



# IEEE Joint Control Systems Society-Instrumentation & Measurement Society Kolkata Chapter



## Annual Report 2022 IEEE Joint CSS-IMS Kolkata Chapter Kolkata Section, CS23/IM09 (CH10673)

### Event 1:

**Event Type:** Webinar

**Date:** Jan 07, 2022

**Time:** 6.30pm IST

**Venue:** Cisco WebEx, Virtual Platform

**Lecture Title:** "Operation Technology (OT) Cybersecurity Overview and Case Studies"

**Speaker:** Mr. Debasis Guha, Control Systems Specialist, Petrofac, UAE

**Organized by:** IEEE Joint CSS-IMS Kolkata Chapter

The program started at 6.30pm IST on 7<sup>th</sup> Jan. 2022 with a brief introduction of the event, the members of the organizing team present, and formal welcome to the participants by Munmun Khanra, Secretary of the Chapter. Further, Prof. Kaushik Das Sharma, Chair of IEEE Joint CSS-IMS Kolkata Chapter introduced the speaker to the audience.

The talk focused on the following points:

- Anatomy of cyberattack and types of malware
- IT VS. OT cyberattack
- Details of OT relevant to security like protection structure
- Two case studies on cyberattack in process plants
- Best practices for OT cybersecurity
- Future of OT cybersecurity

The lecture was ended with small interaction/Q&A session between the speaker and the audience followed by the vote of thanks by Munmun Khanra.

### Registration for participation breakup:

IEEE members	Non-IEEE members
52	114



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## Event 2:

**Event Name:** 5 Day Faculty Development Program on "Computational Intelligence in Control, Power and Instrumentation (CICPI)

**Event Type:** Faculty Development Program

**Date:** January 31 to February 04, 2022

**Venue:** Zoom, Virtual Platform

**Organized by:** Department of Electrical & Electronics Engineering Department (EEE), Institute of Engineering & Management (IEM)

Department of Electrical & Electronics Engineering Department (EEE), Institute of Engineering & Management (IEM) has organized a five-day Faculty Development Program (FDP) on "Computational Intelligence in Control, Power and Instrumentation (CICPI) from January 31 to February 04, 2022. The program was technically co-sponsored by IEEE Joint CSS-IMS Kolkata Chapter.

The main aim of this FDP is to focus on the area of Computational intelligence and their application in the field of Power, Control and Instrumentation. The FDP began with energetic & motivating inaugural session with a speech from President Sir and Principal Sir.

Day-1 we have a speech from Dr. Prashant Kumar Tiwari from MNIT, Allahabad who gives a very depth knowledge of electricity market and their applications in Foreign and Indian Market.

Day-2 we learn the implementation of Machine learning in power system from the speech of Dr. Rajib Kumar Mondal from NIT, Patna.

Day-3 gives us the knowledge of optimal placement of distributed generation in the field of power system from the speech of Dr. Partha Kayal from NIT, Silcahr.

Day-4 we have a different taste of knowledge from Dr. Jayati Dey of NIT, Durgapur on the application of Computational intelligence in the field of Control system.

Day-5 we conclude the FDP with a great speech from Dr. Sk.Babar Ali from Alia University on Application of different sensing devices in the field of agriculture field.

The program is finally concluded with a valedictory session and a test on the FDP.

We have set that 80% attendance and 60 % marks in the test is eligible for getting the certificate for this FDP. We had overwhelming response of 112 participants from all over globe and among them 70 participants are eligible for getting the certificate.

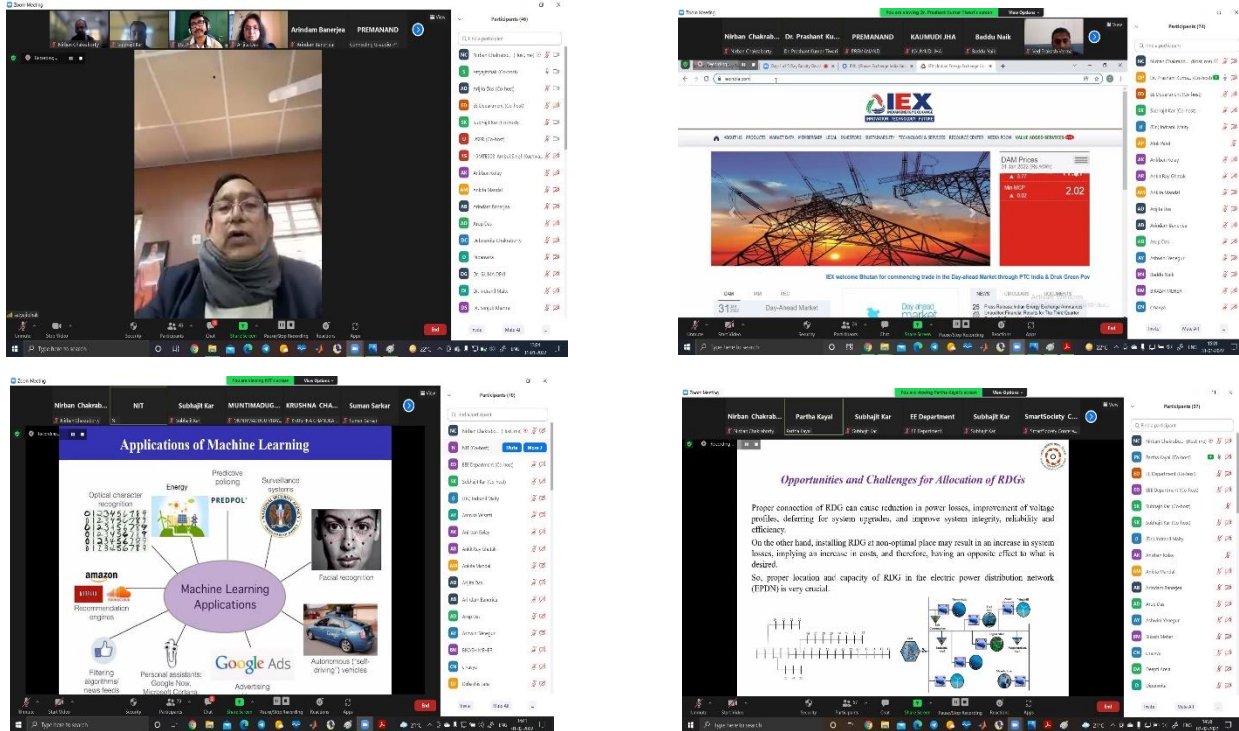


Fig 1 : During the FDP event.

## Event 3:

**Event Name:** Two Day Symposium on Application of Artificial Intelligence in Control, Measurement and Instrumentation

**Event Type:** Seminar

**Date:** 23 and 24 September, 2022

**Venue:** Meghnad Saha Auditorium, University of Calcutta, Rajabazar Campus

**Organized by:** Joint IEEE CSS-IMS Kolkata Chapter

IEEE Joint CSS-IMS Kolkata chapter, in collaboration with the Department of Applied Physics, CU, organized a “Two-Day Symposium on Application of Artificial Intelligence in Control, Measurement and Instrumentation” on 23-24 September 2022. The program was sponsored by IEEE Instrumentation & Measurement Society, USA, and IET (UK) Kolkata LN. The objective of the program was to distribute knowledge about and discuss Artificial Intelligence and its applications

in Control, Measurement, and Instrumentation field among participants. The participants, which included undergraduate, and post-graduate students, researchers, academicians, etc., learned about different tools of artificial intelligence, machine learning tools, and its applications, etc.

The program was arranged with an inaugural session, six technical lectures, and a valedictory session. The inaugural session started at 9:30 a.m. by welcoming the guests on the dais, among them were Prof. Rajarshi Gupta (Head of the Department), Prof. Kaushik Das Sharma, and Prof Amlan Chakrabarti. At first Prof. Gupta gave a welcome address to the audience, and then Prof. Das Sharma and Prof. Chakrabarti gave a speech about the importance of the theme of the symposium. This session ended with a vote of thanks passed by Dr. Binoy Kumar Karmakar, Assistant professor of the Department of Applied Physics.

The first technical session started at 10 am on 23 September 2022 with the lecture by Prof Amlan Chakrabarti and another lecture by Prof Amit Konar from 12 pm. Dr. Hena Ray gave her lecture from 3 pm at the second technical session after the lunch break, which was the last session of the day. On the next day, September 24, 2022, the third technical session started with the talks by Prof. Aurobinda Routray at 10 am. Prof Shubhendu Bhasin was the second speaker of the session and started his talks at 12 pm. The last technical session started at 3 pm when Prof Ananda Shankar Chowdhury presented his lecture. The two-day-long symposium ended with the valedictory session, where participation certificates were distributed among participants by Prof S. Bhasin and Prof A. S. Chowdhury. A brief description of each session is presented below.

## Inaugural session

**Fig 2:** Prof K. Das Sharma is giving a speech in inaugural session.



## Technical Session 1

<b>Lecture title</b>	"Medical Diagnosis using Artificial Intelligence: Techniques, Algorithms and Applications"
<b>Speaker 1</b>	Dr. Amlan Chakrabarti, Professor, University of Calcutta, Kolkata, India
<b>Time</b>	10 am – 12 pm on September 23, 2022

### Discussion Brief

Prof Chakrabarti shared a few of his and his research group's findings on the use of artificial intelligence (AI) in medical diagnostics. He addressed the importance of neural networks (NN) in disease diagnosis. He also highlighted one of his group's most recent achievements, in which they devised a way for diagnosing lung diseases using image processing. In collaboration with Peerless Hospital Kolkata, they created a lung imaging database that may be utilized by academics for future study.

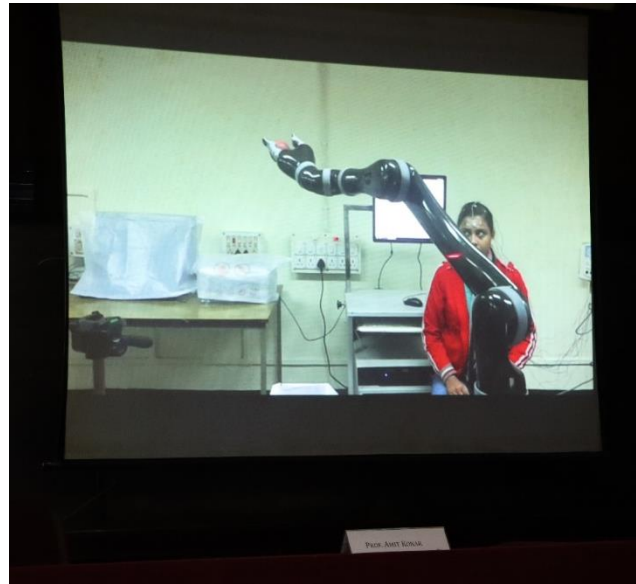
**Fig 3:** Prof Chakrabarti is delivering his lecture.



<b>Lecture title</b>	"Brain-Computer Interfaces for Neuro-motor Rehabilitative Applications"
<b>Speaker 2</b>	Dr. Amit Konar, FNAE, Professor, Jadavpur University, Kolkata, India
<b>Time</b>	12 pm – 2 pm on September 23, 2022
<b>Discussion Brief</b>	The human-machine interface with AI is one of the recent research interests, that can be used for rehabilitation purposes which was the theme of the discussion of Prof A. Konar. In his talk, Prof Konar describes a few works of his research group. He presented two major works, (a) robotic manipulator mobilization reading human brain generated signals and (b) analysis of human brain generated signals during car driving.



**Fig 4:** Human-robot  
interaction  
demonstration  
presented during the  
lecture of Prof Konar.



### Technical Session 2

<b>Lecture title</b>	"Robotics in Agriculture"
<b>Speaker 3</b>	Dr. Hena Ray, Joint Director, C-DAC Kolkata, India
<b>Time</b>	3 pm – 5 pm on September 23, 2022
<b>Discussion Brief</b>	CDAC Kolkata is one of the R&D organization, established and run by the Indian government, working on finding solutions to real-life challenges. From this organization, Dr. H. Ray presented recent developments which are robotic-based products in agriculture. She described the construction and the working of all these products.

**Fig 5:** Dr. Ray is delivering her lecture.



### Technical Session 3

<b>Lecture title</b>	"Human in Loop in Cyber Physical Systems: the monitoring of human subjects and stimuli to enhance the onboard performance"
<b>Speaker 4</b>	Dr. Aurobinda Routray, Professor, IIT Karagpur, India
<b>Time</b>	10 am – 12 pm on September 24, 2022
<b>Discussion Brief</b>	Prof A. Routray shared his knowledge and experience about the application of AI in the biomedical domain. He discussed the measurement of vital signs or human body condition by using wearable and non-wearable devices. The measurement of vital signs can be used to develop products that can monitor human health and mental condition.

**Fig 6:** Prof A. Routray is delivering his lecture.



<b>Lecture title</b>	"Control of Uncertain Constrained Systems: An Adaptive Control Perspective"
<b>Speaker 5</b>	Dr. Shubhendu Bhasin, Professor, IIT Delhi, India
<b>Time</b>	12 pm – 2 pm on September 24, 2022
<b>Discussion Brief</b>	Prof Bhasin gave a lecture on different controller designs. He mainly discussed the basic philosophy of three different controllers, (a) model reference adaptive controller, (b) model predictive controller, and (c) safe reinforcement learning controller. The lecture was arranged with different tutorials to understand the working of those controllers.

**Fig 7:** Prof Bhasin is delivering his lecture.



<b>Technical Session 4</b>	
<b>Lecture title</b>	"Two Seasons of Artificial Intelligence for Pattern Analysis"
<b>Speaker 6</b>	Dr. Ananda Shankar Chowdhury, Professor, Jadavpur University, Kolkata, India
<b>Time</b>	3 pm – 5 pm on September 24, 2022
<b>Discussion Brief</b>	The application of AI in image or video signal processing was the essence of Prof A. S. Chowdhury's lecture. He beautifully described the different neural network techniques with several examples.



**Fig 8:** Prof A. S. Chowdhury is delivering his lecture.



### Valedictory Session

**Fig 9:** A group photo with speakers and participants.



### Attendance / Audience breakup:

IEEE members	Non-IEEE members
27	81

## Event 4:

**Event Name:** Symposium on “Recent Advances in Control System Engineering”

**Event Type:** Webinar

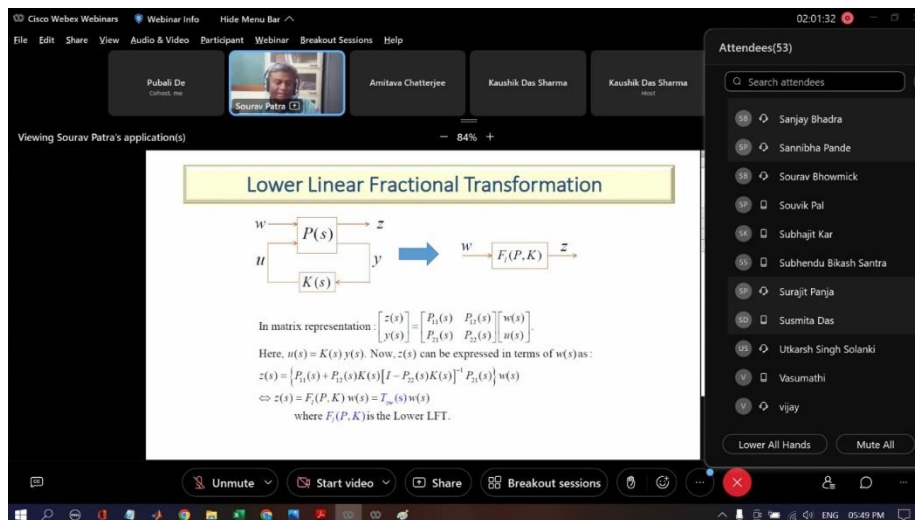
**Date:** 03 December 2022

**Time:** 5 pm IST

**Venue:** Cisco Webex, Virtual Platform

**Organized by:** Joint IEEE CSS-IMS Kolkata Chapter

IEEE Joint CSS-IMS Kolkata Chapter organized a Symposium on “Recent Advances in Control System Engineering” on December 03, 2022. The Symposium was held in ONLINE mode and it comprised two Expert Talks by two very eminent academicians in the domain of Control Theory and Applications. Each Expert Talk was of duration of one and a half hours. At the outset Prof. Kaushik Das Sharma, Chairman, IEEE Joint CSS-IMS Kolkata Chapter, delivered the Inaugural Address. Then Dr. Sourav Patra, Associate Professor, Department of Electrical Engineering, Indian Institute of Technology, Kharagpur, India, delivered his Expert Lecture on “Controller Synthesis with Closed-loop Convex Design Specifications.” In his talk, Dr. Patra primarily focused on how system level synthesis can be used to solve linear controller design problems by formulating the problem at hand entirely in terms of closed-loop convex design specifications. Dr. Patra’s lucid presentation and great explanation skills turned the session into a very lively one, marked by extensive audience interactions in the end.



Lower Linear Fractional Transformation

Block diagram showing a system with input  $w$  and output  $z$ . The system consists of a plant  $P(s)$  and a controller  $K(s)$ . The input  $w$  is fed into the plant  $P(s)$ , and the output  $z$  is fed back through the controller  $K(s)$  to the input of the plant.

In matrix representation  $\begin{bmatrix} z(s) \\ y(s) \end{bmatrix} = \begin{bmatrix} P_1(s) & P_2(s) \\ P_3(s) & P_4(s) \end{bmatrix} \begin{bmatrix} w(s) \\ u(s) \end{bmatrix}$

Here,  $u(s) = K(s)y(s)$ . Now,  $z(s)$  can be expressed in terms of  $w(s)$  as:

$$z(s) = [P_1(s) + P_2(s)K(s)][I - P_3(s)K(s)]^{-1} P_4(s) w(s)$$

$$\Leftrightarrow z(s) = F_1(P, K) w(s) = T_w(s) w(s)$$

where  $F_1(P, K)$  is the Lower LFT.

Attendees(53)

- Sanjay Bhadra
- Sannibha Pande
- Sourav Bhowmick
- Souvik Pal
- Subhagit Kar
- Subhendu Bikash Santra
- Surajit Panja
- Susmita Das
- Utkarsh Singh Solanki
- Vasumathi
- vijay

Fig. 10 Dr. Sourav Patra, during his Expert Talk.

Next, another very active researcher and control theory academician, Dr. Sandip Ghosh, Associate Professor, Dept. of Electrical Engineering, Indian Institute of Technology (BHU) Varanasi, India, delivered his Expert Talk on “Feedback under Structural Constraints: Design and Applications”. He mainly concentrated on the control problem of loop selection when structural restrictions are imposed in the feedback loop for systems with many inputs and many outputs. His session was an equally informative one where he chose an example of vector control in induction motor to demonstrate how control specifications can be designed in robust control framework. This session also concluded with a lively audience interaction and an extensive question-answer session.

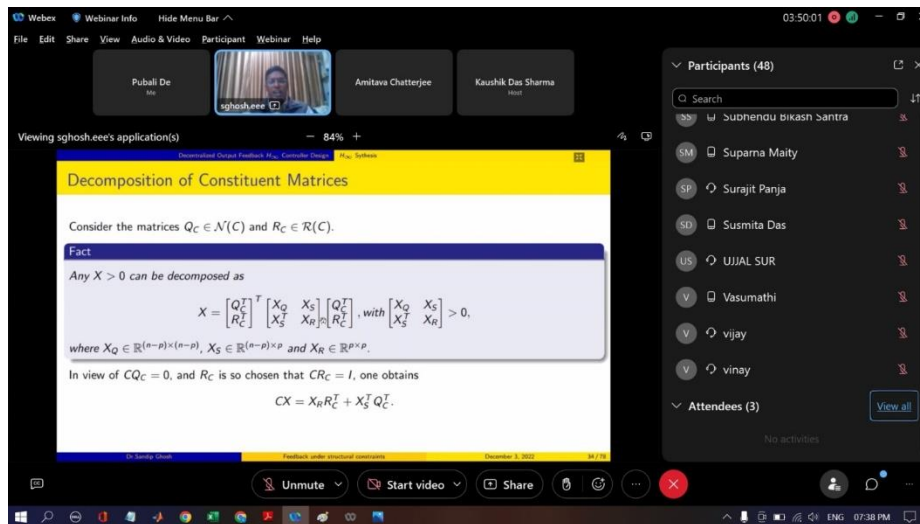


Fig.11: Dr. Sandip Ghosh, during his Expert Talk.

The Symposium came to a conclusion when Prof. Rajarshi Gupta, Immediate Past Chairman, IEEE Joint CSS-IMS Kolkata Chapter, delivered the Vote of Thanks. Initially there were 129 registered participants for this Symposium. Finally, there were 67 participants who attended the Symposium in online out of which 23 were IEEE members and 44 were non-IEEE members. This included 05 IEEE-IMS members and 13 IEEE-CSS members. The audience comprised a large population of enthusiastic undergraduate and graduate students, research scholars, young faculties as well as senior Professors.

#### Attendance / Audience breakup:

IEEE members	Non-IEEE members
23	44

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## Administrative Meeting

- There are **5 executive committee meetings** (ExeCom), and **1 annual general meeting** (AGM) was held from January 01, 2022 till December 31, 2022.
- **Executive Committee Meeting:**
  1. The 1<sup>st</sup> ExCom of 2022 was held on **February 18, 2022**, with Prof. Kaushik Das Sharma in the chair, over Google Meet. The meeting was progressed with the following agenda,
    - i. Confirmation of MOM of last meeting of EXECOM-2021 held on December 17, 2021.
    - ii. New chapter opening proposal by a group of members from Silchar Sub-Section.
    - iii. New event proposals for technical co-sponsorship, if any.
    - iv. Annual program planning of the chapter for the year 2022.
    - v. Miscellaneous, if any.In this meeting total, **10 members** were present.
  2. The 2<sup>nd</sup> ExCom of 2022 was held on **June 01, 2022**, with Prof. Kaushik Das Sharma in the chair, over Google Meet. The meeting was progressed with the following agenda,
    - i. Confirmation of last EXCOM minutes held on February 18, 2022
    - ii. New event proposals for technical co-sponsorship, if any
    - iii. IEEE IMS Chapter Chairs' Summit 2022Miscellaneous if any In this meeting total **8 members** were present.
  3. The 3<sup>rd</sup> ExCom of 2022 was held on **August 26, 2022**, with Prof. Kaushik Das Sharma in the chair, over Google Meet. The meeting was progressed with the following agenda,
    - i. Confirmation of last EXECOM minutes held on June 01, 2022.
    - ii. Upcoming events.
    - iii. New event proposals for technical co-sponsorship, if any.
    - iv. Miscellaneous if any.In this meeting total **8 members** were present.
  4. The 4th ExCom of 2022 was held on **November 08, 2022** with Prof. Kaushik Das Sharma in the chair, over Google Meet. The agenda points of this meeting are,
    - i. Confirmation of the last EXECOM minutes held on August 26, 2022.
    - ii. New event proposals for technical co-sponsorship, if any.
    - iii. SLATE for 2023 EXECOM of IEEE Joint CSS-IMS Kolkata Chapter.

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iv. Miscellaneous if any.

In this meeting total **7 members** were present.

5. The 4th ExCom of 2022 was held on **December 21, 2022** with Prof. Kaushik Das Sharma in the chair, over Google Meet. The agenda points of this meeting are,
- Confirmation of the last EXECOM minutes held on November 08, 2022.
  - New event proposals for technical co-sponsorship, if any.
  - Annual report of the chapter for the year 2022.
  - AGM of the chapter for the year 2023.
  - Miscellaneous, if any.

In this meeting total **9 members** were present.

- **Annual General Meeting:**

1. The 8th AGM of the IEEE Joint CSS-IMS Kolkata Chapter, Kolkata Section, was held on Wednesday, **January 16, 2022** at 6:30 P.M. over Google Meet. The agenda of the meeting was,
  - Confirmation of minutes of last AGM (2021)
  - Confirmation of SLATE of chapter 2022
  - Welcome address by New Chair
  - Activities report of the chapter 2021 and plan for 2022
  - Misc, if any.

A total of **10 members** was present at this meeting.