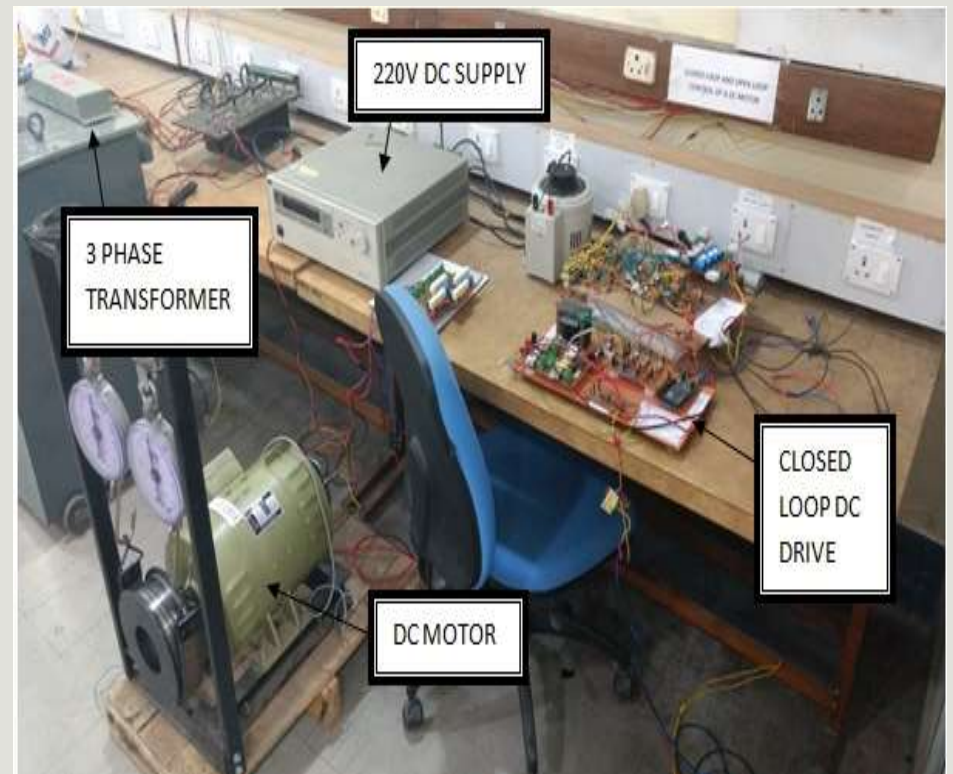
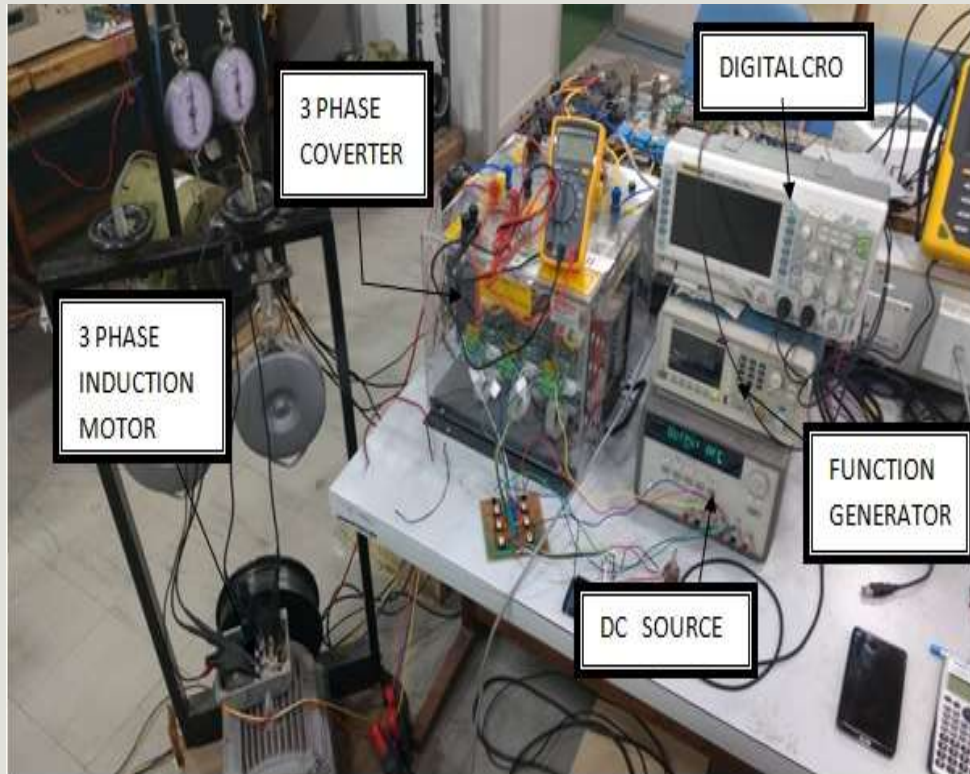


Dr. Ajay Kumar
Assistant Professor



Dr. Soumya Samanta
Assistant Professor

Industrial Drives Lab



Battery Management System

Research Focus:

- Selection of the suitable battery for the system and study of its various parameters.
- Design and apply power-converter based cell balancing system for various parameters such as internal resistance, state of charge, cell temperature etc.
- Analyse dynamic parameters of voltage and current profile of battery using IoT based cloud computational platform.

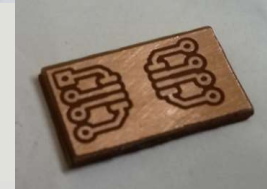
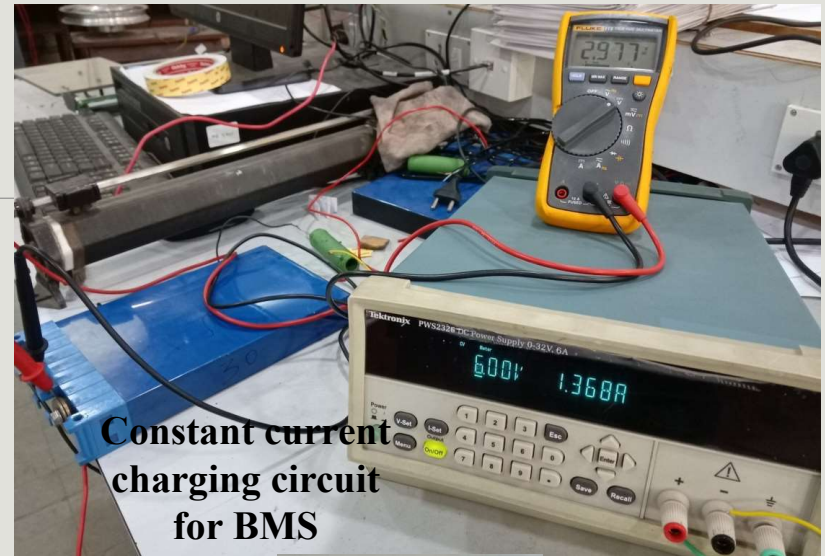
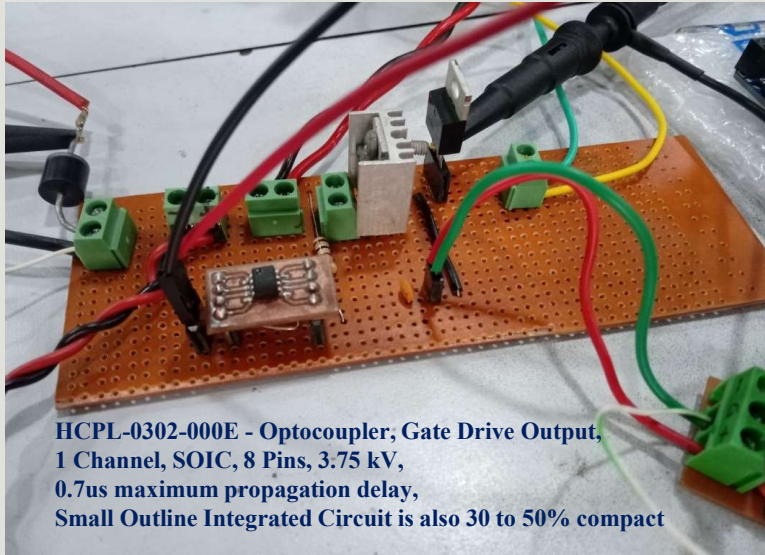
Grid Integrated Renewable Energy Management



Speed Control of Induction Motor using H-Bridge Multilevel Inverter

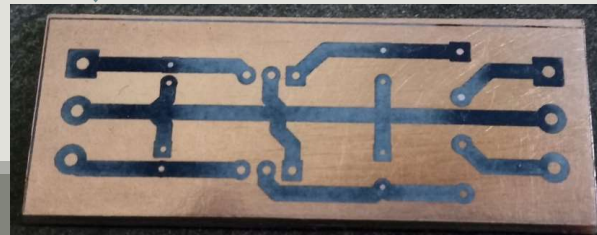


Designed Hardware Setup for BMS

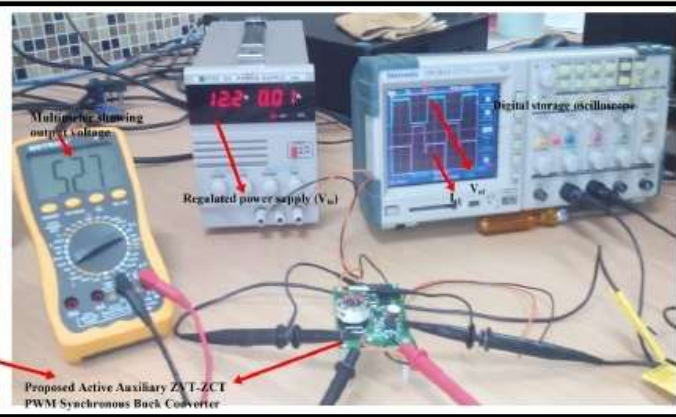
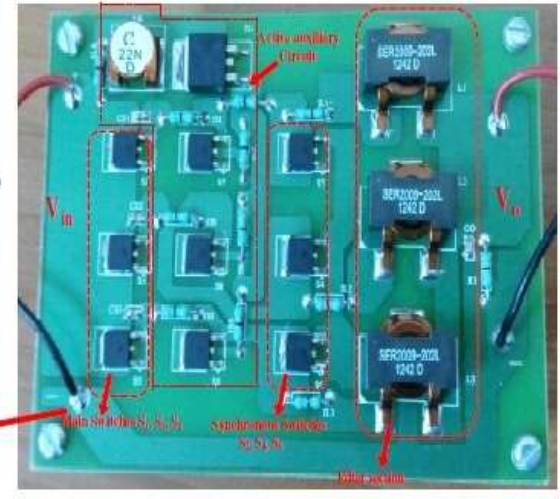
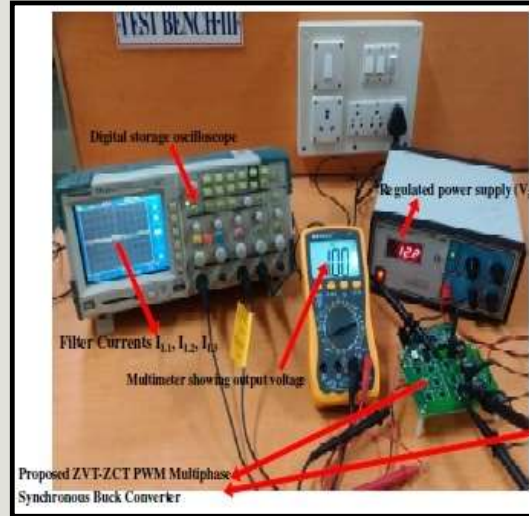
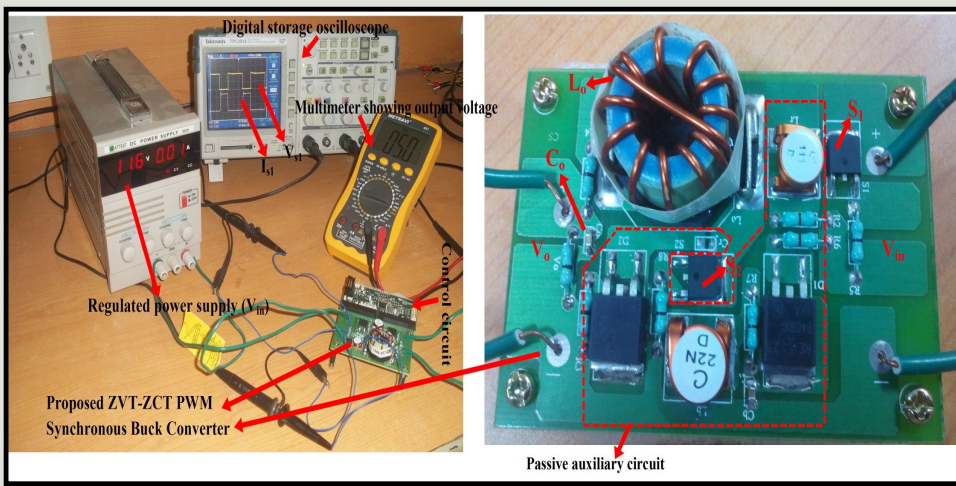


Before etching

After etching

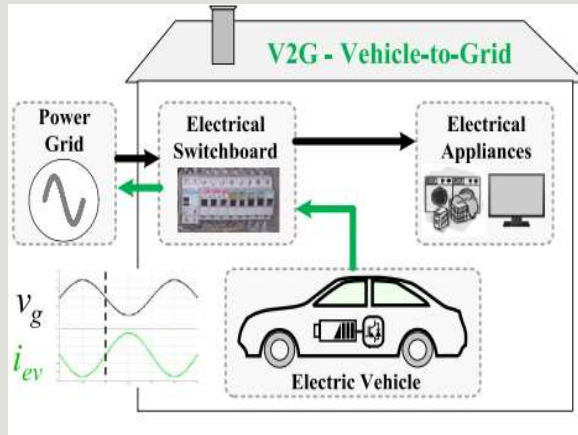


Soft Switching of Different Synchronous Buck Converter Topologies For Electric Vehicle Charging

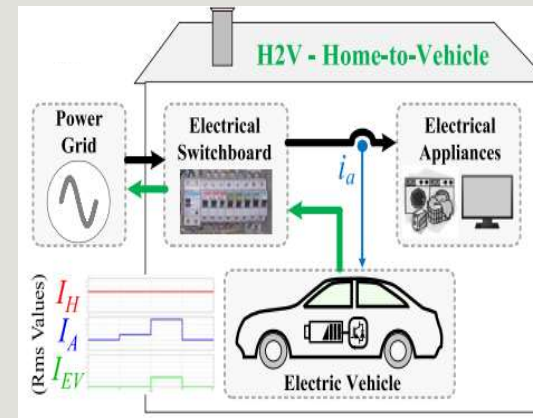
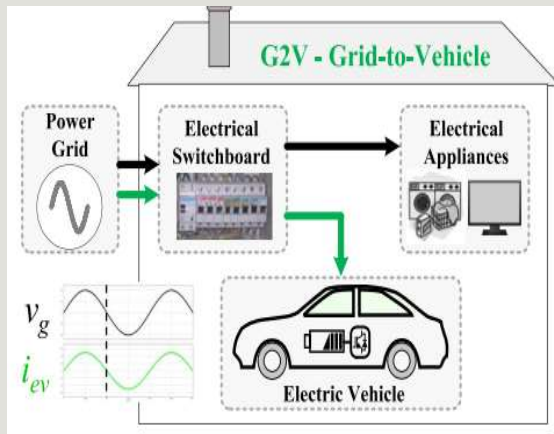
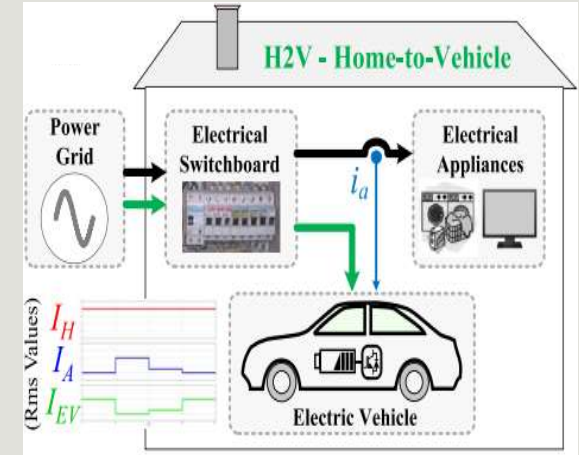


Vehicle to Grid System (V2G)

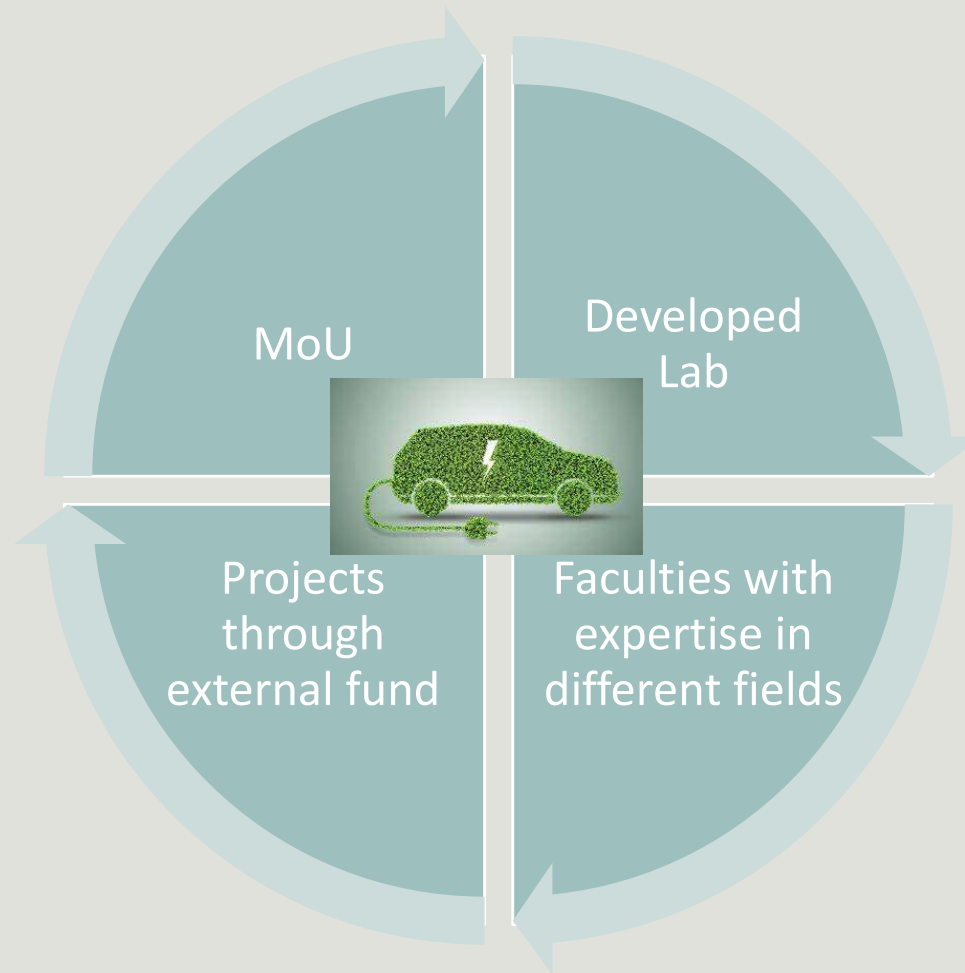
Schematic for Bidirectional Energy Flow in V2G System.



Schematic for Bidirectional Energy Flow in V2G System including home appliances



Target 2025



Specific research areas where we can make an impact in the next 2-3 years are in terms of publication, patent, PhD supervision, technology development/ transfer, industry collaboration, facility creation

Specific research areas where we can make an impact in the next 2-3 years for facility creation

- To develop specific laboratory facilities for research, testing, calibration, and consultancy in the Department
HIL is going to be procured with facility for integrating the application of power system, control system and power electronics-50%
- Grid integration of renewable sources-90%
- Planning, operation, and remote wide area control of microgrid-ongoing
- Demand-side Management-ongoing
- Converter design and control, Wide Band Gap Devices (fast charging) based Converter Design for EV-ongoing
- Vehicle to Grid Technology, Grid to Vehicle Technology-future project and has been initiated
- Battery Management System (BMS) for EV-90%
- Advanced control system Lab to be developed for research in the area of AI-based Visual Control of AGEV-Initiated
- Electrochemical Impedance Spectroscopy (EIS) based test bench for Electric Vehicle Battery health monitoring and diagnostics, EMI noise testing, and certification for Power Converters for Power Electronics Lab-future project
- Robotics & Automation- ongoing
- Artificial Intelligence/Soft Computing/ Machine Learning and real-time control applications in fields such as Smart Grid, Micro-Grid, Electric Vehicle using Cloud computational platform and IoT tools-initiated
- Cyber-Physical Systems-research initiated

Budget

SL NO	EQUIPMENT	QUANTITY	Amount in Lacs	SL NO	Furnitures & Fittings	QUANTITY	Amount in Lacs	SL NO	COMPUTER AND SOFTWARE	QUANTIT Y	Amount in Lacs
1	DIGITAL MULTIMETER	4	1.68	1	ALMIRAH	4	0.6	1	DESKTOP COMPUTER i7	15	12
2	REAL TIME SIMULATOR	1	35	2	TABLE	2	0.4				12
3	REAL TIME MACHINE VISION SYSTEM	1	8	3	CHAIR	10	0.6	2	LABVIEW 2020- 10 USER LICENSE		12
4	ECOSENSE PROGRAMMABLE SOLAR PV EMULATOR INTEGRATED WITH PROGRAMMABLE CONVERTERS	NEW	5.75		TOTAL		1.6	3	PSCAD V5 (V5.0.0) EDUCATIONA L LICENSE-5 SEAT CERTIFICATE LICENSE		2.2
5	DSP STARTER KIT	1	3.6						TOTAL		14.2
6	INTERNET BASED KIT FOR IOT AND CLOUD COMPUTIONG FOR SMART ENERGY METER OPERATION	1	0.5								
	TOTAL		54.53						Total Budget: Rs. 82.33 Lacs		

Outreach

**SEMINARS, CONFERENCES, WORKSHOPS, COLLABORATIONS,
STUDENT ACTIVITIES**

WORKSHOP CONDUCTED BY THE DEPARTMENT

Sl. No.	Title of Workshop	Coordinators	Funding / Sponsoring Agency	Date of Workshop
1	Workshop on Electrical Machines	Dr. P. R. Thakura	<i>BIT Mesra</i>	<i>15-23May , 2016</i>
2	Workshop on Advanced Microcontroller Applications	Dr. P. R. Thakura Dr. T. Ghose	TEQIP	11 th -17 th Feb., 2016
3	Workshop on Electrical Machine Laboratory	Dr. P. R. Thakura	EEE Dept.	13 th -20 th May, 2016
4	One week workshop on Advanced Microcontroller Applications	Dr. P. R. Thakura	TEQIP	2 nd -8 th Feb, 2015
5	National Workshop on 'Intelligent Computational Technique Applications'	Dr. V. Laxmi	Jharkhand Council of Science and Technology	23 rd -27 th Nov., 2015
6	Workshop on Microcontroller based Engineering Applications and Automation	Dr. P.R. Thakura	BIT, UGC (SAP)	06 th -13 th January 2014
7	National Workshop on Power Electronics	Dr. P. R. Thakura Mr. N. Neogi	DeitY, NaMPET, GOI, CDAC	7 th -8 th Nov., 2014
8	Workshop on Control Systems	Dr. V. Laxmi	NMEICT	2 nd -12 th Dec, 2014
9	Workshop on Microcontroller Based Applications	Dr. T. Ghose	TEQIP Phase-II	20 th Feb.-2 nd March, 2013

SHORT – TERM COURSES/ CONFERENCES ARRANGED BY THE DEPARTMENT (Last 5 Years)

Sl. No	Title of Short – term Course	Coordinators	Funding / Sponsoring Agency	Date of Short – term Course
1.	Two Week ISTE STTP On Electric Power System	Mr. Prem Prakash Dr. Sudip Das	National Mission on Education through ICT (MHRD, Govt. of India)	10 th -15 th July 2017
2.	GIAN Course on ‘Synchronized Phasor Measurement for Enhancing Situation Awareness in Smart Grid’	Dr. D. K. Mohanta Dr. R. C. Jha	AICTE, MHRD	9 th -15 th October 2017
3.	IoT based Power Electronic Interface for Green Energy Management System.	Dr. Aftab Alam Dr. S. Shiva Kumar	TEQIP-III	20 th -24 th May 2019
4.	International Conference on Emerging trends for Smart Grid Automation and Industry 4.0	Dr. Debomita Ghosh Dr. Deepak Kumar	TEQIP-III TYPHOON HIL	5-7 th December 2019
5.	Trends in Measurement and Control for System Automation	Dr. V. Laxmi	AICTE	28 th – 2 nd June 2021

Placements: Recruiters

Electrical Core

- TATA Steel
- TATA Power
- IOCL
- Hindalco
- JUSCO
- JSW Steel
- ISWPL
- Usha Martin
- Vedanta
- Maruti Suzuki
- Visa Steel
- ...and many more

Electronics Core

- Synopsys
- Infineon
- NXP Semiconductors
- IBM
- Cyprus
- ...and many more

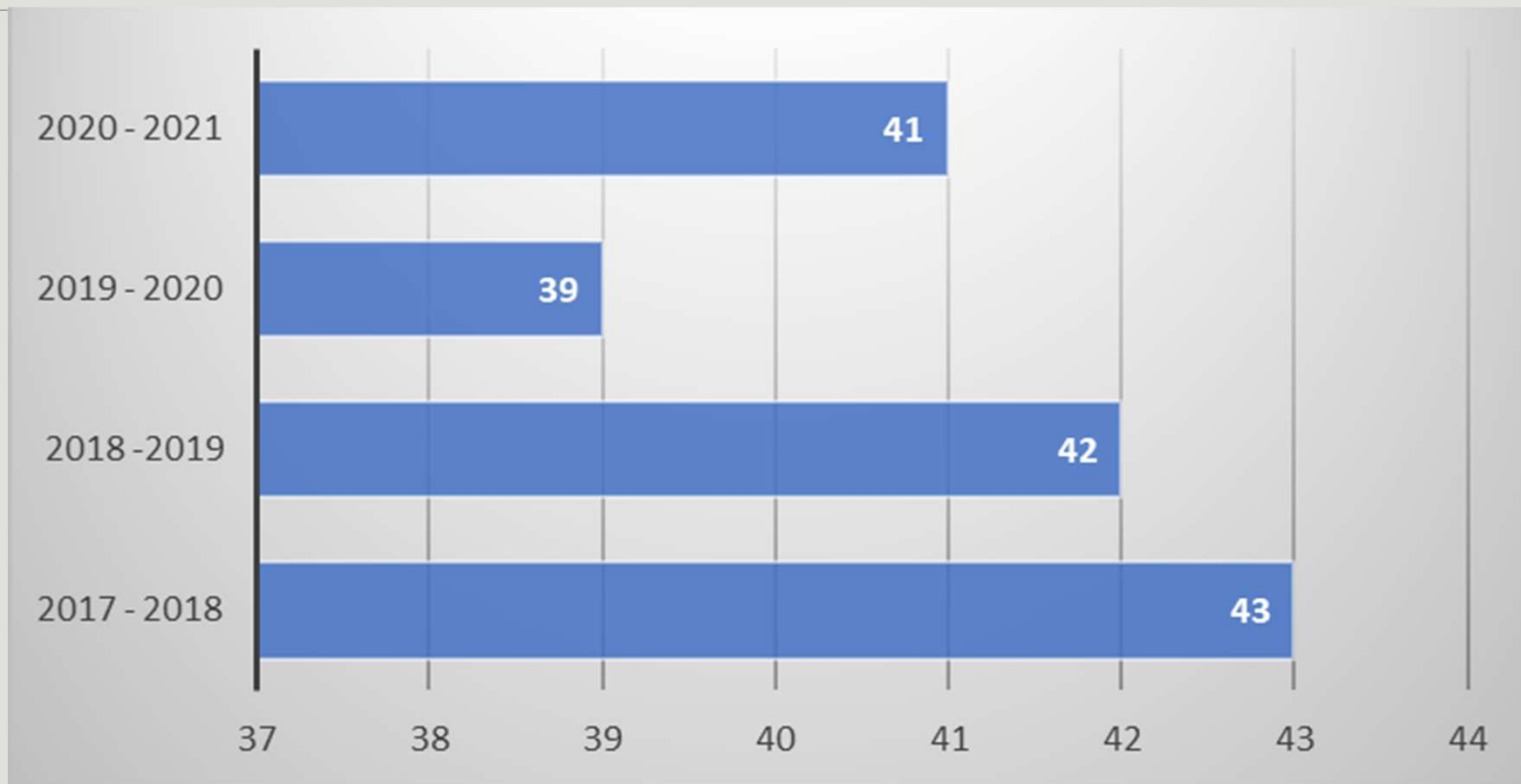
Software

- Amazon
- Walmart Labs
- Microsoft
- Infosys
- Optum
- Microland
- Oracle
- Intel
- Directi
- Cognizant
- ...and many more

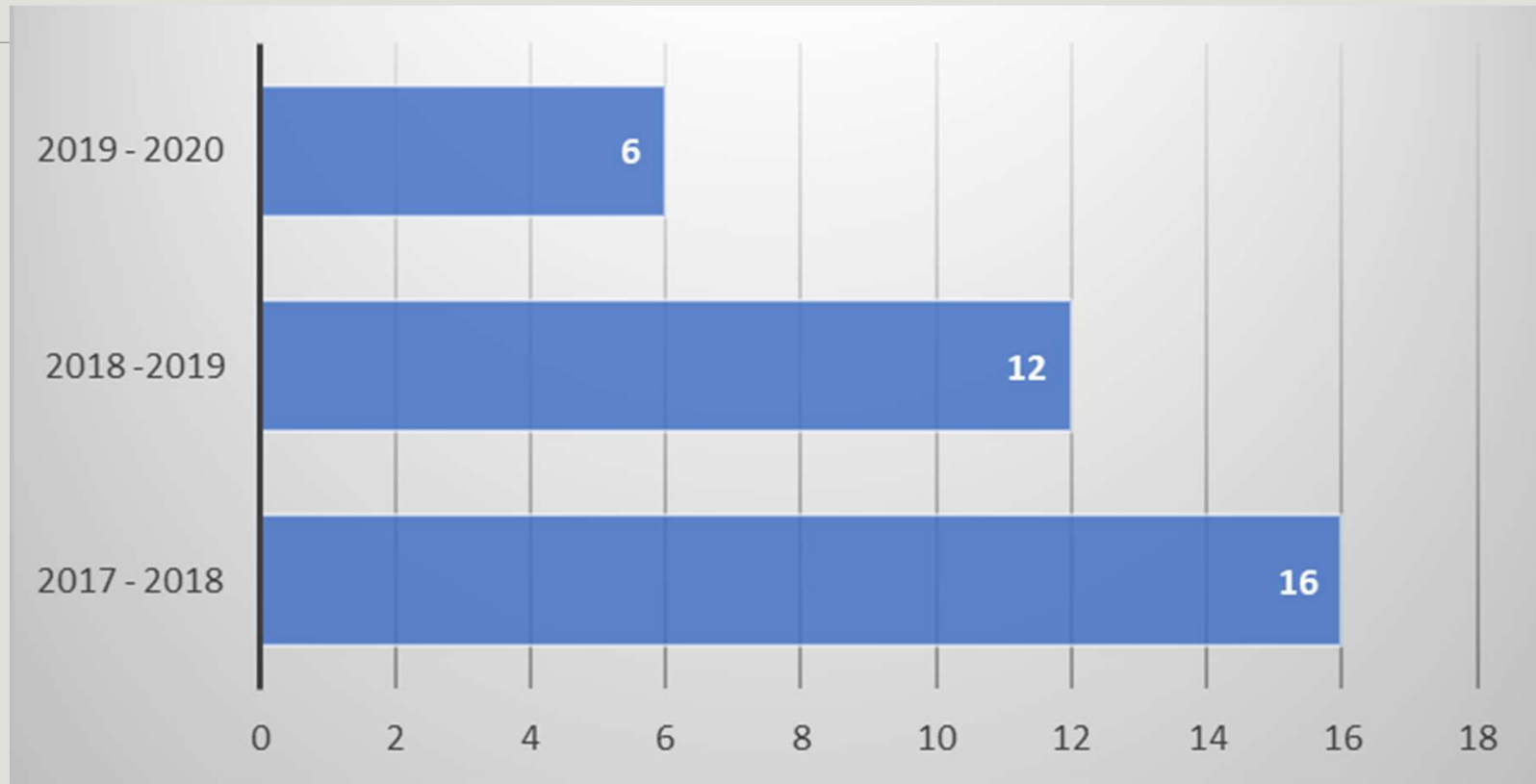
Consultancy/ Data Analytics

- PWC
- ZS Associates
- KPMG
- Capgemini
- Deloitte
- Mu Sigma
- Goldman Sachs
- EXL
- ...and many more

Placement Profile of the Department

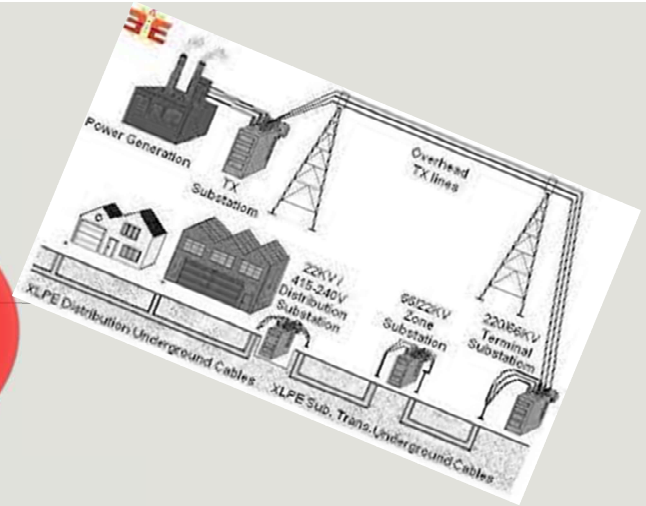


Higher Studies



THANK YOU

Revamp of power distribution system to 33kV

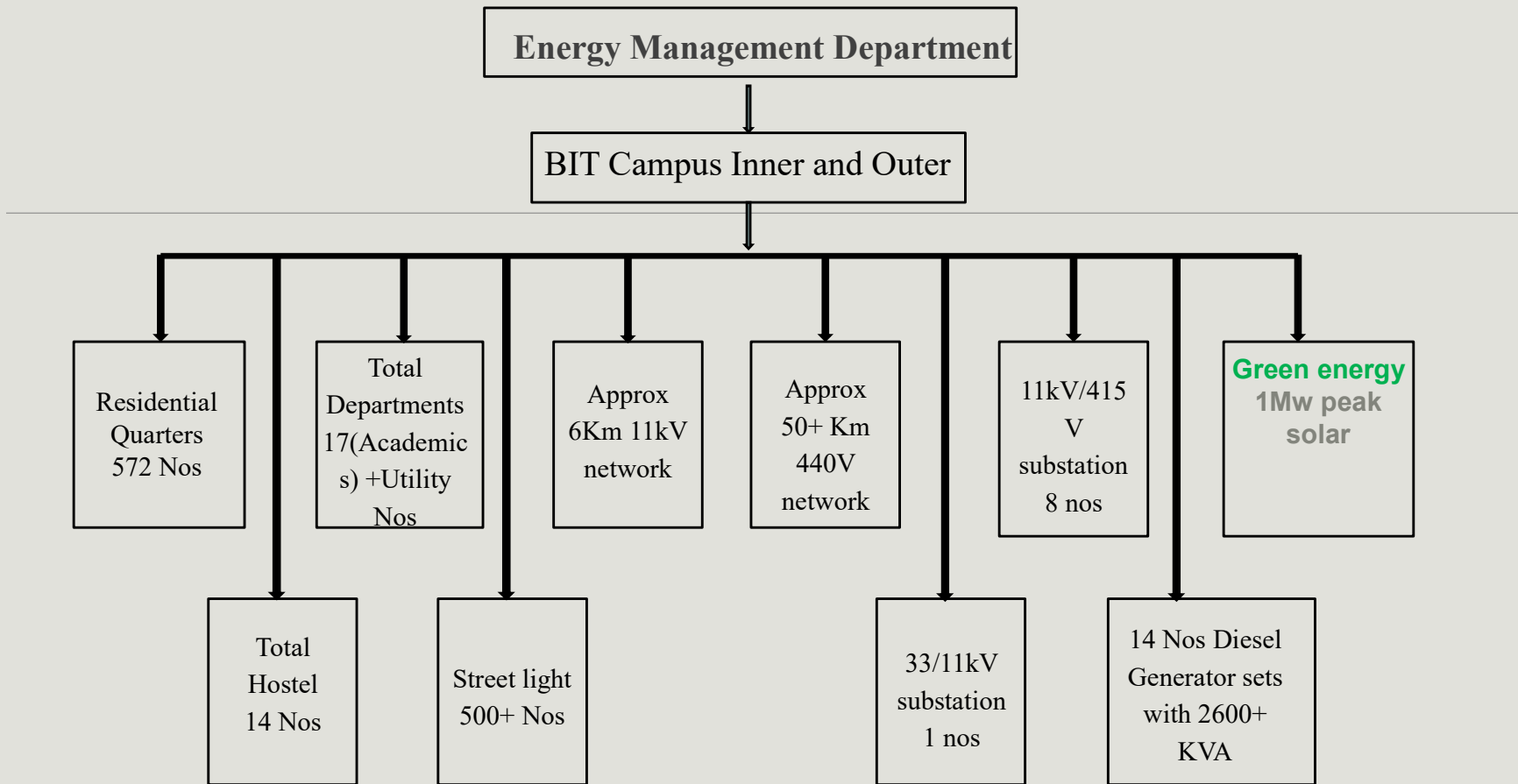


BIT Energy Management Initiatives

SCADA monitoring system

Installation of 1MW Solar Power plant





Line diagram of the existing power system network of BIT, Mesra Campus

ADVANTAGES OF GIS OVER AIS

- Low maintenance requirements due to expedient design and protection against external elements.
- Compartmentalized enclosure of the live parts makes GIS a very reliable system due to reduced disruption of the insulation system.
- The earthed metal enclosure makes for a safe working environment for the attending personnel.
- Less space is required than in the normal AIS system.

SIRDO Substation (AIS)



33kV GIS panel



ADVANTAGES OF ENERGY MANAGEMENT AUTOMATION

- Online data acquisition and control of the power distribution and DG sets
- Energy savings through efficient energy management.
- Immediate detection of faults and quick restoration of power
- Better customer service and more accurate smart metering

BIT ENERGY MANAGEMENT INITIATIVES

- Provision of state of art infrastructure by upgrading the 11kV system to 33kV system
- Due to solar installation BIT is in a position of exporting energy, contributing to the nations mission of green energy.
- Renovation design and electrical renovation jobs are accomplished by in-house personnel with negligible power cuts
- DG and transformers operational maintenance is periodically monitored and repaired by in-house personnel which attributes in saving institute financially.
- Upgrading the existing 11kV to 33kV underground cabling system curtails transmission and distribution losses in-turn enhances efficiency.
- Introducing PIR sensor as a pilot project will save the energy as per the norms of NAAC.
- Overall lighting i.e., 70-80% provided is through LED which again minimizes the power usage.
- UPS backup power is provided at the places of importance like classrooms and laboratories etc.,
- The power cuts are minimal throughout the year.

THANK YOU