



Legacy that Inspires the Future

R&D News Letter

Quarterly Newsletter of the Office of the Dean (R&D), IIT(ISM) Dhanbad

Vol. 1, April-June, 2024



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About R&D News Letter

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Dear Reader,

This issue of "*R&D News Letter*" is to showcase our excellence in academic and research activities. With our ever expanding academic network and research base, we are able to show our strength as an Institute of National Importance.



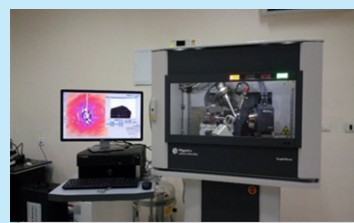
Dean (R&D)

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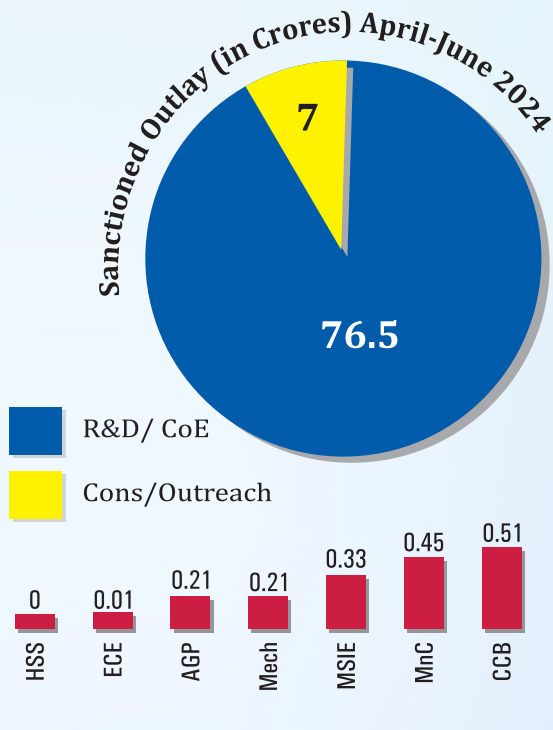
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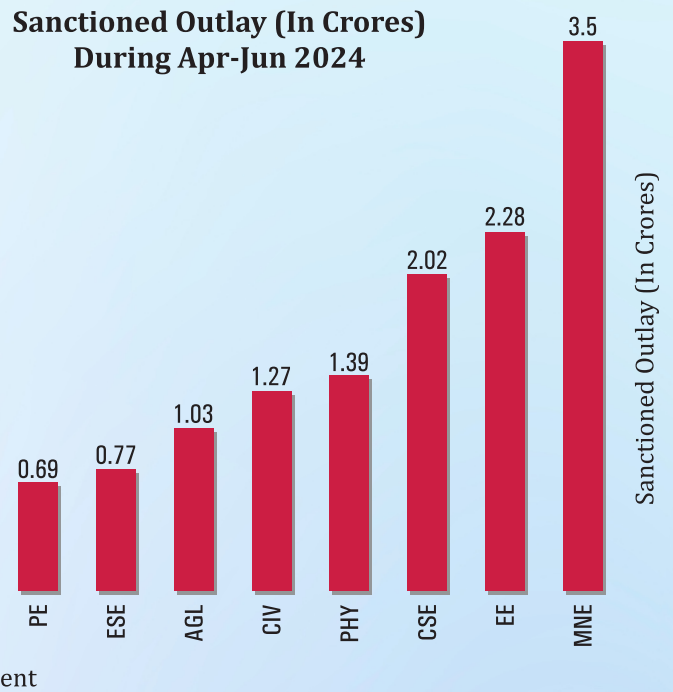


R&D Funding of the Institute

Overall funding



Department wise funding



Major Projects/Consultancy-EDP/CoEs

- A **Centre of Excellence (CoE)** namely “*IMiN - Centre of Excellence for Mining 4.0 at TEXMiN at IIT(ISM) Dhanbad campus*” has been sponsored (**Rs. 67.5 Crores**) by Coal India Limited under the leadership of **Prof. Dheeraj Kumar**, Department of Mining Engineering.
- **Prof. Sachin Tripathy** and his team (Prof. Hari Om, Prof. D. Ramesh, Prof. A. K. Pal as Co-PIs), Department of Computer Science & Engineering have received a R&D project (**Rs. 2.01 Crores**) entitled “*Information Security Education and Awareness (ISEA) Project Phase-III*”, funded by MeitY, Govt. of India, New Delhi.
- **Prof. Kripamoy Sarkar**, Department of Applied Geology has received a R&D Project (**53.5 Lakhs**) entitled “*Analysis, modelling and mitigation methods for landslides along Bhalukpong-Tawang road in Arunachal Pradesh, India*”, funded by SERB, DST, New Delhi.
- **Prof. Dheeraj Kumar** and his team (Prof. V. G. K. Villuri and Prof. Md. Soyeb Alam as Co-CIs) from Department of Mining Engg. have received project for organising an Executive Development Programme (**Rs. 1.57 Crores**) namely “*Six-Week Intensive Course on Advances in Mine Surveying Technology*”, for CIL & its subsidiaries.
- **Prof. Biswajit Paul** and his team (Prof. Manish K. Jain and Prof. Vipin Kumar as Co-CIs) from Department of Env. Sc. Engg. have received a Consultancy Project (**Rs. 50.15 Lakhs**) entitled “*Source Apportionment Study of Polluting Units Lying in the Buffer Zone of Tasra Coking Coal Washery Plant of Steel Authority of India Limited, with respect to Ecosystem Services and Biodiversity of the area*”, funded by M/s KTMPL, Sindri, Dhanbad.
- **Prof. Pankaj Jain** and his team (Prof. Shalini Gautam and Prof. Anand Anupam as Co-CIs) from Department of Fuel, Mineral and Metallurgical Engg. have received a testing project (**Rs. 56.35 Lakhs**) entitled “*Sampling and Quality Assessment of Reject /Slurry of all Washeries of BCCL*”, funded by BCCL, Dhanbad.
- **Department of Electrical Engineering** has received a **FIST grant of Rs. 2.03 Crores**.

Publications

Total No. of Publications : 421

Selected Publications

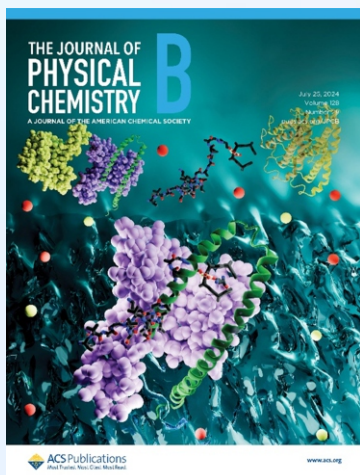
1. A. Doley, **V. Mahto**, **V. K. Rajak**, **R. Kiran**, and **R. Upadhyay**. "Investigation of Filtration and Shale Inhibition Characteristics of Chitosan-N-(2-hydroxyl)-propyl trimethylammonium Chloride as Drilling Fluid Additives." *ACS Omega*, 9(19), 21365-21377, **2024**.
2. Y. K. Pandit, **V. Mahto**, **G. Udayabhanu**, B. Ravishankar, M. Dhandi. "Preparation, characterization, and evaluation of a nanomaterial reinforced particle gel system for the control of excessive water production in the mature oil fields." *Geoenergy Science and Engineering*, 235, 212707, **2024**.
3. Y. Dhandhi, V. Bhardwaj, R. K. Saw, **T. K. Naiya** "Demulsification of Water-in-Crude Oil Field Emulsion Using Green Demulsifier Based on *Sesamum indicum*: Synthesis, Characterization, Performance, and Mechanism." *SPE Journal*, 29 (08), 4166-4178, **2024**.
4. L. Jangid, S. Dey, D. Joshi, N. Saxena, **K. Ojha**, **A. Mandal**. "Exploring interfacial properties and thermodynamic parameters of synthesized biodegradable surfactants from Brassica Juncea and their emulsification characteristics." *Journal of Molecular Liquids*, 408, 125326, **2024**.
5. S. Prakash, D. Joshi, **K. Ojha**, **A. Mandal**. "Enhanced Oil Recovery Using Polymer Alternating CO₂ Gas Injection: Mechanisms, Efficiency, and Environmental Benefits." *Energy & Fuels*, 38 (7), 5676-5689, **2024**.
6. J. M. Chang, B.N. Yadav, **A. Mandal**, J. K. Tiwari, K. Kam, D. Liu, P. C. Lin, "Carbon nanotubes used to enhance the wear properties of AlSi10Mg/CNTs nanocomposites prepared through additive manufacturing." *Diamond and Related Materials*, 144, 110993, **2024**.
7. B. K. Lenka, **R. K. Upadhyay**, "New results on dynamic output state feedback stabilization of some class of time-varying nonlinear Caputo derivative systems." *Communications in Nonlinear Science and Numerical Simulation*, 131, 107805, **2024**.
8. **R. K. Upadhyay**, **D Pradhan**, SK Sharma, A Mondal, "Emergence of spiral and antispiral patterns and its CGLE analysis in Leech-Heart neuron model with electromagnetic induction." *Applied Mathematical Modelling*, 128, 154-167, **2024**.
9. R. Singh, A. Ojha, N. K. Thakur, **R. K. Upadhyay**, "Delay-induced nutrient recycling in plankton system: Application to Sundarban mangrove wetland." *Nonlinear Analysis: Modelling and Control*, 29, 562-587, **2024**.
10. S. Mandau, Nazmul Sk, Pankaj Kumar Tiwari, **R.K. Upadhyay**, "Chaos and extinction risks of sexually reproductive generalist top predator in a seasonally forced food chain system with Allee effect." *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 34(6), 063142, 1-26, **2024**.
11. A.M. Stancu, **A. Jayswal**, I. M. Stancu-Minasian, "Efficiency in multiobjective fractional programming with generalized (F, b, ϕ , ρ , θ)-type I univex n-set functions." *U.P.B. Sci. Bull.* 86(2), 71-84, **2024**.
12. A. Das, A. Maharana, **J. Kumar**, D. Sarkar, "Multivariate population balance modeling and simulation of ultrasound-assisted crystallization of a plate-type pharmaceutical: Nucleation, growth, and breakage." *Computers & Chemical Engineering*, 184, 108651, **2024**.
13. A. Vinod, A. K. Prasad, S. Mishra, B. Purkait, S. Mukherjee, A. Shukla, N. Desinayak, **B. C. Sarkar** & **A. K. Varma**, "A novel multi-model estimation of phosphorus in coal and its ash using FTIR spectroscopy." *Scientific Reports*, 14(1), 13785, **2024**.
14. T. Chakraborty, T.H. Syed, E. Heggy, D. Putrevu, **U. Dutta**, "On the reachability and genesis of water ice on the Moon." *ISPRS Journal of Photogrammetry and Remote Sensing*, 211, 392-405, **2024**.

15. A. Negi, J. Mago, Sunali, A. K. Kumar, **E. Ahmad**, M. Ali Haider, S. Fatima, "Targeted Functionalization of Waste Lignocellulosic Biomass to Produce Sound Absorbing Materials." *Waste and Biomass Valorization*, <https://doi.org/10.21203/rs.3.rs-3349333/v1>, **2024**.
16. G. Shrivastav, **E. Ahmad**, T. S. Khan, M. Ali Haider, "Customizing reformulated gasoline using biofuel-additives to replace aromatics." *Journal of Molecular Liquids*, 398, 124251, **2024**.
17. S. Prasad, A. Kumar, **S. Dutta, E. Ahmad**, "Chemocatalytic oxidation of 5-hydroxymethylfurfural into 2,5-furandicarboxylic acid over nickel cobalt oxide." *ChemCatChem*, E202400973, **2024**.
18. A. Roy, **S. Sen Gupta, A. Samanta, P.V.S.S. Likhith, S. K. Das**, 'Prospects of energy-efficient power generation system with Ammonia as Hydrogen carrier.' *International Journal of Hydrogen Energy*, 71, 131-142, **2024**.
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23. **A. Kar**, P. Dhivakar, S. Roy, B. Panda, A. Shaikh, "Iyer-Wald ambiguities and gauge covariance of Entropy current in Higher derivative theories of gravity." *arXiv preprint arXiv*, 07, 016, **2024**.
24. M. Hazarika, L. D. N. V. V. Konda, **V. K. Rai**, "Photocatalytic activity of Ho³⁺-Yb³⁺ activated BiVO₄ upconverting phosphors." *Journal of Alloys and Compounds*, 1002, 175453, **2024**.
25. K Sandhya, **K Chatterjee**, "Study the impact of renewable and non-renewable energy sources on micro-grid using time series data based information transfer." *Energy Reports*, 11, 4957-4966, **2024**.
26. F. A. Khan, S. Mekhilef, V. K. Ramchandaramurthy, N. F. A. Aziz, **N. Pal**, A. Yaseen, A. Yadav, M. Asim and O. Alshammari, "Design and Development of Grid Independent Integrated Energy System for Electric Vehicle Charging Stations at Different Locations in Malaysia." *Energy*, 302, 1-23, **2024**.
27. F. Sadeque, M. Gursoy, **D. Sharma** and B. Mirafzal, "Autonomous Control of Inverters in Microgrid." *IEEE Transactions on Industry Applications*, 3, 4313-4323, **2024**.
28. AM Aparicio, **Haswanth Vundavilli**, "A Modular Trial of Androgen Signaling Inhibitor Combinations Testing a Risk-Adapted Strategy in Patients with Metastatic Castration-Resistant Prostate Cancer." *Clinical Cancer Research*, 30, 13, **2024**.
29. **V. L. Srinivas**, J. Wu, B. Singh, S. Mishra, "Hybrid state-estimation in combined heat and electric network using SCADA and AMI measurements." *International Journal of Electrical Power & Energy Systems*, 156, 109726, **2024**.
30. D. Dwivedi, S. Mitikiri, K. Babu, P. K. Yemula, **V. L. Srinivas**, P. Chakraborty, M. Pal, "Technological advancements and innovations in enhancing resilience of

electrical distribution systems." *International Journal of Critical Infrastructure Protection*, 46, 100696, 2024.

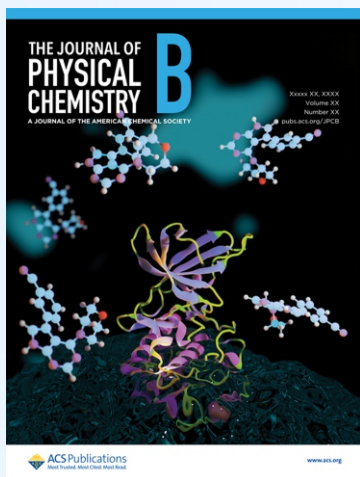
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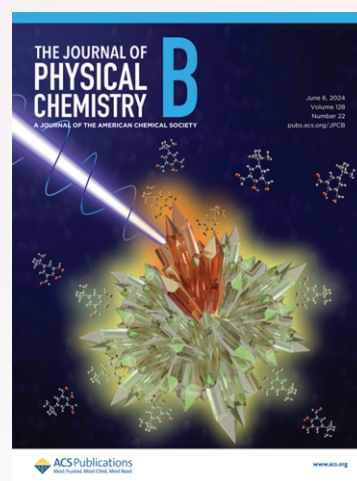


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34. M. Kumar, H. P. Nayek, "Syntheses and exploration of the catalytic activities of organotin(IV) compounds." *Dalton Transactions*, 53, 9827–9837, 2024.
35. A. Shukla, A. S. Biswal, A. Chowdhury, R. Halder, S. Chatterjee, "Aggregation induced modulation of ground and excited state photophysics of 5-(tert-Butyl)-2-Hydroxy-1, 3-Isophthalaldehyde (5-tBHI)." *The Journal of Physical Chemistry B*, 128, 5437, 2024.

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37. V. Talukdar, K. Mondal, P. Halder, P. Das, "Ullmann-Type N-, S-, and O-Arylation Using a Well-Defined 7-Azaindole-N-oxide (7-AINO)-Based Copper(II) Catalyst: Scope and Application to Drug Synthesis." *The Journal of Organic Chemistry*, 89, 7455–7471, 2024.
38. P. Halder, K. Mondal, A. Jash, P. Das, "Exploiting Chloroform-Coware Chemistry for Pd-Catalyzed Carbonylation of Naturally Occurring and Medicinally Relevant Phenols." *The Journal of Organic Chemistry*, 89, 9275–9286, 2024.
39. T. Ahmed, M. K. Das, "Enhanced Efficiency in Thin Film Solar Cells: Optimized Design with

Patents

Granted:

- **Shibayan Sarkar**, Aditya Kumar Nag, "A Self-adjustable flap blade hydrokinetic turbine", Patent No: 531514, Date of grant: 02.04.2024.
- B. Saha, A. S. Patra, P. Patra, **Sagar Pal**, A. K. Mukherjee, "Carboxymethyl cellulose based Polymer as an organic binder in iron ore pelletization", Patent No: 532143, Date of grant: 04.04.2024.
- **P. K. Sadhu**, Rahul Raman, Chayan Chakraborty, Palash Pal, Bidrohi Bhattacharjee, Swapan Kumar Bakshi, "Solar induction heating system using high frequency modified half-bridge series resonant inverter under ZSI mode", Patent No: 532009, Date of grant: 05.04.2024.
- **Pankaj Kumar Jain**, "A device with an improved design of sharpening blade with application in pencil sharpener", Patent No: 532620, Date of grant: 12.04.2024.
- **Kaushik Mazumdar**, "Design and investigation of IN0.52AL0.48AS/IN0.53GA0.47A SMOSFET with optimized switching efficiency", Patent No: 538728, Date of grant: 20.05.2024.
- **Sandipan Kumar Das, Siddhartha Sengupta, Soumyajit Sen Gupta, Arun Kumar Samanta**, "An integrated fluidized bed reactor system for ammonia combustion to obtain hydrogen and power and method for the same", Patent No: 541857, Date of grant: 14.06.2024.
- **Vivek Bajpai, N. K. Singh**, Rajesh Sahoo, "A variable diameter e-shaped rail-clip fastened on rail for uniform stress distribution", Patent No: 543584, Date of grant: 28.06.2024.

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- **T. K. Naiya**, Sampa Guin, "A pour point depressant for flow assurance of Indian waxy crude oil, a process for the preparation thereof and the use thereof", Patent Application No: 202431028934 dated 09.04.2024
- **Arun Kumar Samanta, Sandipan Kumar Das, Soumyajit Sen Gupta**, Babuni Prasad, "A fabric based structured bed gas solid

Front Nanotextured and Rear Nanowire-Based Light Trapping Structure." *IEEE Transactions on Nanotechnology*, 23, 456-466, **2024**.

40. A. Rani, **S. Das**, "A High Isolation SIW Self-Octaplexing Antenna with Independent Frequency Tuning Capacity." *IEEE Antennas and Wireless Propagation Letters*, 23, 6, 1954-1958, **2024**.
41. **S. K. Raghuvanshi**, C. Kumar, "Simultaneous Photonics Generation of Multiple Chirp rate Microwave Waveform with Manifold Frequency Multiplying Capability by Using Triple Parallel Mach-Zehnder Modulators." *Journal of Lightwave Technology*, 99, 1-9, **2024**.
42. P. Kumar, **R. K. Ranjan**, S. M. Kang, "A Memristor Emulation in 180-nm CMOS Process for Spiking Signal Generation and Chaos Application." *IEEE Transactions on Circuits and Systems I: Regular Papers*, 71, 4, **2024**.
43. K. K. Suman, T. Kumari, **R. K. Gangwar**, V. S. Gangwar, "Design and Optimization of a Monolithic Thinned Dielectric Superstrate for Performance Enhancement in DRAA." *IEEE Antennas and Wireless Propagation Letter*, 23(6), 1904-1908, **2024**.
44. A.K. Pandey, N. K. Sahu, **R. K. Gangwar**, R. K. Chaudhary, "SIW-Cavity-Backed Wideband Circularly Polarized Antenna Using Modified Split-Ring Slot as a Radiator for mm-Wave IoT Applications." *IEEE Internet of Things Journal*, 11(7), 11793-11799, **2024**.
45. R. K. Yadav, **H. B. Mishra, S. Mukhopadhyay** R. Mishra, "IRS-OTFS System: Design of Reflection Coefficients for low-Complexity ZF Equalizer." *IEEE Transactions on Vehicular Technology*, 99, 1-6, **2024**.
46. M, Cherkasskii, **R. Mondal**, L, Rózsa, "Inertial spin waves in spin spirals." *Physical Review B*, 109(18), 184424, **2024**.
47. R. Rodriguez, M. Cherkasskii, R. Jiang, **R. Mondal**, A. Etesamirad, A. Tossounian, B. A. Ivanov, and I. Barsukov, "Spin Inertia and Auto-Oscillations in Ferromagnets." *Physical Review Letters*, 132(24), 246701, **2024**.

contactor system for capturing CO₂ and process for capturing CO₂ therein”, Patent Application No: 202431032179 dated 23.04.2024.

- **Vivek Bajpai**, Abhipsa Kar, Rajesh Sahoo, “Advanced boring tool assembly with multiple rollers for elongated cylindrical boring operation”, Patent Application No: 202431037149 dated 10.05.2024.
- **Somnath Chattopadhyaya**, Sayan Chatterjee, Jaya Kori, “Development of umbrella like deployable reflector antenna via 3D printing”, Patent Application No: 202431041749 dated 29.05.2024.
- **Tanmay Dutta**, Rahul Ranjan, Devesh kumar, Ram Babu Gupta, “An air cooled thermal management system of lithium ion battery pack using synergistic integration of conduction and convection”, Patent Application No: 202431044685 dated 10.06.2024.
- **Sumanta Kumar Padhi**, Aman Mishra, “A process for the hydrogenation of carbon dioxide (CO₂) to methanol”, Patent Application No: 202431048508 dated 25.06.2024.
- **Sumanta Kumar Padhi**, Aman Mishra, “A process for the preparation of methanol by the hydrogenation of bicarbonate and carbon dioxide (CO₂) captured from air”, Patent Application No: 202431048509 dated 25.06.2024.

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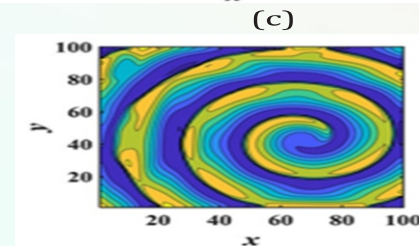
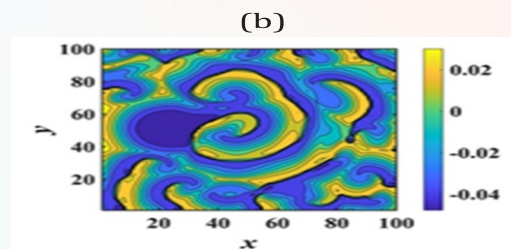
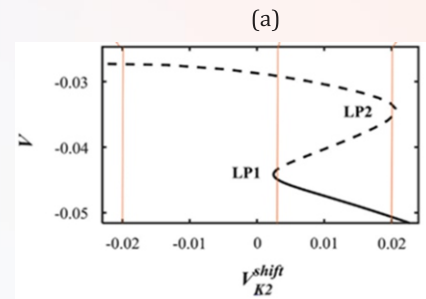
- **Sarat Das, G. C. Nayak**, Surabhi Jain, “A sustainable fiber board material using red mud (bauxite residue) and agricultural biomass”, Patent Application No: 202431041041 dated 27.05.2024.

Major Research output

Prof. R. K. Upadhyay & his team

A model of medicinal leech’s heart (LH) interneuron is considered to describe the dynamics of neurons with a varied range of electrical activities. The crucial insights into the model’s dynamics are explored in three different parameter regimes: phasic spiking, regular spiking, and bursting, based upon the

codimension one bifurcation. The spatiotemporal dynamics of the model are explored by allowing 1D and 2D diffusion in the membrane voltage. The 1D diffusive system produces irregular bursting dynamics for the intermediate value of diffusion coefficients, whereas, at higher values, it shows synchronized oscillations. In the presence of 2D diffusion, the emergence of different types of spiral patterns is observed in the system. Furthermore, the system is extended by incorporating electromagnetic induction in the membrane voltage to explore the effect of induction on the various dynamics of neural model. By varying its intensities, the membrane voltage in the extended model produces a variety of discharge modes, such as periodic spiking, fast-spiking, resting, and spike-adding phenomena. In addition, the emergence of anti-spiral patterns in the extended model near subcritical Hopf bifurcation is analytically verified using the complex Ginzburg-Landau equation (CGLE). These findings demonstrate that the firing patterns vary based on the control parameters, and these variations contribute to our understanding of how the brain system transmits and processes the signals.



LH interneuron model system: (a) The bifurcation diagram of the system where solid black lines signifies stable regions and dotted black lines suggest unstable regions, respectively, (b)-(c) Pattern formations in the model system with EMI with different $D = 15$ and 25.5 respectively.

Prof. Anirban Ghoshal:

Synchronous One Leg Modulation (SOLM) technique has been used for dc Bus Electrolytic Capacitor-less Voltage Source Inverter (VSI) in some recent works. The dc bus in such VSIs has a six-pulse waveform. Existing method of modulating signal generation for SOLM technique utilizes a sector-based selection approach. In this work it is shown through mathematical analysis as well as hardware results that the average pole voltages are same for both Space Vector Pulse Width Modulation (SVPWM) and SOLM. However, the

instantaneous dc bus voltage, modulating signal and instantaneous pole voltage waveforms are different between them. Using this understanding, implementation of SOLM technique as an extension of conventional SVPWM technique is proposed in this work. In this method sector selection to construct the modulating signal is not required, resulting into a simplified process of implementation. SOLM technique also has the advantage of lower switching loss compared to SVPWM technique. However, in SOLM technique the dc bus voltage needs to be varied in magnitude to maintain constant V/f ratio at the output for applications like induction motor drive. In this work, the theoretical understandings are verified via a 1.25 kVA experimental setup used as a variable six-pulse dc bus electrolytic capacitor less VSI for constant V/f

operation of induction motor drive. This technique can be used for efficient operation of Induction motor based solar water pumps

Prof. Vedantham Lakshmi Srinivas:

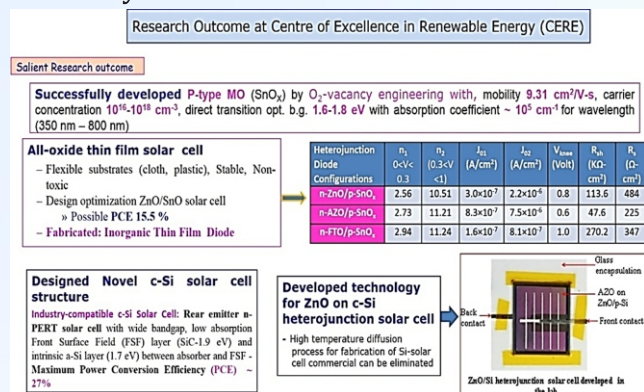
A Model Reference Adaptive System (MRAS) based sensorless speed estimation of PMSG based Wind Energy conversion system integrated with grid. In comparison with the conventional control algorithms, the presented strategy compels the symmetrically balanced grid currents, unity power factor correction, and harmonic mitigation features even with the deviations from nominal conditions in the grid side network. The MRAS based system accurately estimate the speed and rotor position of PMSG. For the extraction of

fundamental component of load current Fourth Order generalized integrator is used. Maximum power extraction from the wind system is achieved by generating proper gating pulses for the Machine side converter. Simulated results show the satisfactory performance of the system in steady state and also under various dynamic operating conditions. The Opal-RT OP4510 simulator-based real-time system performance is tested under manifold operating conditions such as load unbalancing, sudden variation in wind speed, distorted grid voltages, etc. In comparison with the traditional algorithms, these results demonstrate that the grid currents are unequivocally symmetrical even under abnormal grid voltages irrespective of local nonlinear load. Voltage Stabilization Control with Hybrid Renewable Power Sources in DC Microgrid. The rapid rise in renewable power generation, energy storage devices, DC electronic loads, and electric vehicles (EVs) has forced the technical evolvement of the present Microgrid structure from AC to DC. The DC Microgrid (DCMG) can still work with the AC system but with reduced conversion stages and improved reliability and efficiency. A single AC-DC converter connected to the utility can source the DC bus, supporting multiple DC generation to feed both AC and DC loads. This reduces the grid's burden and makes the generation system environment-friendly. The present work demonstrates the detailed control strategy of one such DCMG with a hardware setup working at 600V DC. The sources considered are Solar Photovoltaic System (SPVS), Permanent Magnet Synchronous Generator (PMSG)-based wind energy conversion system, Battery, and utility grid. The proposed DCMG can maintain stable DC bus voltage under various dynamic conditions by balancing the power on either side of the DC bus. The presence of a grid is considered to maintain stable AC voltage and frequency for AC loads. Electric Vehicle Fast Charging Integrated with Hybrid Renewable Sources for Vehicle-to-Grid and Grid-to-Vehicle Operations. The popularity of electric vehicles (EVs) on the road is rising quickly, placing stress on the electrical infrastructure as EV use rises. This research provides a vehicle-to-grid (V2G) power transmission strategy that uses electric

vehicle (EV) battery storage energy coupled to a DC microgrid (DCMG) to alleviate grid stress. Through the use of an innovative energy management design, the DCMG system with the V2G concept performs better overall. A bidirectional DC-DC converter manages the transfer of electricity to and from an EV battery (BDDC). The suggested technique allows for a significant reduction in DC bus voltage fluctuation caused by sudden system changes by including an extra power reference tracking in the outer loop of the BDDC in addition to the voltage reference control. It is noticed that the suggested energy management system maximizes the power harvested from renewable energy sources while maintaining a stable power balance and optimizing the use of renewable energy resources. First, the suggested algorithm is evaluated in a variety of operating modes using a MATLAB®/Simulink model of the DCMG system. Using the WAVECT (WCU300) control interface, an experimental test bed has been created, and the suggested algorithm has been successfully validated under a range of test scenarios.

Prof. Mukul Kumar Das :

The primary challenge in improving the efficiency of thin-film flexible solar PV cells is their weak absorption of longer wavelength photons. Additionally, traditional organic thin-film solar cells face issues with toxicity. A simulation study has proposed an optimized design for inorganic thin-film solar cells, incorporating appropriate light enhancement technologies. By employing a suitable nanowire-based light enhancement technique, a microcrystalline silicon ($\mu\text{c-Si}$) thin-film solar cell can achieve a maximum power conversion efficiency of 21.39%.



Prof. S. K. Raghuwanshi :

1. A Polarization-controlled dispersion tunable module for microwave photonic filter and the implementation of an optoelectronic oscillator and frequency octupling without a band pass filter.
2. An optoelectronic Oscillator (OEO) with a single loop and dual OEO is implemented in optisystem software and realized in an experiment in the microwave photonics lab in IIT(ISM) Dhanbad.
3. A Tunable PS-FBG-based OEO is investigated in a simulation.
4. Optical Sideband Suppression ration (OSSR) and the Side Mod Suppression ratio (SMSR) over a 0.5 km single mode fibre are 38 dB and 55 dB, respectively.
5. A Q factor of 621.11 and phase noise of -112dBc/Hz at 10 kHz offset frequency is measured with the proposed scheme.

Prof. Rajeev Ranjan :

A prototype memristor emulator was successfully fabricated and tested at UMC foundry Belgium, which shows good agreement with the simulation results. Overall, the outcomes contribute to the advancement of memristor technology, spiking signal generation, chaos applications, and low-power VLSI design, with potential implications for neuromorphic computing and communication systems.

Successfully designed, simulated and experimented the meminductor prototype. Its application has been also used to design chaotic oscillators.

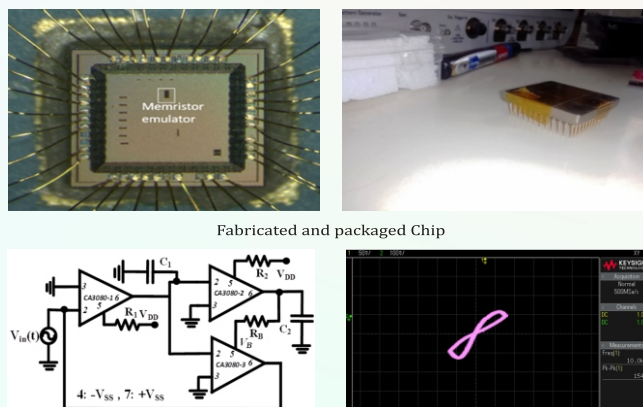


Fig.2: Experimental Prototype and its result

Prof. Ravi Kumar Gangwar :

A low-profile wideband circularly polarized SIW antenna is designed, optimized, and fabricated for the mm-wave 5G-enabled IoT applications. Here, the wideband CP is achieved by loading a modified circular-shaped split-ring slot and four strategically placed metallic shorting vias.

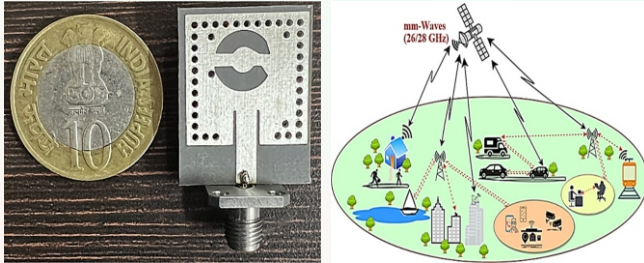


Fig. 1. (a) Fabricated prototype (b) Typical mm-wave 5G network for IoT applications

Prof. Pankaj Jain :

Developed a working prototype of continuous mineral separator. The invention relates to a film concentrator which is used for separation of fine heavy and light material in a flowing film based on their difference in densities. Earlier, only batch type mineral separators were available which had very low capacity and limited industrial applications. The current development is a continuous separator, has high capacity and may be applicable to varieties of ores including, iron ores, PG minerals, gold ore, Beach sands, critical minerals, etc. A patent application for the same is currently under process of being filed jointly by Texmin and IIT (ISM) Dhanbad.

Individual Faculty Achievement

Prof. Vedantham Lakshmi Srinivas

Received ISSS Young Scientist Award 2023: FIRST prize under the Young Scientist Award 2023 category.

Prof. R. K. Upadhyay

Editor –in –Chief, JISST – Journal of Innovation Sciences and Sustainable Technologies, A Make in India Creation (Online) <https://jisst.com/>

Women Faculty Achievers



Prof. Madhulika Gupta, Department of Chemistry and Chemical Biology was nominated by Anusandhan National Research Foundation (ANRF), Ministry of Science and Technology, Govt. of India among 20 women scientists working under AI, health care and energy solutions to represent India in the ASEAN-INDIA Women Scientists Conclave (AIWSC) from 24-26 April 2024 in Singapore, co-organized by Singapore's Agency of Science, Technology and Research (A*Star) with India's Department of Science & Technology and ANRF with the support of the ASEAN Secretariat. The AIWSC aims to share scientific knowledge, strengthen cooperation in science, technology, and innovation for women scientists, broaden their scientific horizons, and facilitate collaborative scientific and innovative activities. The AIWSC included presentations on scientific achievements by women scientists, sharing sessions on overcoming societal expectations from women in STEM, panel discussions, and competition on innovation for selected participants on innovative projects within the scientific themes of the conclave. She was also selected among the 8 women scientists to be invited by High Commission India in Singapore with officials from DST to discuss research opportunities in Singapore on 27th April 2024.



International Visits



Prof. Bobby Antony Department of Physics visited University of Kent, UK during 24th May to 19th June, 2024 under the Royal Society International Exchange project titled “Leptonic collisions with macromolecular systems” in collaboration with Prof. Nigel Mason, OBE. The project will concentrate on developing data for large and complex, molecular systems for which experimental studies are currently not viable but for which data is needed for applications from radiotherapy to study of molecular synthesis on astronomical bodies. During the visit, he delivered a talk on “Progress, Challenges, and Future Prospects in Lepton Collisions and Photoionization of Molecules”.



Prof. Tusharkanti Dey and his PhD student **Mr. Romario Mondal** Department of Physics visited IFW Dresden, Germany during June-July, 2024 as part of the Indo-German Joint Research Collaboration funded by DST, Govt. of India and DAAD German Academic Exchange Service.

Dr. S. K. Padhi, Department of Chemistry and Chemical Biology, visited LUND University during 12th June to 28th June, 2024 Sweden under the STINT, INDIA Initiation Grant funded by



At LUND University, Sweden



At the University of Southern Denmark (SDU), Odense, Denmark.

“The Swedish Foundation for International Cooperation in Research and Higher Education (STINT)” in collaboration with Prof. Ebbe Nordlander. During the visit, the “Electrocatalytic proton and carbon dioxide reduction” using homogeneous catalysts was discussed and the output of the project was decided to be communicated in the international journal of repute. On 26th June 2024, Dr. Padhi delivered an invited talk on “Homogeneous Catalysts in activating HCOOH and CO₂” at the University of Southern Denmark (SDU), Odense, Denmark. The future collaborations on CO₂ reduction were discussed with Prof. Christine Joy Mckenzie, University of Southern Denmark (SDU).



Prof. Sheeja Jagadevan during International Water Association (IWA), held from 18-21 June, 2024 at Palermo, Italy

Prof. Sheeja Jagadevan, Department of Env. Sc. & Engg. has visited and attended the International Conference on Wider-Uptake of Water Resource Recovery from Wastewater Treatment – ICWRR2024 organized by the International Water Association (IWA), held from 18-21 June, 2024 at Palermo, Italy. In this forum, she had an opportunity to present her research findings, entitled “Prospect of Seawater Utilization as a Source of Magnesium for Struvite Synthesis from Distillery Wastewater for Sustainable Resource Recovery”. Apart from listening to very insightful keynote lectures and interesting research undertaken globally, she got an opportunity to

make connections with several European and UK-based research groups working in the area of resource recovery.



During the visit to attend the IWA International Conference in Italy, in June 2024, Prof. Sheeja Jagadevan made several new international contacts for possible collaborations. She also visited few laboratories located in the University of Palermo to have a look at their existing lab facilities, and for possible future research collaborations



Prof Binata Panda, Department of Physics visited the Department of Chemical Physics at Lund University Sweden during 12th June to 22nd June, 2024. During the visit she interacted with Professor in the Department of Chemical Physics as well as Department of Physics to explore possibilities for future collaborations.

Prof. Ajay Suri, Department of Petroleum Engg. has visited Oman for attending and delivering a talk entitled “(SPE-218666-MS) Using Casein Peptone as A Sustainable and Natural Solution for Mitigating Gas Hydrate-induced Flow Assurance Challenges in Natural Gas Pipelines” in SPE conference (International)-Oman Petroleum & Energy Show (OPES), during April-June .

Prof. Sachin Tripathi, Department of Computer Science and Engg. has visited School of Engineering , ZHAW , Zurich , Switzerland and Terraview , Gmbh Company located in Zurich, Switzerland. He has received letters of intents from both the places for signing formal MoUs.



Prof. Saurabh Datta Gupta, Department of Applied Geophysics visited to Pyeongchang, Gangwon-do, South Korea to attend at AOGS 2024 conference during last week of June.

Asia Oceania Geosciences Society (AOGS) was established to promote geosciences and its application for the benefit of humanity, specifically in Asia and Oceania and with an overarching approach to global issues and delivered ongoing research work in Lunar architecture in the AOGS 2024 platform.

He is also working in close collaboration with renowned scientists from PRL/ISRO.



Prof. Rajib Sarkar, Dept. of Civil Engg. and **Prof. Shibayan Sarkar**, Dept. of Mechanical Engg. visited different laboratories of the Faculty of Power and Aeronautical Engineering at Warsaw University of Technology, Poland during 18th to 20th June, 2024. Prof. Rajib Sarkar delivered a lecture on “Seismic Performance of Monopile Foundations of Offshore Wind Turbines in Indian Context”. In this talk, design for suitable monopile foundations for multi-megawatt offshore wind turbines (OWT) for seven Indian coastal regions was presented. Methodology of seismic hazard analysis and evaluation of liquefaction potential were discussed in detail. Next, seismic behaviours of monopile foundations were presented for the expected seismicity of the regions. Further, seismic fragility of OWT for Gujarat coast of India was presented considering 3D finite element modelling.

MoUs Signed



Department of Civil Engineering, IIT(ISM) Dhanbad and M/s. Teree Armee, Reinforced Earth India Pvt. Ltd. had an MoU signed on 6th May, 2024 in the office of the Dean (R&D). This MoU will help mutually for collaborative research work related to real site problems and research internship of our students. Col. Soumendra Banerjee (Retd), the Vice President of M/s. Teree Armee, was present during the MoU. Prof. Sowmiya Chawla, Department of Civil Engineering, is the Faculty Coordinator from IIT(ISM) Dhanbad of this MoU.



An MoU was signed with JSW Cement Ltd., Mumbai by Prof. Sagar Pal on 29th May, 2024 for a collaborative R&D project for the 'Development of polymeric admixture for concrete'.



An MoU was signed between Vista Drone UAV LLC and IIT(ISM) Dhanbad on 3rd June, 2024 for collaborative research on Drone Technology. Prof. Rajeev Upadhyay, Dept. of Petroleum Engineering, is the Faculty Coordinator from IIT(ISM) Dhanbad of this MoU.

An MoU was signed between IIT(ISM) Dhanbad and Ganga Envirotech & Research Laboratory, Lucknow for collaborative research as well as to carry out various water testing as per NABL guidelines. Prof. B. K. Mishra, Dept. of Environmental Science & Engineering, is the Faculty Coordinator from IIT(ISM) Dhanbad of this MoU.

Workshop / Conference / Seminar



- The Department of Mathematics and Computing, IIT (ISM) Dhanbad has organised a National Conference on Modeling Analysis and Simulation (MAS-2024) (comprising the realms of AI, ML, and IoT) during June 28 to June 30, 2024. MAS-2024 is not merely a conference; it is a platform for intellectual exchange, collaboration, and innovation.



It is an opportunity to engage with leading minds, share pioneering ideas, and embark on a collective journey towards unlocking the full potential of the most impactful invention ever witnessed. The relevance lies in its ability to offer insights, test hypotheses, and guide practical applications, contributing to advancements and problem-solving in diverse domains.



- Prof. Nitai Pal, Department of Electrical Engineering, organised a workshop on “Opal-RT Real Time HIL Simulation”, that was held in the Department of Electrical Engineering, IIT (ISM) Dhanbad during 05–06, April 2024 under the R&D project (No. JREDA/2023-24/1046/EE) entitled "Deployment of Smart Portable Off-Grid Hybrid Combined Heat & Power Unit based on Hybrid Energy (Solar and Biomass) for Micro Farming and Small Food Processing Industries Located in Rural Areas of Jharkhand", sponsored by Jharkhand Renewable Energy Development Agency (JREDA), Department of Energy (Govt. of Jharkhand) Ranchi. About 35 participants were benefitted from this program.

The following topics were covered in this workshop:

- 1) Introduction to OPAL-RT.
- 2) Real-Time Simulation Fundamentals with RT-Lab Software.
- 3) Working with Real-Time Simulator (I/Os Configuration) and Hardware-in-the-loop (HIL) Demonstration using OPAL-RT.
- 4) Hands-on practices.

- DST-NGP, Govt. of India sponsored program of Three Weeks Summer School in Geospatial Science and Technology (Level-2)- Geospatial Solutions for the Sustainable Development Goals was organised during 14-06-2024 to 04-07-2024 at IIT (ISM), Dhanbad.



The program was organised by Prof. Srinivas Pasupuleti Department of Civil Engineering as Coordinator and Prof. S. R. Samadder, Department of Environment Science & Engineering, as Co-Coordinator.



- The 60th Yusuf Hamied Chemistry Camp was organized in the IIT (ISM) Dhanbad campus during 07th June 2024 to 9th June 2024 by the



Department of Chemistry and Chemical Biology (CCB) under the aegis of the Royal Society of Chemistry as a part of the 'Inspirational Science Programme'. For this 3-day free residential chemistry camp, 77 students (39 girls and 38 boys) of class IX from around 15 Government schools of Dhanbad and nearby areas were selected for this camp. Head of the Department of CCB, Prof. Parthasarathi Das, and RSC program coordinator, Mrs. Melissa Mendonza, supervised the complete camp activities along with 12 senior and junior research scholars of the Dept. of CCB who volunteered to make the event successful. They guided the school students during the camp sessions which included laboratory experiments, scientific lectures, quizzes, fun chemical experiments, and campus tours.

At the end of this successful 3-day chemistry camp, the students were provided with certificates as well as camp materials like school bags, T-shirts, periodic tables, travel allowance, etc. by the Yusuf Hamied Foundation.

