Sarvajanik Education Society
Sarvajanik College of Engineering & Technology
Dr. R. K. Desai Marg, Opp. Mission Hospital,
Athwalines, Surat-395001
SUTEX FACULTY OF ELECTRICAL ENGINEERING

AICTE Sponsored Six Days STTP

On

"Digital Signal Controllers for Control of Power Electronic Converters and Applications"

Series-II (1-6 March-2021)

Online Mode

Sarvajanik Education Society

SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY, SURAT

ELECTRICAL ENGINEERING DEPARTMENT

AICTE Sponsored
Six Days Online Short Term Training Program
on

DIGITAL SIGNAL CONTROLLERS FOR CONTROL OF POWER ELECTRONIC CONVERTERS AND APPLICATIONS

Organized by

Department of Electrical Engineering

(NBA Accredited)

Dr. Nilesh V. Shah
Coordinator

Prof. Aditi Hajari
Convener, HOD

Dr. Hiren H. Patel
Principal

Dr. Kalpesh Patil
Co-coordinator

Organising committee:
Prof. Sharad Patel, Prof. Hemin Motiwala, Prof. Krishna Vakharia, Prof. Dimple Bhanabhagvanwala

Series-I (14th –19th December-2020) **Series-II (1st –6th March-2021)**

Chief Patron
Shri Kamlesh Yagnik
Chairman, Sarvajanik Education Society

Patrons
Shri Yatish Parekh,
Chairman's Representative, SCET
Dr. Hiren H. Patel, Principal, SCET

Convener
Prof. Aditi Hajari, Head of Department, EED

Coordinator
Dr. Nilesh V. Shah, Associate Professor, EED

Co-coordinator
Dr. Kalpesh Patil, Assistant Professor, EED

Organizing Committee
Prof. Sharad Patel, Associate Professor, EED
Prof. Dimple Bhanabhgwanwala, Assist. Prof., EED
Prof. Krishna Vakharia, Assistant Professor, EED
Prof. Hemin Motiwala, Assistant Professor, EED

Program Monitoring Committee:

1) Dr. Hiren H. Patel, Principal, SCET (Chair Person)
2) Dr. Nilesh V. Shah, Associate Professor, EED, SCET (Program coordinator, Member Secretary)
3) Prof. Aditi Hajari, HOD, EED, SCET (Convener, Member)
4) Dr. Utpal T. Pandya, Professor and Head, Instrumentation and Control Engg. Dept., SCET (Member)
5) Dr. Shabbir Bohra, Professor, EED, SCET (Subject Expert, Member)

Programme Objective: Various applications in the field of power electronics and drives, renewable energy integration to grid, power quality conditioner, Electrical vehicles, instrumentation, automation system, biomedical equipments, communication, image processing etc. are developed using advanced digital signal processors/Microcontrollers. In this context it is of utmost importance to create expertise in this area to not only solve the software/hardware issues related to this applications but to also explore some new areas where these controllers can provide better control or can provide extra feature. Major objective of this short term training program (STTP) is to train the faculties for recent development in Digital Signal Processors/Microcontrollers Architecture, programming and controlling power electronic converters using Digital Signal Controller (DSC) for various applications. This training is also intended to help the researchers and the students to implement and validate their theoretical, analytical or simulation concepts of their research, especially for the domain of power electronics.

Relevance: In most of the UG/PG courses, there is subject of DSP/Microcontroller. Also, for research in the domains such as power electronics and drives, renewable energy integration to grid, active power conditioners, FACTs devices, biomedical Instrumentation, automation system etc. the implementation of the research project requires sound knowledge of some intelligent controller like DSP/Microcontroller. Thus, the knowledge of DSP/Microcontroller programming and its application are unavoidable. Hence, the STTP is designed to disseminate the knowledge about DSP/Microcontroller architecture, programming, and designing through interactive sessions and the hands-on training.

Benefit to Faculty: Faculties teaching the subjects related to DSP/Microcontroller can be benefitted by enhancing/sharing their knowledge through the interaction with the experts in the domain. The STTP can also be useful in guiding research scholar developing applications using DSP/Microcontroller. Faculty can be able to set new experiments in the field of controlling power electronic converters using DSP/Microcontroller.

COURSE CONTENT:

- Recent development in Digital Signal Controllers, architecture, peripherals and programming.
- Control of power electronic converters using digital signal controllers: DSP, ARM Microcontroller, DSPACE.
- Control of Power Electronic converters using DSC for recent applications like renewable energy sources integration with grid, power quality conditioners, distributed generation system, electrical vehicle, electrical drives.

Expected Outcome:

After the successful completion of the STTP, the participants can

- design, develop and debug software using Digital Signal Controller for power electronic converters
- develop embedded system/product using DSC
- develop experiments based on DSC for power electronics as well as other subjects
- validate analytical/simulation results of the research works using DSC based hardware
- Conduct workshop/STTP/FDP for the students, researchers, faculties and/or industries.

Programme Schedule (Series-II):

Day & Date	Session Time	Name of Expert and Affiliation	Topic
1-3-2021 Monday	9:00 – 10:00 AM		Registration and Inauguration
	10:00-11:30 AM	Dr. Kaushik Basu IISC, Bengaluru	Embedded Controllers for Power Electronic Converters
	11:45 AM-1:30 PM	Dr. Pramod Agarwal Professor, IIT, Roorkee	Microprocessor/Microcontroller Based Control of Converters
	2:00 PM- 4:00 PM	Er. Ketan Patel Edutech Learning Solutions Pvt. Ltd., Vadodara	Introduction to C2000 DSP Architecture, Features, Peripherals Programming DSP28335 using code composer studio
	4:00 PM -5:45 PM	Dr. Bhim singh, Professor, IIT, Delhi	Control of Power Electronic Converters for Wind Energy Conversion and Integration With Grid
2-3-2021 Tuesday	9:30-11:30 AM	Er. Ketan Patel Edutech Learning Solutions Pvt. Ltd., Vadodara	Control of Induction Motor/BLDC Motor using DSP28335, related peripherals programming and demonstration
	11:45 AM-1:45 PM	Prof. Janak Patel SVNIT, Surat	Introduction to STM32 (ARM CORTEX M4) Microcontroller, Features, Peripherals
	2:15-4:00 PM	Prof. Jasmin Patel Dr. S. & S. S. Ghandhy college of Engg. & Tech., Surat	Programming STM32 (ARM Cortex- M4) Microcontroller, demo of peripheral programming
3-3-2021 Wednesday	9:30-11:30 AM	Dr. P. N. Tekwani Professor, Nirma University, Ahmedabad	Multi-level Inverter and Converters: their Control and Applications
	11:45 AM-1:30 PM	Dr. Nilesh V. Shah SCET, Surat	Global Peak Power Point Tracking in a Photovoltaic System Operating under Uniform and Non-uniform Insolation Conditions
	2:15-4:00 PM	Dr. M. A. Mulla SVNIT, Surat	Laboratory Experimentation of VSC-based FACTS Controller.
	4:00 PM -5:45 PM	Dr. Nilesh V. Shah, SCET, EED, Surat	Multifunctional Grid Interactive Photovoltaic System Operating under Uniform and Non-uniform Insolation Conditions

Day & Date	Session Time	Name of Expert and Affiliation	Topic
4-3-2021 Thursday	10:00-11:45 AM	Prof. Jasmin Patel Dr. S & S. S. Gandhy Engineering College, Surat	Programming STM32 (ARM Cortex- M4) Microcontroller, demo of peripheral programming
	11:45 AM-1:45 PM	Prof. Janak Patel SVNIT, Surat	Design and Development of High Speed Data Acquisition Card using STM32 Microcontroller (Lab demo)
	2:15-3:45 PM	Engineers From Dynafusion, Bengaluru	Rapid Control Prototyping – MicroLabBox Demo: ACMC Kit with Motor Control Applications
5-3-2021 Friday	10:00-11:45 AM	Dr. Dipankar Debnath IIT, Kharagpur	Motors, Motor Controller and Battery Charger for EV Application
	11:45 AM-1:45 PM	Dr. Krishna Vasudevan Professor, IIT, Madras	Control of Inverters for Grid Connected Photovoltaic Systems
	2:15-3:45 PM	Engineers From Dynafusion, Bengaluru	dSPACE Solution for Generic topology-oriented Modelling: Electrical Power Systems Simulation Demo: Electrical Power Systems Simulation
6-3-2021 Saturday	10:00-11:45 AM	Dr. V. K. Shah ABB, Vadodara	Digitalisation in Electrical Power Systems- Evolutionary Trend
	11:45 AM- 1:45 PM	Dr. Pramod Agarwal Professor, IIT, Roorkee	Microprocessor/Microcontroller Based Control of Voltage Source Inverter
	2:15-4:00 PM	Dr. Sabharaj Arya SVNIT, Surat	Design and Control of Custom Power Devices
	4:00-5:00 PM		Valedictory & Test

RESOURCE PERSONS (Series-II):

The resource persons invited for Series-II of STTP are from IISC, IIT, NIT, other reputed institutions and industry as well as from the host institute as listed below:

Dr. KaushikBasu, IISC, Bengaluru
Dr. Pramod Agarwal, Professor, IIT, Roorkee
Dr. Bhim singh, Professor, IIT, Delhi
Dr. Dipankar Debnath, IIT, Kharagpur
Dr. Pramod Agarwal, Professor, IIT, Roorkee
Dr. Krishna Vasudevan, IIT, Madras
Dr. V. K. Shah, ABB, Vadodara
Er. Ketan Patel, Edutech Learning Solutions Pvt. Ltd., Vadodara
Dr. P. N. Tekwani, Nirma University, Ahmedabad
Prof. Janak Patel, SVNIT, Surat
Dr. M. A. Mulla, SVNIT, Surat
Dr. SabharajArya, SVNIT, Surat
Prof. J. M. Patel, Dr. S. & S. S. Ghandhy college of Engg. & Tech., Surat
Dr. Nilesh V. Shah, SCET, Surat
Engineers from Dynafusion, Bengaluru

Total Number of Registration (Series-II):

We had received 92 registrations for series –II. Based on the completion of the STTP and Test conducted by Programme Monitoring Committee, 44 participants have successfully completed the STTP Series-II. The list of participants of series-II who had successfully completed the STTP is mentioned below:

Sr. No.	Registr-ation ID	Name of Participant	Name of Institute	E-mail ID
1	DSC201	Dr. Alok Jain	Pandit Deendayal Energy University(PDPU), Gandhinagar	ALOK.JAIN@SOT.PDPU.AC.IN
2	DSC202	Mr. Ashish Dhirubhai Joshi	GEC,DAHOD	Joshiashish22@yahoo.co.in
3	DSC204	Mrs. Bhumika L. Pambhar	Babaria Institute of Technology	bhumikapambhar.ee@bitseducampus.ac.in
4	DSC205	Mr. Chekuri Murali	Sagi Rama Krishnam Raju Engineering college, Chinnamiram, Bhimavaram	chmvsraju@gmail.com
5	DSC206	Mr. Dennis Thomas	AMAL JYOTHI COLLEGE OF ENGINEERING, KANJIRAPPALLY, KERALA	dennisthomas@amaljyothi.ac.in
6	DSC208	Mr. Dhaval A. Patel	Shri S'ad Vidya Mandal Institute of Technology, Bharuch	iddhaval@gmail.com
7	DSC209	Mr. Dhaval Yogeshbhai Raval	Atmiya University, Rajkot	dhavalraval004@gmail.com
8	DSC211	Dr. Bindeshwar Singh	Kamla Nehru Institute of Technology, Sultanpur	bindeshwar.singh2025@gmail.com
9	DSC212	Dr. Prasanna Kumar S C	R. V. College of Engineering, Bengaluru	prasannakumar@rvce.edu.in
10	DSC213	Mrs. Garima Kothari	Narnarayan Shastri Institute of Technology, Jetalpur	kothari.garima@gmail.com
11	DSC216	Dr. Hemantaraj M. Kelagadi	KLE Technological University, Hubli	hmkelagadi@bvb.edu
12	DSC218	Mrs. J. Uma Maheswari	Kamaraj College of Engineering and Technology, Madurai	anishmakilan@gmail.com
13	DSC219	Mr. Jignesh S Patel	G H Patel College of Engineering and Technology, V.V. Nagar	jigneshpatel@gcet.ac.in
14	DSC220	Mr. Kashyap Mukesh Gandhi	Tolani F G Polytechnic - Adipur	kashyapeee@gmail.com
15	DSC221	Mr.Katanguri Ajith	Kakatiya Institute of Technology & Science, Warangal	akreddy.eee@kitsw.ac.in
16	DSC222	Mr. Keyur Kinariwala	GANPAT UNIVERSITY, Mehsana	krk01@ganpatuniversity.ac.in
17	DSC223	Mrs. M. Vigneswari	Kamaraj College of Engineering and Technology, S. P. G. C. Nagar, K. Vellakulam	vigneswarieie@gmail.com
18	DSC224	Mr. Manan Desai	Dr. Subhash Technical Campus, Junagadh	manand@drsubhashtech.edu.in
19	DSC225	Mr. Maulik J. Shah	CSPIT, CHARUSAT, Changa	maulikshah.ee@charusat.ac.in
20	DSC227	Ms. Monika Gupta	Babaria Institute of Technology,Vadodara	monikagupta.ee@bitseducampus.ac.in
21	DSC228	Mr. Mujahidmahedi Mirchiwala	Parul Uiversity, Waghodia	mujahidmahedi.mirchiwala@paruluniversity.ac.in
22	DSC229	Mrs. Mukur Gupta	Vivekananda Institute of Technology, Jaipur	gupta.mukur@vitj.ac.in
23	DSC230	Mr. Munjal Kamalbhai Bhatt	Shantilal Shah Engineering College, Bhavnagar	munjalbhatt2410@gmail.com

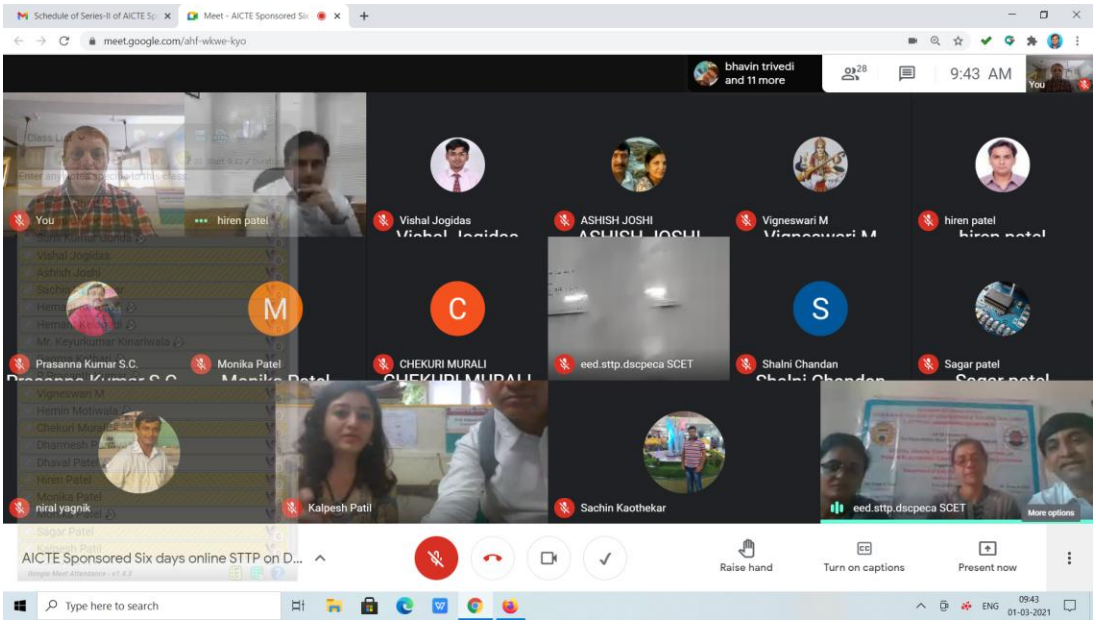
Sr. No.	Registr-ation ID	Name of Participant	Name of Institute	E-mail ID
24	DSC232	Mr. Niral Yagnesh Yagnik	Atmiya Institute of Technology & Science, Rajkot	niralyagnik@gmail.com
25	DSC233	Mrs. Parul Dhavalkumar Oza	Sal Engineering and Technical Institute, Ahmedabad	parul.oza@sal.edu.in
26	DSC234	Mr. Dharmesh Jagdishchandra Pandya	Atmiya University,Rajkot	djpandya@gmail.com
27	DSC235	Ms. Monika Devrajbhai Patel	Atmiya University,Rajkot	monikapatel1985@gmail.com
28	DSC236	Mr. Pirmahammad Jamalbhai Vasovala	Parul University, Vaghodia, Vadodara	pjvasovala@gmail.com
29	DSC237	Mr. Prabhakar Ramesh Holambe	College of Engineering Pune (CoEP), Pune	hpr18.elec@coep.ac.in
30	DSC238	Mr. Punit Sompura	Babaria Institute of Technology, Vadodara	punitsompura.ee@bitseducampus.ac.in
31	DSC239	Mr. R Anil Kumar	Gokaraju Rangaraju Institute of Engineering and Technology, Nizampet, Kukatpally	anil.rajagiri301@gmail.com
32	DSC242	Ms. S. Kavitha	Kamaraj College of Engineering and Technology, S. P. G. C. Nagar, K. Vellakulam	kavisuresh90@gmail.com
33	DSC244	Mr. Saifee K Kanjetawala	Babaria Institute of Technology, Vadodara	saifeekanjetawala.ee@bitseducampus.ac.in
34	DSC245	Ms. Shalni Chandan	AMIETE, Delhi	shalni.ipu@gmail.com
35	DSC246	Mrs. Shilpa Kunal Patel	L. E. College, Morbi	shilpa5185@gmail.com
36	DSC247	Mr. Shukla Abhay	Ganpat University, Kherva, Mehsana	shuklaabhay473@gmail.com
37	DSC249	Mr. Sunilkumar Gunda	Kakatiya Institute of Technology and Science, Warangal	gsk.eee@kitsw.ac.in
38	DSC250	Mr. T. Viswanathan	Kumaraguru College of Technology,Chinnavedampatti	viswanathan.t.eee@kct.ac.in
39	DSC251	Mr. Bhavin Satyendra Trivedi	GIDC Degree Engineering College, Navsari	bhavin.trivedi1190@gmail.com
40	DSC252	Dr. Vijaya Sanjay Rajguru	College of Engineering Pune, Pune	vsr.elec@coep.ac.in
41	DSC253	Mr. Vishal N. Jogidas	Dr. Subject Technical Campus, Junagadh	vishalj@drsubhashtech.edu.in
42	DSC254	Mr. Jatinkumar Jagamohandas Patel	G H Patel College of Engg. & Technology, Vallabh Vidyanagar	jatinpatel@gcet.ac.in
43	DSC256	Mr. Bhavik Arvindbhai Brahmbhatt	Government Engineering College, Modasa	bhavik0072009@gmail.com
44	DSC258	Mr. Chirag Lalit Bafna	PES'S Modern College of Engineering, Pune-05	bafnachirag773@gmail.com

Details of Day-wise session of STTP (Series-II)

Day-1 (Monday) (1st March-2021)

The first day of the STTP started with the inauguration ceremony headed by MOC Prof. Dimple Bhanabhagwanwala and Prof. Krishna Vakharia, Assistant Professors of Electrical Engineering Department, SCET. By offering warm welcome to the participants and guests present in the inauguration ceremony, Dr. Nilesh V. Shah, Associate Professor, Program Coordinator of the STTP presented brief introduction about the program objective, relevance, content of the STTP and expert speakers chosen for the STTP. Followed by brief introduction about the program, Dr. Hiren Patel, Principal, SCET has briefed participants about the organization SCET, one of the oldest self finance engineering college in Gujarat and its contribution in teaching-learning process in the engineering and technology in the region. Dr. Patel motivated participants to take benefit of the STTP by actively participating in the sessions. Finally, Prof. Aditi Hajari, Convenor, HOD of Electrical Engineering Department has given vote of thanks to AICTE for giving permission for organizing the STTP; Principal SCET, Management, Technical and Non-technical teams associated in organizing the STTP as well as participants for showing their interest in the STTP.

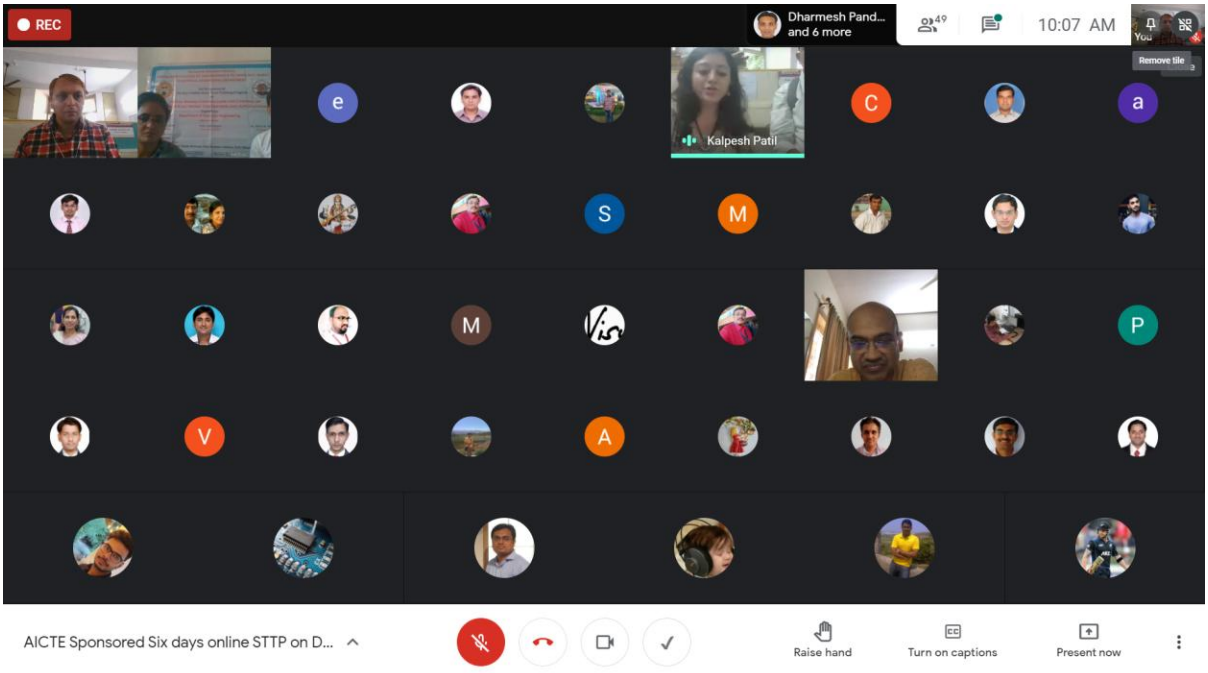
STTP Team

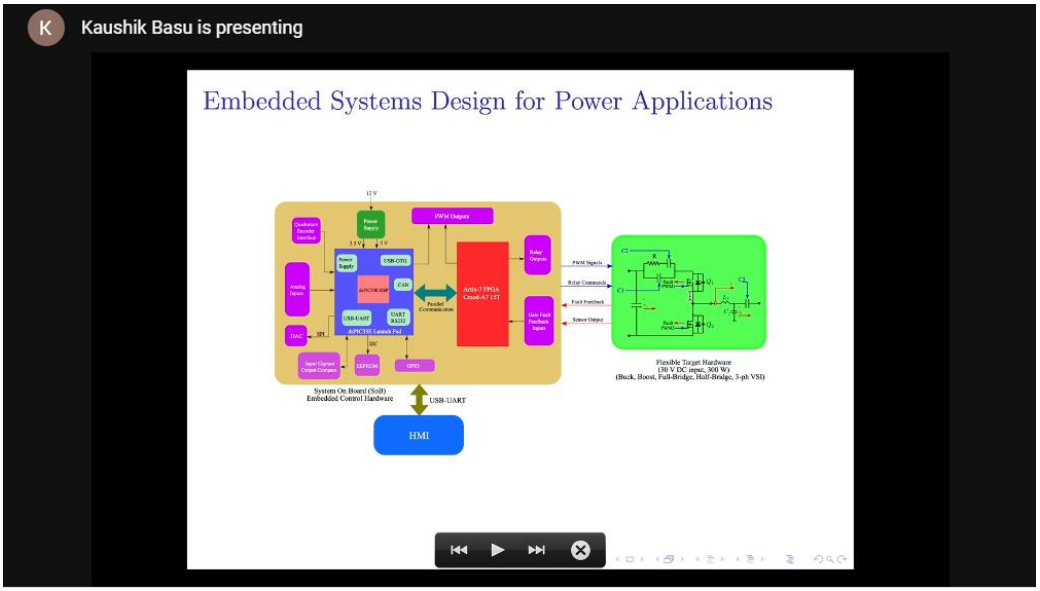


Glimpse of Inauguration on 1st March-2021

Day-I Session-I

The STTP started with first keynote session on “Embedded Controllers for Control of Power Electronic Converters” delivered by Dr. Kaushik Basu, IISC bengaluru. Dr. Basu explained about different types of controllers like DSP, Microcontroller, FPGA and their major features. The need for these controllers for control of various power electronics converters applications was well elaborated by Dr. Basu. His talk charged participants about the overall STTP theme and need for learning such topics. Participants had enjoyed the session and appreciated the queries addressed by Dr. Basu.

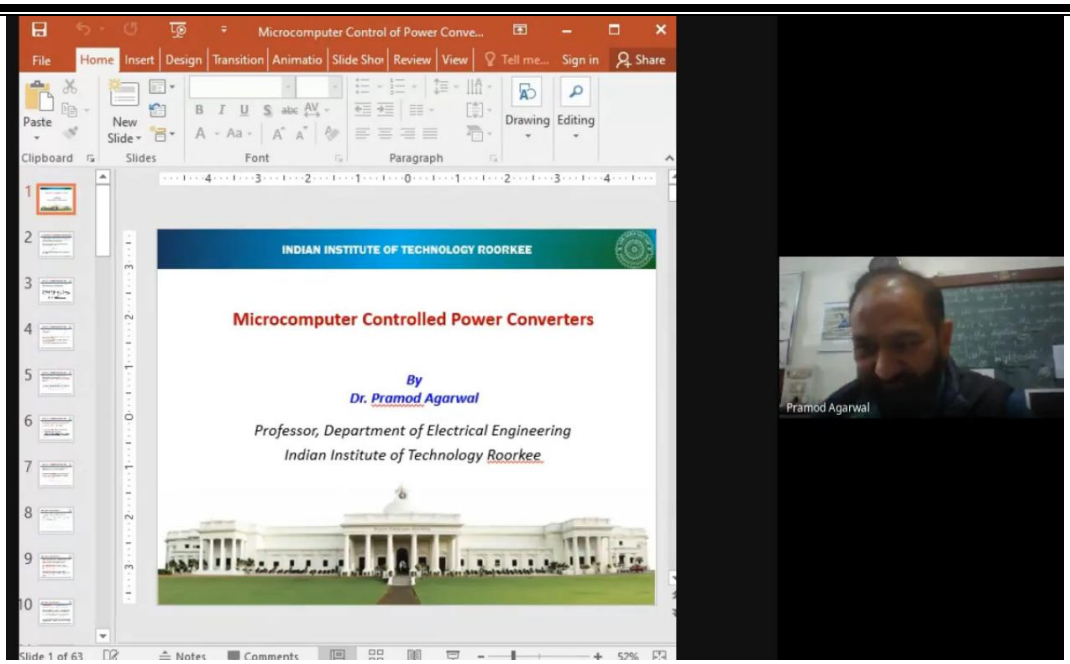


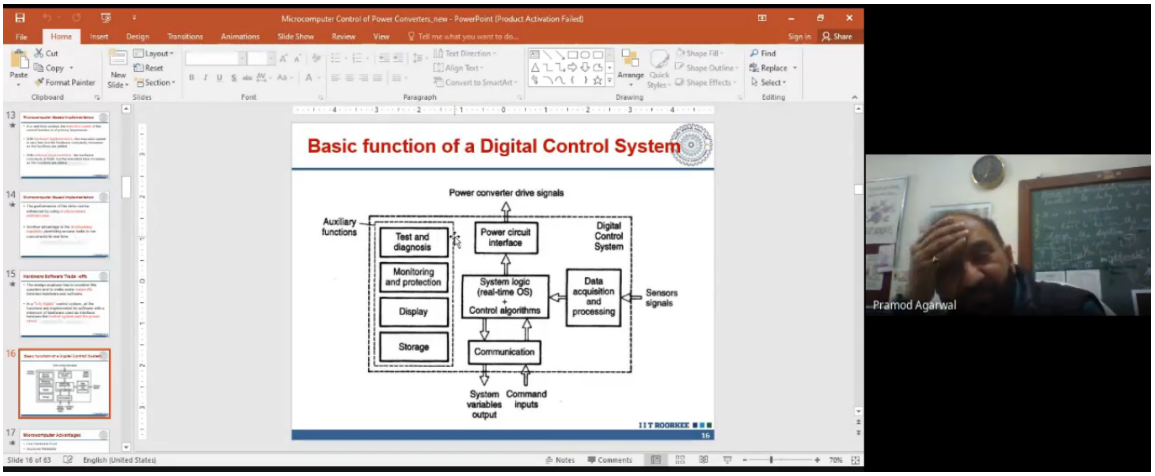


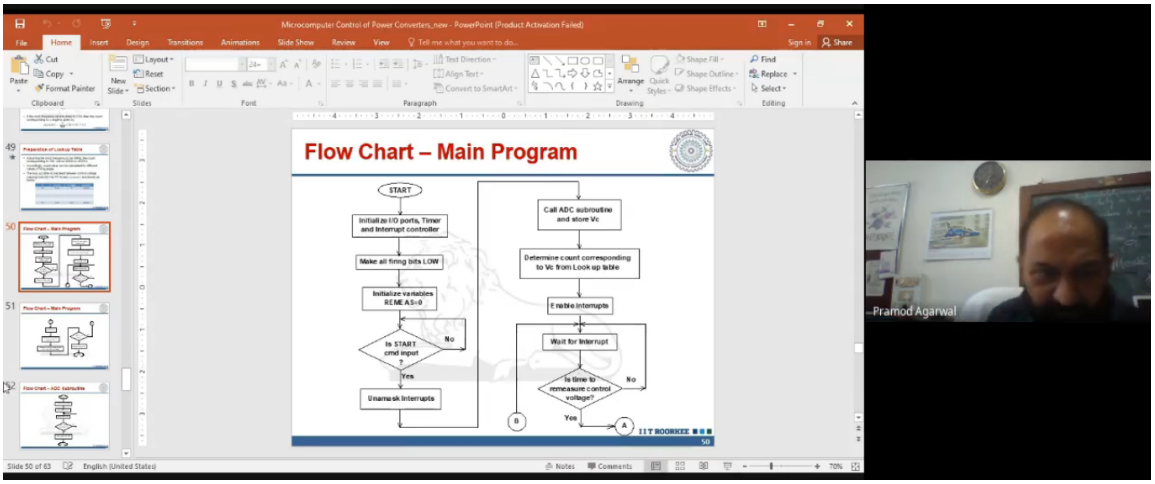
Glimpse of Day-1 session-I by Dr. Kaushik Basu, IISC Bengaluru

Day 1 Session-II

On day-1, session-II was delivered by Prof. Pramod Agarwal form IIT, Roorkee on “Microprocessor/Microcontroller Based Control of Converters”. Dr. Agarwal had explained about control algorithm implementation using microprocessor for controlled rectifier in detail. He had also discussed about the protection features for the converter incorporated in the implementation of the algorithm. The need of ZCD circuit and use of times and interrupt of microprocessor for control of converter was well elaborated by Dr. Agarwal.





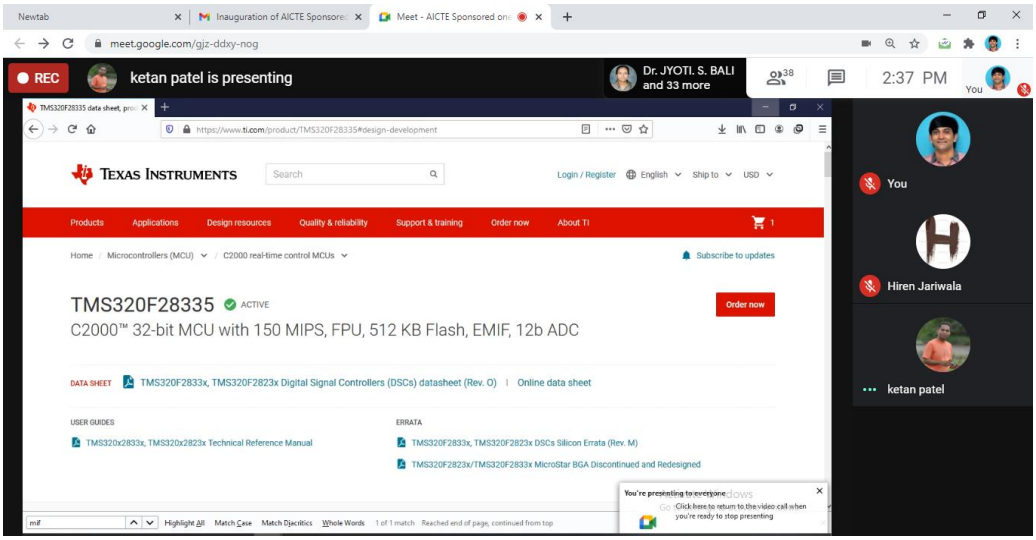


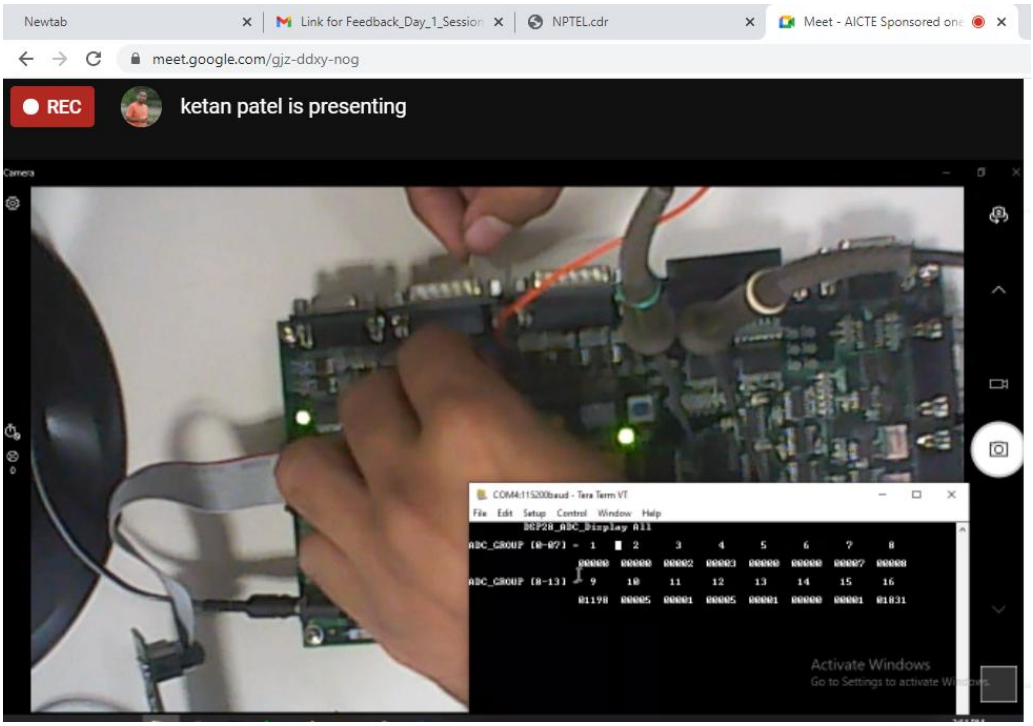
Glimpse of Day-1 session-II by Prof. Pramod Agarwal from IIT, Roorkee

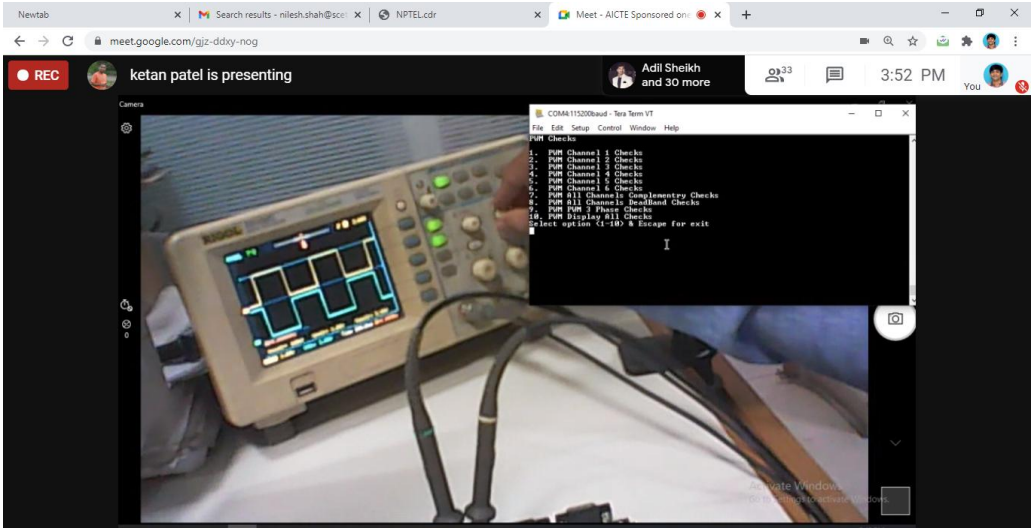
Day 1 Session-III

On day-1, session-III was delivered by an industrial expert Er. Ketan Patel form Edutech Learning solutions PVT. Ltd, Vadodara. Seesion-II was on Introduction to Texas Instruments C2000 DSP Architecture, Features and Peripherals. Er. Ketan has briefly discussed about C2000 family of digital signal processors, major features and applications. The architecture of TMS320F2812 and TMS320F28335 DSPs which are useful for motor control and major electrical control applic ations were explained in details with associated peripherals. Er. Ketan then explained about programme development tool Code composure studio for TMS320F28335. The programming of various peripherls

such as PWM timer, ADC, DAC using TMS320F28335 has been demonstrated in online mode. Finally, Er. Ketan very patiently solved the queries of the participants on programming and debugging software of TMS320F28335 DSP using code composure studio.



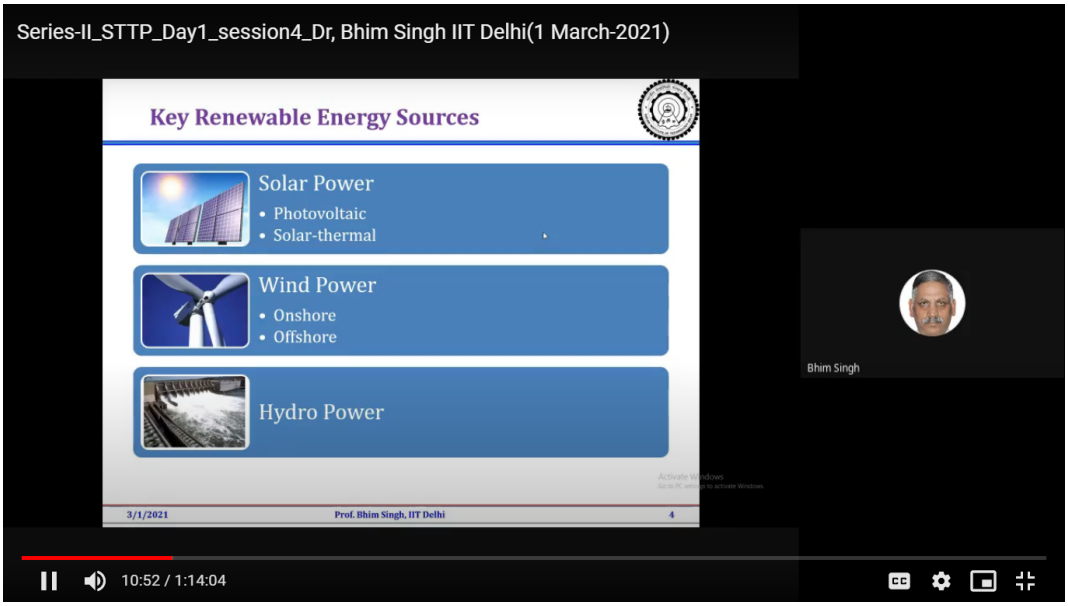


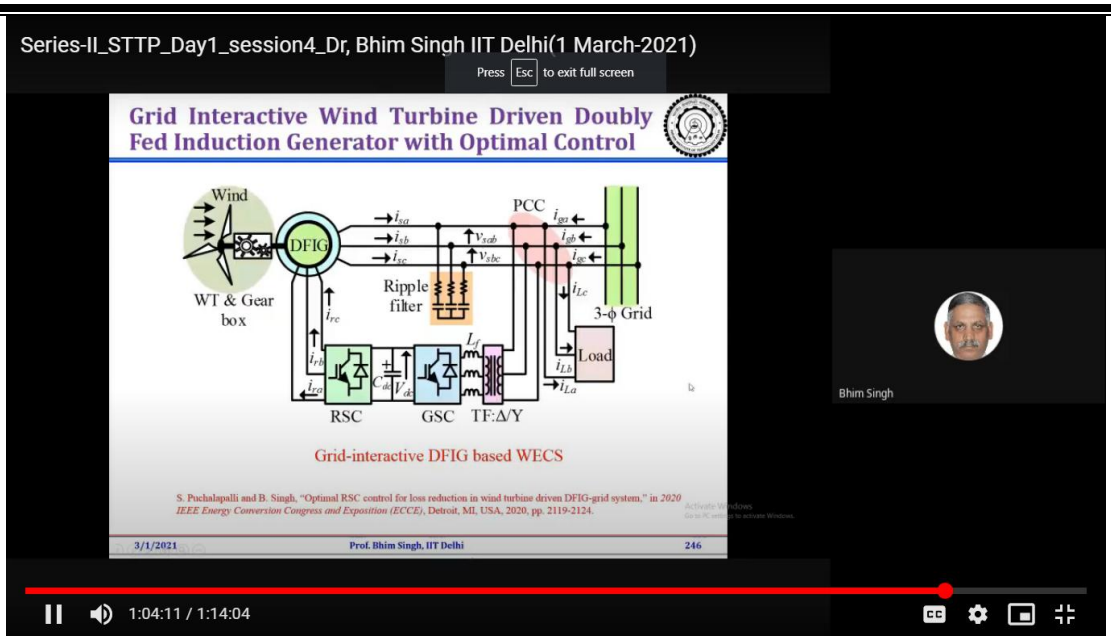


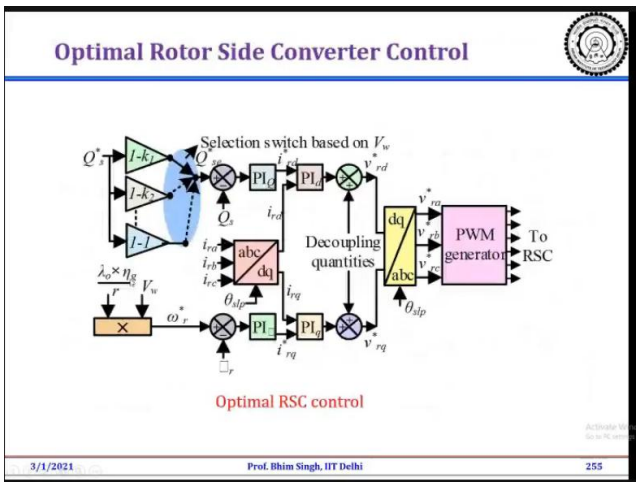
Glimpse of Day-1 session-III by Er. Ketan Patel from Edutech Learning Solutions Pvt. Ltd., Vadodara

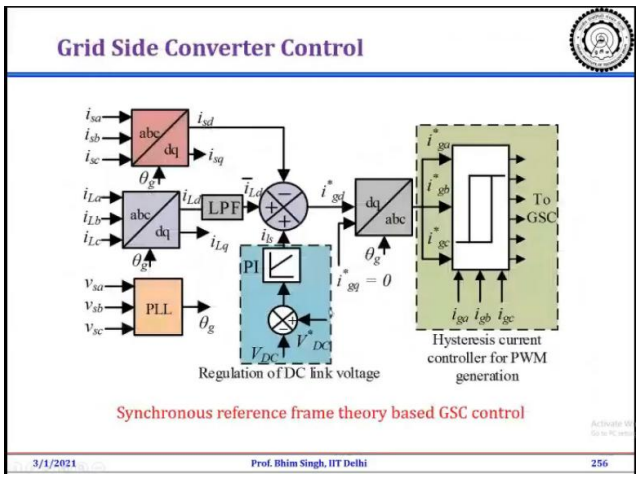
Day-1 session-4

The last session-4 of day-1 was delivered by Prof. Bhim Singh from IIT, Delhi on "Control of Power Electronic Converters for Wind Energy Conversion and Integration with Grid". Dr. Bhim Singh had briefly discussed about the global wind energy scenario as well as importance of clean enrgy. Dr. Singh had elaborated about different types of wind turbines. He discussed many topologies for grid integration of wind energy with the control scheme. Dr. Bhim Sing had also presented PV-Wind based grid integrated system. Sir had demonstrated practical results of grid integrated wind energy system implemented using DSP as well as dSPACE. Dr. Singh had highlighted further scope of research in the domain of Renewable Energy. All the queries of participants were well addressed by Dr. Bhim Singh.







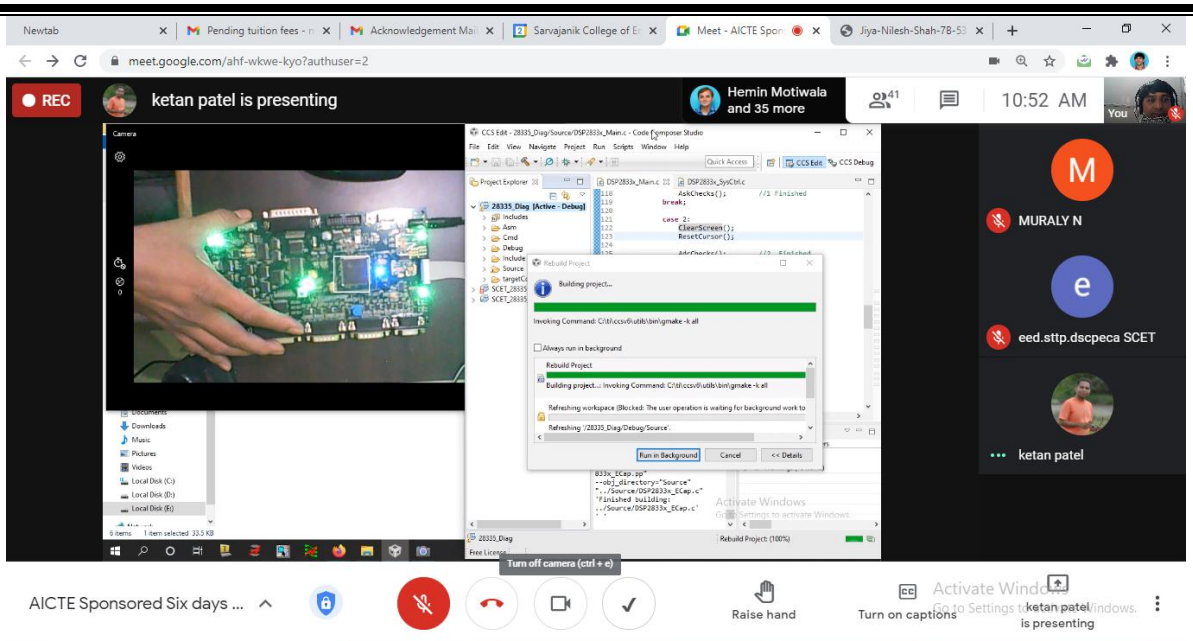


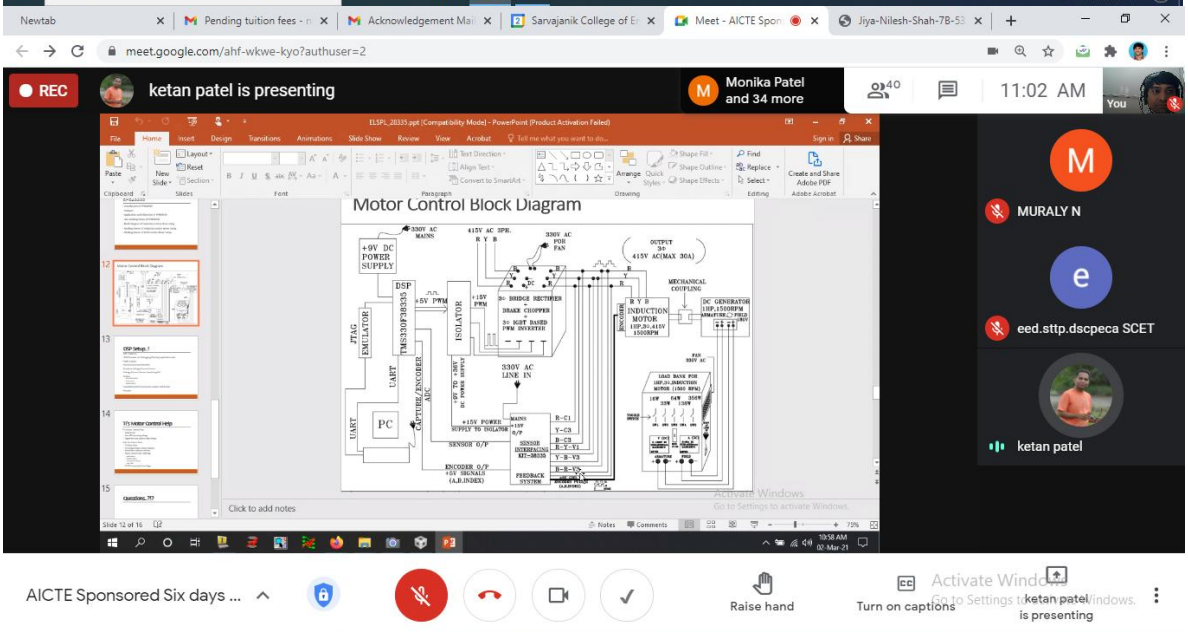
Glimpse of Day-1 session-IV by Dr. Bhim Singh from IIT Delhi

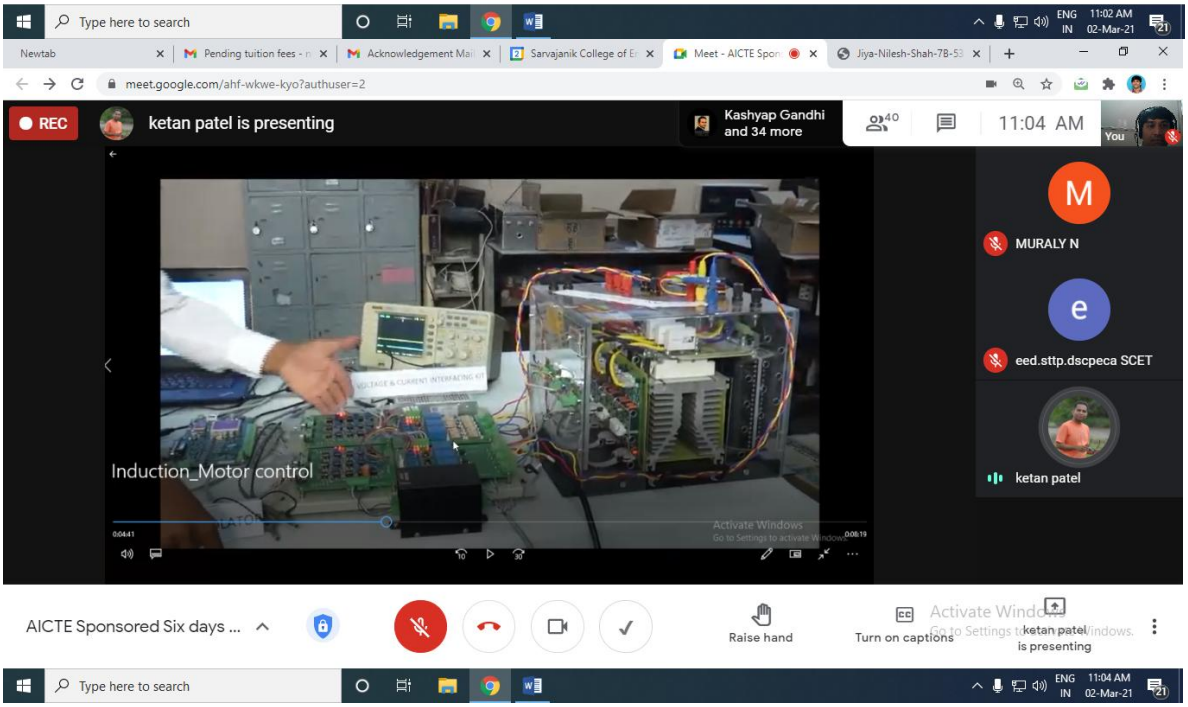
Day-2 (Tuesday) (2nd March-2021)

Day-2 session-I

The first session of Day-II was again delivered by Er. Ketan Patel of Edutech Learning Solutions Pvt. Ltd. Vadodara. He explained the control of Induction Motor and BLDC Motor using TMS320F28335 with related programming and use of peripherals. He also demonstrated the applications of controlling Induction motor as well as BLDC motor remotely through recorded videos. The participants appretiated the practical session on demostration of Induction motor and BLDC motor control using TMS320F28335 by Er. Ketan Patel.



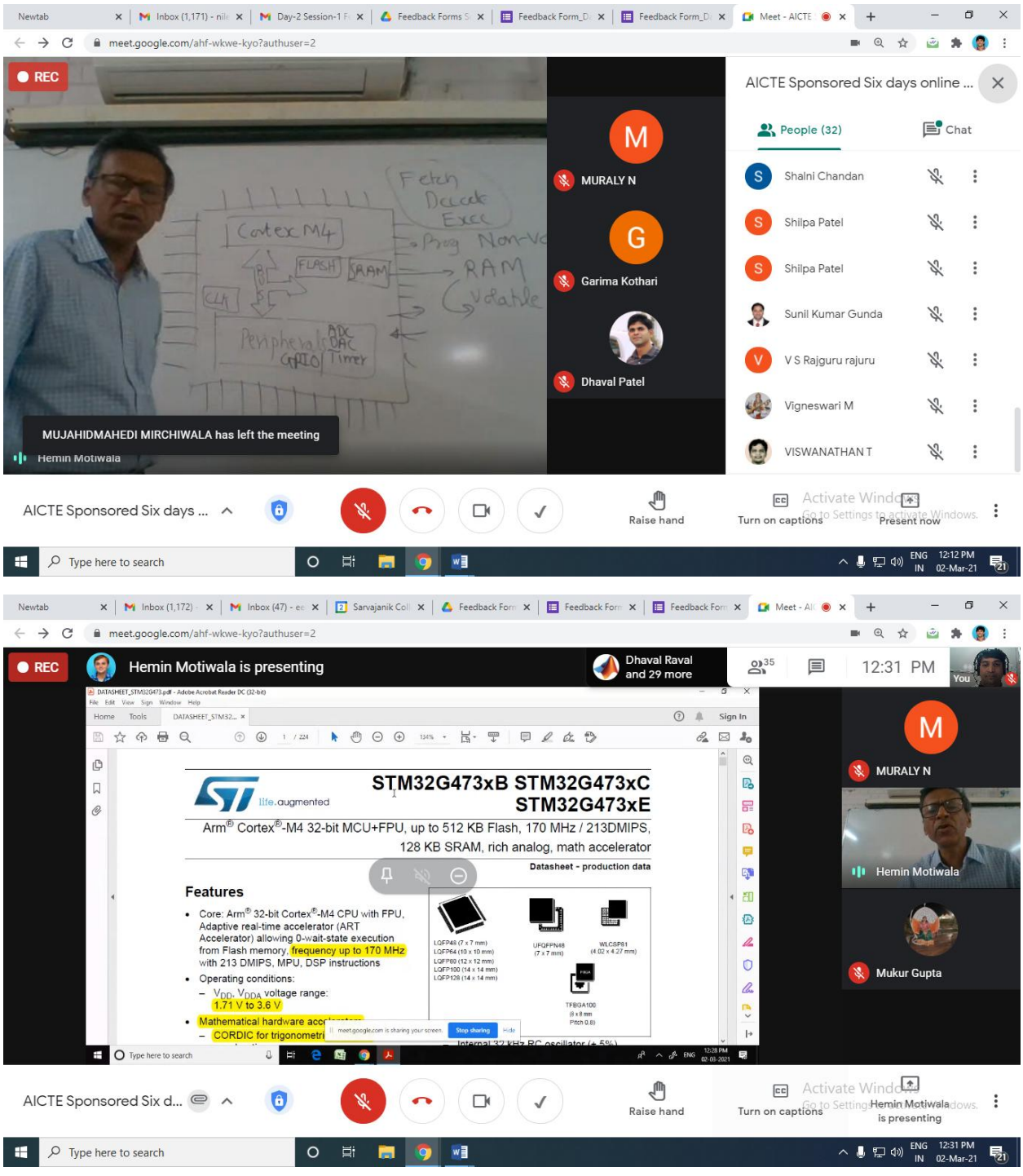




Glimpse of Day-2 session-I by Er. Ketan Patel from Edutech Learning Solutions Pvt. Ltd., Vadodara

Day 2 Session-II

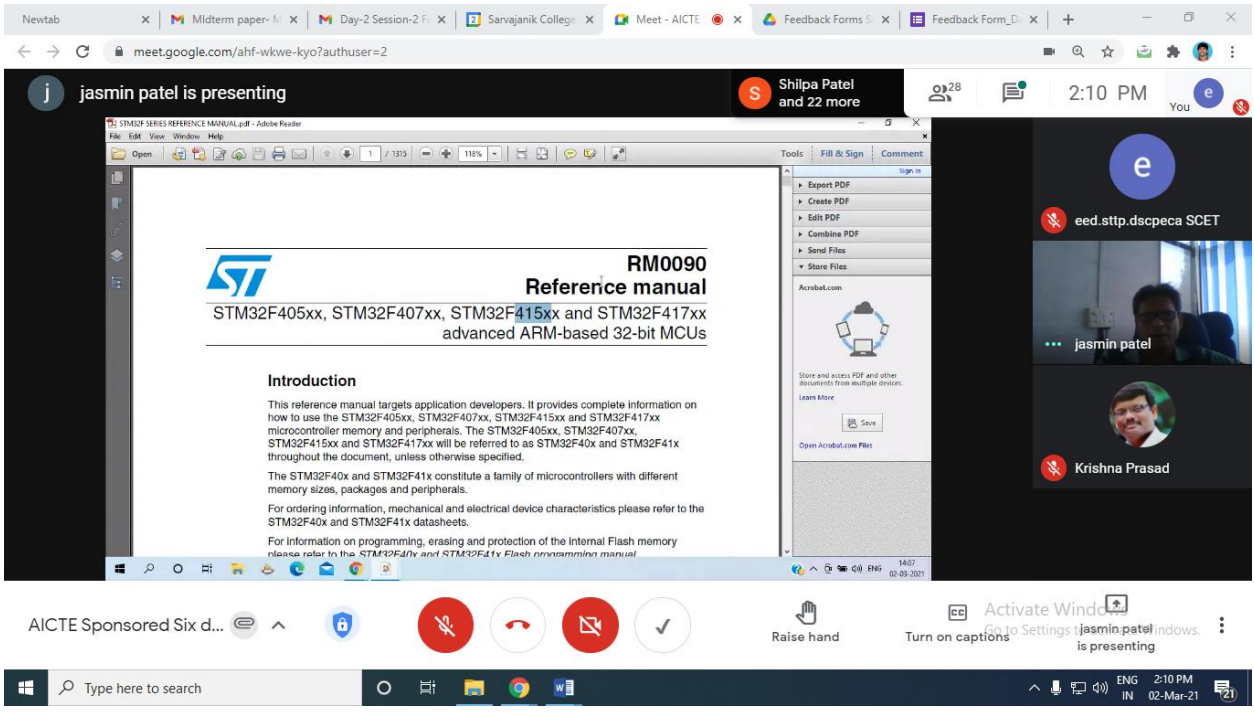
On day-2, session-II was delivered by Prof. Janak J. Patel from SVNIT, Surat on "Introduction to STM32 (ARM CORTEX M4) Microcontroller, Features, Peripherals". Prof. Janak Patel has briefly discussed about ARM Cortex Microcntroller family, major features, onchip peripherals and applications. The architecture of STM32 ARM CORTEX M4 32-bit microcontroller with a goal of control of power electronic converters for various applications was excellently explained in detail with associated peripherals. Prof. Patel had strongly addressed the mathematical and peripheral power of STM32 Cortex M4 series ARM controller for different power electronic applications. Prof. patel had continously interacted with the participants during the session. The talk was delivered in the form of presentation as well as white-board teaching in online mode from the department of electrical engineering at SCET which was very much appreciated by the participants.

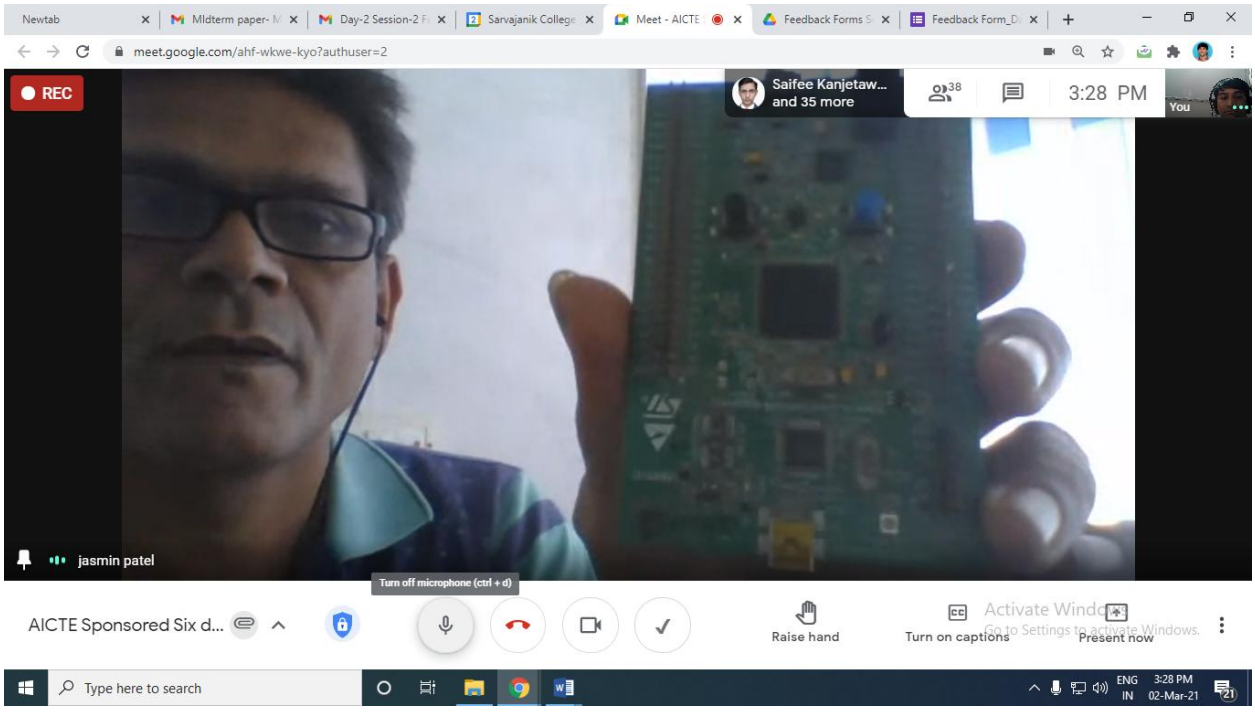


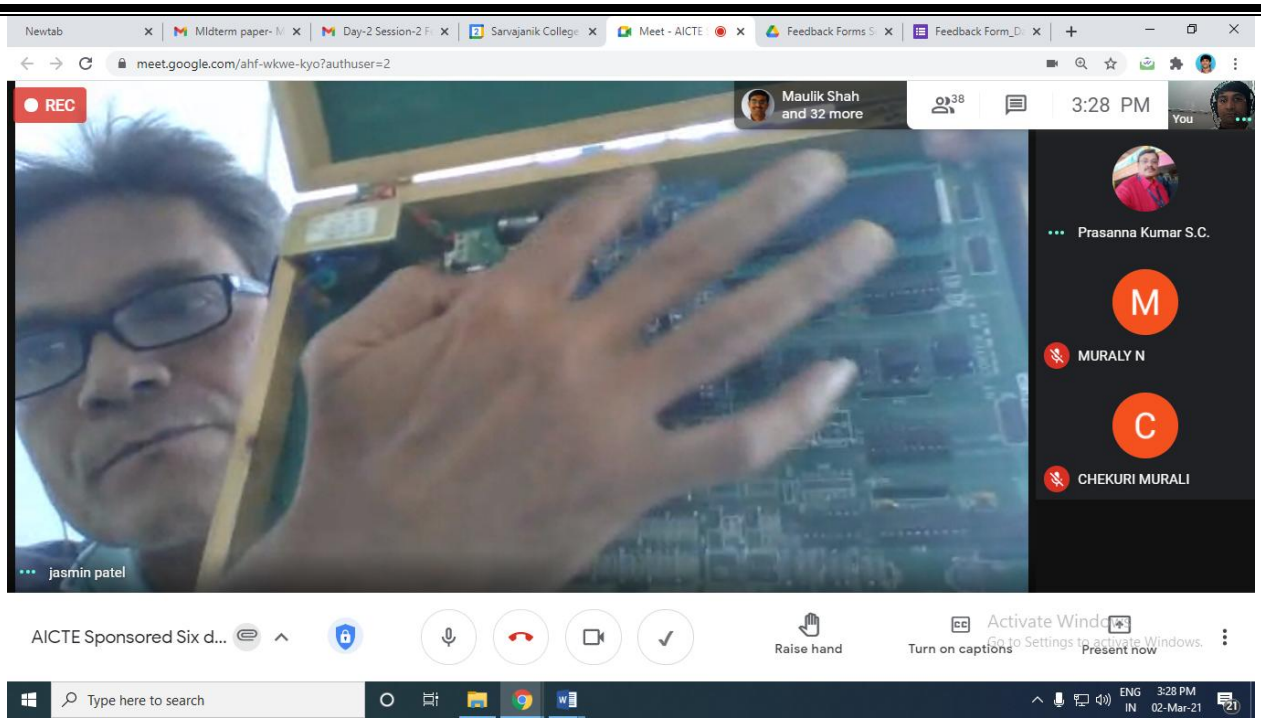
Glimpse of Day-2 Session-II by Prof. Janak Patel, EED, SVNIT, Surat

Day-2 Session-III

Third session of day-3 was delivered by Prof. Jasmin Patel from Dr. S. & S. S. Gandhy Engineering College, Surat on “Programming STM32 (ARM Cortex- M4) Microcontroller, demo of peripheral programming”. Professor Jasmin explained various methods of programming STM32 ARM microcontroller. Highlighting, simplicity and ease of programming, Prof. Jasmin explained programming STM 32 microcontroller by using STM Cube IDE. He explained the development, compiling, program downloading and debugging techniques with online demonstration. He also explained STM32 GPIO port peripheral in detail and demonstrated STM32 Microcontroller Port-Programming. At the end of the talk, he developed confidence in participants about program development for STM32 Microcontroller using STM32 Cube IDE. Participants appreciated the practical oriented talk with demonstration presented by Prof. Jasmin.





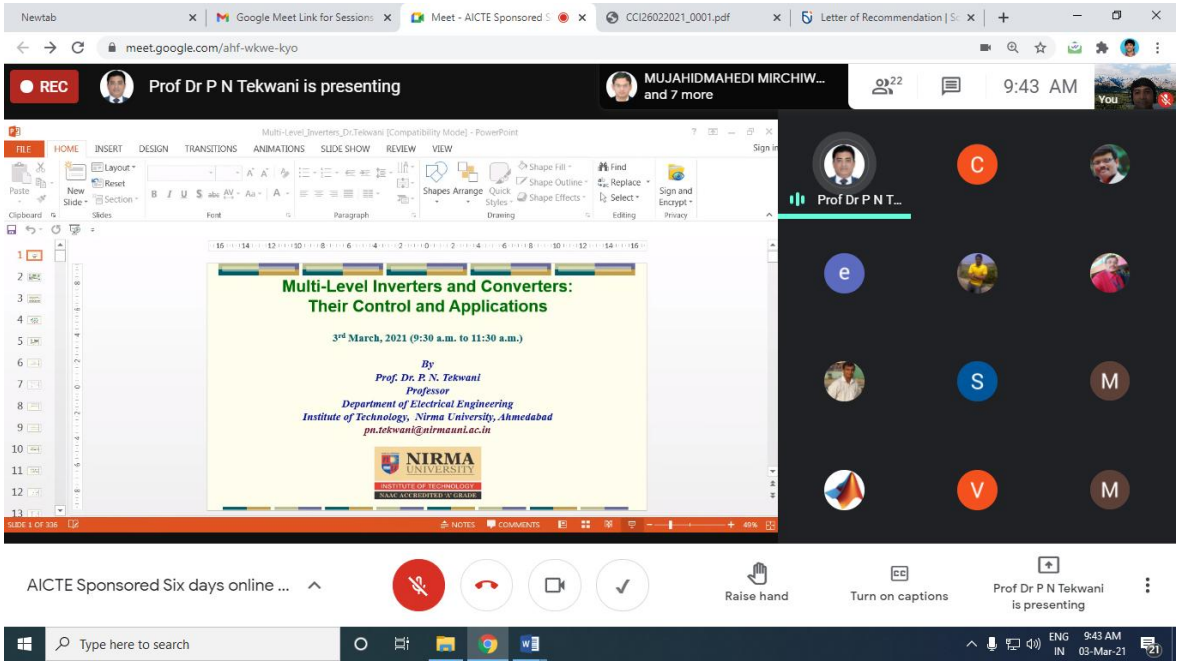


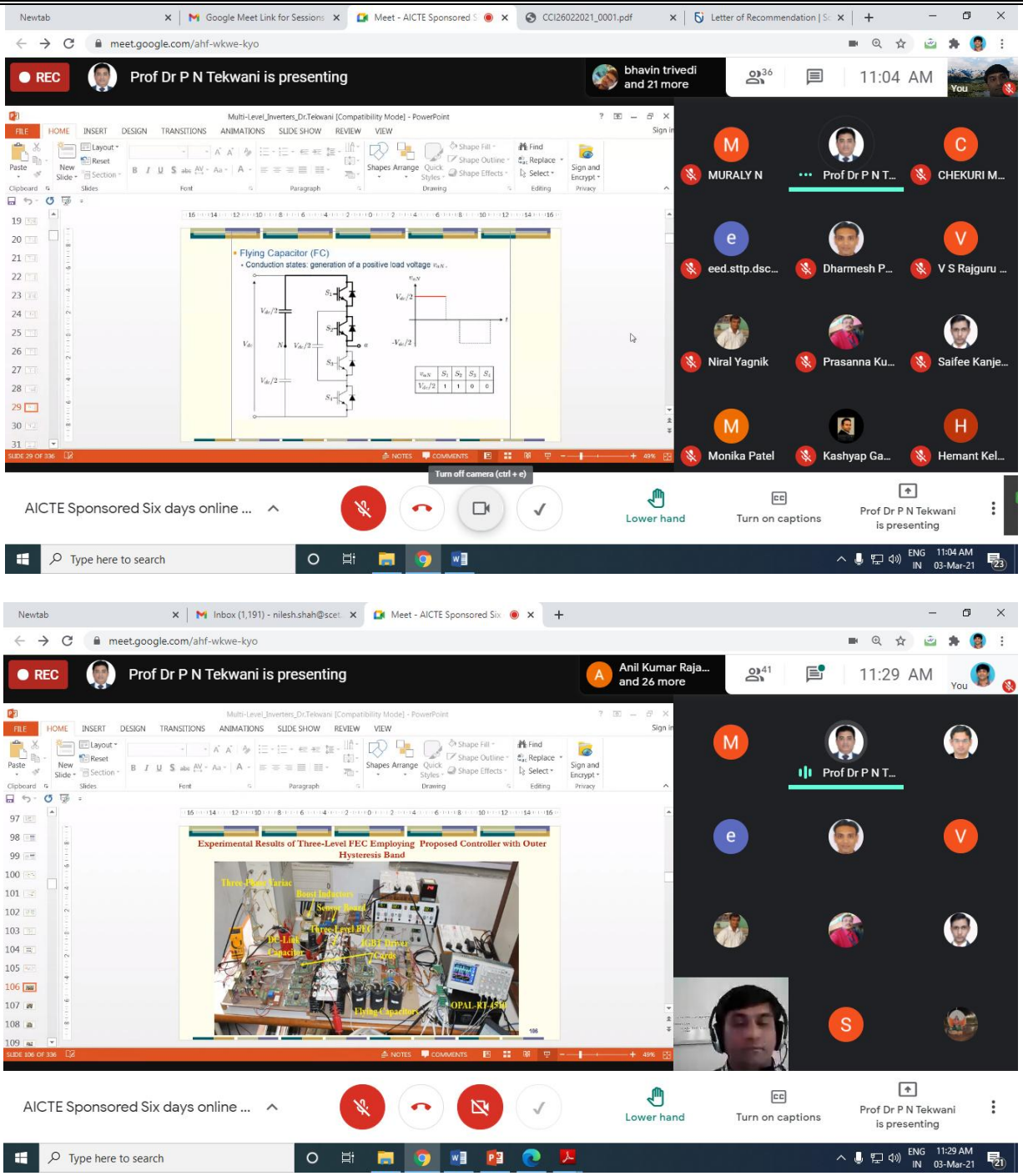
Glimpse of day-2 session-III by Prof. Jasmin Patel, Dr. S & S. S. Gandhy Engg. College, Surat

Day-3 (Wednesday) (3rd March-2021)

Day-3 session-I

On day-3, first session was delivered by Dr. P. N. Tekwani, Professor, Nirma University. Dr. Tekwani delivered a talk on Multi-level Inverter and Converters: their Control and Applications. He had covered basic multilevel inverter topologies such as Cascaded H-Bridge MLI, Diode clamped MLI, Flying Capacitor MLI and control schemes. Dr. Tekwani also discussed various advanced topologies of MLI and its control schemes. He demonstrated MLI based Front End Converter topology with detailed design concepts and control using TMS320F28335 DSP. He had also demonstrated control of three-level MLI using OPAL-RT tool. Participants got enough insight about MLI topologies and their control using DSP and OPAL-RT.

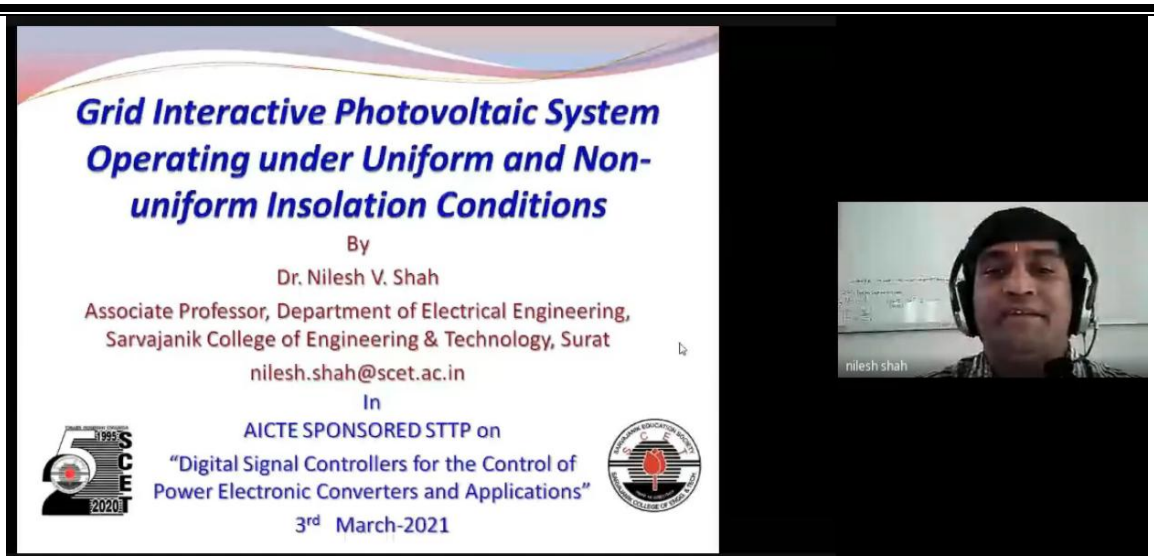


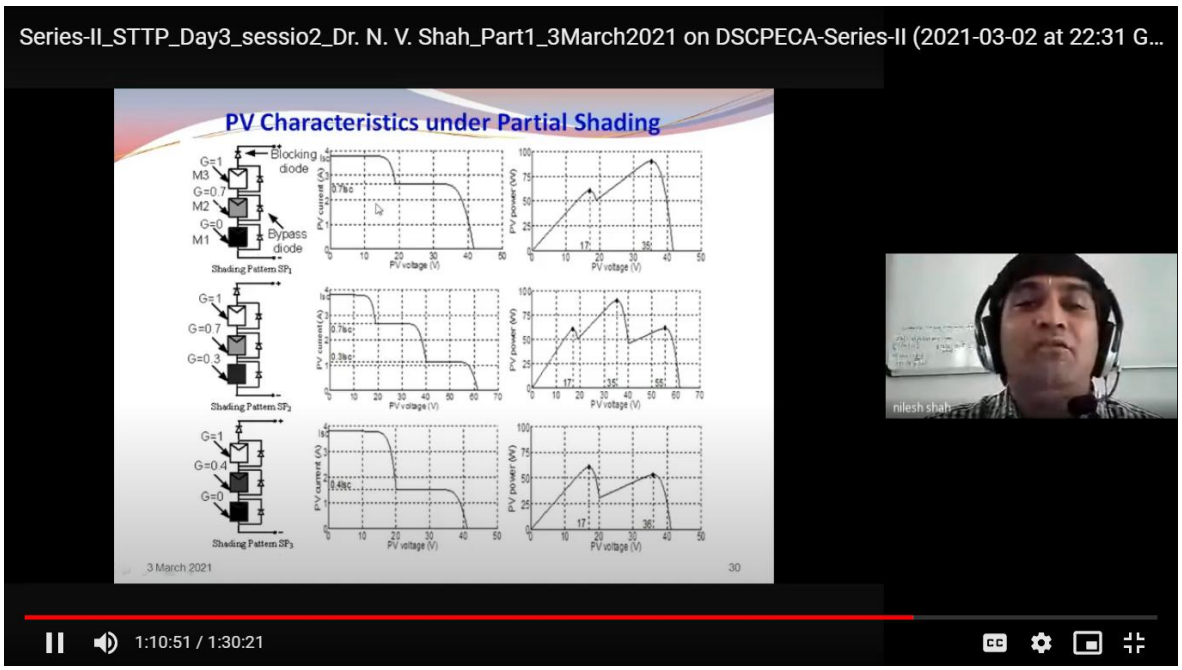


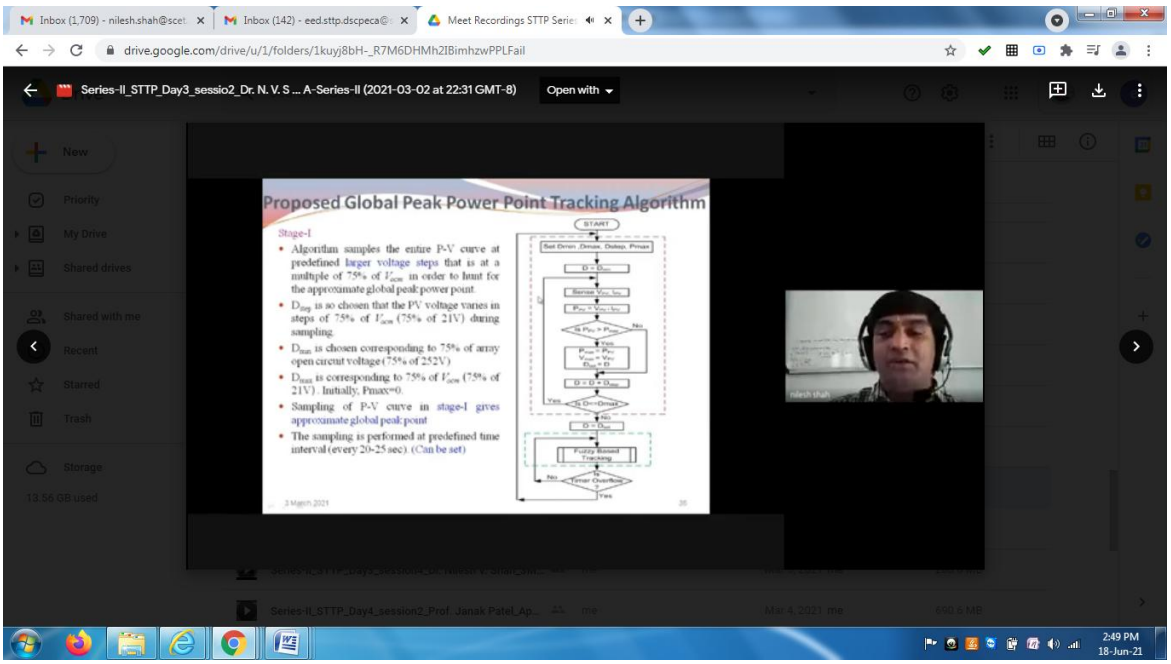
Glimpse of Day-3 Session-I by Prof. P. N. Tekwani, Nirma University, Ahmedabad

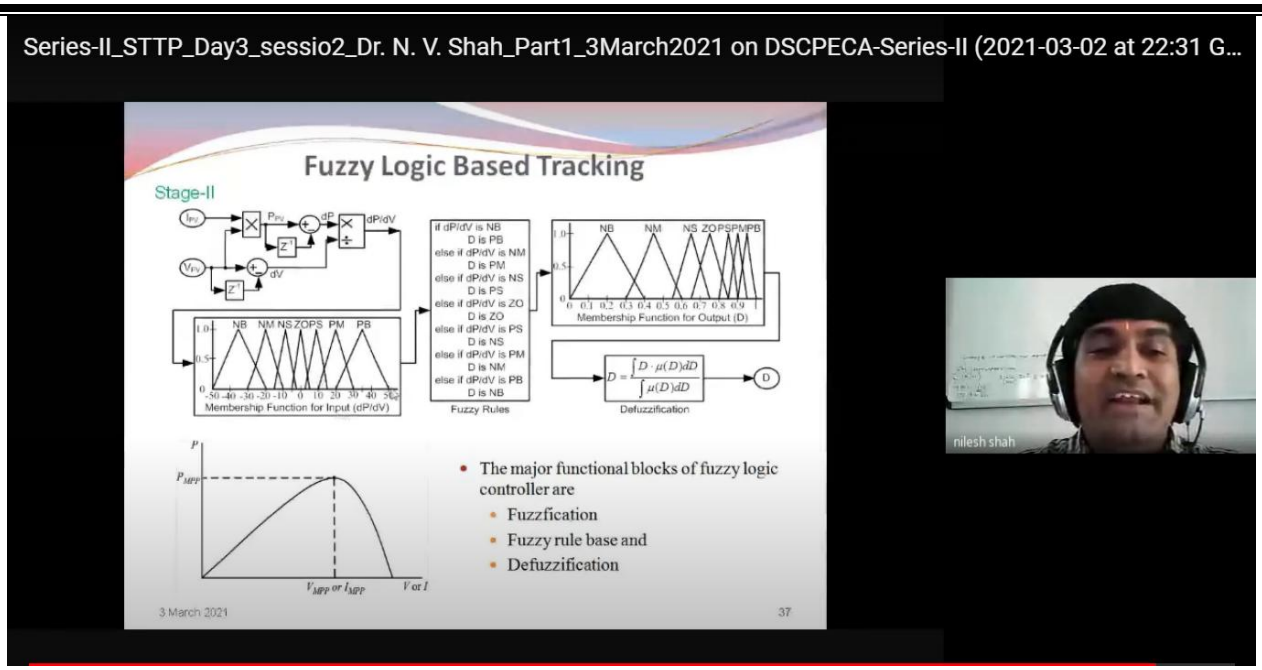
Day-3 session-II

On day-3 session-II was delivered by Dr. Nilesh V. Shah from SCET on “Grid Interactive photovoltaic system operating under uniform and Non-uniform insolation conditions”. By giving basic introduction of PV system, Dr. Nilesh had explained the need for global peak power point tracking algorithm for large PV system. He had presented fuzzy logic based global peak power point tracking algorithm. The algorithm was presented with the simulation results that justified the superiority of algorithm under various partial shading conditions. Dr. Shah also explained about grid interactive PV system and presented simulation results for active and reactive power control, harmonic elimination that had justified the overall utilization of the PV system. All queries of the participants were solved satisfactorily.


Grid Interactive Photovoltaic System Operating under Uniform and Non-uniform Insolation Conditions
By
Dr. Nilesh V. Shah
Associate Professor, Department of Electrical Engineering,
Sarvajanik College of Engineering & Technology, Surat
nilesh.shah@scet.ac.in
In
AICTE SPONSORED STTP on
"Digital Signal Controllers for the Control of Power Electronic Converters and Applications"
3rd March-2021
nilesh shah


Series-II_STTP_Day3_sessio2_Dr. N. V. Shah_Part1_3March2021 on DSCPECA-Series-II (2021-03-02 at 22:31 G...
PV Characteristics under Partial Shading
Blocking diode
Bypass diode
Shading Pattern SP1
Shading Pattern SP2
Shading Pattern SP3
PV voltage (V)
PV current (A)
PV power (W)
3 March 2021
30
nilesh shah
1:10:51 / 1:30:21

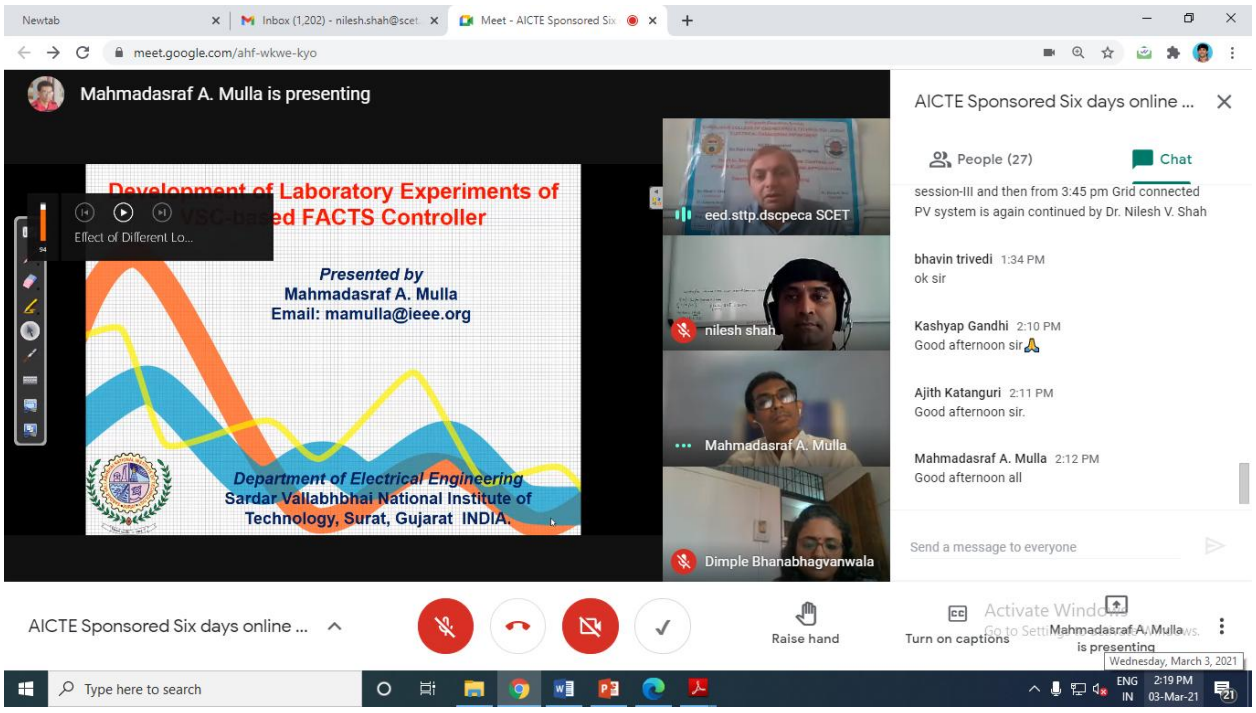

drive.google.com/drive/u/1/folders/1kuyj8bH-_R7M6DHMh2IBimhzwPPLFail
Series-II_STTP_Day3_sessio2_Dr. N. V. S ... A-Series-II (2021-03-02 at 22:31 GMT-8)
Open with
Proposed Global Peak Power Point Tracking Algorithm
Stage-I
Algorithm samples the entire P-V curve at predefined larger voltage steps that is at a multiple of 75% of Vscm in order to hunt for the approximate global peak power point.
Dstg is so chosen that the PV voltage varies in steps of 75% of Vscm (75% of 21V) during sampling.
Dstart is chosen corresponding to 75% of array open circuit voltage (75% of 252V)
Dstart is corresponding to 75% of Vscm (75% of 21V). Initially, Pmax=0.
Sampling of P-V curve in stage-I gives approximate global peak point
The sampling is performed at predefined time interval (every 20-25 sec). (Can be set)
START
Fuzzy Based Tracking
nilesh shah
2:49 PM
18-Jun-21

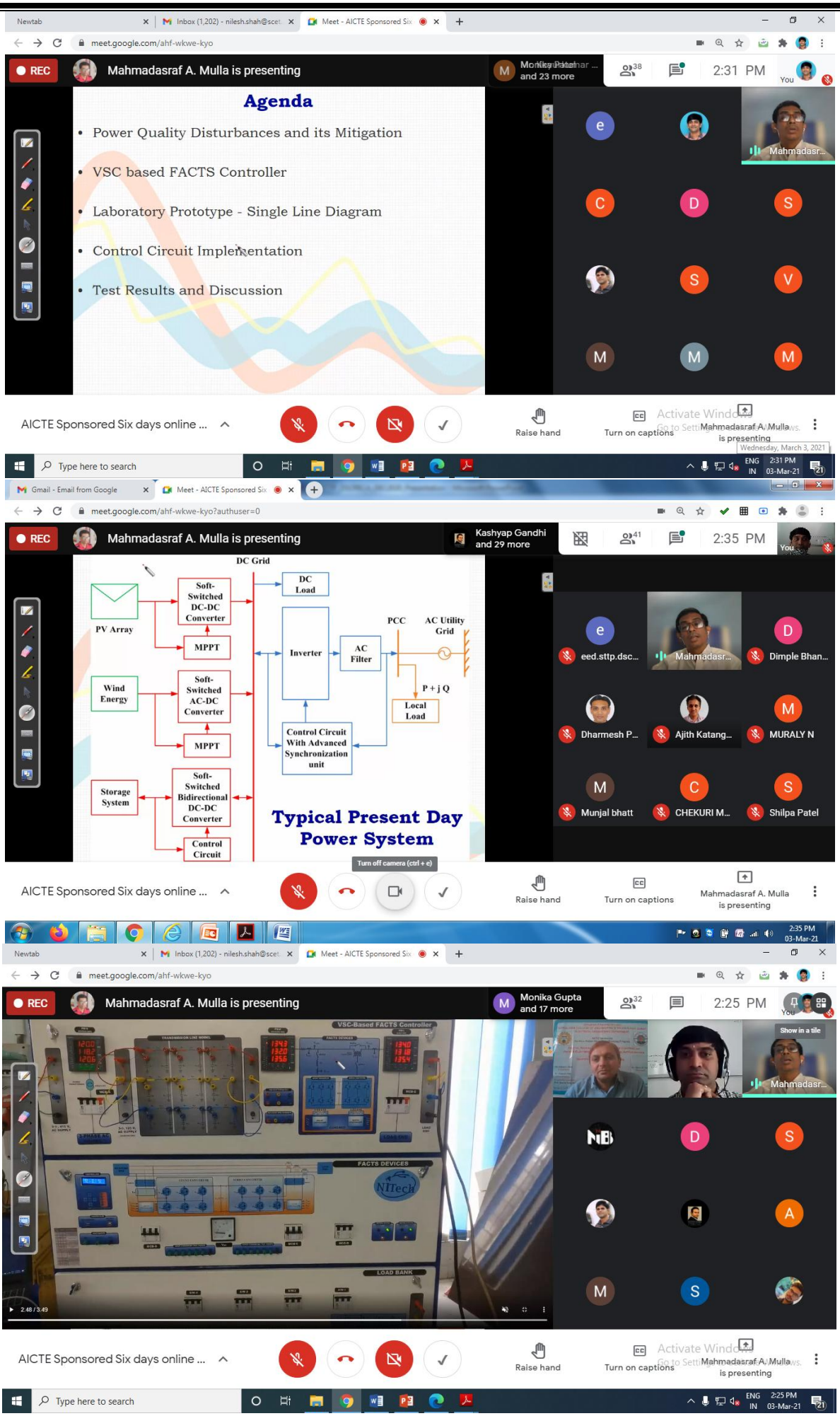


Glimpse of day-3 session-II by Dr. Nilesh V. Shah, SCET, Surat

Day-3 Session-III

On day-3, session-III was delivered by Dr. Asaraf Mulla from SVNIT, Surat on "Laboratory Experimentation of VSC-based FACTS Controller". In his talk, Dr. Mulla discussed about need for FACTS controllers, different types of FACTS controller with their control strategies in detail. Dr. Mulla had also presented the control scheme implementation for Series, Shunt and UPQC controllers using STM32F704VG cortex M4 ARM Microcontroller. He has also demonstrated the results of implementation of FACTS controller through online video. His demonstration majorly included laboratory Experimental demonstration of FACTS controllers. The session was highly interactive and participants had appreciated the implementation of an important application of FACTS controller though control of VSI using STM32 Cortex M4 ARM microcontroller.

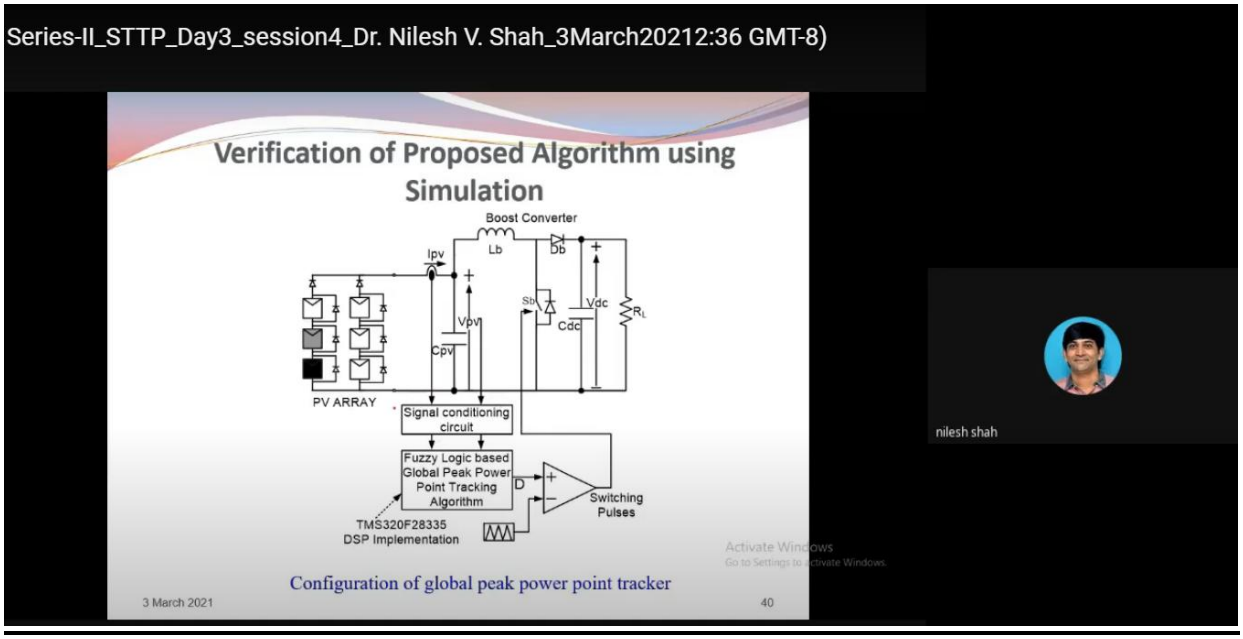


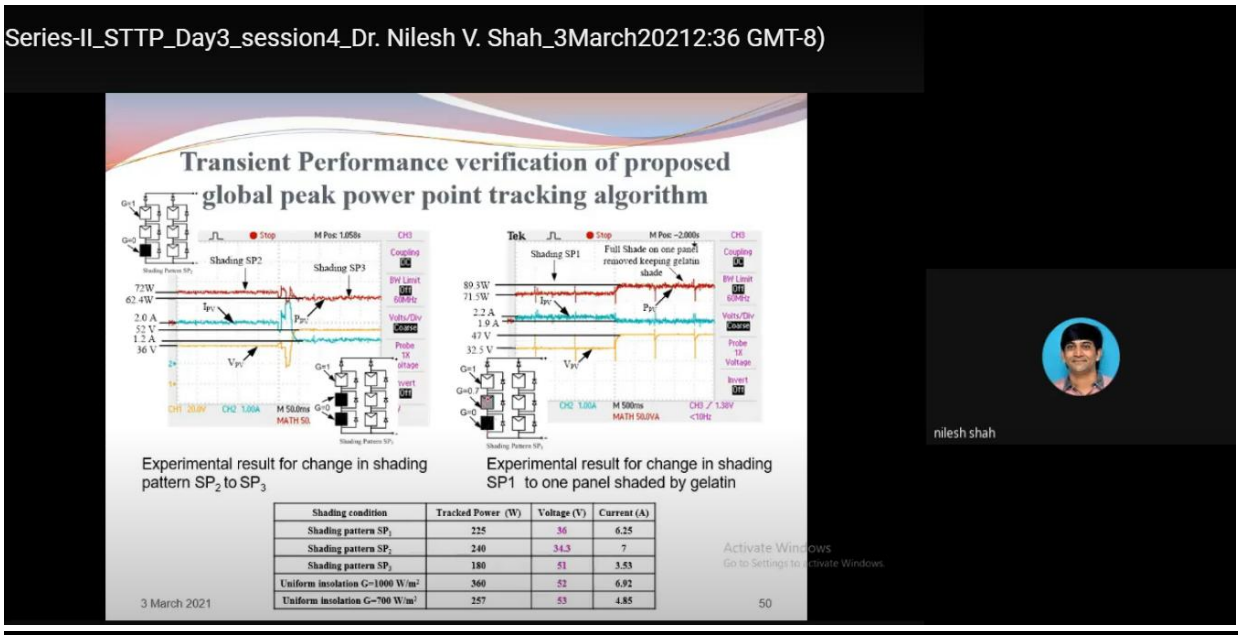


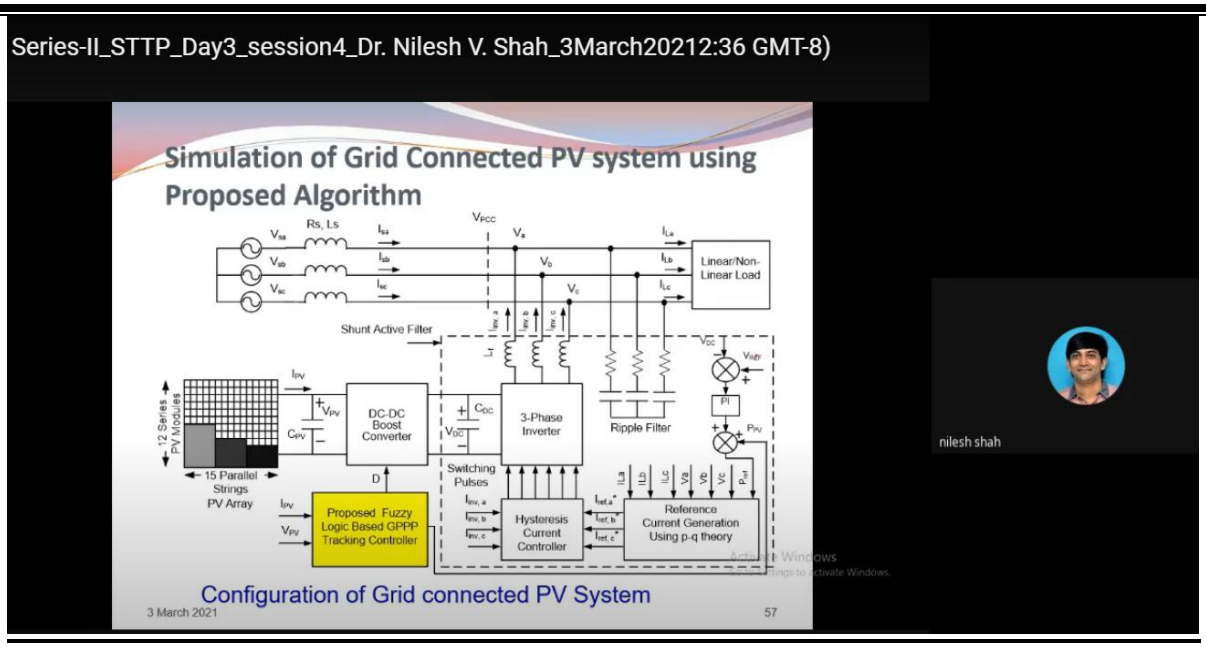
Glimpse of day-3 session-III by Dr. M. A. Mulla, SVNIT, Surat

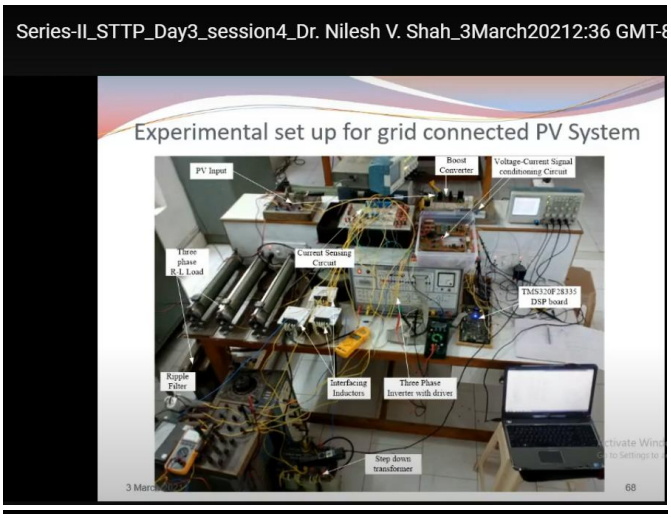
Day-3 session-IV

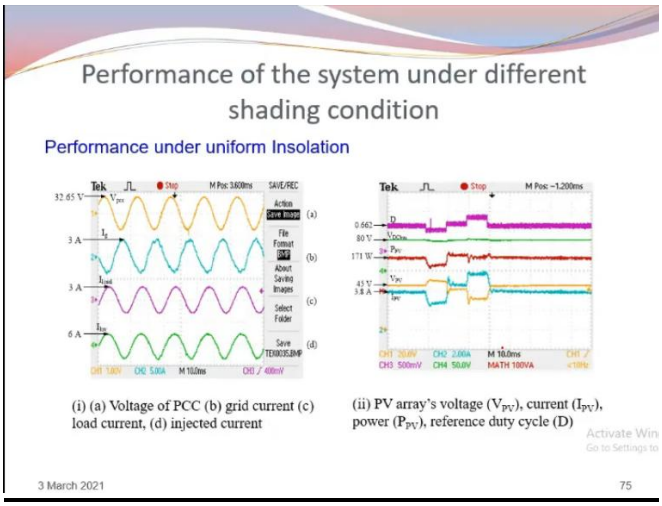
In continuation of talk discussed in session-II, Dr. Nilesh conducted session-IV on "Hardware Implementation of Grid Interactive Photovoltaic System using DSP28335". He explained about major features required in the processor for implementing control algorithm of grid interactive PV system and highlighted suitability of TMS320F28335 DSP for implementing such control algorithm. He explained about the implementation of fuzzy logic based global peak power point tracking algorithm using embedded 'C' programming of TMS320F28335 DSP. The algorithm was validated by presenting experimental results for various partial shading conditions that had build confidence amongst participants about such implementation. The detailed implementation of control algorithm of inverter based on p-q theory was also explained and the experimental results were presented for various partially shaded conditions. The utilization of PV inverter by incorporating reactive power compensation as well as non-linear load harmonic elimination specifically during night was well elaborated with relevant experimental results obtained by using TMS320F28335 DSP processor. Participants had appreciated the experimental implementation work presented by Dr. Nilesh.

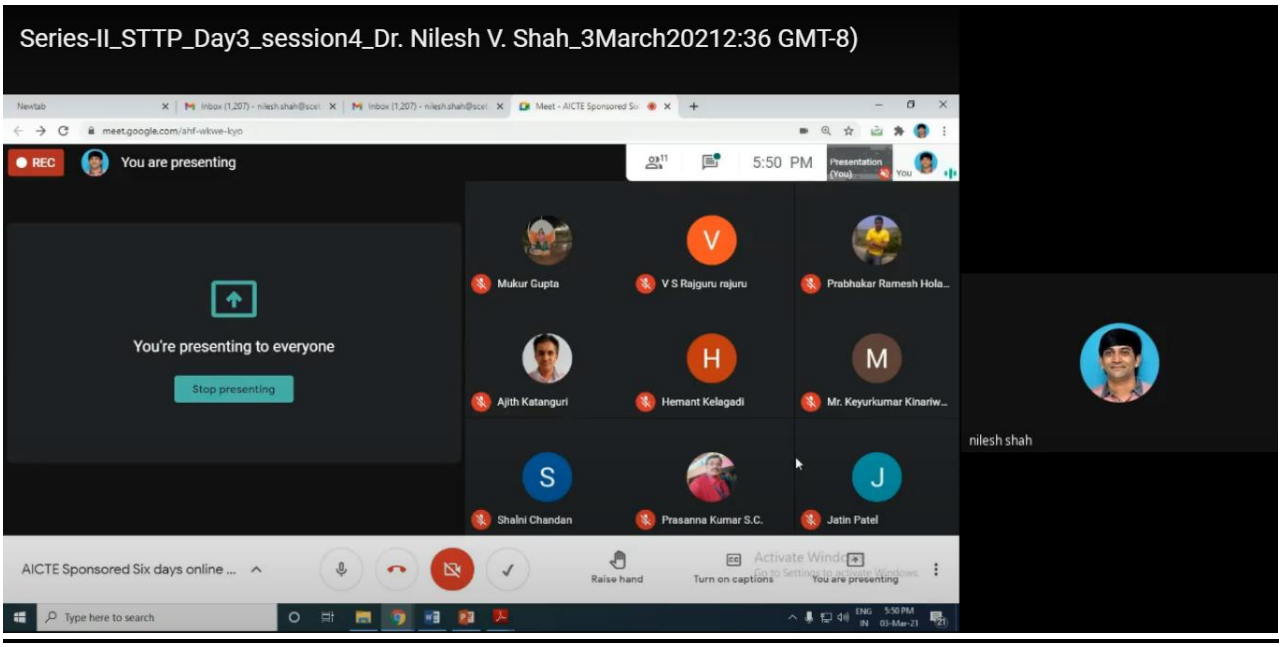










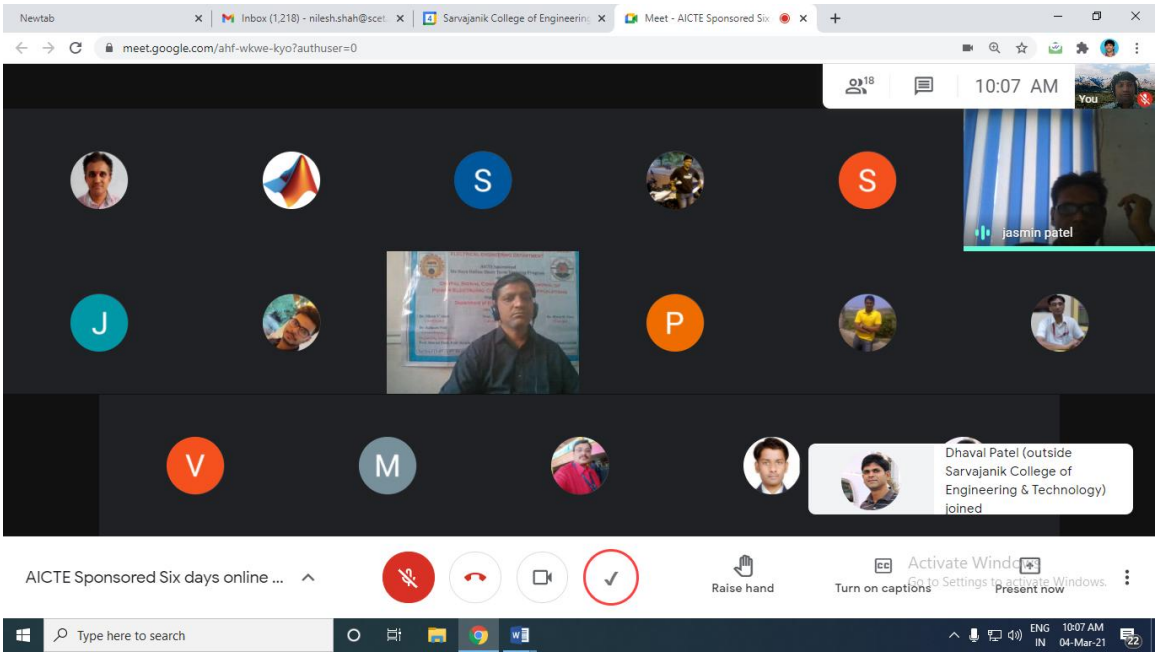


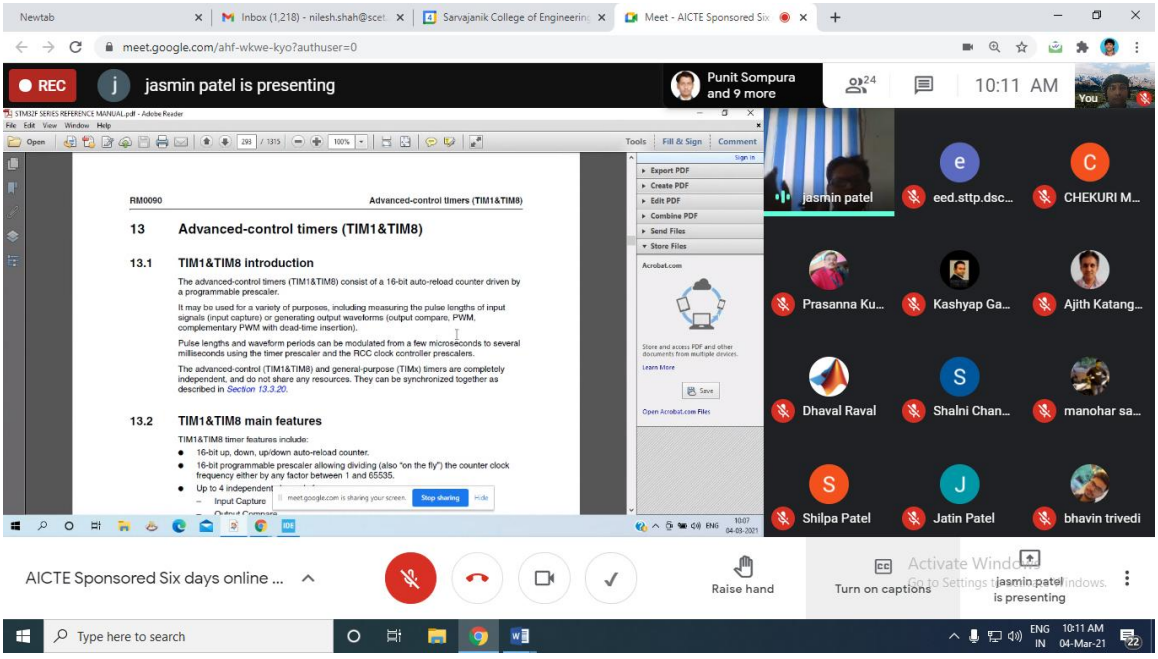
Glimpse of day-3 session-IV by Dr. Nilesh V. Shah, SCET, Surat

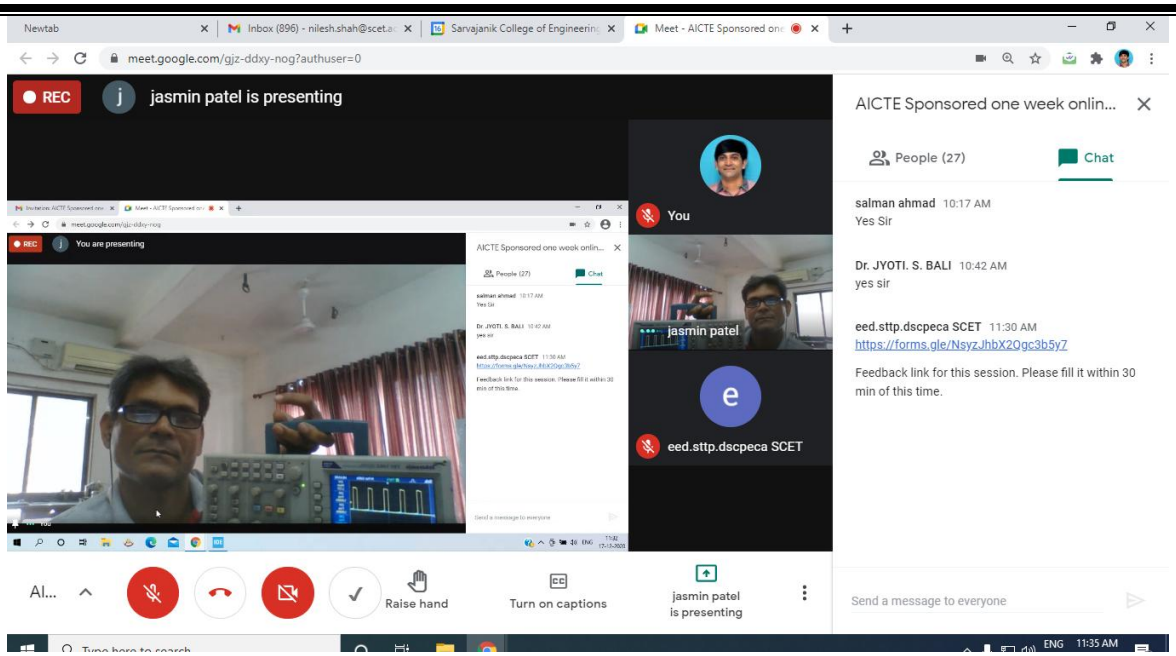
Day-4 (Thursday) (4th March-2021)

Day-4 Session-I

Session-I of day-4 was delivered by Prof. Jasmin Patel from Dr. S. & S. S. Ganghy Engineering College, Surat in continuation of his talk delivered on day-3 on "Programming STM32 (ARM Cortex-M4) Microcontroller, demo of peripheral programming". In this session, Professor Jasmin explained about timers and timer modes of STM32F704VG ARM controller. He discussed about generation of PWM pulse using timer of STM32F704VG ARM controller. He had also demonstrated timer programming using STM Cube IDE for PWM pulse generation. The generated PWM pulses were displayed on DSO and everyone witnessed the results of PWM pulse as per the programmed frequency. Everyone enjoyed the practical session and it has been very much appreciated.



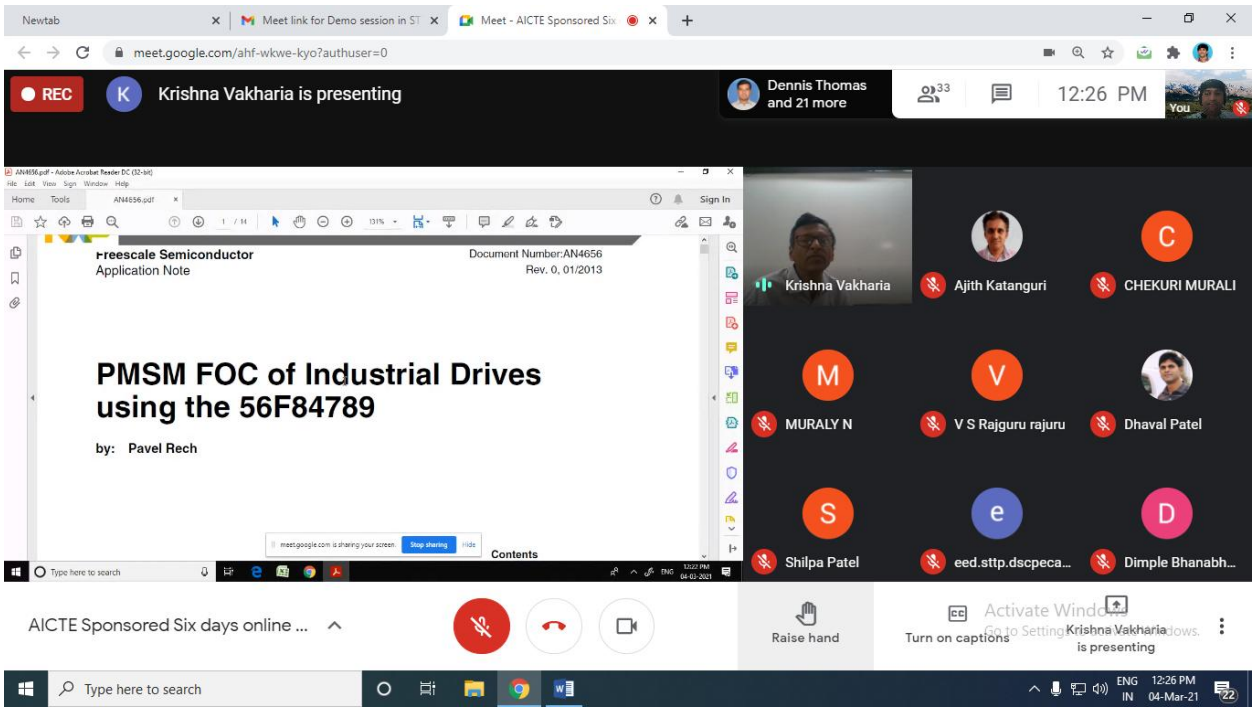


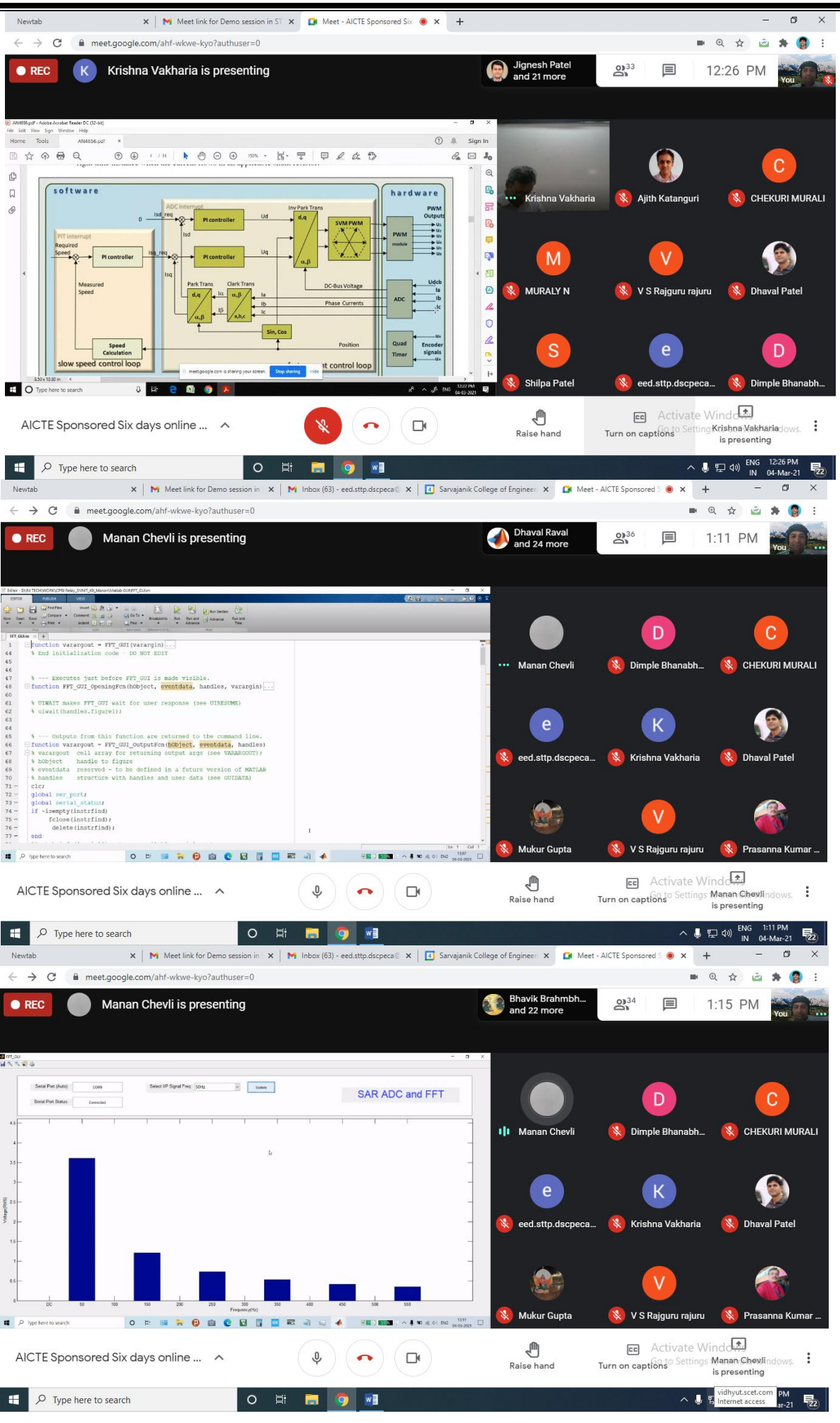


Glimpse of day-4 session-I by Prof. Jasmin Patel, S & S. S. Gandhy Engg. College, Surat

Day-4 Session-II

Day-4 session-II was delivered by Prof. Janak Patel of SVNIT, Surat on "Design and Development of High Speed Data Acquisition Card using STM32 Microcontroller (Lab demo)". In this session, first Prof. Janak patel had explained about field oriented control of PMSM motor using Cortex M4 Microcontroller, related peripherals and algorithm implementation. Prof. Janak Patel had also explained about the need for high speed data acquisition for many applications, the requirement of related peripherals of the controller such as ADCs, timer, DMA controller and then the programming of STM32F407VG Cortex M4 Microcontroller for acquiring the signals at high speed. He had also demonstrated the data acquisition and FFT analysis in online mode along with a research scholar Mr. Manan Chevali. Participants had well appreciated the practical session and demonstration. The session was delivered from the department of electrical engineering, SCET.

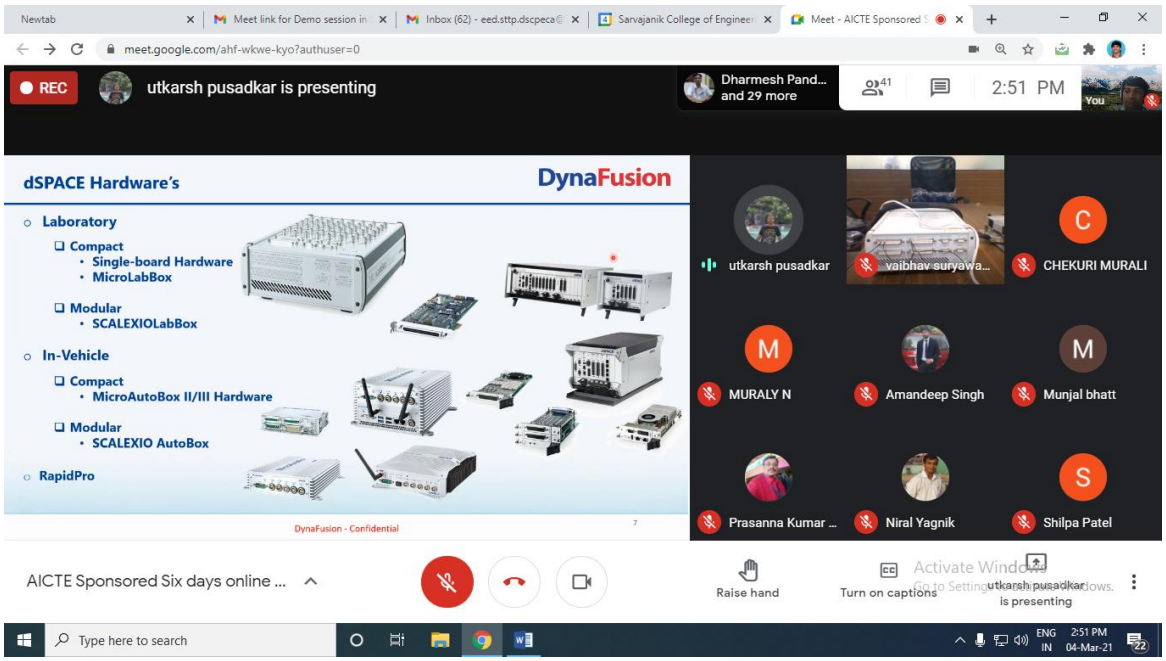


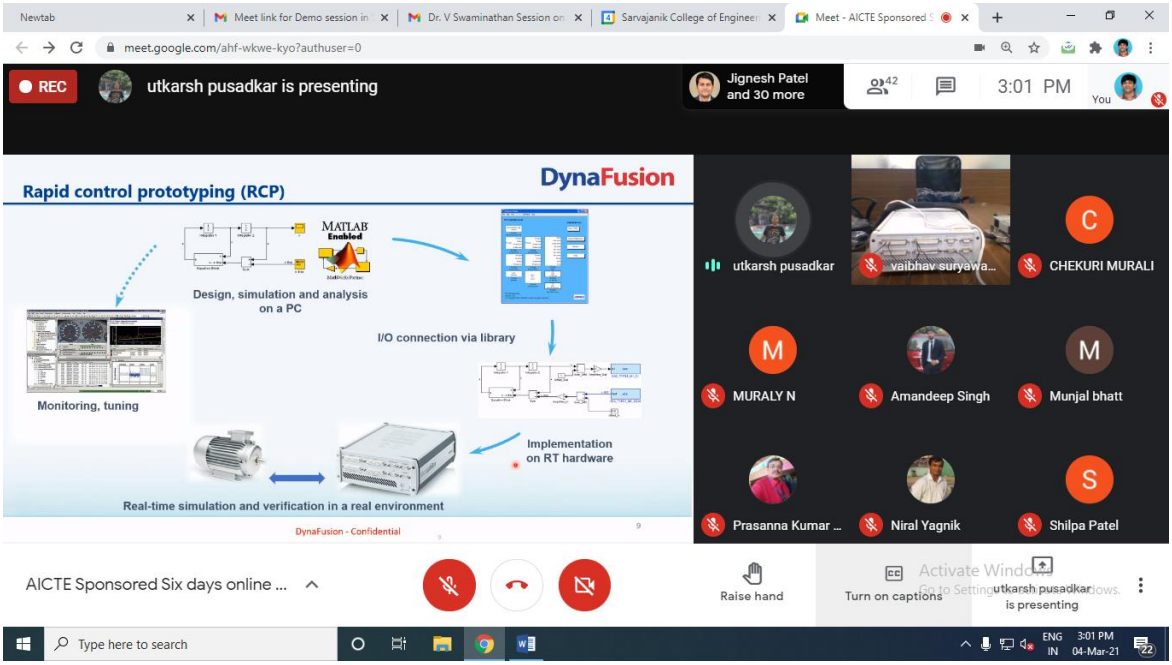


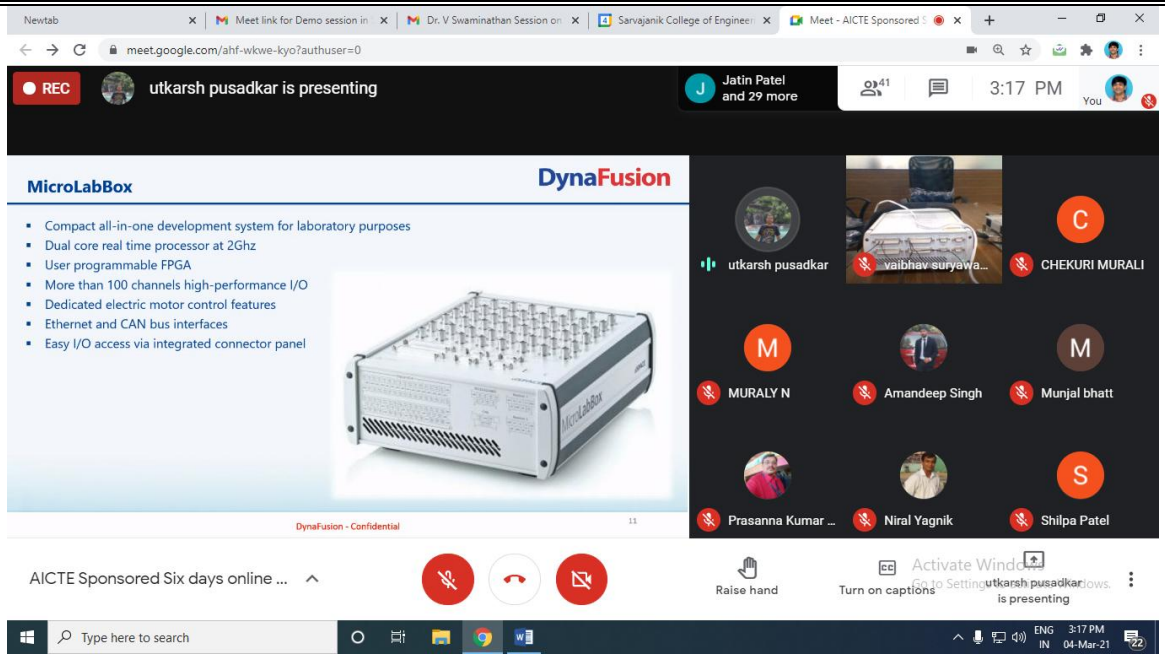
Glimpse of day-4 session-II delivered by Prof. Janak Patel, EED, SVNIT, Surat

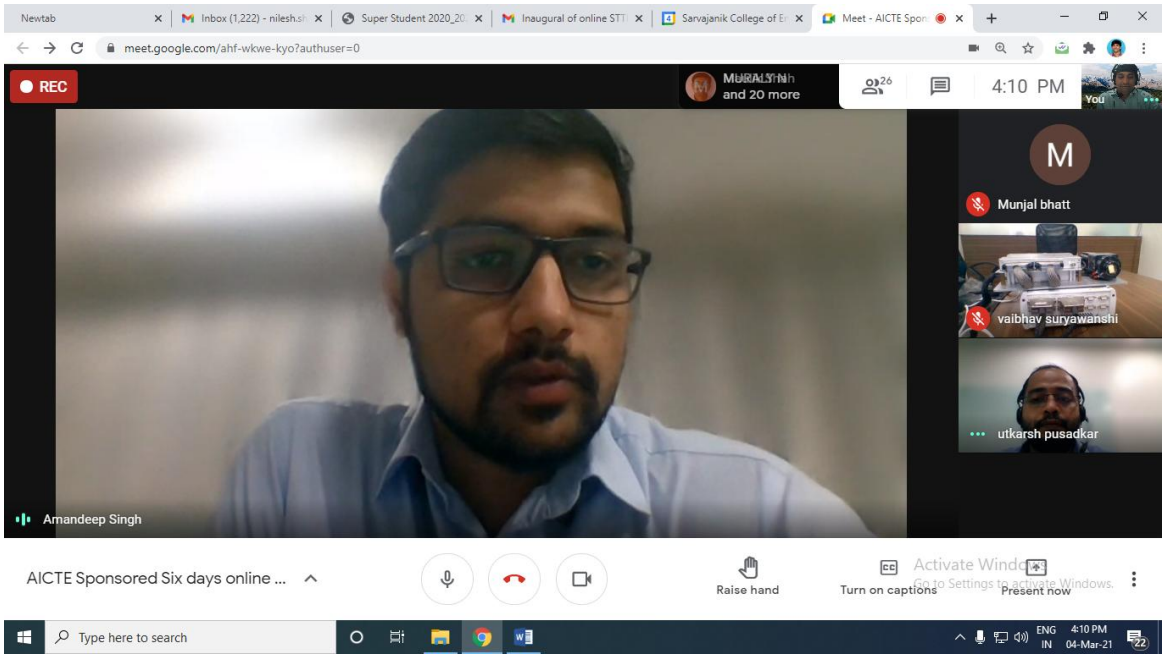
Day-4 Session-III

On day-4, session-3 was delivered by a team of an Industrial expert from Dynafusion, Bengluru on "Rapid Control Prototyping – MicroLabBox". In the beginning of the session, Mr. Amandeep Sigh presented about dSPACE, Microlabboc and its academic well as industrial applications. Then Mr. Pushadkar had discussed about how rapid control prototypes can be developed using MicrolabBox for power electronic applications. He had explained hardware and software of the MicroLabbox. Mr. Pushdkar and team had also demonstrated development of motor control software using Matlab and MicroLabbox by implementing on real time hardware. Everyone present enjoyed the practical demonstrated by Dynafusion team.







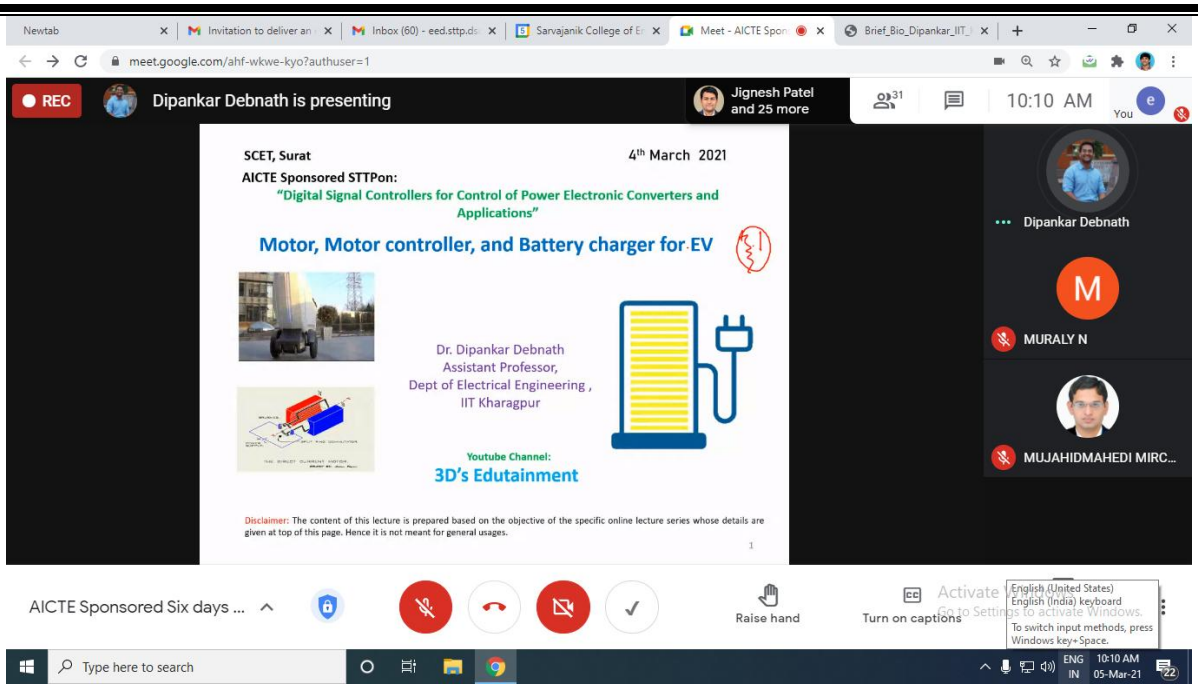


Glimpse of day-4 session-III delivered by Mr. Amandeep Singh, Mr. Utkarsh, Dynafusion, Bengluru

Day-5 (Friday) (5th March-2021)

Day-5 Session-I

On Day-5, first session was delivered by Dr. Dipankar Debnath from IIT, Kharagpur on **"**Motors, Motor Controller and Battery Charger for EV Application". In the beginning, Dr. Debnath had given idea about trends of EV and different types of EVs developed by various companies in 2-wheeler, 3-wheeler and 4-wheeler segment. He then discussed about different types of motors used in EVs along with the motor construction and characteristics. Dr. Dipankar has also explained about control of the motor. Finally he discussed about different types of chargers, ratings and the power electronic converter topologies used in charger. He had also discussed about development in wireless EV charging. He also highlighted the controllers used by industry for EV applications.


REC
Dipankar Debnath is presenting
Jignesh Patel and 25 more
10:10 AM
You
SCET, Surat
4th March 2021
AICTE Sponsored STTPon:
"Digital Signal Controllers for Control of Power Electronic Converters and Applications"
Motor, Motor controller, and Battery charger for EV
Dr. Dipankar Debnath
Assistant Professor,
Dept of Electrical Engineering ,
IIT Kharagpur
Youtube Channel:
3D's Edutainment
Disclaimer: The content of this lecture is prepared based on the objective of the specific online lecture series whose details are given at top of this page. Hence it is not meant for general usages.
Dipankar Debnath
MURALY N
MUJAHIDMAHEDI MIRC...
AICTE Sponsored Six days ...
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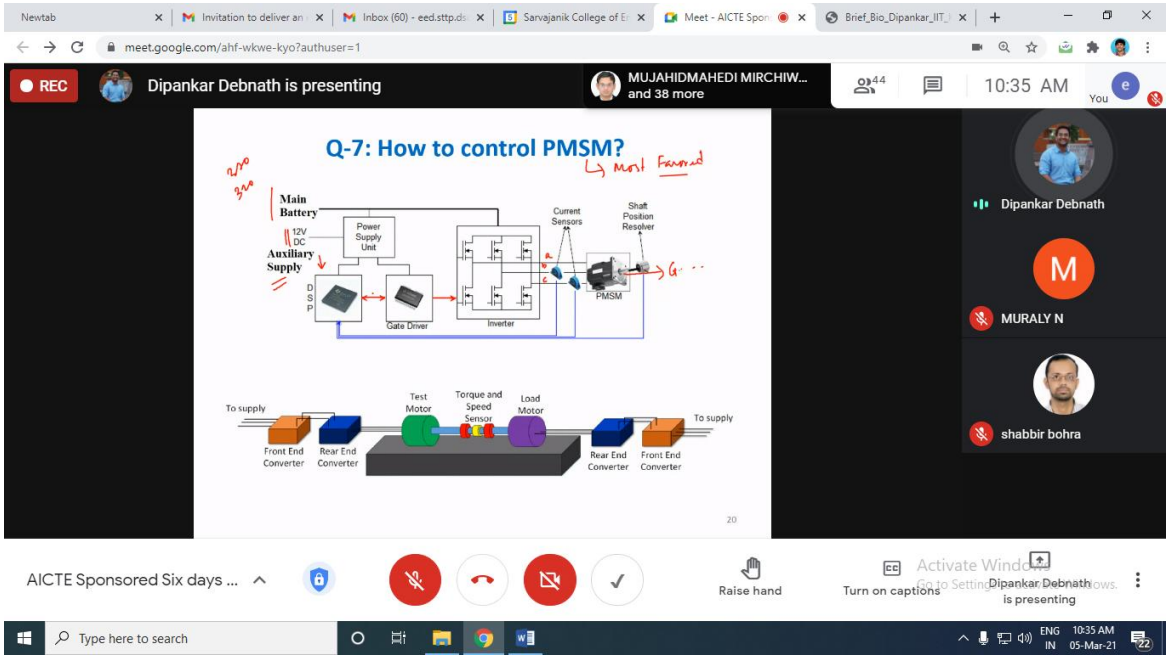
ENG IN
10:10 AM
05-Mar-21


REC
Dipankar Debnath is presenting
MUJAHIDMAHEDI MIRCHIW... and 38 more
10:35 AM
You
Q-7: How to control PMSM?
Most Favored
Main Battery
12V DC
Auxiliary Supply
Power Supply Unit
DSP
Gate Driver
Inverter
Current Sensors
Shaft Position Resolver
PMSM
To supply
Front End Converter
Rear End Converter
Test Motor
Torque and Speed Sensor
Load Motor
Rear End Converter
Front End Converter
To supply
20
Dipankar Debnath
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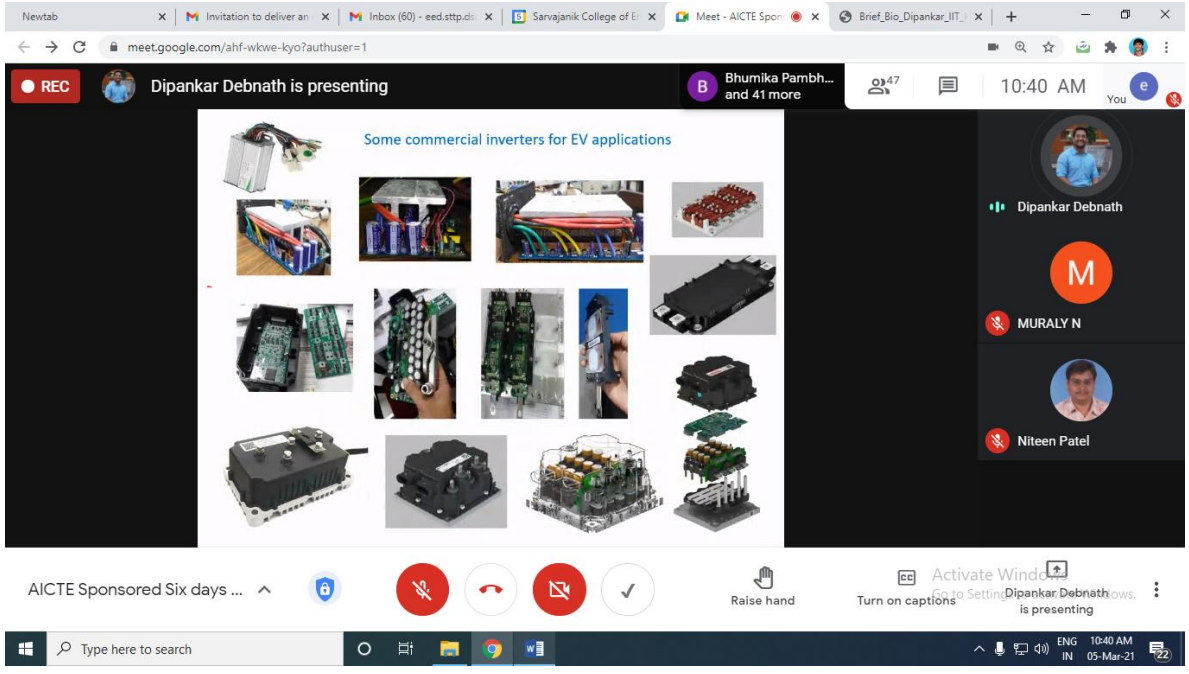
REC
Dipankar Debnath is presenting
Bhumika Pambh... and 41 more
10:40 AM
You
Some commercial inverters for EV applications
Dipankar Debnath
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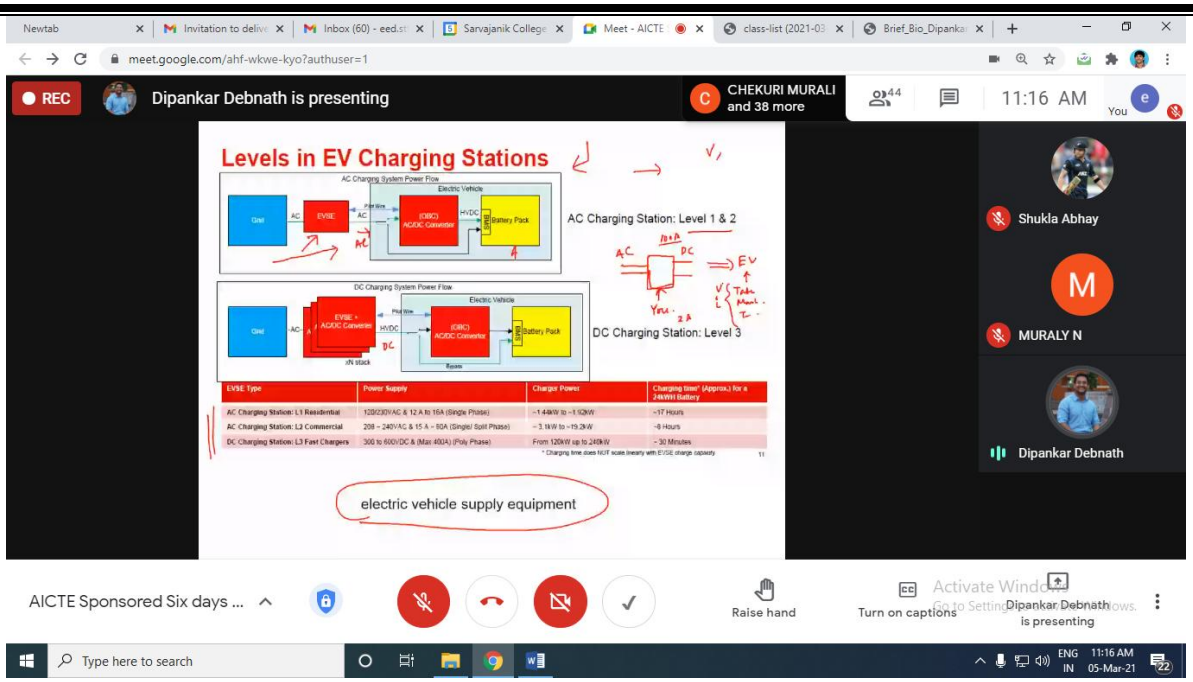

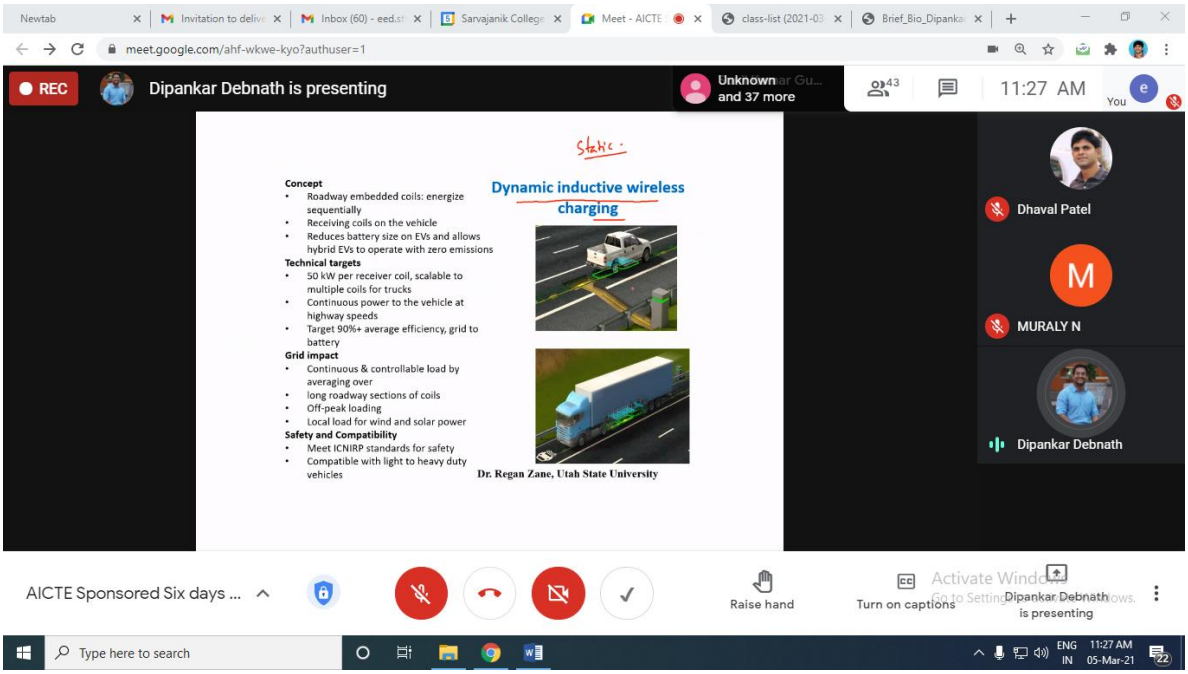

Glimpse of day-5 session-I delivered by Dr. Dipankar Debnath from IIT, Kharagpur

Day-5 Session-II

On day-5, session-II was delivered by Dr. Krishna Vasudevan, Professor from IIT, Madras on "Control of Inverters for Grid Connected Photovoltaic Systems". Dr. Vasudevan highlighted the control goals for inverter for PV integration to grid and explained d-q based control technique in detail. He had also presented need of filter and about different types of filters with an idea of how to select filter for grid connected PV inverter. Dr. Vasudevan also presented islanded mode of operation of the PV system. Dr. Vasudevan ended his talk by patiently solving all the queries of participants.

Dr. Krishna Vasudevan is presenting

Shalni Chandan and 29 more

11:51 AM

Control of Inverters for Grid Connected Photovoltaic Systems

Krishna Vasudevan

Introduction

Output Filter

PLL

Islanding

Summary & Outlook

Control of Inverters for Grid Connected Photovoltaic Systems

Krishna Vasudevan

Department of Electrical Engineering
Indian Institute of Technology Madras

5/3/2021

Dr. Krishna Vasudevan

Prasanna Kumar S.C.

eed.sttp.dscpeca SCET

AICTE Sponsored Six days ...

Raise hand

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Dr. Krishna Vasudevan is presenting

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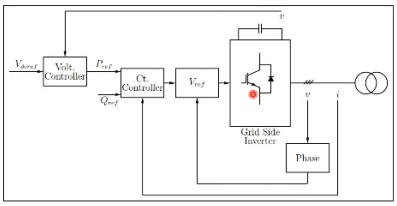
Dr. Krishna Vasudevan is presenting

Dennis Thomas and 33 more

12:07 PM

Control Structure

Generic



Dr. Krishna Vasudevan

Prasanna Kumar S.C.

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Dr. Krishna Vasudevan is presenting

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Dr. Krishna Vasudevan is presenting

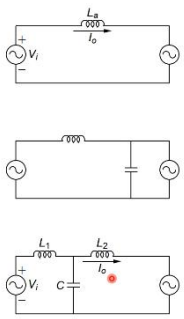
Dennis Thomas and 30 more

12:18 PM

Output Filter

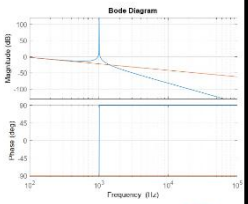
Plant for the control loop

The *plant* to control is actually the filter!!



$L_a = 2$ mH

$L_1 = L_2 = 1$ mH, $C = 50\ \mu$F



Transfer function: $\frac{I_o(s)}{V_i(s)}$

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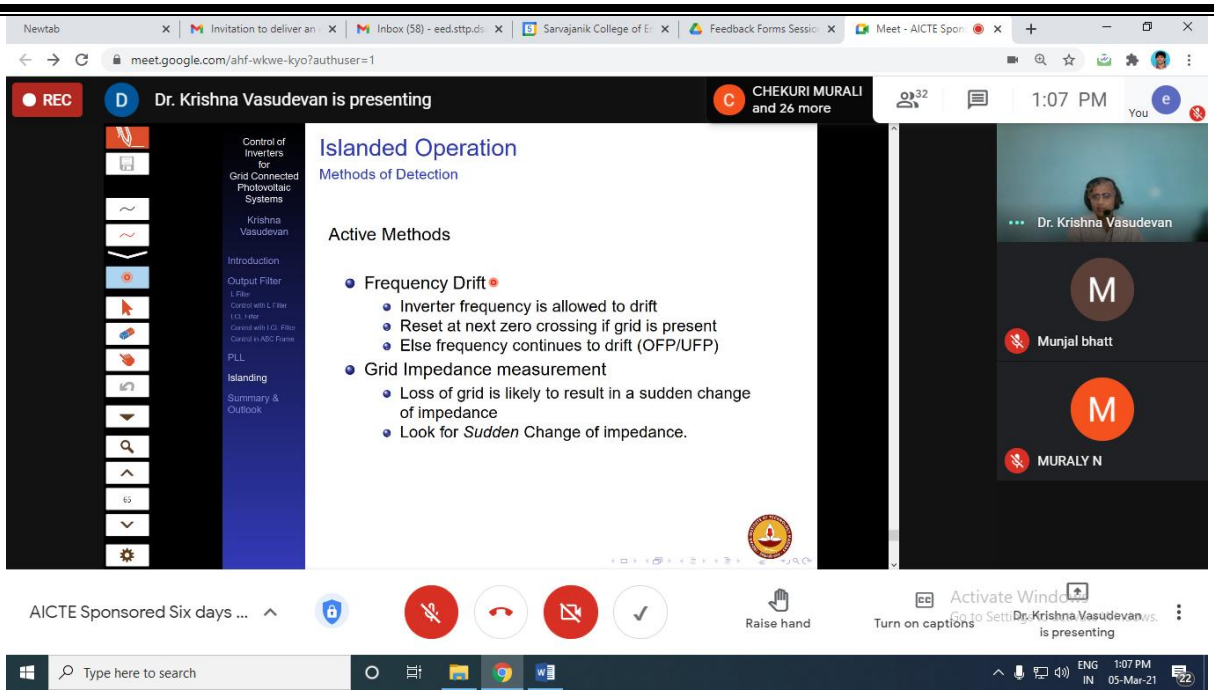
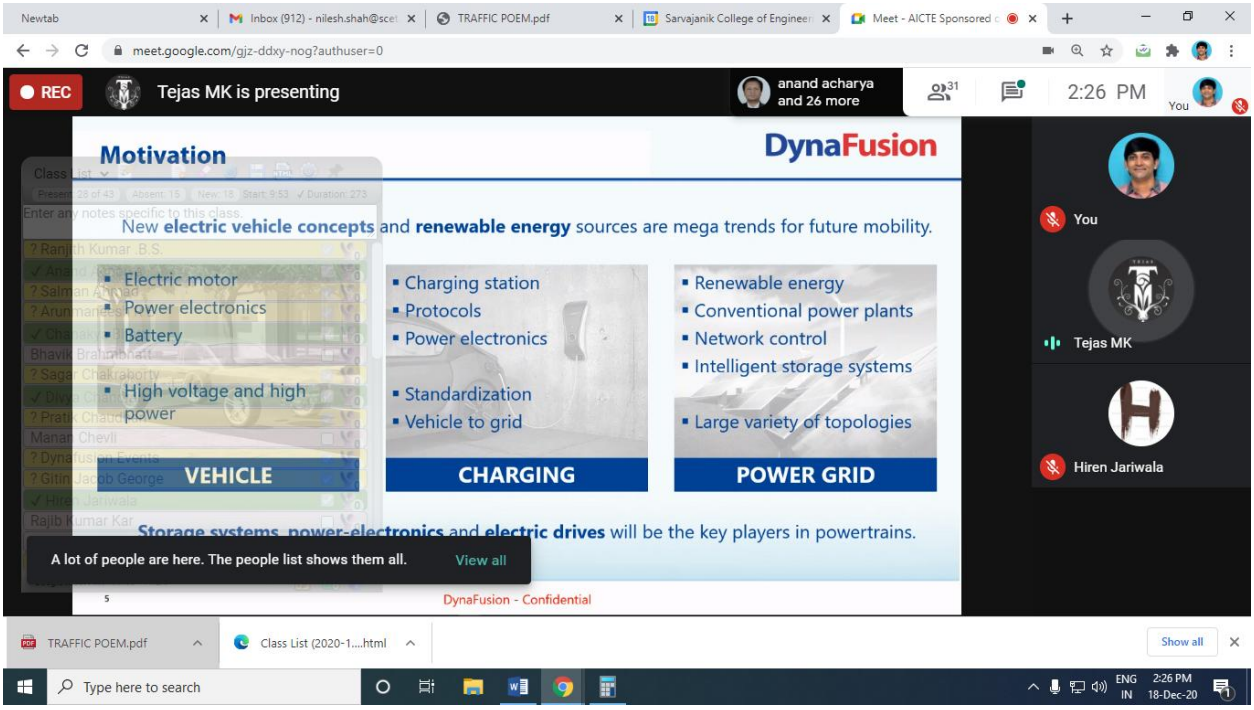
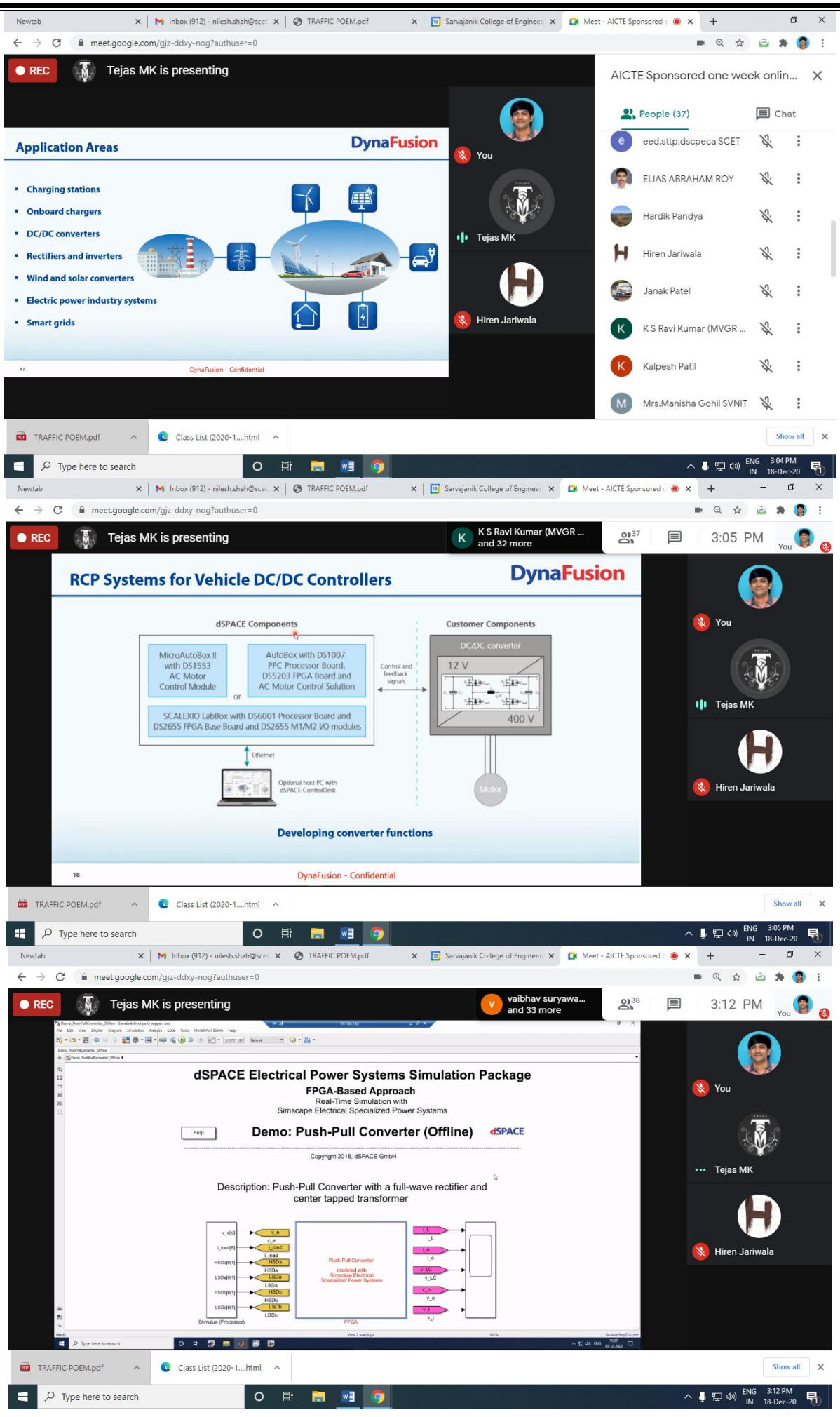


Glimpse of day-5 session-II delivered by Dr. Krishna Vasudevan, IIT Madras

Day-5 Session-III

Session-3 on day-5 was delivered by a team of an Industrial expert from Dynafusion, Bengluru on "dSPACE Solution for Generic topology-oriented Modelling: Electrical Power Systems Simulation". Mr. Tejas form dynafusion presented about various applications of dSPACE in electrical power system. He had discussed about various versions of dSPACE suitable for different applications. He also discussed about electrical vehicle, vehicle charging and renewable energy applications. Mr. Teaj demonstrated about how rapidly a control prototype can be developed for DC-DC converters for vehicle battery charging using dSPACE. He also presented a demo of Push-Pull converter control in online mode. Participant had appreciated the session delivered by Dynafusion team on rapid control prototyping of using dSPACE.



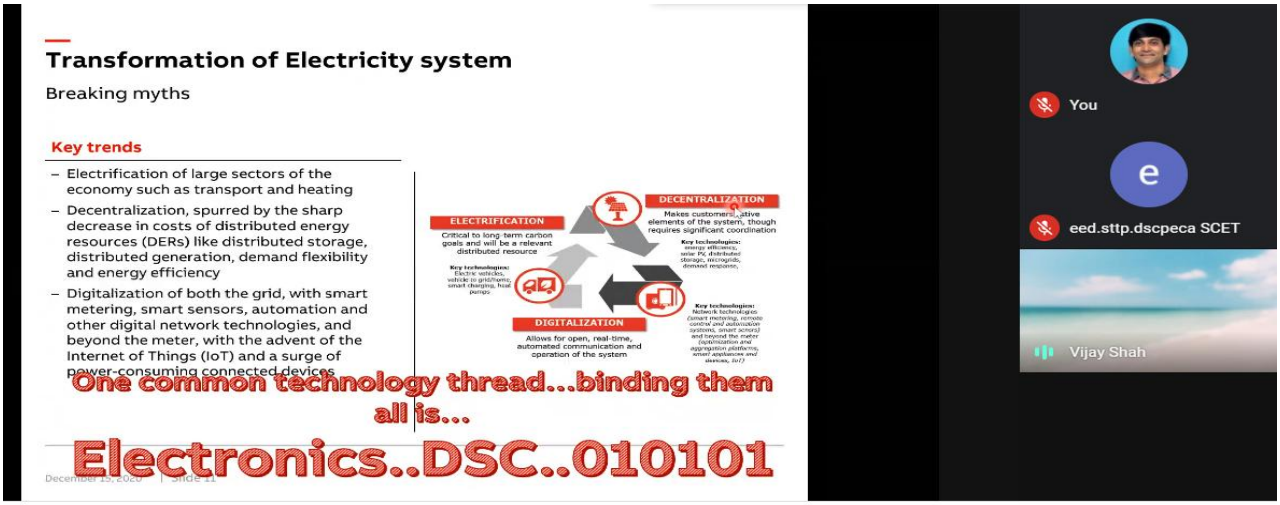


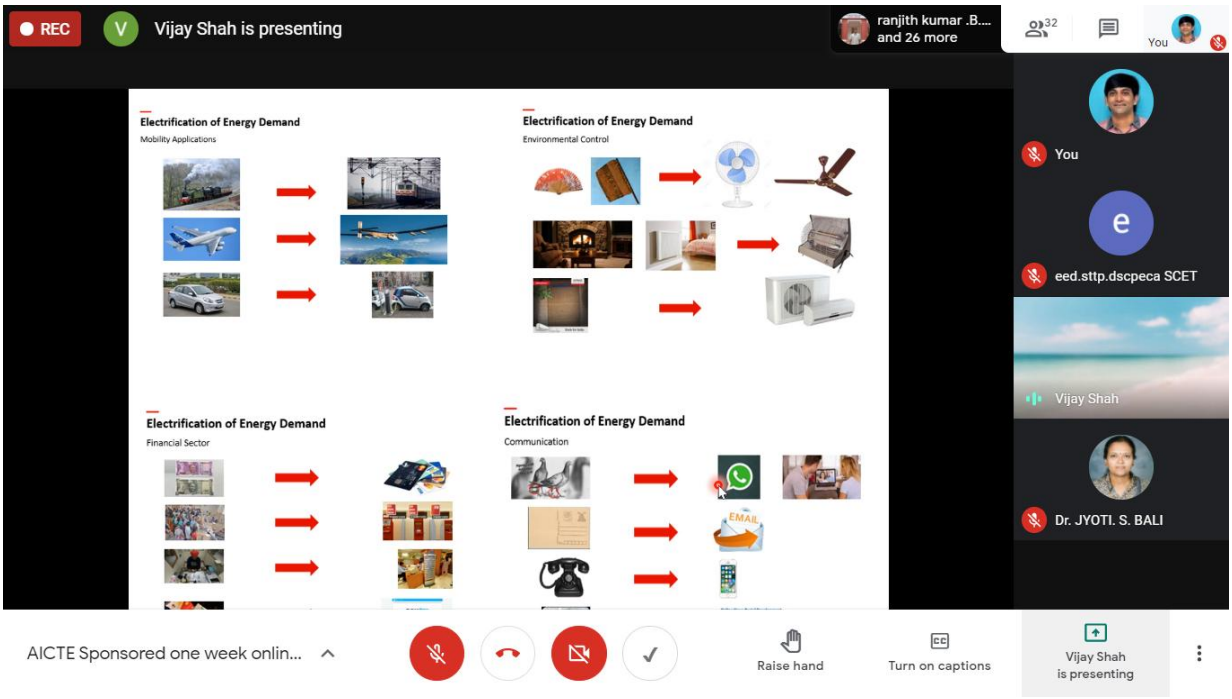
Glimpse of day-5 session-III by Mr. Amandeep Singh, Mr. Tejas M.K., Dynafusion, Bengluru

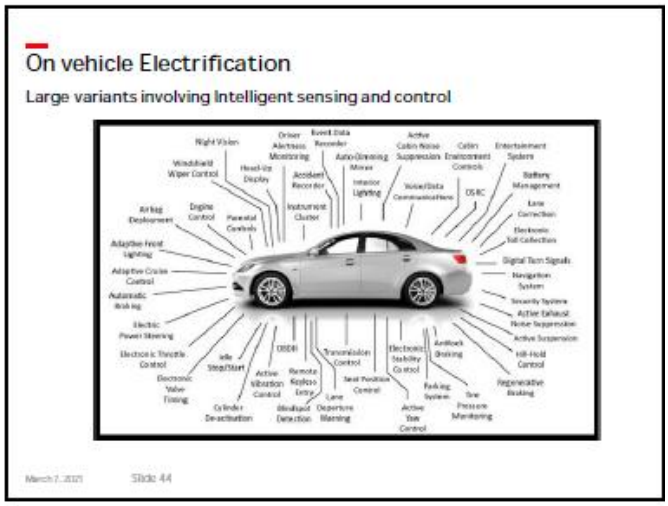
Day-6 (Saturday) (6th March-2021)

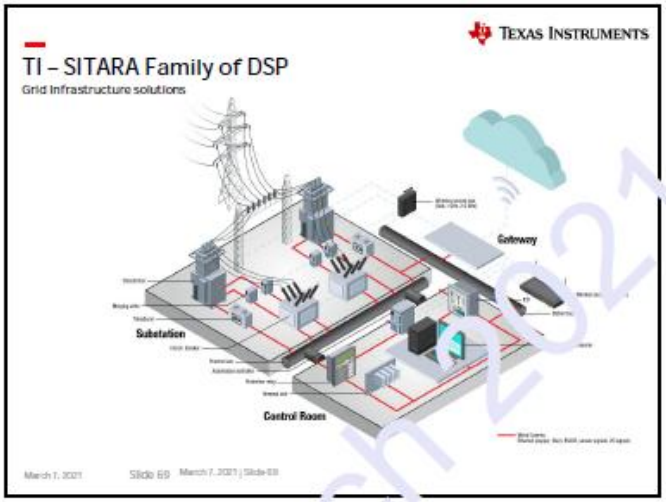
Day-6 Session-I

The first session on day-6 has been delivered by an eminent Industry expert Dr. V. K. Shah from ABB, Vadodara. Dr. V. K. Shah delivered a talk on "Digitalisation in Electrical Power Systems- Evolutionary Trend". He discussed about the trends of development in Microprocessors, Microcontrollers and DSP processors as demanded by various applications. His discussion majorly covered Digitalisation in Electrical Power Systems. The evolutionary trends in applications of processors and their control for protection of power system as well as HVDC system were of interesting parts covered by Dr. V. K. Shah. He discussed about scope of the controllers in enhancing the power system operation and control with advancements in Numerical relay and protective devices. He also covered smart grid concepts with electrical vehicles and then discussed about automotive electronics. Dr. V. K. Shah also highlighted TI-Sitara Family of DSP, features and its application for protective relays, grid integration of renewable, EV charger etc. Dr. V. K. Shah's vast industrial experience in the domain added a different flavour in the session and everyone appreciated the session very much.





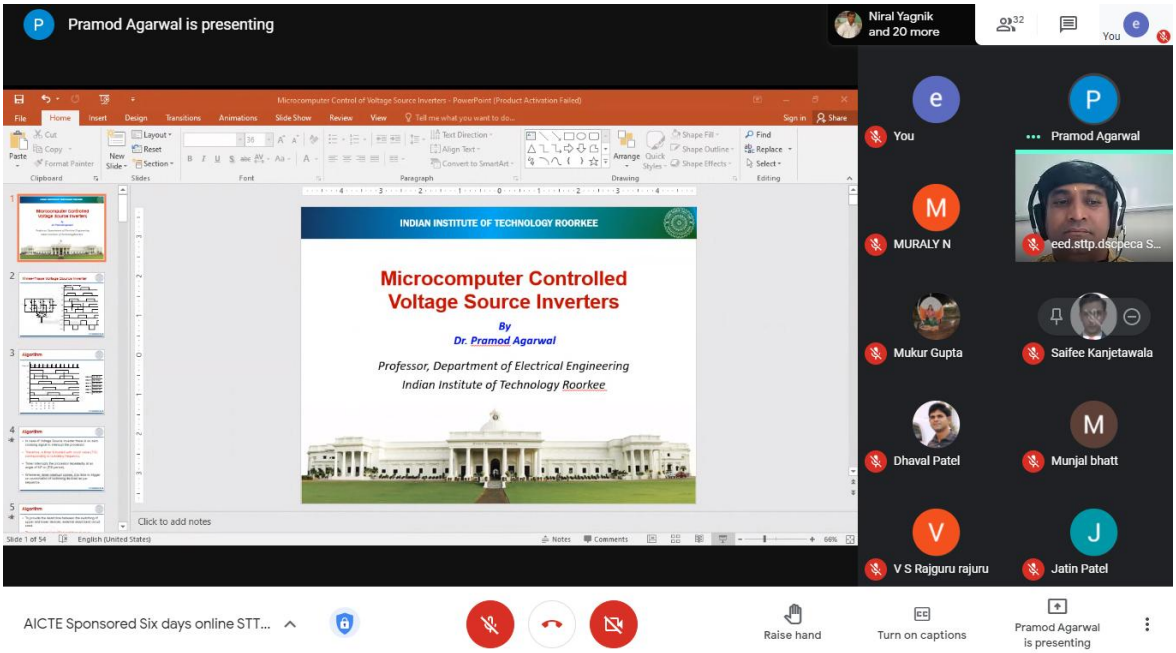


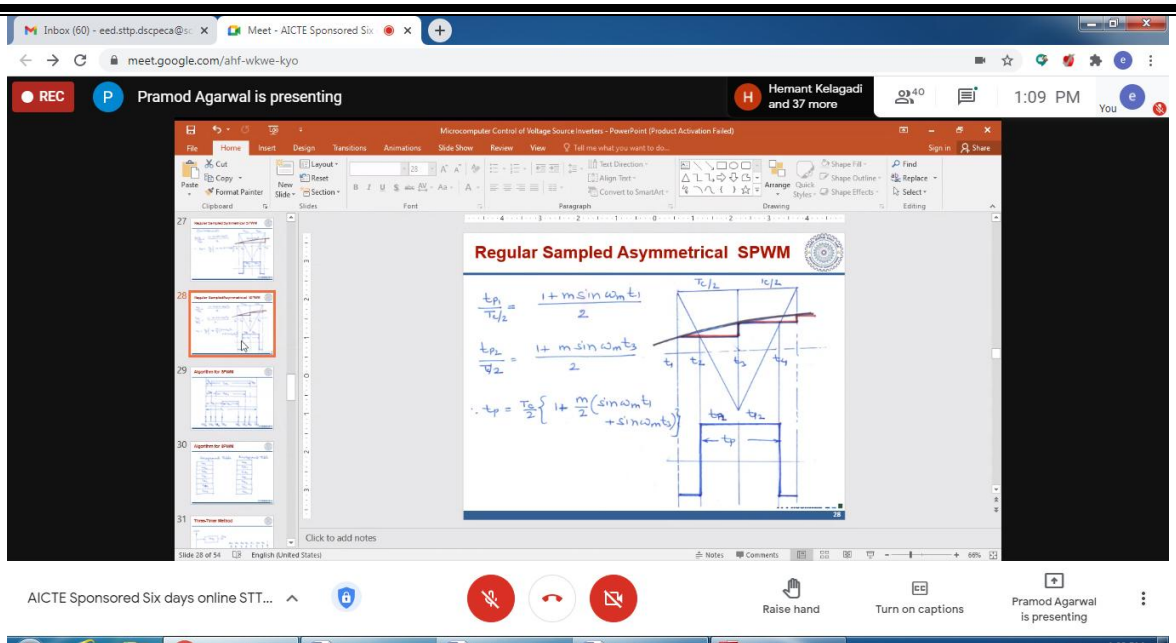


Glimpse of Day-6 Session-I delivered by Dr. V. K. Shah, ABB, Vadodara

Day-6 Session-II

On day-6, session-II was delivered by Prof. Pramod Agarwal form IIT, Roorkee on Microcomputer Controlled Voltage Source Inverters. Dr. Agarwal had explained about Sinusoidal Pulse Width Modulation as well as Space Vector Modulation for control techniques of voltage source Inverters. The algorithm implementation using microprocessor for inverters is explained in detail. The use of Timer and Interrupts of microprocessor for implementation of SPWM and SVPWM algorithms for inverters was well explained by Dr. Agarwal. He had also discussed about the protection features for the inverter incorporated in the implementation of the algorithm. The queries raised by the participants were well addressed by Dr. Agarwal.

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Hemant Kelagadi and 37 more
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Regular Sampled Asymmetrical SPWM
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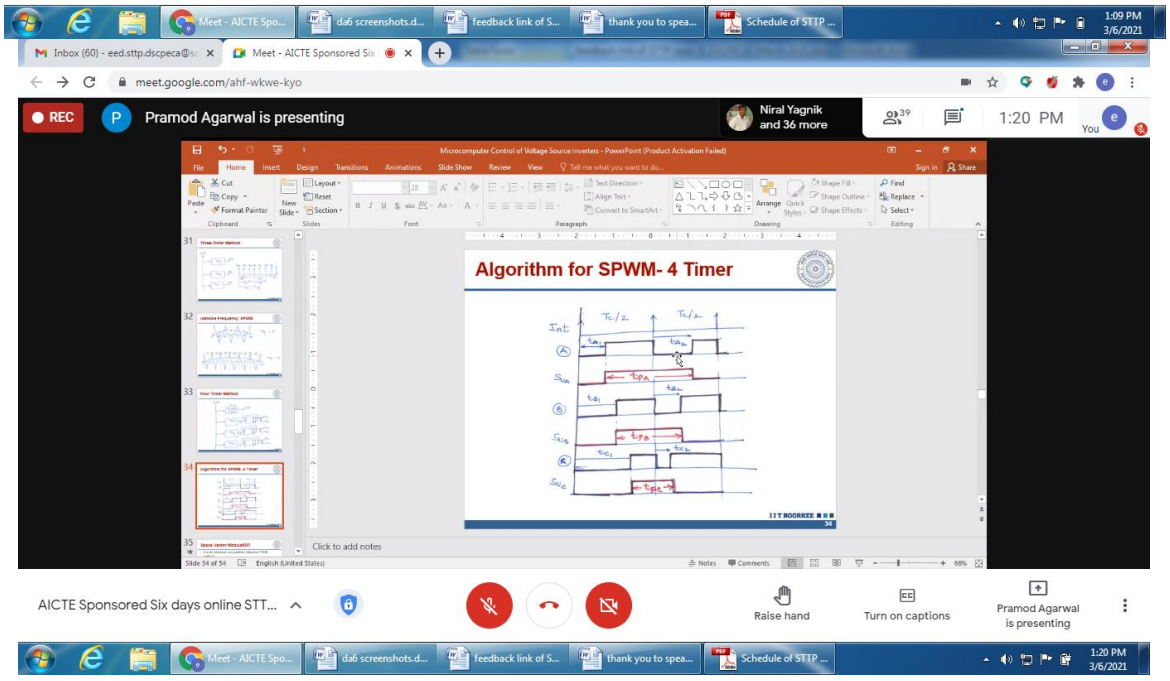
Pramod Agarwal is presenting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Microcomputer Control of Voltage Source Inverters - PowerPoint (Product Activation Failed)
Algorithm for SPWM- 4 Timer
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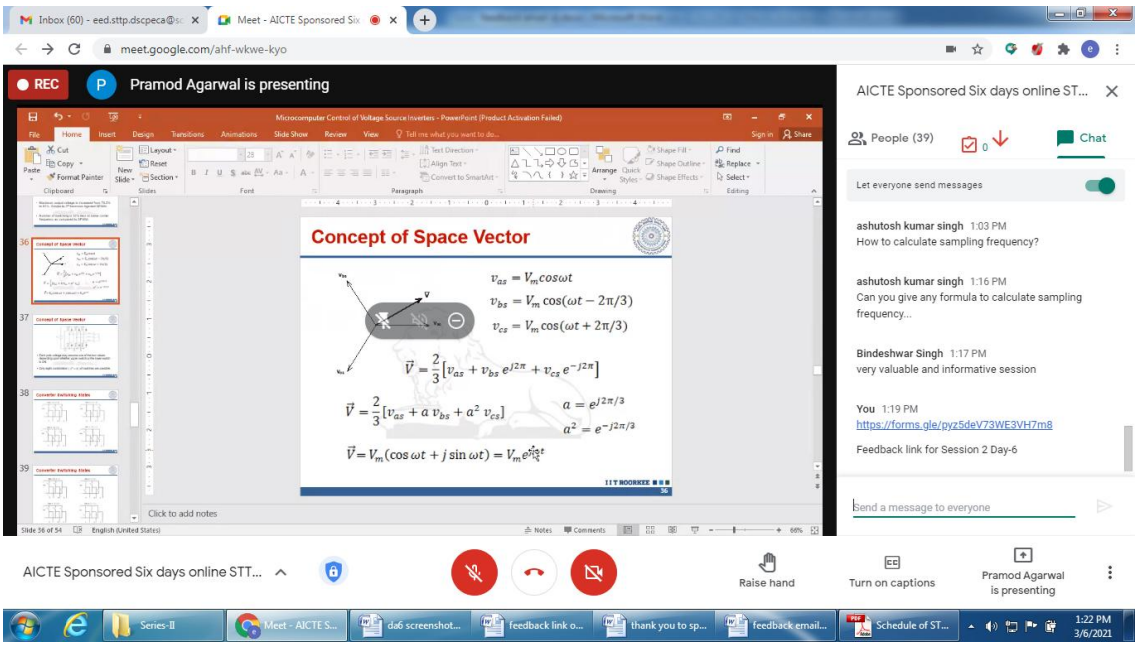
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REC
Pramod Agarwal is presenting
Microcomputer Control of Voltage Source Inverters - PowerPoint (Product Activation Failed)
Concept of Space Vector
$v_{as} = V_m \cos\omega t$
$v_{bs} = V_m \cos(\omega t - 2\pi/3)$
$v_{cs} = V_m \cos(\omega t + 2\pi/3)$
$\vec{V} = \frac{2}{3}[v_{as} + v_{bs}\, e^{j2\pi} + v_{cs}\, e^{-j2\pi}]$
$\vec{V} = \frac{2}{3}[v_{as} + a\, v_{bs} + a^2\, v_{cs}]$
$a = e^{j2\pi/3}$
$a^2 = e^{-j2\pi/3}$
$\vec{V} = V_m(\cos\omega t + j \sin\omega t) = V_m e^{j\omega t}$
Click to add notes
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People (39)
Chat
Let everyone send messages
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How to calculate sampling frequency?
ashutosh kumar singh 1:16 PM
Can you give any formula to calculate sampling frequency...
Bindeshwar Singh 1:17 PM
very valuable and informative session
You 1:19 PM
https://forms.gle/pyz5deV73WE3VH7m8
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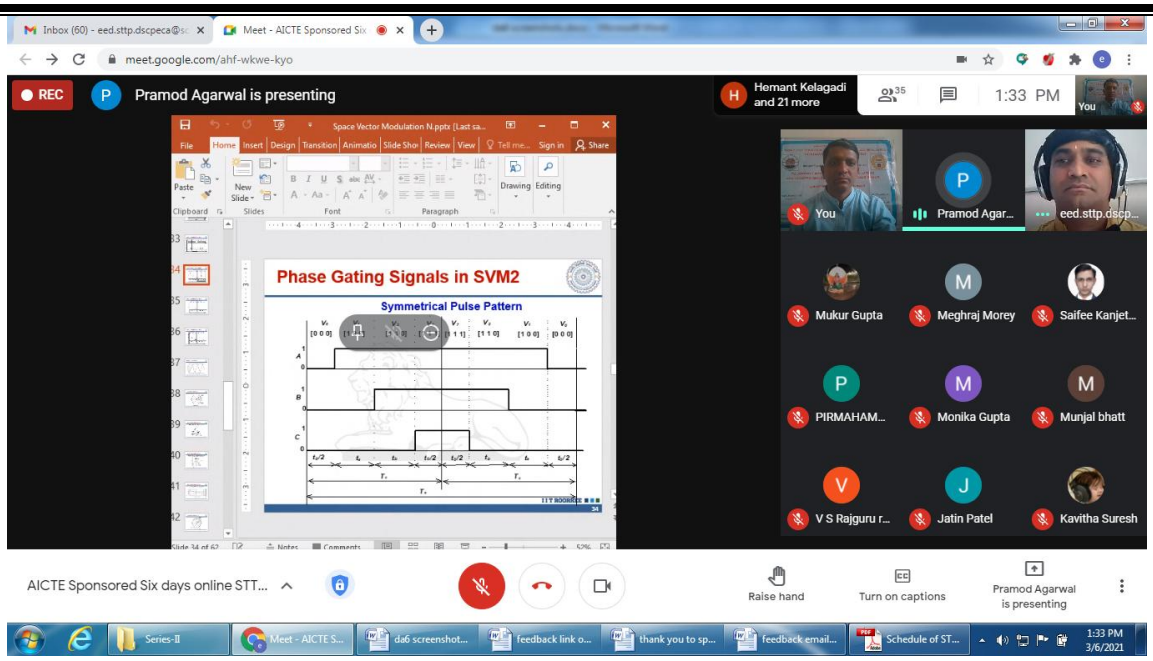
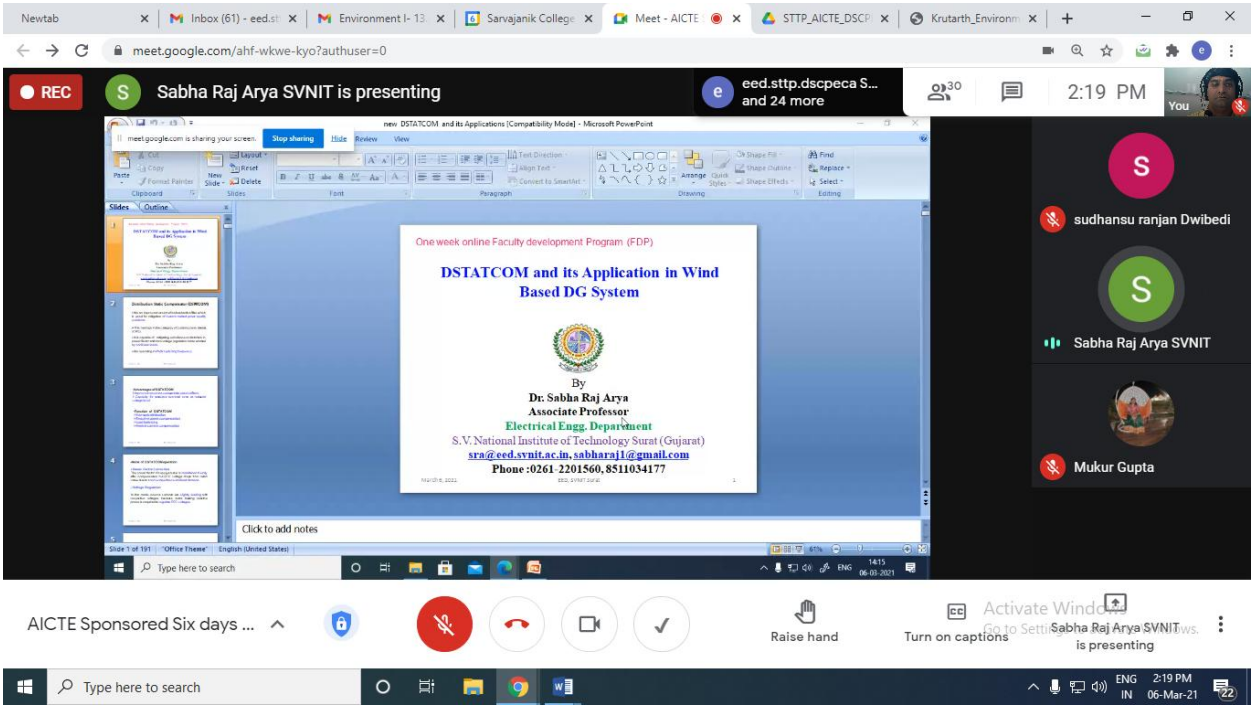


Glimpse of Day-6 Session-II delivered by Dr. Pramod Agarwal, IIT Roorkee

Day-6 Session-III

On day-6, session-III was delivered by Dr. Sabharaj Arya from SVNIT, Surat on "Design and Control of Custom Power Devices". Dr Arya briefly discussed about various custom power devices. Then he explained about D-STATCOM and its control schemes. He had demonstrated the implementation of D-STATCOM by describing selection of various hardware components and control implementation using dSPACE1104. Dr. Arya had also demonstrated experimental set up of DVR and control scheme implementation using Microlabbox. Dr. Arya elaborated in detail about selection of various components for the development of prototype of DVR. The hardware based experimental results presented by Dr. Arya has been very well appreciated by the participants.



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Circuit Configuration

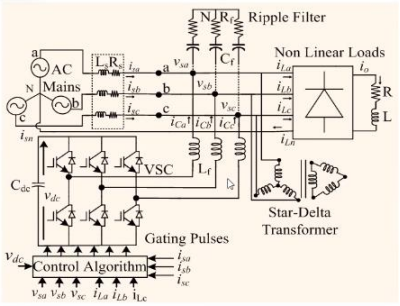

Fig.1 Schematic Diagram DSTATCOM in four wire supply system

March 6, 2021 EED, SVNIT Surat 8

sudhansu ranjan Dwibedi | Sabha Raj Arya SVNIT | Mukur Gupta

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Hardware Implementation of DSTATCOM

- dSPACE 1104
  - complete real-time control system
  - TMS320F240 DSP microcontroller
  - 8 DAC and 8 ADC channel
  - Digital I/O port
  - PWM port

March 6, 2021 EED, SVNIT Surat 31

sudhansu ranjan Dwibedi | Sabha Raj Arya SVNIT | eed.sttp.dscpeca SCET

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Neutral Current compensation (NCC)

1. Star-Delta Transformer based NCC
2. Star-Double Delta Transformer based NCC
3. Star-Double Delta Transformer based NCC
4. Fork Connection based NCC

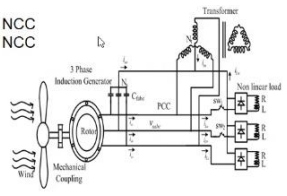

Fig.3 star delta configuration of three phase transformer for neutral current compensation

March 6, 2021 A.K.Giri (D16EL006) PhD Viva Voice at SVNIT, Surat

sudhansu ranjan Dwibedi | Sabha Raj Arya SVNIT | Hitesh Mehta

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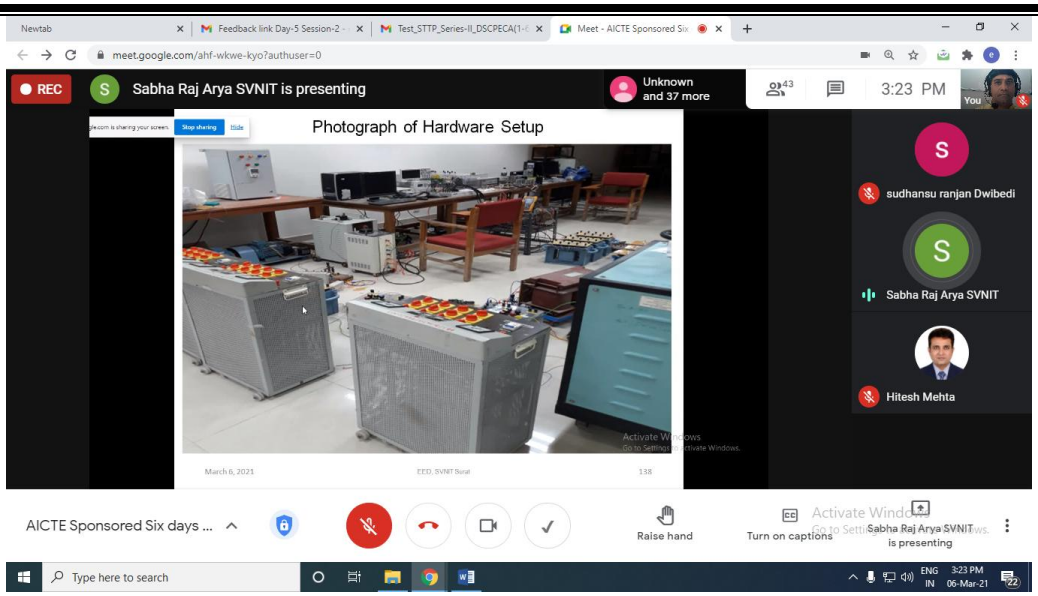
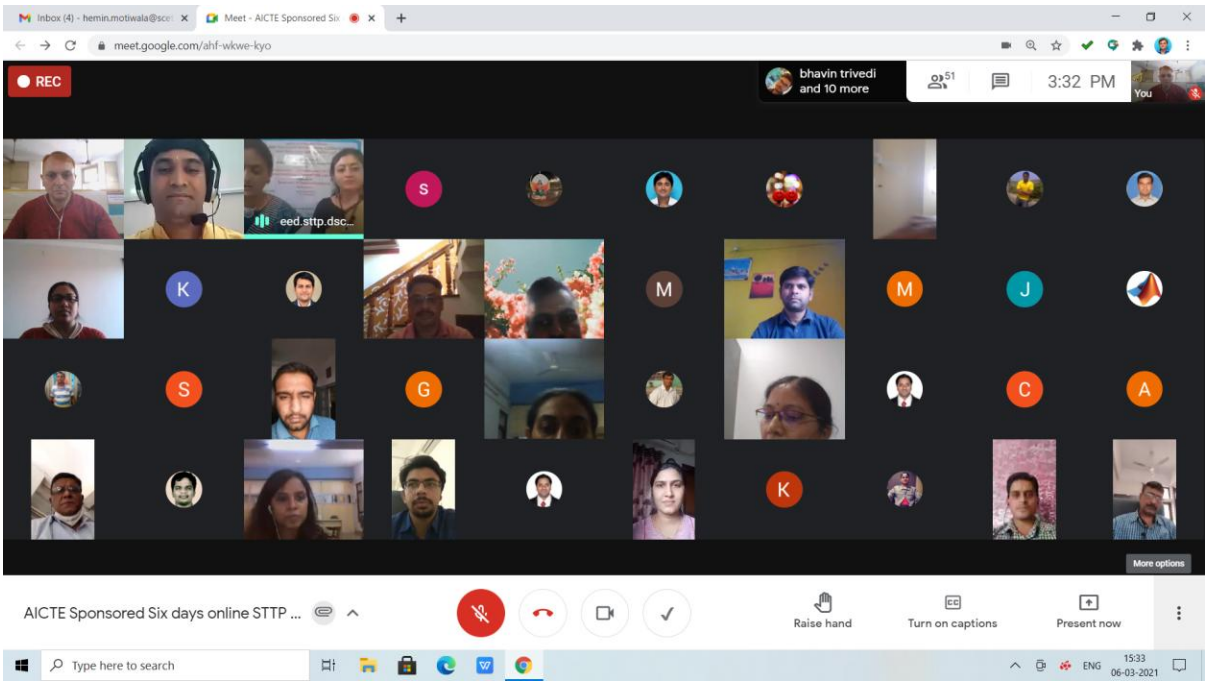


Glimpse of day-6 session-III delivered by Dr. Sabharaj Arya, SVNIT, Surat

Day-6 Valedictory session

Day-6 of the STTP ended with the valedictory ceremony headed by MOC Prof. Dimple Bhanabhagwanwala and Prof. Krishna Vakharia, Assistant Professors of Electrical Engineering Department, SCET. By offering warm welcome to the participants and guests present in the Valedictory ceremony, Dr. Nilesh V. Shah, Associate Professor, Program Coordinator of the STTP presented brief introduction about the program and the content covered by eminent experts. Dr. Nilesh also thanked AICTE for granting the STTP and all the experts who have shared their domain knowledge. Then participants were asked share their views and feedback about the STTP. Participants had given excellent feedback about the successful completion of the STTP and thanked the organizing team for arranging wonderful expert session for thw topics of the STTP. All have appreciated the lab sessions conducted in online mode. Finally, Prof. Aditi Hajari, Head of Electrical Engineering Department, SCET has given vote of thanks to AICTE for giving permission for organizing the STTP; Principal SCET, Management, Technical and Non-technical teams associated in organizing the STTP as well as participants for showing their interest in the STTP.



Glimpse of Valedictory Session

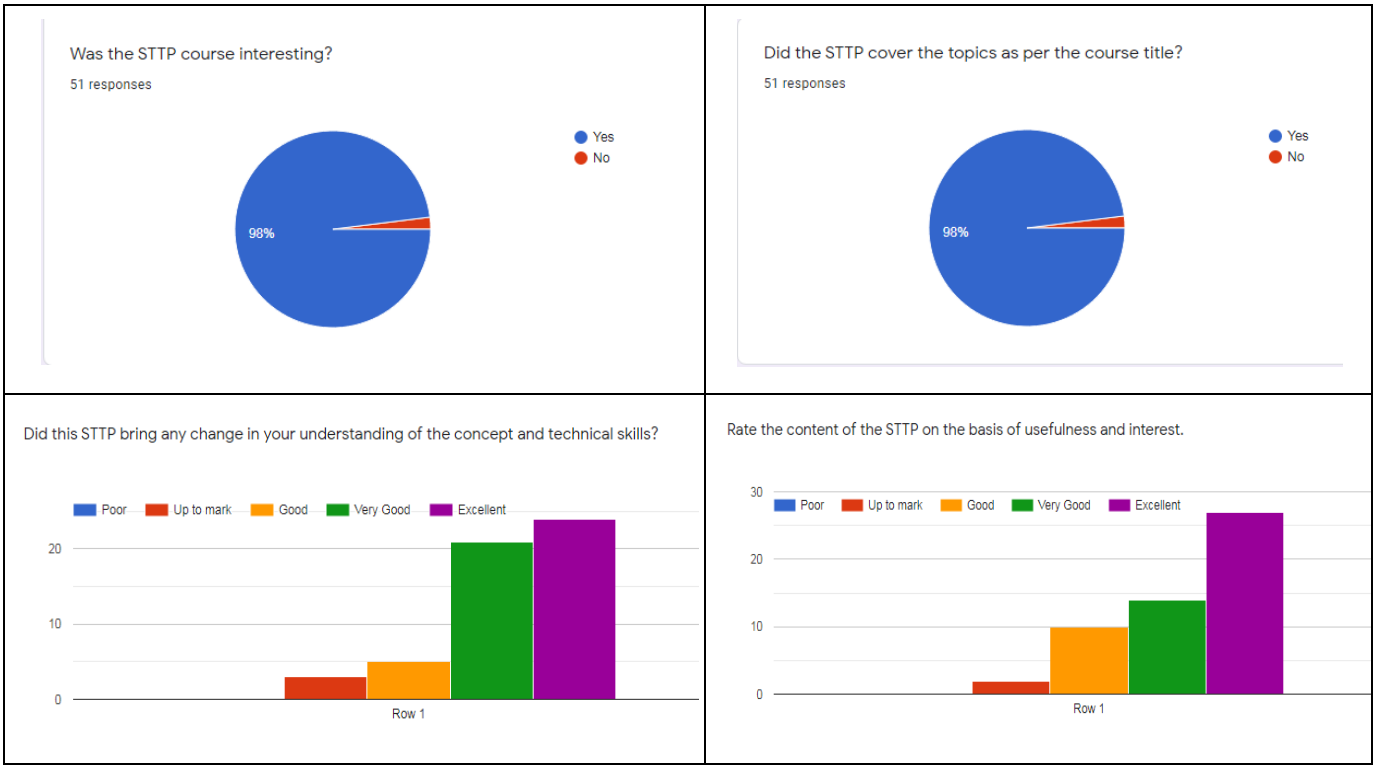
Thus series-II of the one week AICTE sponsored STTP has been successfully completed and ended with Joy and Happiness of learning the course on “Digital Signal Controllers for control of Power Electronic Converters and Applications" amongst participants as well as organizing team.

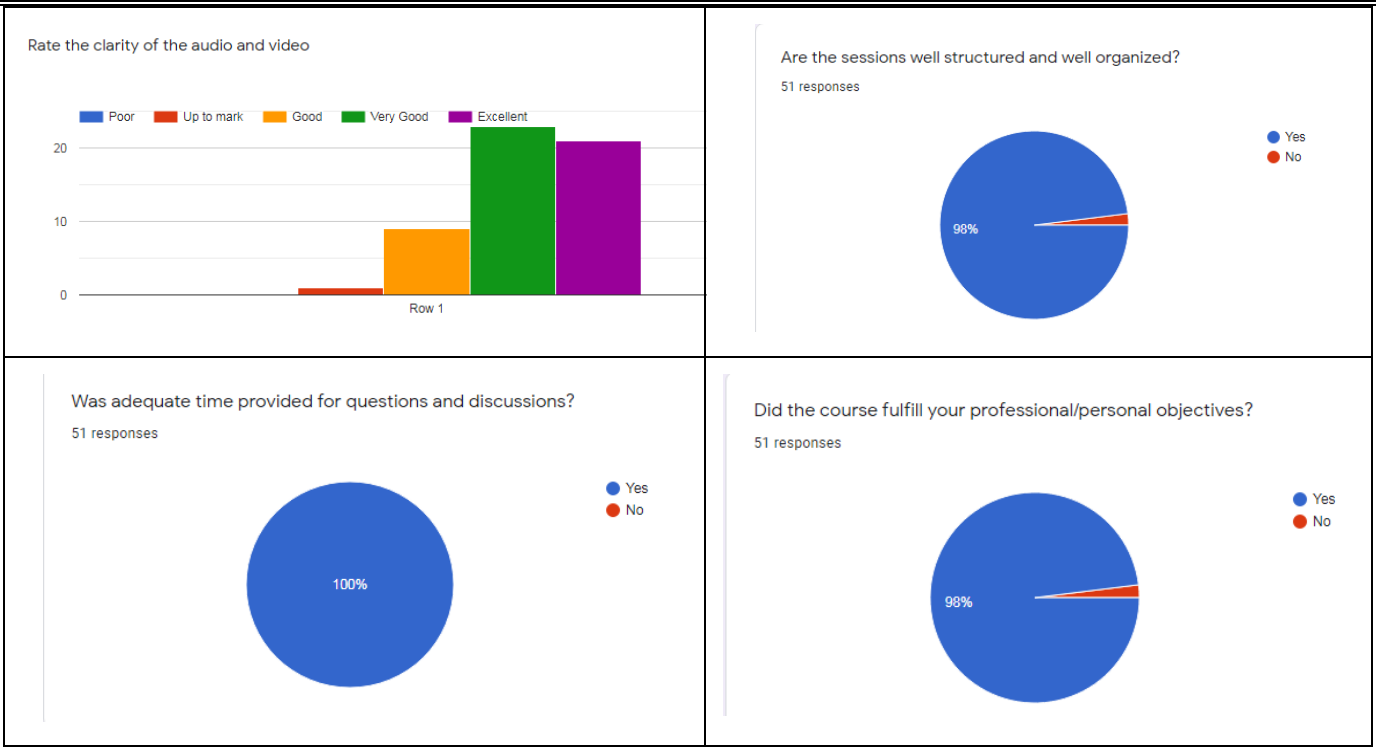
Outcomes of the STTP

1. Enhanced the knowledge in the domain control of power electronic converters using digital signal controllers
2. Created expertise in development of power electronic converters for various applications such as electrical drives, renewable energy integration with grid, electrical vehicles, power quality conditions, power system protective relays.
3. Ability to design, develop and debug software using Digital Signal Controller for control of power electronic converters and its applications.
4. Enriched the participants with the recent trends in digital signal controllers for various industrial applications.
5. Enlighten to pursue research in the domain of power electronic converters and applications.
6. Exposure of developing experiments for control of power electronic converters for various applications.
7. Validate analytical/simulation results of the research works using DSP28335, STM32F407VG Cortex M4 Microcontroller, dSPACE, Microlabbox.
8. Conduct workshop/STTP/FDP for the students, researchers, faculties and/or industries.

Feedback of the STTP

The feedback of the STTP is pretty good. Participants appreciated the content, delivery, quality of experts and learning outcome from the STTP. The detailed feedback analysis is mentioned as under:





Acknowledgement

Department of Electrical Engineering, SCET is very much thankful to **AICTE** for supporting the STTP and permitting SCET to organize the STTP for the benefit of teaching community, research scholars. The STTP has helped faculties and research scholars for enhancing their expertise in the domain of control of power electronic converters using digital signal controllers for various applications which is an indirect help to the students who wants to perceive their career in the domain of power electronic converters and applications. We would also like to thank SCET management for encouraging such knowledge sharing activity, **Dr. Hiren Patel**, Principal, SCET for providing an opportunity to apply for the STTP, and Dr. Chirag Pauwala, Dean R & D, SCET to provide support wherever needed.

Report Compiled by STTP Team

Dr. Nilesh V. Shah (Program Coordinator, Member Secretary)

Dr. Kalpesh Patil, Co-cordinator

Organizing committee members:

Prof. S. B. Patel, Prof. Dimple Bhanabhagwanwala,

Prof. Krishna Vakharia, Prof. Hemin Motiwala

****