



REPORT

on

AICTE sponsored One-week

ATAL Faculty Development Programme

**"Sustainability Engineering" on Theme: "Emerging Trends in Mechatronics, Automation and Robotics to save Planet"
from 14th to 18th December'2020**

One-Week ATAL Faculty Development Programmed on **"Sustainability Engineering" on Theme: "Emerging Trends in Mechatronics, Automation and Robotics to save Planet"** sponsored by AICTE was organized at GGITS, Jabalpur From **14th December to 18th December 2020**.

The objective of the FDP was to provide a platform to the researchers and practitioners from both academia as well as industry to meet and share cutting-edge development and recent innovations in Engineering and Technology. This FDP was targeted to enable them to continually evolve themselves to address the developments which are taking place globally. The FDP aimed at providing a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in various fields of Engineering and Technology. The intended audience is students, faculties and other interested people from research, industry and academic institutions.

Owing this global crisis, the academic boosting activities has now been switched to online mode, During this pandemic time "AICTE" has been aiding us with different e-academic activities, through which we can be benefitted to a great extent, abiding rules of Government and inculcating habits of learning in tough times. These initiatives will prepare us to serves effectively in tough times in a long run. Gyan Ganga Group has always been sincere towards following the guidelines for conducting these events. We had used Microsoft Teams application for conduction of ATAL FDP.

**Schedule for AICTE sponsored ATAL FDP on “Sustainability Engineering”
From 14th to 18th December 2020 organized in GGITS, Jabalpur**

Day -1

Time	Day 1: Monday , 14th December 2020
10.45am-11:15am	Inauguration: Welcome Speech by Dr. R.V. Kshirsagar, Principal -GGITS; Chief Guest: Dr. G.L. Garg, Assistant Director-ATAL Cell and Dr. Rajneet Jain, Secretary-Gyan Ganga Group of Institutions.
11:15am-12:45pm	Guest lecture by Prof. Abhay Phansikar, Azilen Technologies on “LoRaWAN: Technology & Applications”
01:00pm-02:30pm	Guest lecture by Prof. Abhay Phansikar, Azilen Technologies on “Applications of Recent Technologies to Automation – Building Environment Friendly Solutions”
03:30pm-05:00pm	Guest Lecture by Dr. B.Satyanarayana, TIFR, on “Sensors and actuators for Robotics, Automation and Mechatronics”

Day -2

Time	Day 2: Tuesday, 15th December 2020
10:30am-12:00pm	Guest Lecture by Prof. Puneet Tandon, IIITDM, Jabalpur, M.P. on “Product development”
12:30pm- 02:00pm	Guest Lecture by Ms. Anushka A. Karira, Life Coach, Counselor & Psychotherapist, Corporate Trainer, Meditation Trainer and Pranic Healer, Nagpur, Maharashtra on “Health and Happiness”
02:30pm-04:00pm	Guest Lecture by Dr. Rajesh Kumar, MNIT, Jaipur on Advance Learning Capabilities for Robotics

Day -3

Time	Day 2: Wednesday, 16th December 2020
10:30am-12:00pm	Guest Lecture by Dr. Agya Mishra, JEC, Jabalpur, M.P. on “Artificial Intelligence based Predictive system Design”
12:30pm- 02:00pm	Guest Lecture by Prof. S. Valai Ganesh, Ramco Institute of Technology, Rajapalyam, Tamil Nadu on “Introduction to firebird v 2560 Robot”
06:00pm-07:30pm	Guest Lecture by Prof. Sanjeev Bedi, NSERC Design Chair and Design Ideas, University of Waterloo, Ontario, Canada on “Using real-world problems for teaching Mechatronics Engineers”

Day -4

Time	Day 2: Thursday, 17th December 2020
10:30am-12:00pm	Guest Lecture by Prof. S. Valai Ganesh, Ramco Institute of Technology, Rajapalyam, Tamil Nadu on “CIROS Virtual Simulation Tool- Lab Session”
12:30pm- 02:00pm	Guest Lecture by Prof. S. Valai Ganesh, Ramco Institute of Technology, Rajapalyam, Tamil Nadu on “ Virtual Lab Session using IITK”
02:30pm-04:00pm	Guest Lecture by Dr. Tushar Kanti Bera Technology (BEAT),National Institute of Technology Durgapur (NITDgp), Durgapur on “ Electrical Impedance Tomography (EIT) Based Characterization of Artificial Skins for Robotics: New Possibilities”

Day -5	
Time	Day 2: Friday, 18th December 2020
10:30am-12:00pm	Guest Lecture by Dr. Parag Kulkarni, Kvinna Ltd on “Reinforcement ML in action for Social Good”
12:30pm- 02:00pm	Guest Lecture by Prof. Vijay Kumar Gupta, IIITDM, Jabalpur, M.P. on “Harvesting Energy from Environment for Various Applications”
02:30pm-03:00pm	Valedictory Session: Feedback by Participants & Vote of Thanks by Dr. Neeta Nathani, Program Coordinator – ATAL FDP

Day 1st: (14th December 2020, Monday)

Inauguration Session:

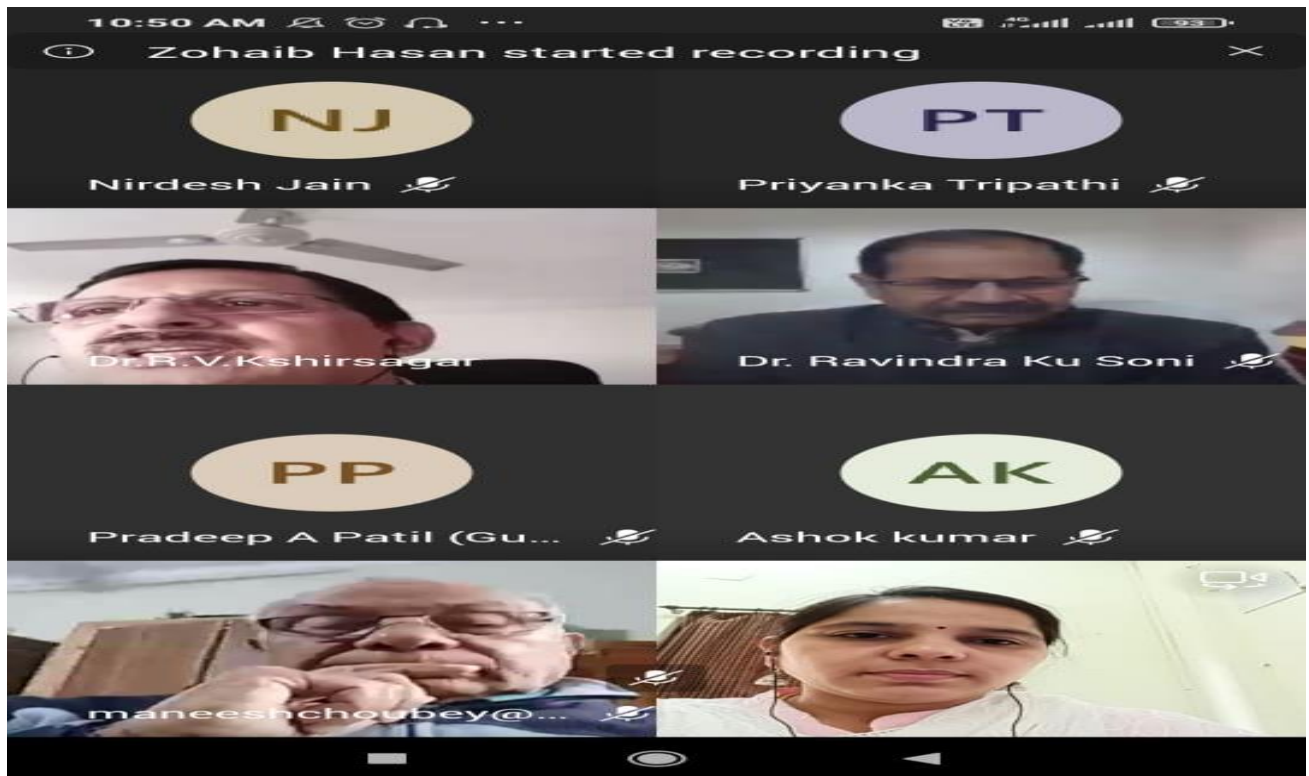
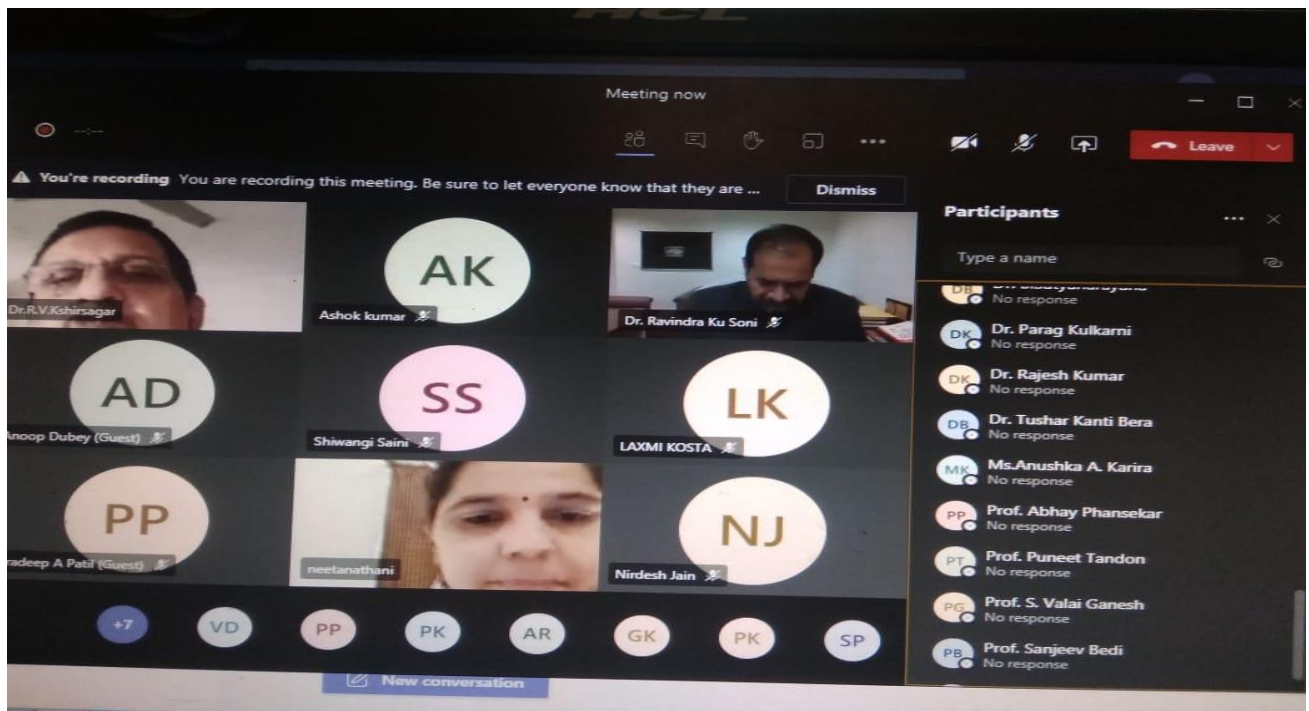
ICIET-20 was inaugurated on 14th December 2020 at 10.45am by Dr. Girdhari Lal Garg,, Assistant Director, ATAL Academy Cell, HQ Delhi in the presence of Dr. Rajneet Jain, Secretary, Gyan Ganga Group of Institutions; Dr. Maneesh Choubey, Group Director, Gyan Ganga Group of Institutions, Dr. R.V. Kshirsagar, Principal GGITS, Dr. Neeta Nathani, HOD EC & Program Coordinator of FDP and all the participants.

Dr. R.V. Kshirsagar welcomed all the dignitaries and delegates. In his welcome speech, he highlighted the importance and objectives of organizing this Faculty Development Program. As conceptual understanding of the various research methods, tools and techniques is an essential prerequisite to conduct empirical research in different areas like management, science, technology etc. Academicians must work hard on industry oriented research to make industry oriented experts. Practical learning is as much important as the theoretical learning is. This is the sole responsibility of the teachers, who transmits their theoretical and practical knowledge to their academic circles and students. So, it is essential to develop an academician that is capable of early identifying the thrust areas of research.

In his inaugural speech, he gave insight regarding various research funding schemes available for researchers and teachers in the departments of Universities with AICTE. He further added that AICTE has provided special benefits to the faculties in various disciplines by funding the research projects to encourage quality research. He emphasized that quality among teachers can be build only through development programs.

Dr. Girdhari Lal Garg, Assistant Director, ATAL Academy Cell, HQ Delhi congratulated the Institution for organizing the FDP and added that these kind of FDPs are beneficial to the faculties and also to the student who are studying in various Institutions. The FDPs will help faculties in enhancing their knowledge and their innovation skills. Dr. Rajneet Jain gave his blessings and extended his good wishes to Organizing Committee, participants and AICTE. He also highlighted the importance and objectives of organizing this ATAL FDP. He gave his thanks and blessings to Dr. R.V. Kshirsagar and Dr. Neeta Nathani for the achievement in such a short span of time and

appreciated him for his contribution in promoting quality management, technical and architectural education in the surroundings.



Technical session was soon followed after inauguration.

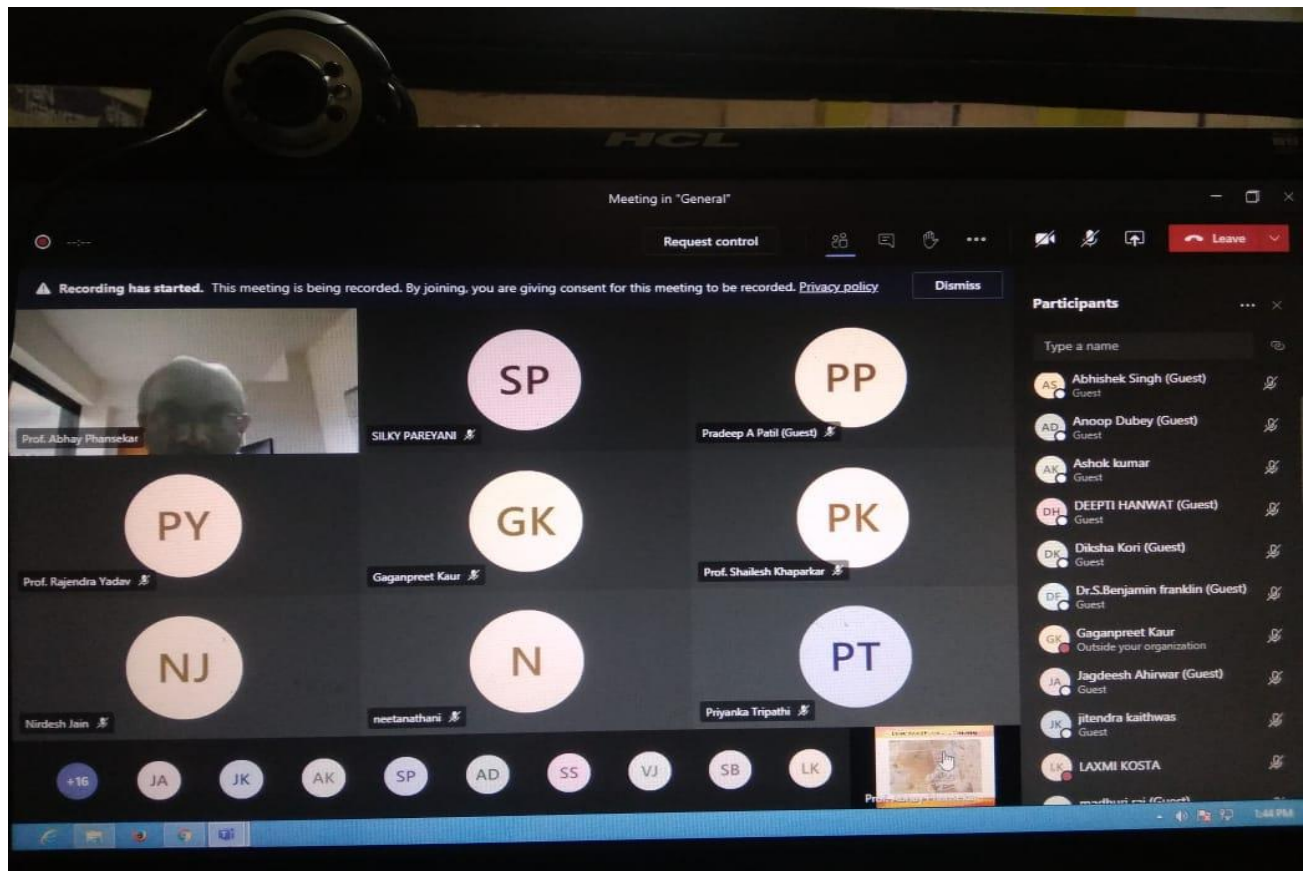
Technical Sessions:

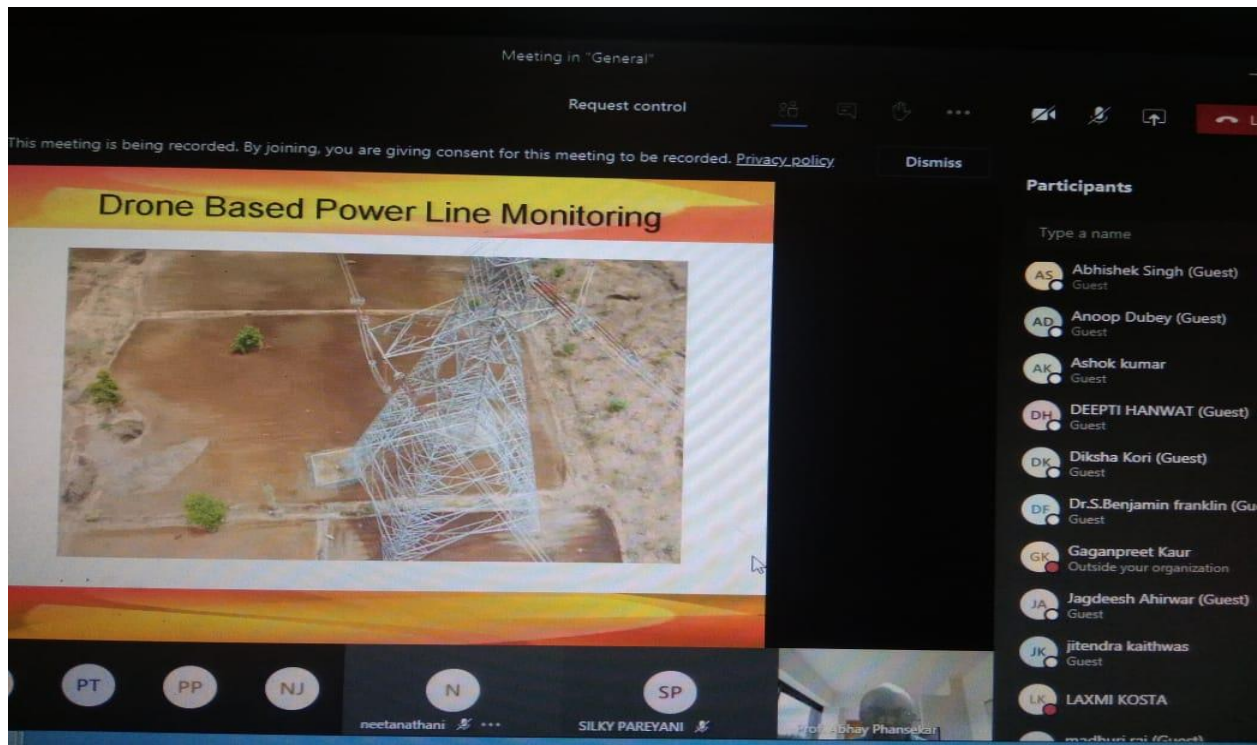
Technical Session 1:

Topic: LoRaWAN: Technology & Applications

Resource Person: Prof. Abhay Phansikar, Azilen Technologies

In the first session, Prof. Abhay Phansikar discussed about the LoRaWAN which is a protocol specification built on top of the Low Range (LoRa) technology developed by the LoRa Alliance. It uses unlicensed radio spectrum in the Industrial, Scientific and Medical (ISM) bands to enable low power, wide area communication between remote sensors and gateways connected to the network. This standards-based approach to building a LPWAN allows for quick set up of public or private IoT networks anywhere using hardware and software that is bi-directionally secure, interoperable and mobile, provides accurate localization. His presentation aimed to fill this gap by analyzing some of the dominant schemes in this area.



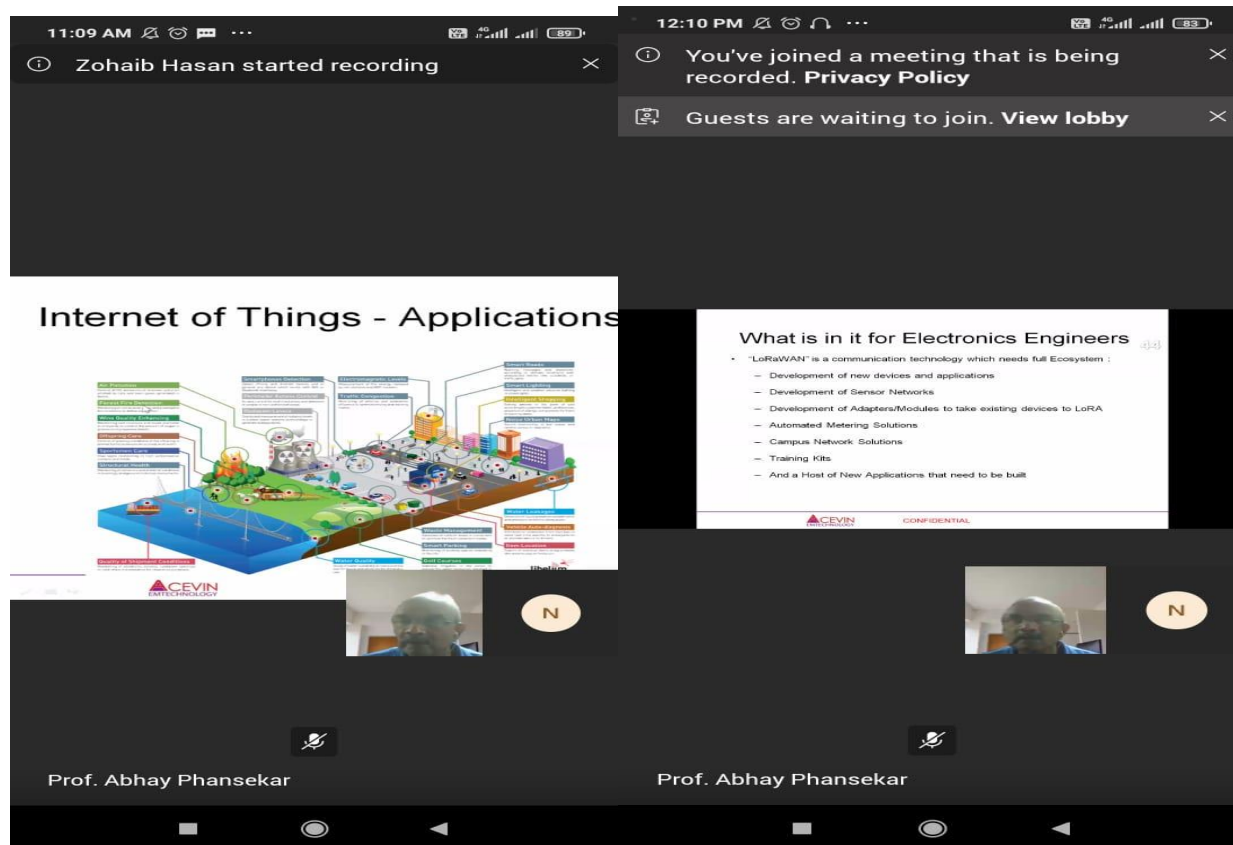


Technical Session 2:

Topic: Application of Recent Technologies to Automation – Building Environment Friendly Solutions.

Resource Person: Prof. Abhay Phansikar, Azilen Technologies

Prof. Abay Phansikar started his discussion an overview of recent theoretical approaches and technologies that respond to the fundamental challenges of modern factory automation. These major methods and technologies are classified into several groups and specially seven of them- namely: vertical integration of factory automation systems; distributed and decentralised control, smart sensors and actuators in factories; networked control systems and wireless sensors and actuators; autonomy and self-organization of factories; advanced sensing for factory automation; semantic models of factories; engineering methods of factory automation systems. He presented his recent research contributions and formulate open technical problems in the domain of modern factory automation

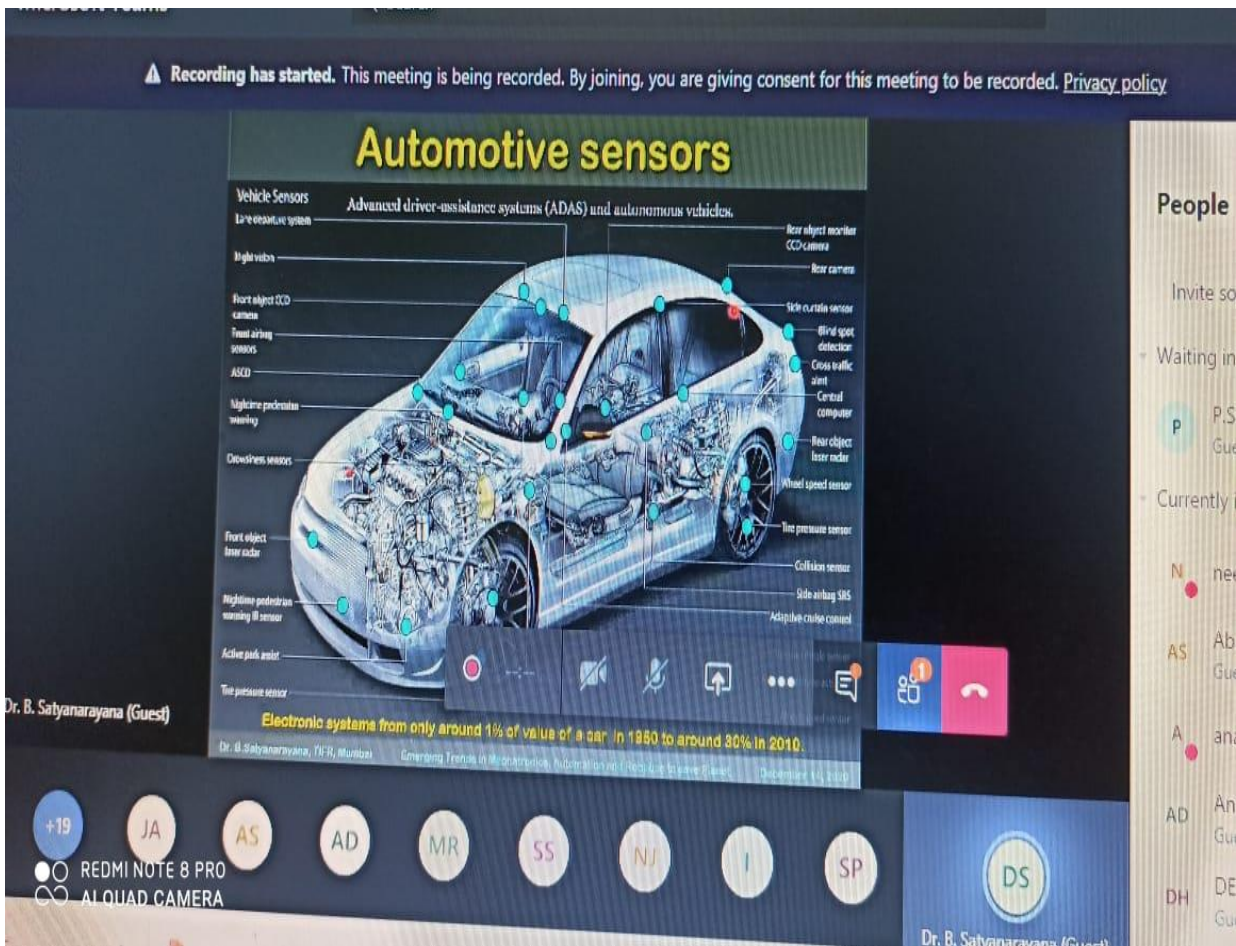
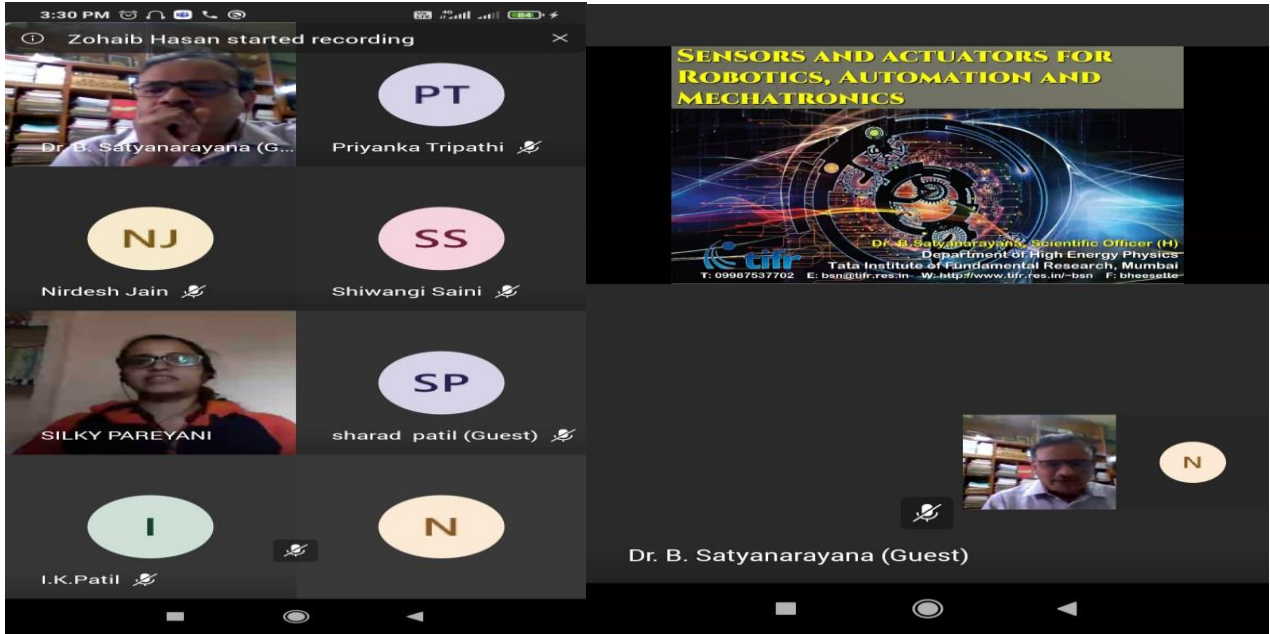


Technical Session 3:

Topic: Sensors and actuators for Robotics, Automation and Mechatronics.

Resource Person: Dr. B.Satyanarayana, TIFR

In this session, Dr. B.Satyanarayana focused on various components that receive less attention in the available literature, such as magnetic sensors, linear and latching solenoid actuators, stepper motors, rotary actuators, and other special magnetic devices including magnetic valves and heart pumps. Each chapter follows a consistent format, working from theory to design, applications, and numerical problems and solutions. Although the crux of the coverage is design and application, the author also discusses optimization and testing, introduces magnetic materials, and shares his enlightened perspective on the social and business aspects of developing world-class technologies. Examples from mainly the automotive industry illustrate the wide variety of mechatronics devices presented. Providing a complete picture from conception to completion, Sensors and Actuators in Mechatronics, its design and applications places critical tools in the hands of any researcher or engineer seeking to develop innovative mechatronic systems.



Day 2nd: (15th December 2020, Tuesday)

Technical Session 4:

Topic: Product Development

Resource Person: Dr. Puneet Tandon IIITDM, Jabalpur, M.P.

Dr. Puneet Tandon described the product development which is the creation of a new or different product that offers innovative new benefits to the end user. This includes both the creation of an entirely new product and modifications to an existing product. These changes or new introductions may be targeting a newly defined customer requirement or a niche category in the market. A product can be defined as a collection of benefits that can be either tangible such as a physical item or intangible such as a service or experience. The new product development process involves two simultaneous activity paths. He focuses on extensive market research and analysis while the other deals with generating ideas, design of the product and detail engineering.





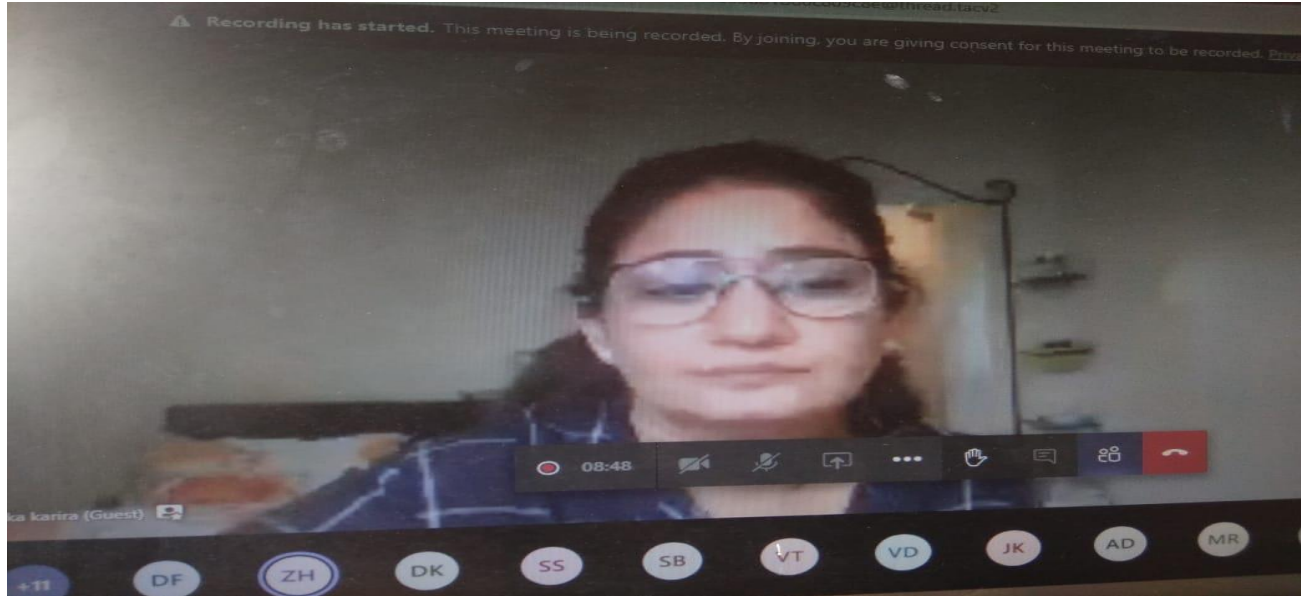
Technical Session 5:

Topic: Health and Happiness

Resource Person: Ms. Anushka A. Karira, Meditation Trainer and Pranic Healer, agpur, Maharashtra.

The resource person of this session, Ms. Anushka A. Karira explained the relationship between happiness and health. She was exploring the possibility that impaired happiness is not only a consequence of ill-health but also a potential contributor to disease risk. Happiness encompasses several constructs, including affective well-being (feelings of joy and pleasure), eudemonic well-being (sense of meaning and purpose in life), and evaluative well-being (life satisfaction). Happiness is generally associated with reduced mortality in prospective observational studies, albeit with several discrepant results. Confounding and reverse causation are major concerns. Associations with morbidity and disease prognosis have also been identified for a limited range of health conditions. The mechanisms potentially linking happiness with health include lifestyle factors, such as physical activity and dietary choice, and biological processes, involving neuroendocrine, inflammatory, and metabolic pathways. Interventions have yet to demonstrate substantial, sustained improvements in subjective well-being or direct impact on physical health outcomes. Nevertheless, this field shows great potential, with the promise of establishing a favorable effect on population health. Happiness and health have been anecdotally linked for quite a while now-"laughter is the best medicine" has

become a cliché for a reason but research backs up what many people have instinctively assumed all along: that happiness and health really are connected, and that one's level of happiness really can impact the level of one's health. Her experiences that induce positive emotion cause negative emotion to dissipate rapidly.. The best therapists do not merely heal damage; they help people identify and build their strengths and their virtues, She stated that the principles of positive psychology can combat these negative states, further increasing the likelihood of health. At the end she said –“There is no true health without happiness”.



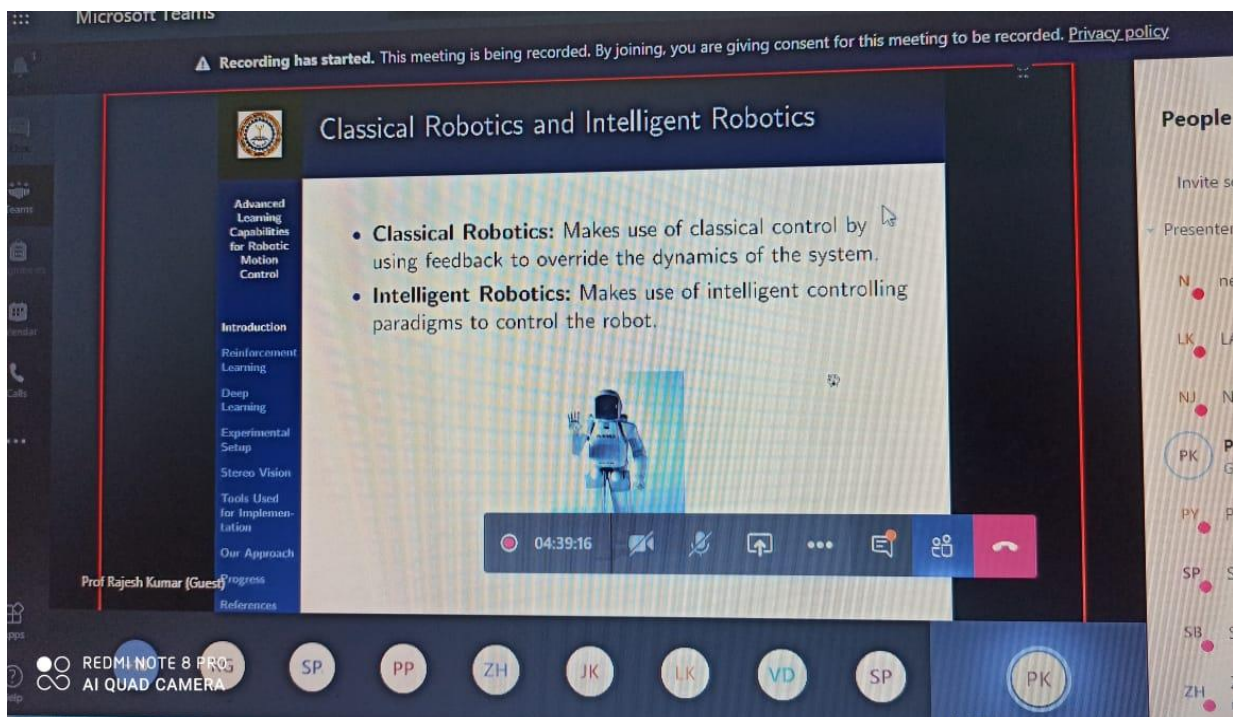
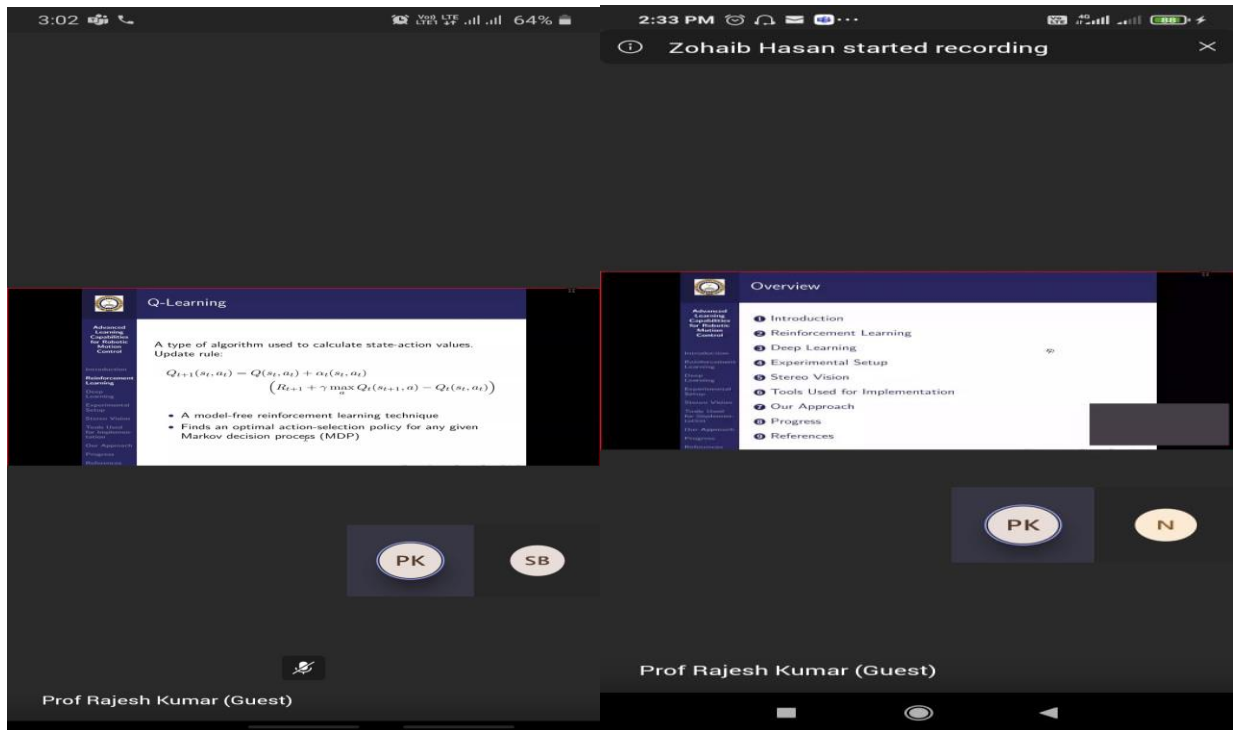
Technical Session 6:

Topic: Advance Learning Capabilities for Robotics

Resource Person: Dr. Rajesh Kumar, MNIT, Jaipur

In this session, Dr. Rajesh Kumar explained the advanced learning capabilities for robotics. He described that robotics is the intersection of science, engineering and technology that produces machines, called robots, that substitute for (or replicate) human actions. Pop culture has always been fascinated with robots. R2-D2. Optimus Prime. Wall-E. Robots are gaining intellectual and mechanical capabilities that don't put the possibility of a R2-D2-like machine out of reach in the future, as technology progresses, so too does the scope of what is considered robotics. In 2005, 90% of all robots could be found assembling cars in automotive factories. These robots consist mainly of mechanical arms tasked with welding or screwing on certain parts of a car. Today, we're seeing an evolved and expanded definition of robotics that includes the development, creation and use of bots that explore Earth's harshest conditions, robots that assist law-enforcement and even robots that assist in almost every facet of healthcare. The robotics industry is still relatively young, but has

already made amazing strides. From the deepest depths of our oceans to the highest heights of outer space, robots can be found performing tasks that humans couldn't dream of achieving. His presentation aimed to fill this gap by analyzing some of the dominant schemes in this area.



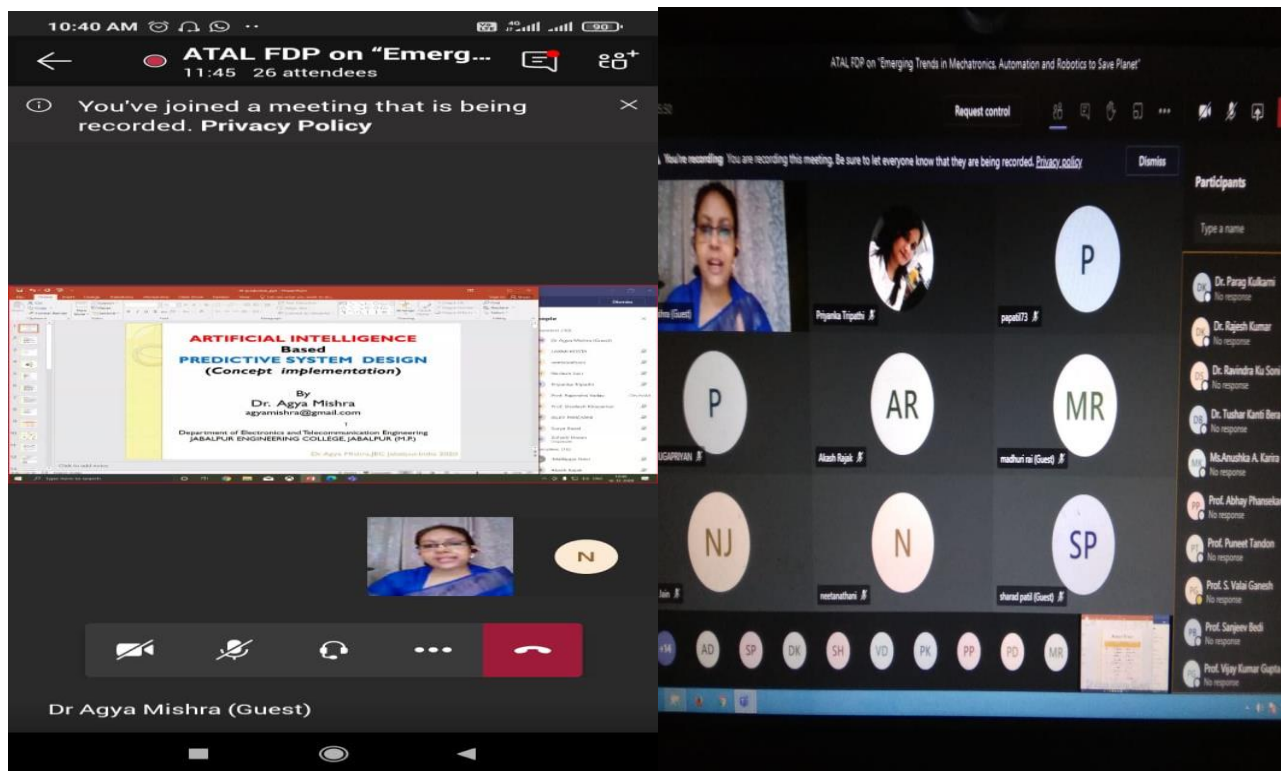
Day 3rd: (16th December 2020, Wednesday)

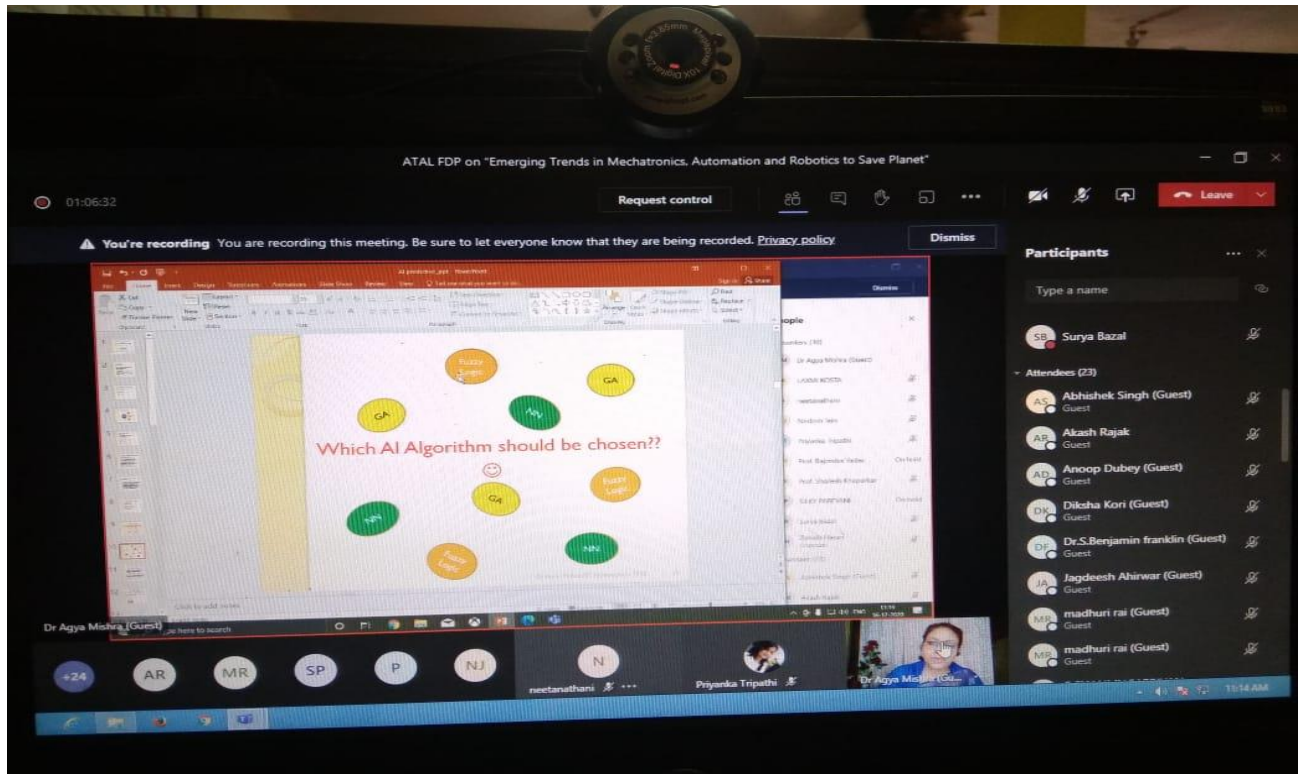
Technical Session 7:

Topic: Artificial Intelligence based Predictive system Design

Resource Person - Dr. Agya Mishra, JEC Jabalpur

In this session, Dr. Agya Mishra described a new approach to intelligent model based predictive control scheme for deriving a complex system. In the control scheme presented, the main problem of the linear model based predictive control theory in dealing with severe nonlinear and time variant systems is thoroughly solved. In fact, this theory could appropriately be improved to a perfect approach for handling all complex systems, provided that they are firstly taken into consideration in line with the outcomes presented. This control scheme is organized based on a multi-fuzzy-based predictive control approach as well as a multi-fuzzy-based predictive model approach, while an intelligent decision mechanism system (IDMS) is used to identify the best fuzzy-based predictive model approach and the corresponding fuzzy-based predictive control approach, at each instant of time. In order to demonstrate the validity of the proposed control scheme, the single linear model based generalized predictive control scheme is used as a benchmark approach.





Technical Session 8:

Topic: Introduction to firebird v 2560 Robot

Resource Person: Prof. S. Valai Ganesh, Ramco Institute of Technology, Rajapalyam

In this session Prof. V. Ganesh elaborated about Firebird v 2560 Robot which helped us get acquainted with the world of robotics and embedded systems, and its innovative architecture and adoption of the 'Open Source Philosophy' in its software and hardware design, we will be able to create and contribute too, complex applications that run on this platform, helping us acquire expertise as you spend more time with them. Firebird V is designed by NEX Robotics and Embedded Real Time Systems lab, CSE IIT Bombay. As a Robotic Research Platform, the Fire Bird V provides an excellent environment for experimentation, algorithm development and testing. Its modular architecture allows us to control it using multiple processors such as 8051, AVR and ARM7 etc. Modular sensor pods can be mounted on the platform as dictated by intended applications. Precision position encoders make it possible to have accurate position control. Platform can be upgraded to tank drive, Hexapod or any other desired form very easily. It is powered by high performance rechargeable NiMH batteries. His presentation was divided into two parts, in part 1 he elaborated the theoretical part where as in part 2 he explained about the programming part. Session contained detailed description and hands-on practice.

Finalschedule for ATAL FDP - val | Join conversation | INTRODUCTION TO FIREBIRD V

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ATAL FACULTY DEVELOPMENT PROGRAMME ON "EMERGING TRENDS IN MECHATRONICS, AUTOMATION AND ROBOTICS TO SAVE PLANET"



INTRODUCTION TO FIREBIRD V 2560 ROBOT



PRESENTED BY
S. VALAI GANESH
ASSISTANT PROFESSOR
DEPARTMENT OF MECHANICAL ENGINEERING
RAMCO INSTITUTE OF TECHNOLOGY



16 DECEMBER 2020

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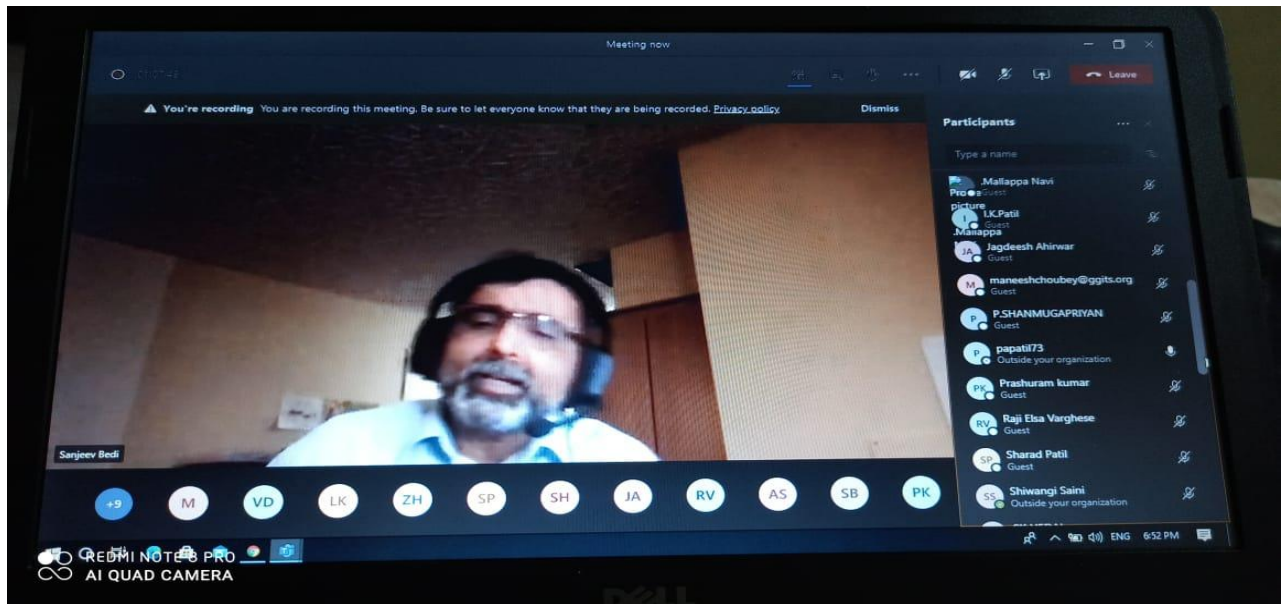
TODAY'S DISCUSSION ↓ KEY POINTS - 1 Introduction to Robotics** - Major Components of a Robot - 2 Introduction to FireBird Platform** - Firebird V 8051 Platform - Firebird V AVR Platform - Firebird V ARM Platform - 3 Introduction to FireBird ATmega-2560** - Platform - Major Components of a Robot - Sensors - Actuators - Control - Intelligence - Power - Communication - Indicating Devices - Block Diagram

Technical Session 9:

Topic: Using real-world problems for teaching Mechatronics Engineers

Resource Person: Prof. Sanjeev Bedi, University of Waterloo, Ontario, Canada

In this session Prof. Sanjeev Bedi discussed about the a small but growing number of institutes offering undergraduate and graduate students opportunities to learn a multidisciplinary, integrated systems approach to engineering, design, and modeling. Mechatronics, the place where mechanics, electronics, and computer science meet, is an increasingly popular discipline at schools whose goal is to turn out scientists capable of working in areas like robotics. He also elaborated about the curriculum which he follows in his workplace (University of Waterloo) specifying the growing demand of Mechatronics in day to day life of people, he gave many live examples which supported his words greatly.

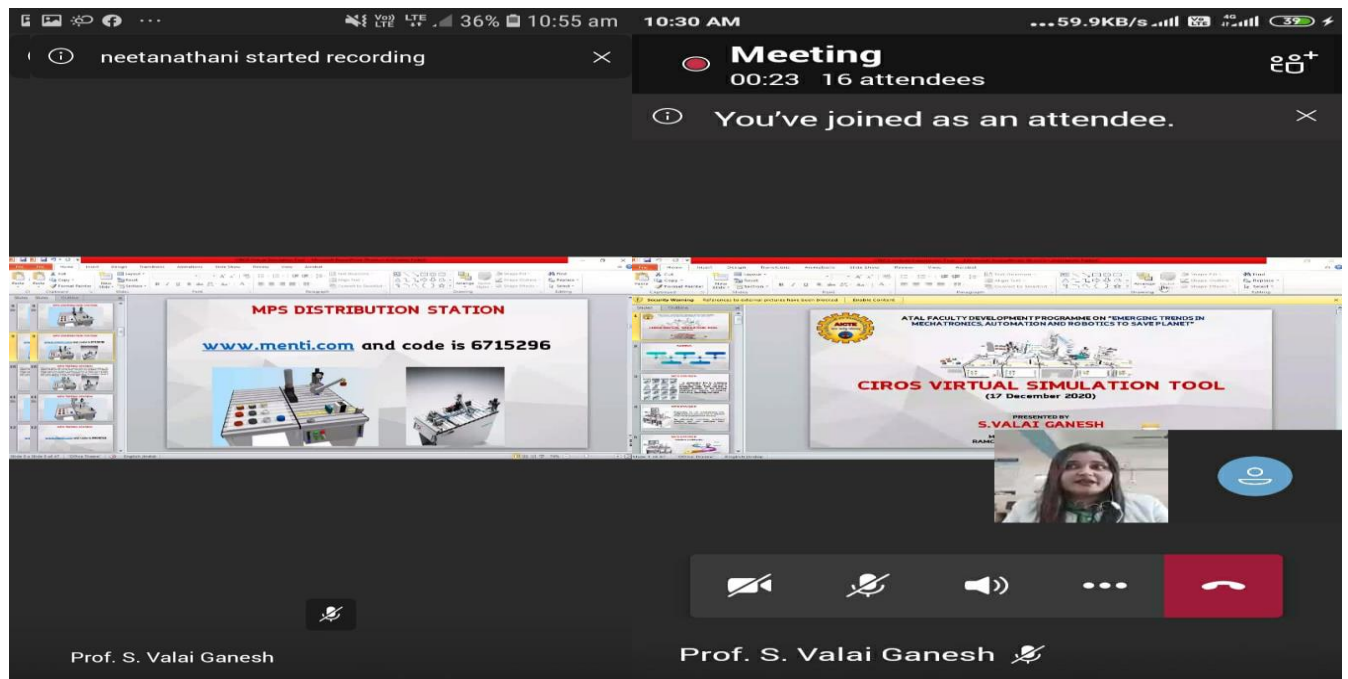


Day 4th: (17th December 2020, Thursday)

Technical Session 10:

Topic: CIROS Virtual Simulation Tool- Lab Session

Resource Person: Prof. S. Valai Ganesh, Ramco Institute of Technology, Rajapalyam



Prof. Valai Ganesh very nicely explained about CIROS® Studio which is the professional tool for creating simulation models. Used by industry, this powerful development platform unites, in one common interface, three essential tools Simulation, Modeling, and Programming. 3D modeling based on standardized import filters for external CAD systems:

- Import filters for STEP, IGES, VRML, and STL
- Basic CAD functions
- Definition of local coordinate systems (Master Frames) for simple relative positioning of objects
- Modeling through parameterization of the geometry, the kinematics, and the material and physical characteristics
- Libraries with industrial robot systems and numerous automation components
- Library with powerful automation mechanisms
- Export filters for DXF, STEP, IGES, VRML, and STL

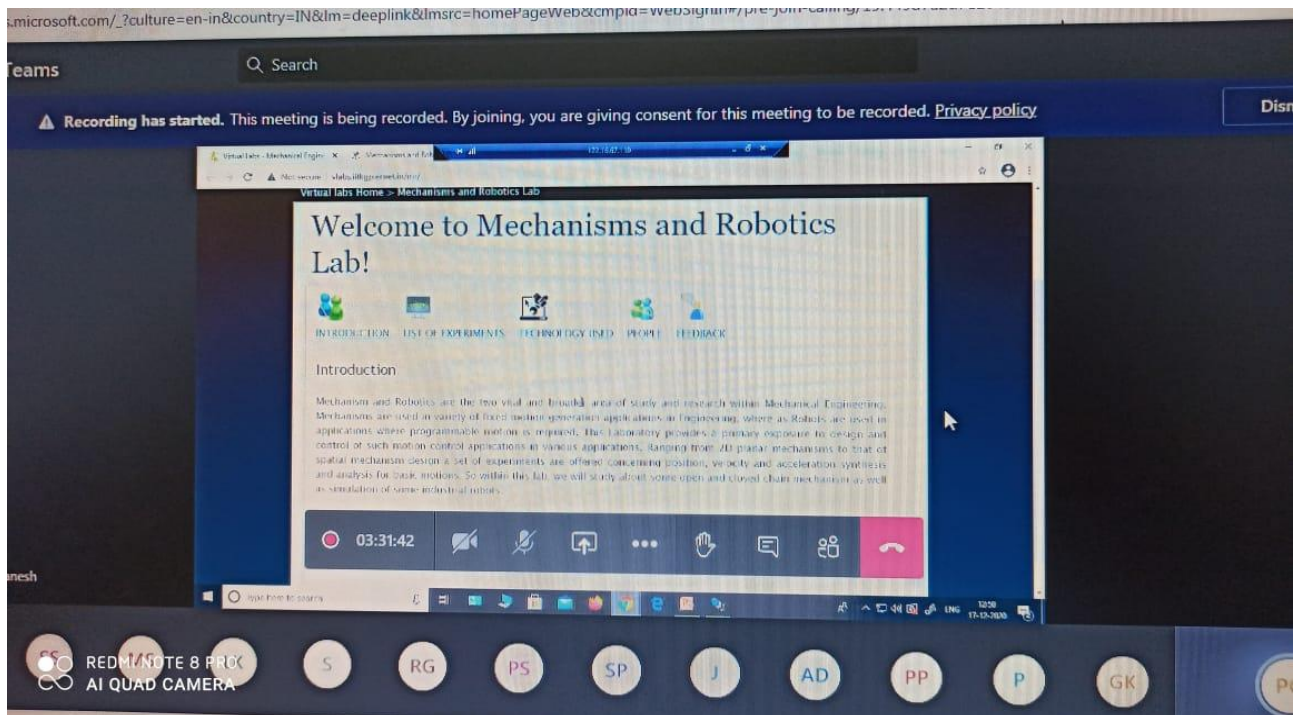
Technical Session 11:

Topic: Virtual Lab Session using IITK

Resource Person: Prof. S. Valai Ganesh, Ramco Institute of Technology, Rajapalyam

Prof. Ganesh continued this session and he explained about Virtual Lab. A virtual laboratory is an on-screen simulator or calculator that helps test ideas and observe results. Learners use advanced technology to perform a series of experiments that yield authentic results. ... Or, they can run code, and, based on results, they can deduce a learning objective. Prof. Valai Ganesh

used “IITK Virtual Laboratory” to elaborate about the virtual lab, owing this pandemic condition these virtual laboratory concept will be aiding us in long run, these Virtual tools not only accomplish the purpose of technical verification but also favoring current scenario of social.

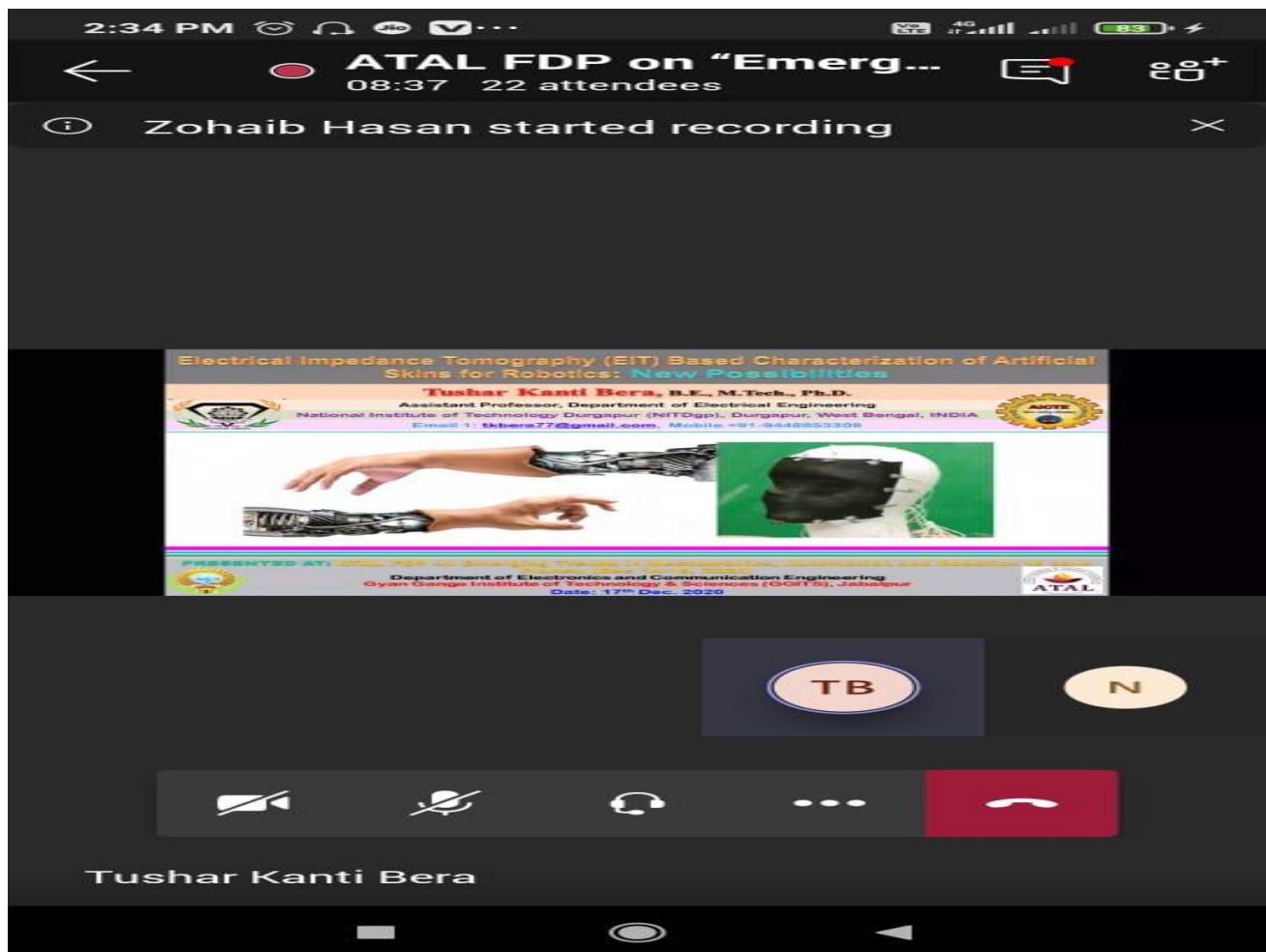


Technical Session 12:

Topic: Electrical Impedance Tomography (EIT) Based Characterization of Artificial Skins for Robotics: New Possibilities

Resource Person: Dr. Tushar Kanti Bera, National Institute of Technology Durgapur, West Bengal

Dr. Tushar elaborated about Electrical impedance tomography (EIT) which is a nondestructive imaging technique used to estimate the internal conductivity distribution of a conductive domain by taking potential measurements only at the domain boundaries. If a thin electrically conductive material that responds to pressure with local changes in conductivity is used as a conductive domain, then EIT can be used to create a large-scale pressure-sensitive artificial skin for robotics applications. This paper presents a review of EIT and its application as a robotics sensitive skin, including EIT excitation and image reconstruction techniques, materials, and skin fabrication techniques. Touch interpretation via EIT-based artificial skins is also reviewed.



Day 5th: (18th December 2020, Friday)

Technical Session 13:

Topic: Reinforcement ML in action for Social Good

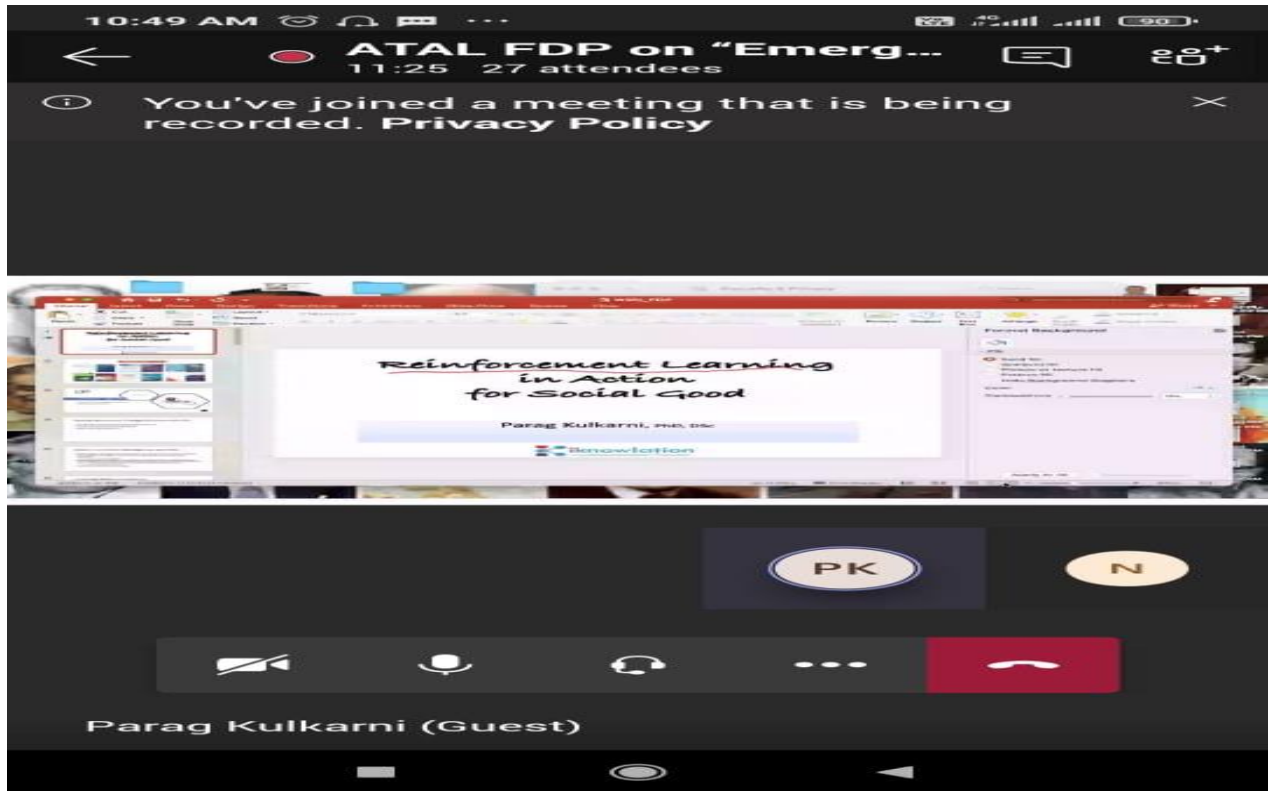
Resource Person: Dr. Parag Kulkarni, Kvinna Ltd.

Dr. Parag discussed about Reinforcement Learning(RL) is a type of machine learning technique that enables an agent to learn in an interactive environment by trial and error using feedback from its own actions and experiences. One can use reinforcement learning for classification problems but it won't be giving, any added benefit and instead slow down your convergence rate. Reinforcement learning is useful when you don't have labeled dataset to learn the correct policy, so you need to develop correct strategy based on the rewards.

Applications of AI and ML for social good includes:

- Forecasting Floods. ...
- Monitoring Marine Life. ...
- Detecting Plant Disease. ...
- Wildlife Conservation. ...
- Preventing Overfishing.
- Predicting Wildfires.
- Advancing Education





Technical Session 14:

Topic: Harvesting Energy from Environment for Various Applications

Resource Person: Prof. Vijay Kumar Gupta, IIITDM, Jabalpur (M.P.)

Dr. Vijay Kumar Gupta discussed about the most widely used energy harvesting devices rely on solar, thermal, RF, and piezoelectric sources of energy. Photovoltaic (PV) or solar cells convert light energy into electricity. Photovoltaic cells have the highest power density and highest power output of the various energy harvesting devices. Energy harvesting is useful as it offers a means of powering electronics where there are no conventional power sources. ... It also opens a lot of new applications in many remote locations, difficult-to-access locations and also underwater where batteries and conventional power are not practical to use.



Valedictory Session:

On the valedictory ceremony of One-Week ATAL Faculty Development Programmed on “Sustainability Engineering” on Theme: “Emerging Trends in Mechatronics, Automation and Robotics to save Planet” sponsored by AICTE was organized at GGITS, Jabalpur on 18th December 2020 using e-platform “Microsoft- Teams” . Dr. Vijay Kumar Gupta Professor-IITDM, Jabalpur joined the session as a Chief Guest along with our Group Director and Dr.

Ravindra V Kshirsagar, Principal, GGITS and HODs of Gyan Ganga Group of Institutions. Initially feedback was given by the participants about the FDP. The assessment test link was shared for the participants which they had to complete and submit within an hour of post of link. The participants were also asked to give feedback in ATAL portal after the valedictory session. Dr. Ravindra V Kshirsagar, welcomed Dr. Vijay Kumar Gupta, Chief Guest of the valedictory ceremony and resource person of the session along with GGITS advisory board, all the dignitaries and delegates present on valedictory session. On this occasion, Dr. Maneesh Choubey, Group Director, GGITS in his address, appreciated Dr. Neeta Nathani, coordinator of this ATAL FDP along with her team, for successful completion of the program. Further, he appreciated the GGITS advisory board for promoting such kind of development programme for the faculties. He also motivated the researchers and faculties about how to keep continuous interest in the research. At the end, the valedictory session was concluded with a vote of thanks given by Dr. Neeta Nathani, HOD-EC and Coordinator of this ATAL FDP in which she paid her gratitude towards all the guests and speakers who spared their valuable time to share their expertise with the participants. She also thanked AICTE and ATAL Cell for giving an opportunity to organize FDP in the Institute.

