



Sarvajani Education Society
Sarvajani 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”**

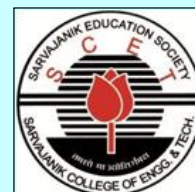
Series-II (1-6 March-2021)

Online Mode

**Sarvajani 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 Bhanabagwanwala

Series-I (14th -19th December-2020)

Series-II (1st -6th March-2021)

Chief Patron

**Shri Kamlesh Yagnik
Chairman, Sarvajani 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 Bhanabagwanwala, 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, DSPICE.
- 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. Gandhi 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. | Registration 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 University, 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 |

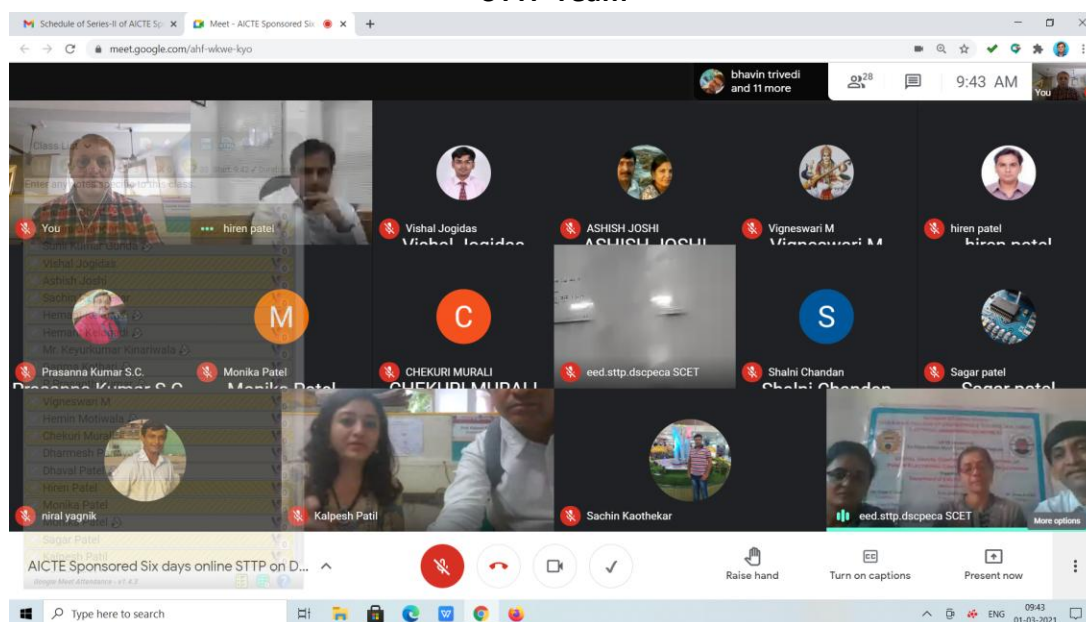
Details of Day-wise session of STTP (Series-II)

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

The first day of the STTP started with the inauguration ceremony headed by MOC Prof. Dimple Bhanabagwanwala 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.



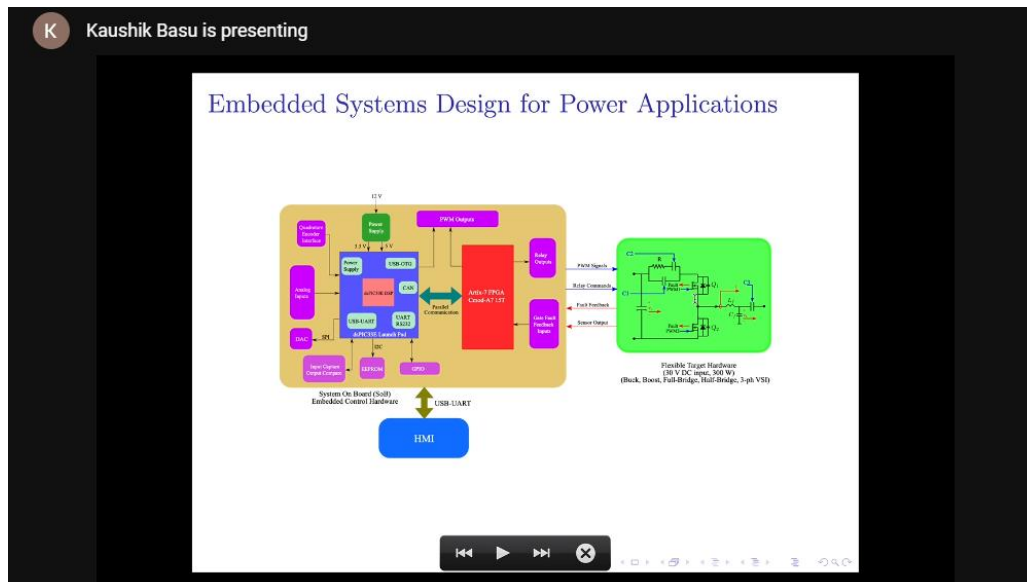
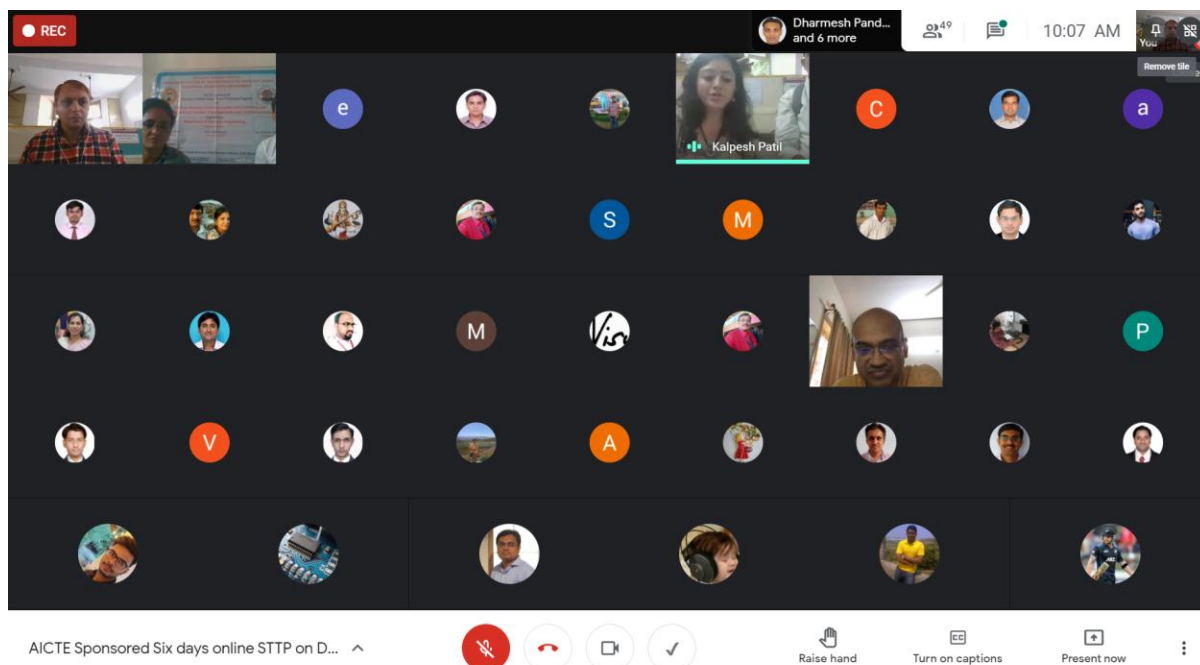
STTP Team



Glimpse of Inauguration on 1st March-2021

Day-I Session-I

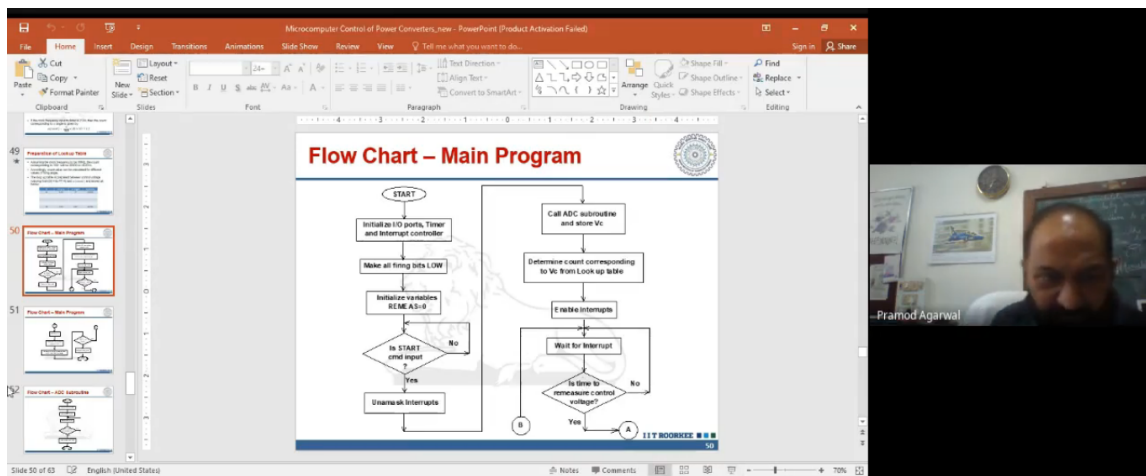
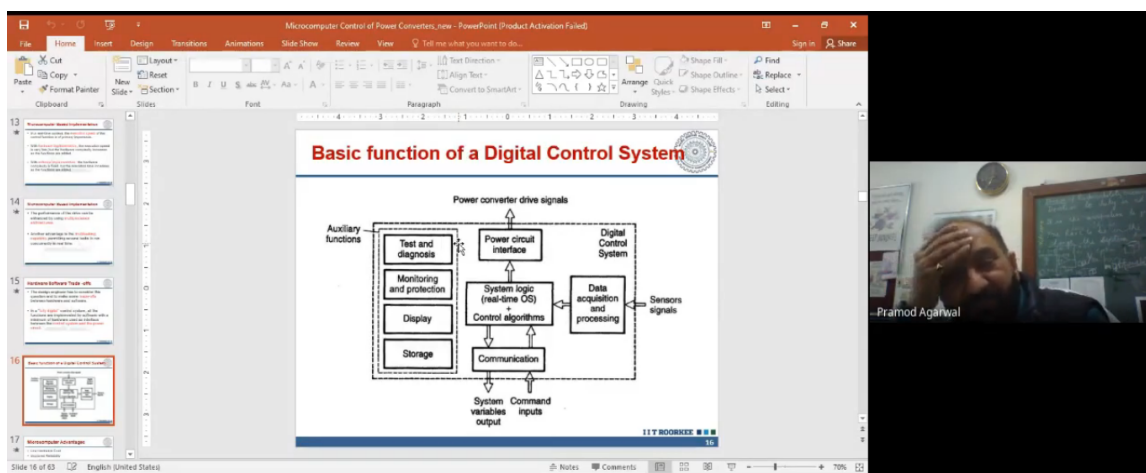
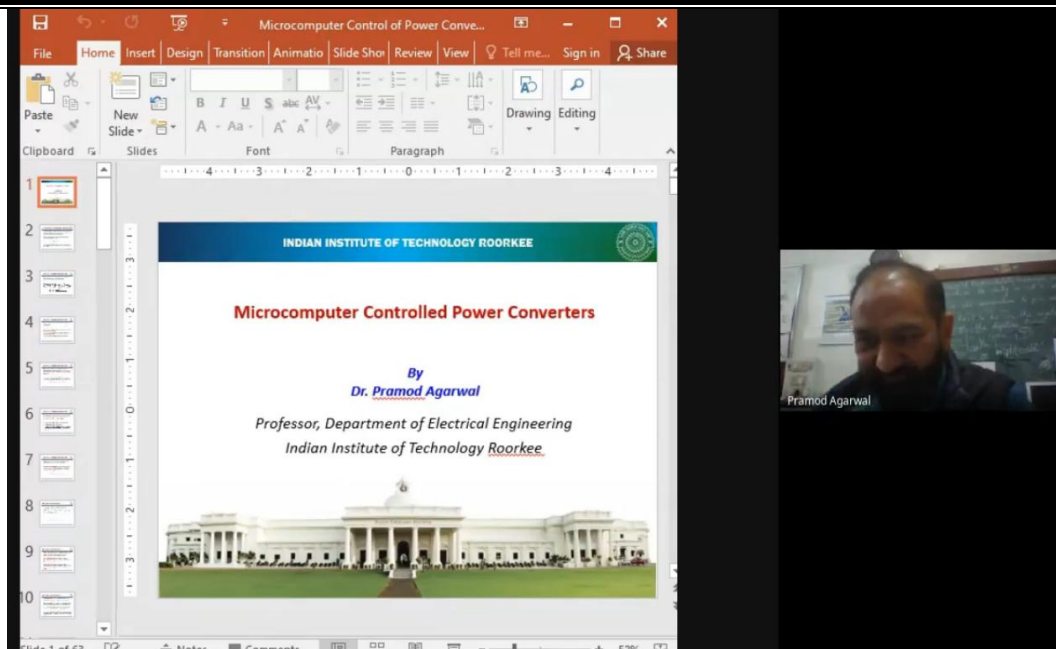
The STTP started with first keynote session on “Embedded Controllers for Control of Power Electronic Converters” delivered by Dr. Kaushik Basu, IISc Bengaluru. Dr. Basu explained about different types of controllers like DSP, Microcontroller, FPGA and their major features. The need for these controllers 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 from 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.

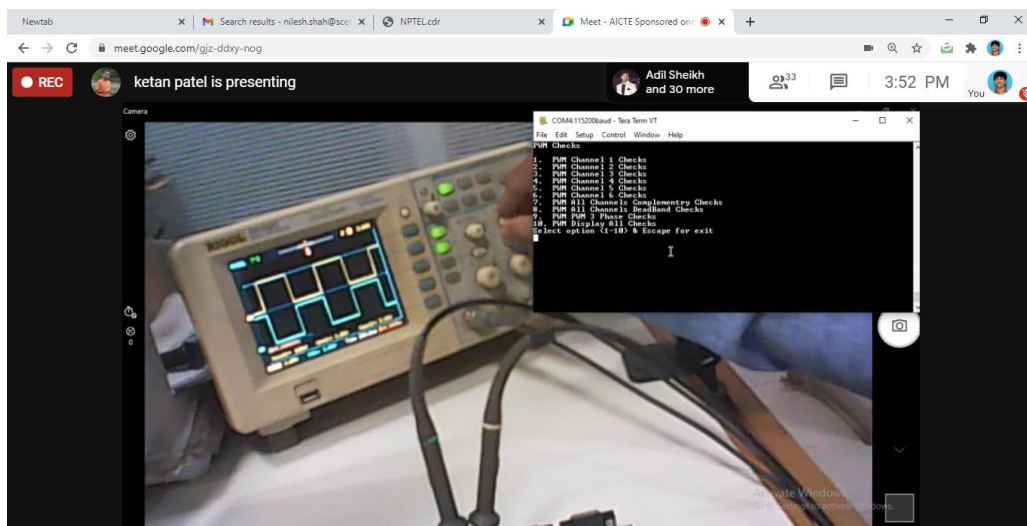
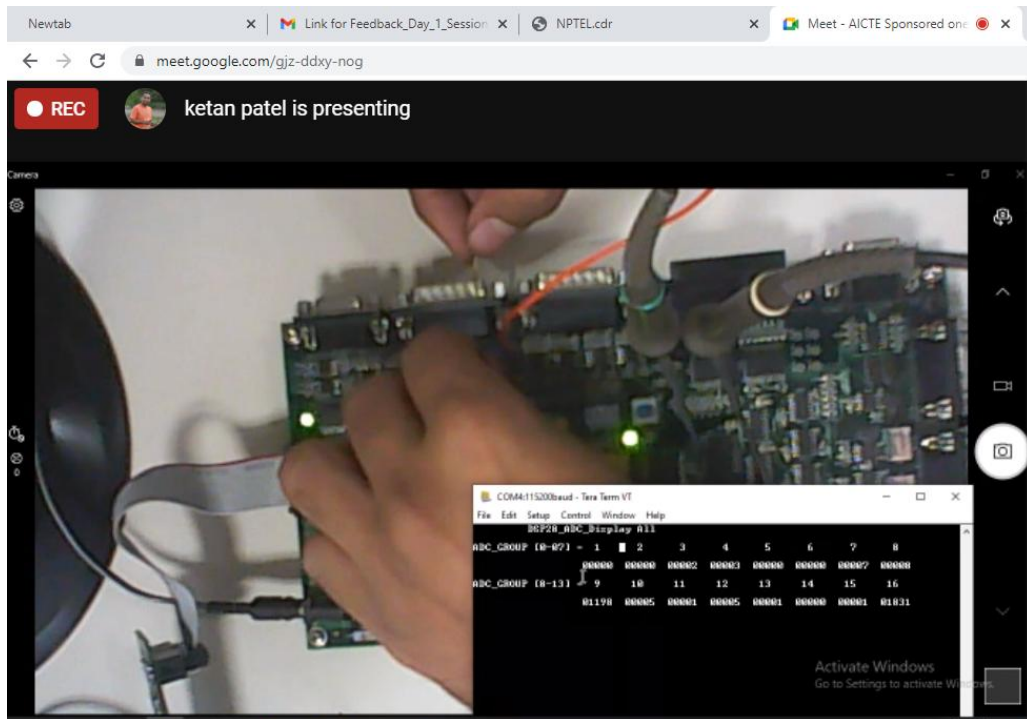
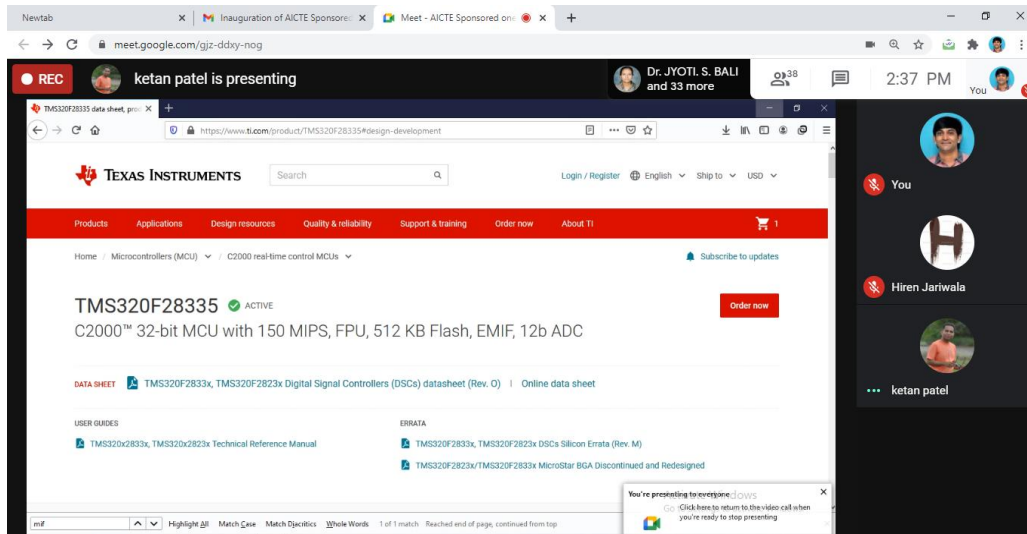


Glimpse of Day-1 session-II by Prof. Pramod Agarwal from IIT, Roorkee

Day 1 Session-III

On day-1, session-III was delivered by an industrial expert Er. Ketan Patel from Edutech Learning solutions PVT. Ltd, Vadodara. Session-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 applications were explained in details with associated peripherals. Er. Ketan then explained about programme development tool Code composer studio for TMS320F28335. The programming of various peripherals

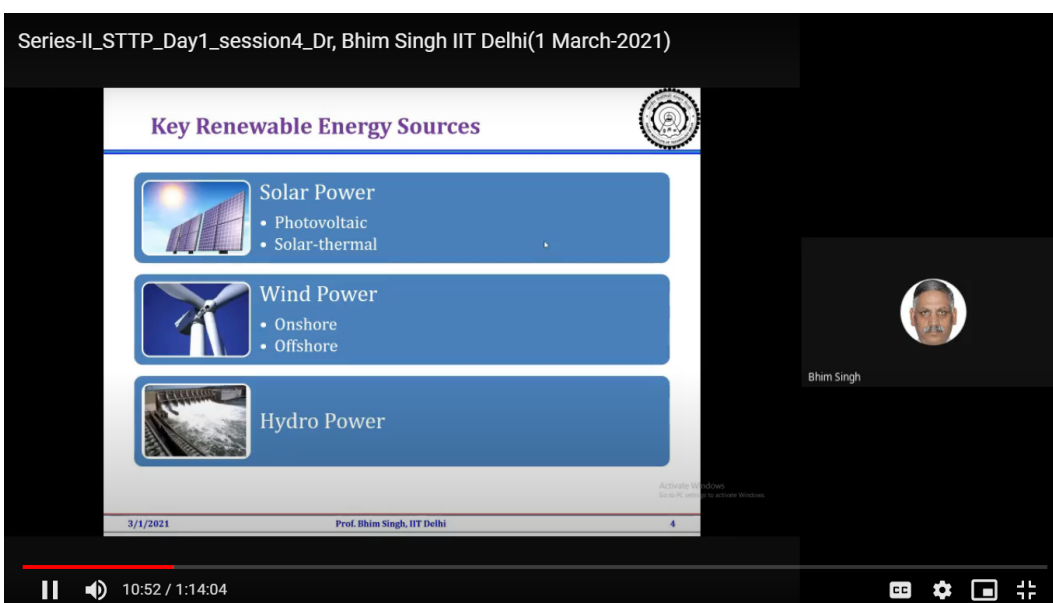
such as PWM timer, ADC, DAC using TMS320F28335 has been demonstrated in online mode. Finally, Er. Ketan very patiently solved the queries of the participants on programming and debugging software of TMS320F28335 DSP using code composer studio.



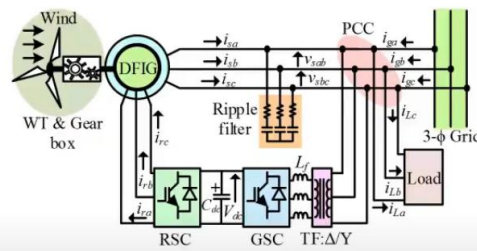
Glimpse of Day-1 session-III by Er. Ketan Patel from Edutech Learning Solutions Pvt. Ltd., Vadodara

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 energy. 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 Singh 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.



Grid Interactive Wind Turbine Driven Doubly Fed Induction Generator with Optimal Control



Grid-interactive DFIG based WECS

S. Puchalapalli and B. Singh, "Optimal RSC control for loss reduction in wind turbine driven DFIG-grid system," in 2020 IEEE Energy Conversion Congress and Exposition (ECCE), Detroit, MI, USA, 2020, pp. 2119-2124.

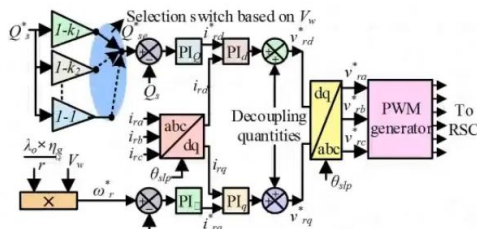
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Prof. Bhim Singh, IIT Delhi

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Optimal Rotor Side Converter Control



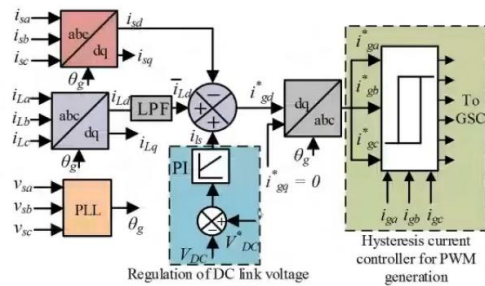
Optimal RSC control

3/1/2021

Prof. Bhim Singh, IIT Delhi

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Grid Side Converter Control



Synchronous reference frame theory based GSC control

3/1/2021

Prof. Bhim Singh, IIT Delhi

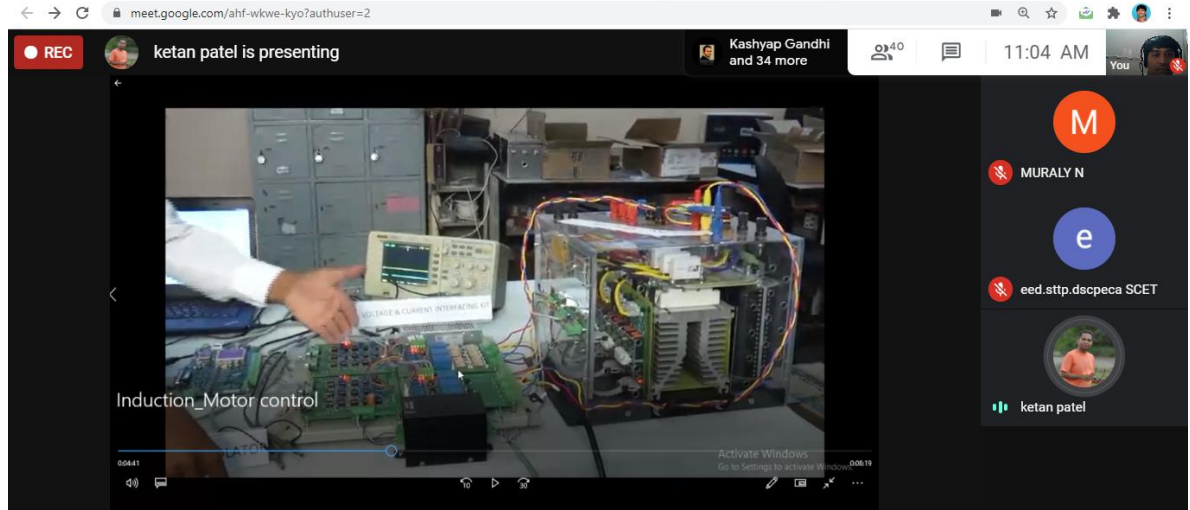
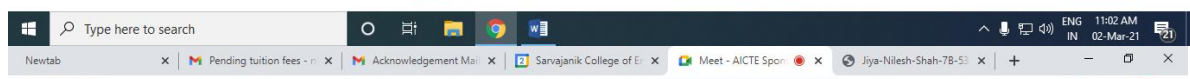
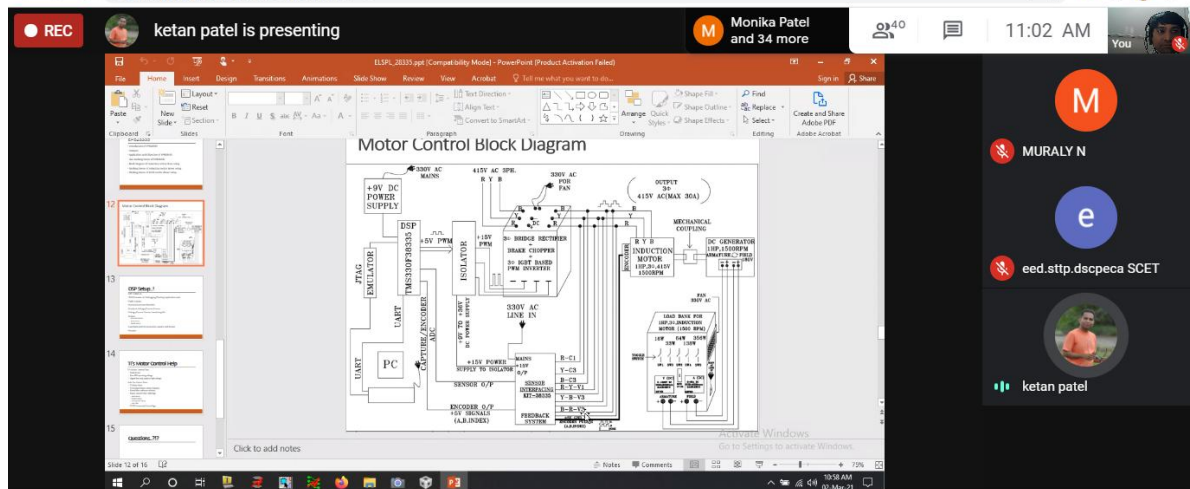
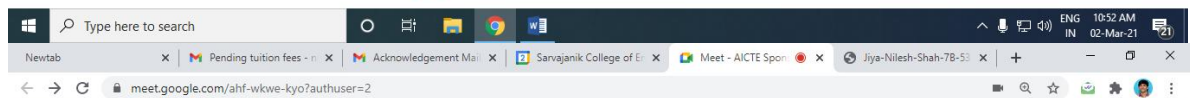
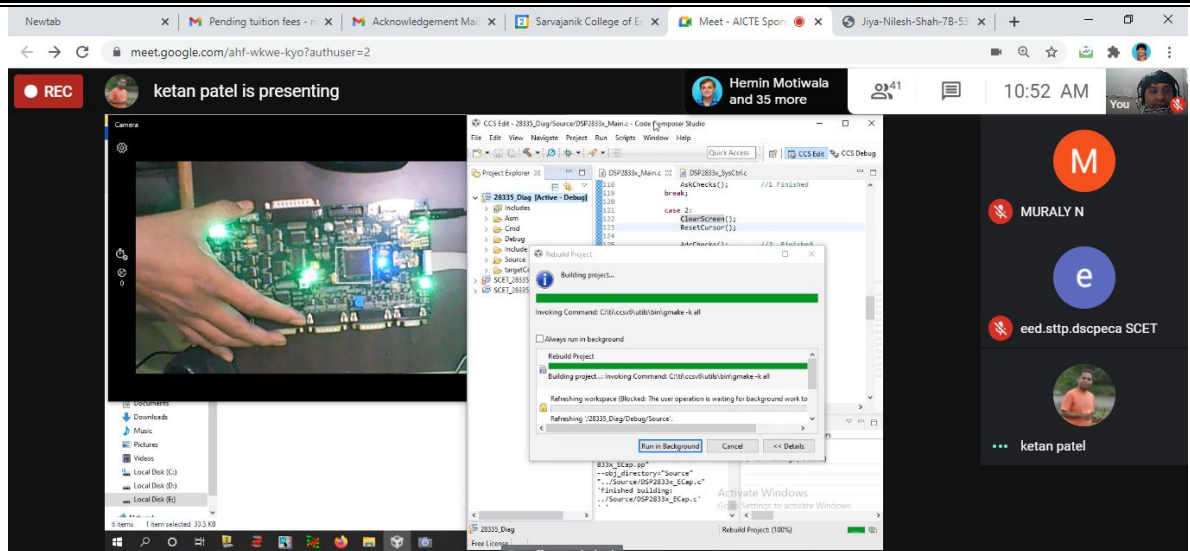
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Glimpse of Day-1 session-IV by Dr. Bhim Singh from IIT Delhi

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 appreciated the practical session on demonstration 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 Microcontroller 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 continuously 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.

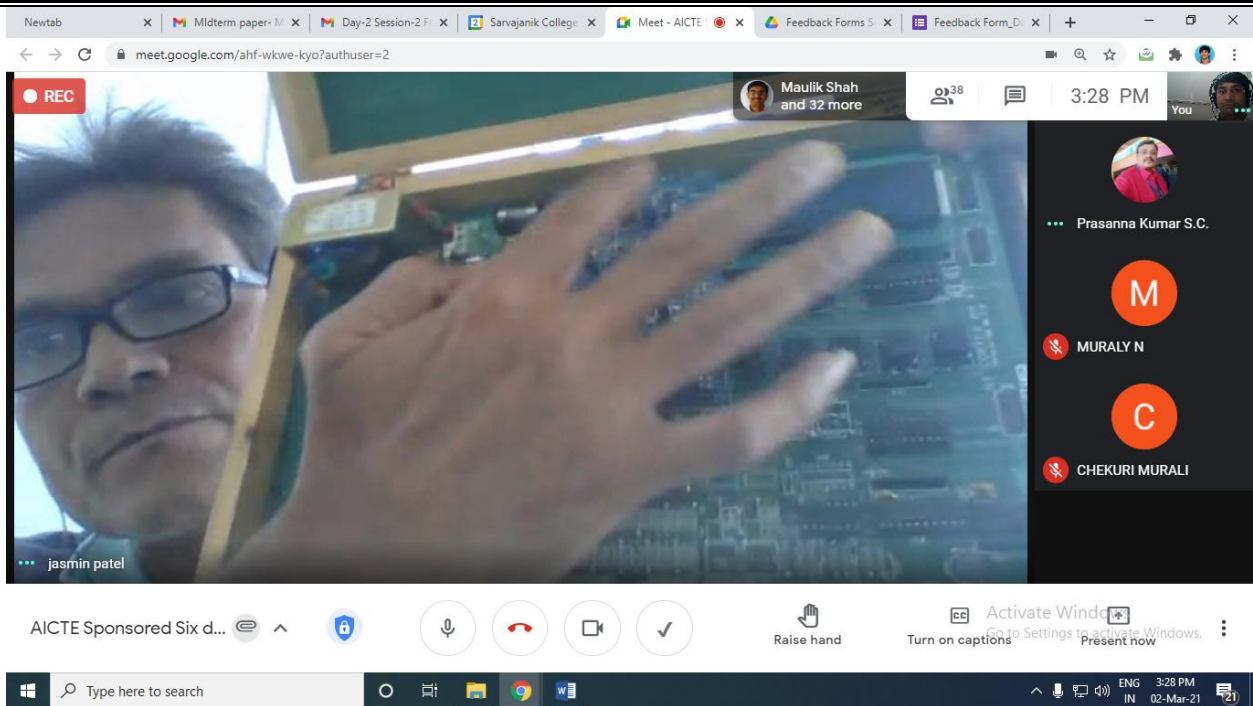
The screenshot displays a Google Meet interface during a session. The primary video feed shows a whiteboard with a hand-drawn block diagram of the STM32 Cortex M4 architecture. The diagram includes blocks for 'Cortex M4', 'FLASH', 'SRAM', 'RAM', 'Peripherals' (containing 'ADC', 'DAC', 'GPIO', and 'Timer'), and 'CLM'. Arrows indicate data flow between these components. Handwritten notes include 'Fetch Delete Exec' and 'Prog Non-Volatile'. A notification at the bottom left of the whiteboard states 'MUJAHIDMAHEDI MIRCHIWALA has left the meeting'. The right sidebar shows a list of participants: MURALY N, Garima Kothari, Dhaval Patel, Shalni Chandan, Shilpa Patel, Sunil Kumar Gunda, V S Rajguru rajuru, Vigneswari M, and VISWANATHAN T. The bottom status bar indicates 'AICTE Sponsored Six days online ...' and 'Hemin Motiwala is presenting'.

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. Gandhi 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.

The image is a screenshot of a Google Meet session. The top part shows a browser window with the URL `meet.google.com/ahf-wkwe-kyo?authuser=2`. The main window displays a presentation titled "STM32F405xx, STM32F407xx, STM32F415xx and STM32F417xx advanced ARM-based 32-bit MCUs" with the reference manual number RM0090. The presentation includes an introduction section. The bottom part of the screenshot shows a video feed of Prof. Jasmin Patel, who is holding up a green STM32 microcontroller board. The interface includes a sidebar with participant names: "Shilpa Patel and 22 more", "eed.stp.dscpeca SCET", "jasmin patel", and "Krishna Prasad". The bottom status bar shows the time as 2:10 PM and the date as 02-Mar-21. The bottom part of the image shows a second screenshot of the same meeting, but with the video feed of Prof. Jasmin Patel in the foreground, showing him holding the STM32 board. The time is now 3:28 PM.

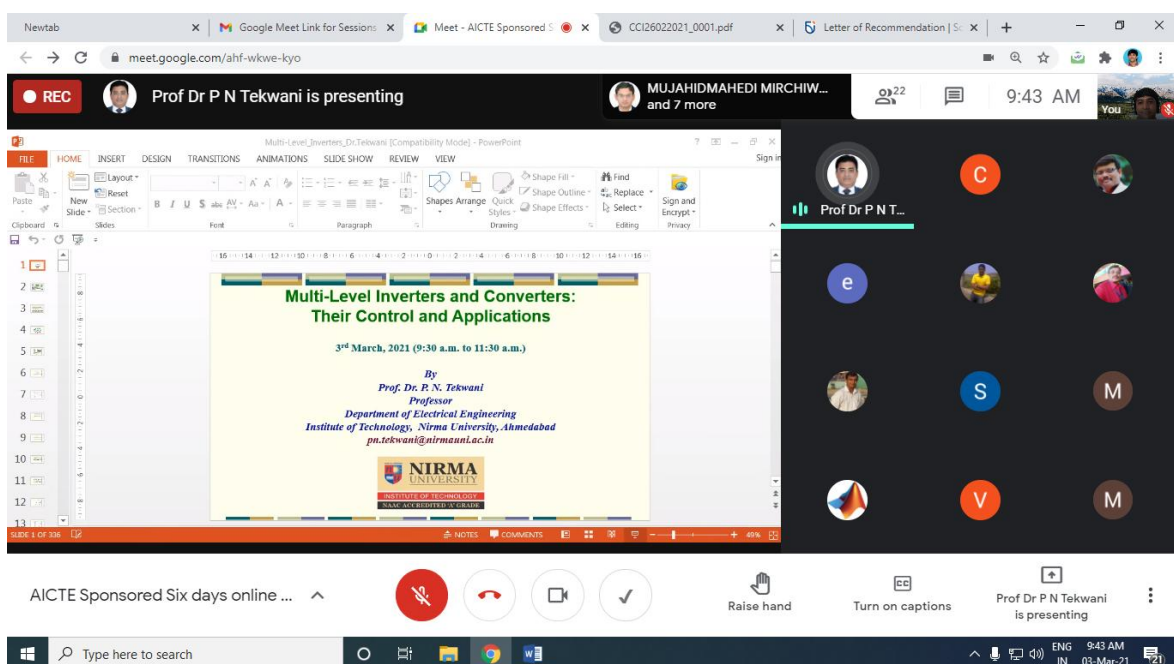


Glimpse of day-2 session-III by Prof. Jasmin Patel, Dr. S & S. S. Gandhi Engg. College, Surat

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.



Multi-Level_Inverters_Dr.Tekwani [Compatibility Mode] - PowerPoint

19 20 21 22 23 24 25 26 27 28 29 30 31

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Flying Capacitor (FC)
Conduction states: generation of a positive load voltage v_{a1} .

$V_{a1}/2$ $V_{a2}/2$ $V_{a3}/2$ $V_{a4}/2$

| | S_1 | S_2 | S_3 | S_4 |
|------------|-------|-------|-------|-------|
| $V_{a1}/2$ | 1 | 1 | 0 | 0 |
| $V_{a2}/2$ | 1 | 0 | 0 | 0 |
| $V_{a3}/2$ | 1 | 0 | 0 | 0 |
| $V_{a4}/2$ | 1 | 0 | 0 | 0 |

AICTE Sponsored Six days online ...

Turn off camera (ctrl + e)

Lower hand Turn on captions Prof Dr P N Tekwani is presenting

Multi-Level_Inverters_Dr.Tekwani [Compatibility Mode] - PowerPoint

97 98 99 100 101 102 103 104 105 106 107 108 109

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Experimental Results of Three-Level FEC Employing Proposed Controller with Outer Hysteresis Band

Three-Phase Inverter
Switch Inductor
Semi-conductor
Three-Phase PV
DC-Link Capacitor
ACB-Inverter
OPAL-RT 4500

AICTE Sponsored Six days online ...

Turn off camera (ctrl + e)

Lower hand Turn on captions Prof Dr P N Tekwani is presenting

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,
Sarvajani College of Engineering & Technology, Surat

nilesh.shah@scet.ac.in

In

AICTE SPONSORED STTP on

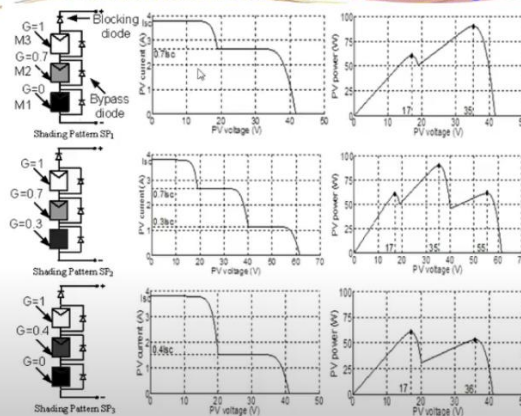
"Digital Signal Controllers for the Control of
Power Electronic Converters and Applications"

3rd March-2021



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



1:10:51 / 1:30:21



drive.google.com/drive/u/1/folders/1kuyj8bH...R7M6DHMH2IBimhwPPLFail

Series-II_STTP_Day3_sessio2_Dr. N. V. S... A-Series-II (2021-03-02 at 22:31 GMT-8)

Proposed Global Peak Power Point Tracking Algorithm

- Algorithm samples the entire P-V curve at predefined larger voltage steps that is at a multiple of 75% of V_{oc} in order to hunt for the approximate global peak power point
- D_{step} is so chosen that the PV voltage varies in steps of 75% of V_{oc} (75% of 21V) during sampling.
- D_{step} is chosen corresponding to 75% of array open circuit voltage (75% of 252V)
- D_{step} is corresponding to 75% of V_{oc} (75% of 21V). Initially, $P_{max}=0$
- 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)

2 March 2021

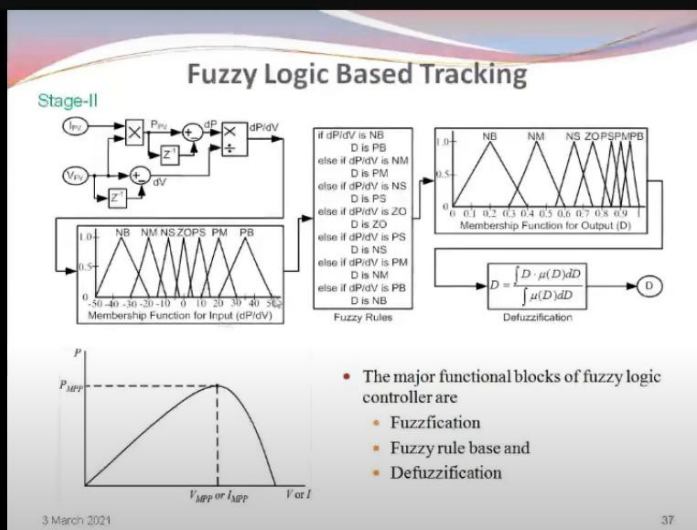
30

Series-II_STTP_Day4_session2_Prof. Janak Patel Ap... me

Mar 4, 2021, me

690.5 MB

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 through control of VSI using STM32 Cortex M4 ARM microcontroller.

newtab x | Inbox (1,202) - Nilesh.Shah@scet x | Meet - AICTE Sponsored Six x

meet.google.com/ahf-wkwe-kyo

Mahmdasraf A. Mulla is presenting

Development of Laboratory Experiments of VSC-based FACTS Controller

Effect of Different Lo...

Presented by
Mahmdasraf A. Mulla
Email: mamulla@ieee.org

Department of Electrical Engineering
Sardar Vallabhbhai National Institute of Technology, Surat, Gujarat INDIA.

eed.sttp.dscpeca SCET

nilesh shah

Mahmdasraf A. Mulla

Dimple Bhanabagwanwala

AICTE Sponsored Six days online ...

People (27)

Chat

session-III and then from 3:45 pm Grid connected PV system is again continued by Dr. Nilesh V. Shah

bhavin trivedi 1:34 PM
ok sir

Kashyap Gandhi 2:10 PM
Good afternoon sir 🙏

Ajith Katanguri 2:11 PM
Good afternoon sir.

Mahmdasraf A. Mulla 2:12 PM
Good afternoon all

Send a message to everyone

Activate Windows
Go to Settings to activate Windows.

Turn on captions

Wednesday, March 3, 2021

ENG 2:19 PM
IN 03-Mar-21

meet.google.com/ahf-wkwe-kyo


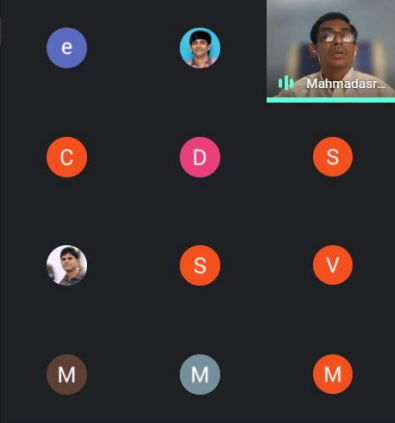
REC Mahmdasraf A. Mulla is presenting

Monika Gupta and 23 more

2:31 PM

Agenda

- Power Quality Disturbances and its Mitigation
- VSC based FACTS Controller
- Laboratory Prototype - Single Line Diagram
- Control Circuit Implementation
- Test Results and Discussion

AICTE Sponsored Six days online ...

Activate Windows

Go to Settings to activate Windows.

Turn on captions

2:31 PM 03-Mar-21

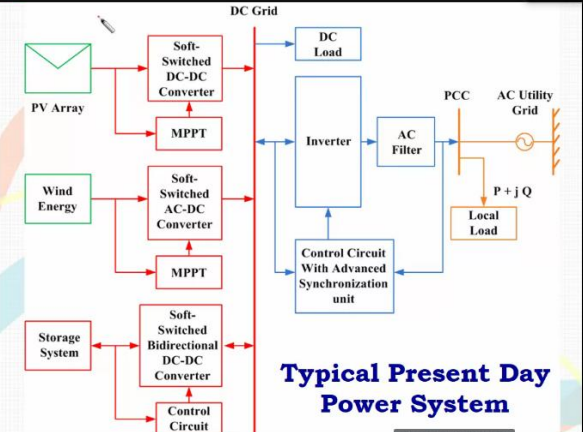
Type here to search

meet.google.com/ahf-wkwe-kyo?authuser=0

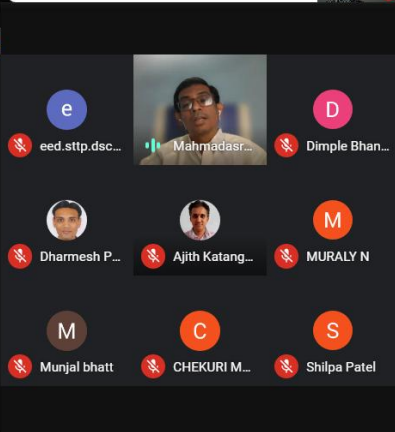
REC Mahmdasraf A. Mulla is presenting

Kashyap Gandhi and 29 more

2:35 PM



Typical Present Day Power System



AICTE Sponsored Six days online ...

Turn off camera (ctrl + e)

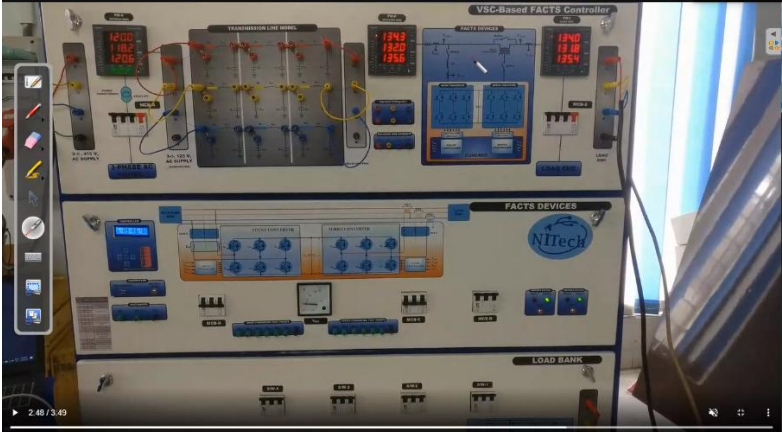
2:35 PM

meet.google.com/ahf-wkwe-kyo

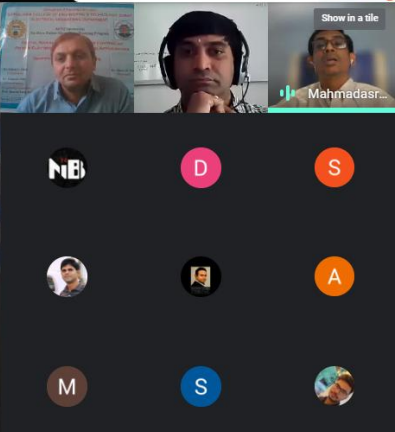
REC Mahmdasraf A. Mulla is presenting

Monika Gupta and 17 more

2:25 PM



VSC-Based FACTS Controller



AICTE Sponsored Six days online ...

Activate Windows

Go to Settings to activate Windows.

Turn on captions

2:25 PM 03-Mar-21

Type here to search

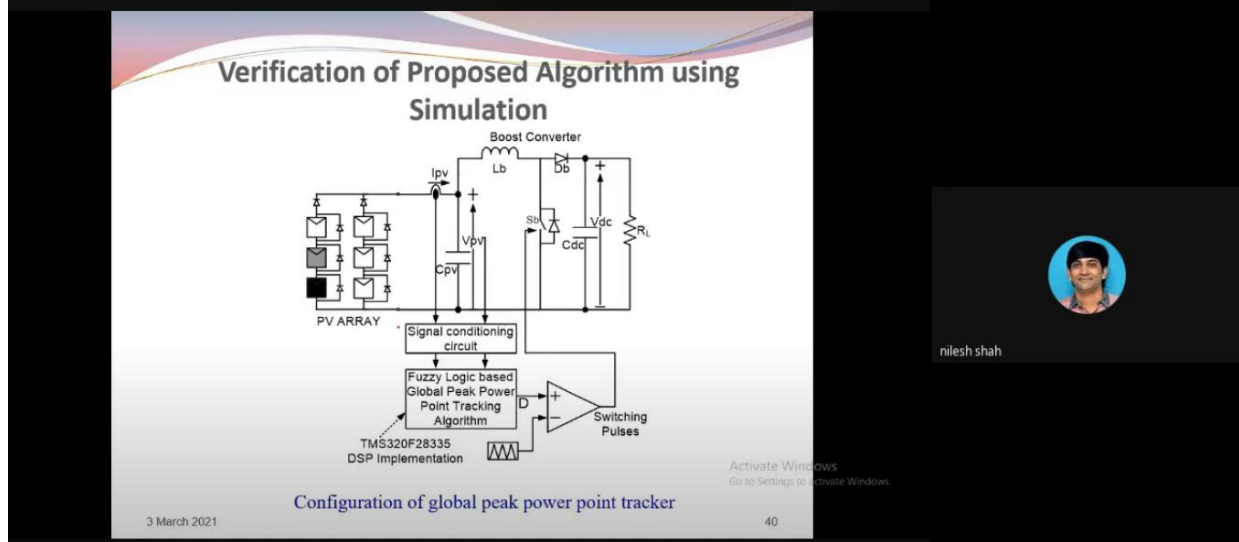
2:25 PM 03-Mar-21

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

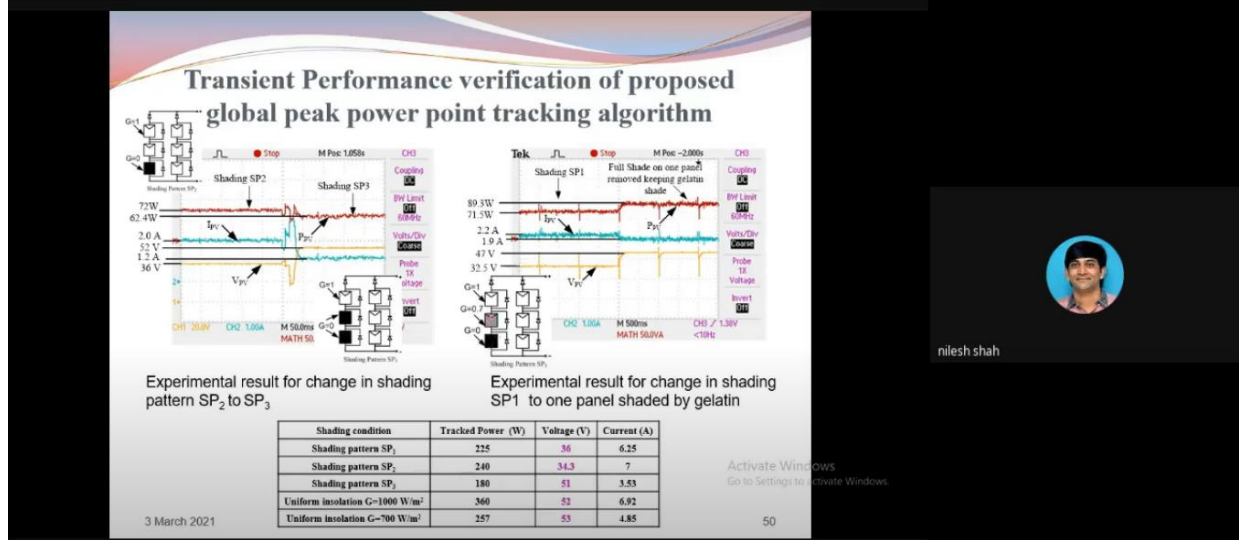
Day-3 session-IV

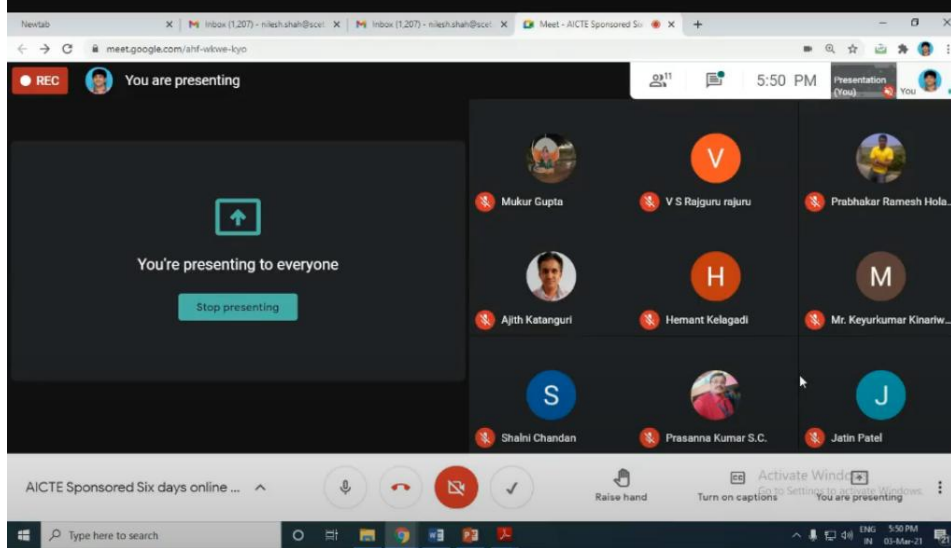
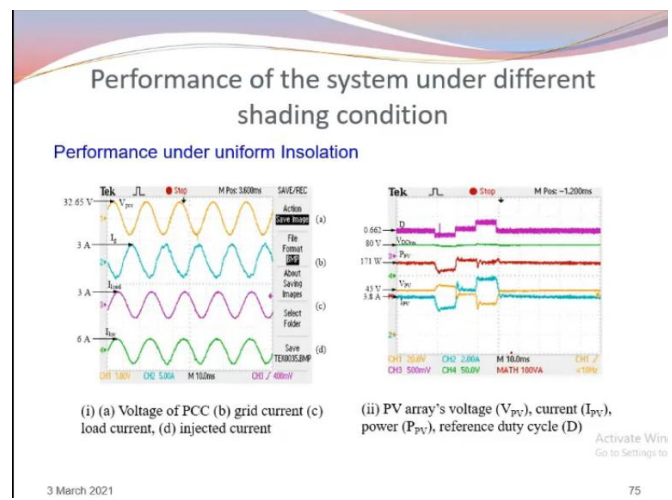
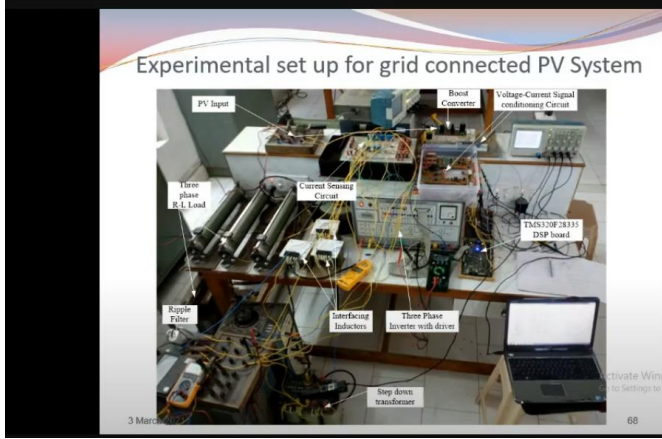
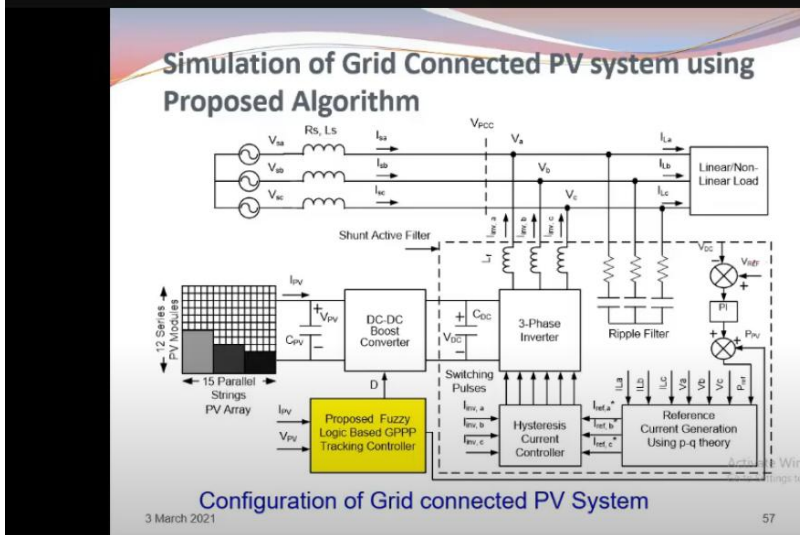
In continuation of talk discussed in session-II, Dr. Nilesh conducted session-IV on “Hardware Implementation of Grid Interactive Photovoltaic System using DSP28335”. He explained about major features required in the processor for implementing control algorithm of grid interactive PV system and highlighted 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.

Series-II_STTP_Day3_session4_Dr. Nilesh V. Shah_3March20212:36 GMT-8)



Series-II_STTP_Day3_session4_Dr. Nilesh V. Shah_3March20212:36 GMT-8)





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.

The top screenshot shows a Google Meet interface with 18 participants. Prof. Jasmin Patel is in the center, presenting. The bottom screenshot shows Prof. Jasmin Patel presenting a PDF document titled "Advanced-control timers (TIM1&TIM8)" from the STM32F704VG Reference Manual. The document content is as follows:

RM0090 Advanced-control timers (TIM1&TIM8)

13 Advanced-control timers (TIM1&TIM8)

13.1 TIM1&TIM8 introduction

The advanced-control timers (TIM1&TIM8) consist of a 16-bit auto-reload counter driven by a programmable prescaler.

It may be used for a variety of purposes, including measuring the pulse lengths of input signals (input capture) or generating output waveforms (output compare, PWM, complementary PWM with dead-time insertion).

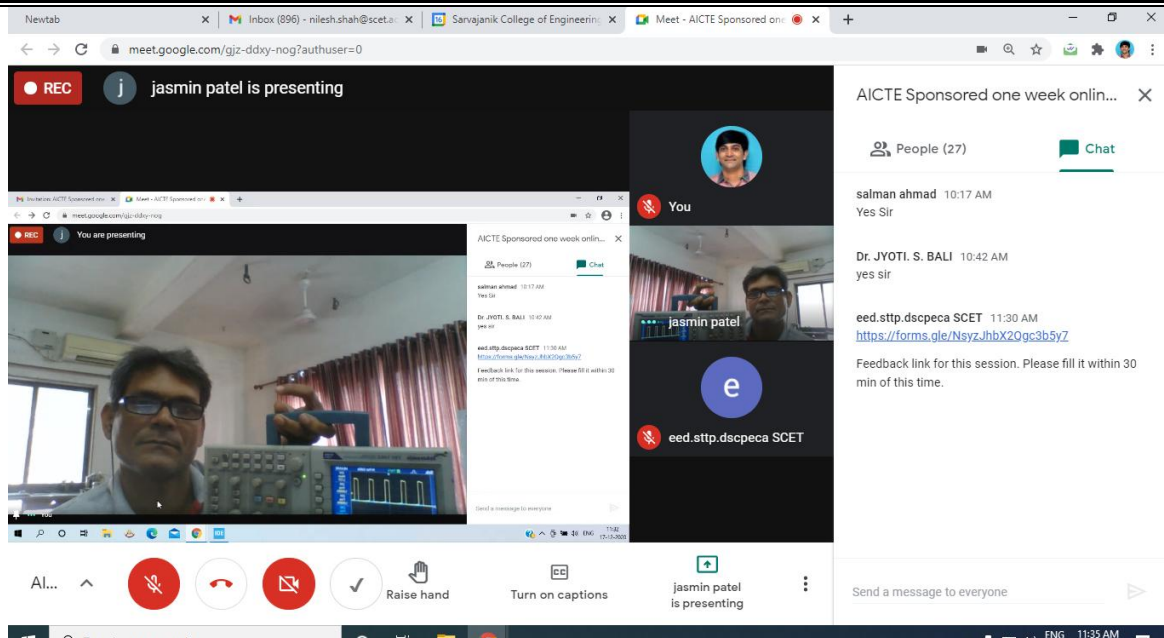
Pulse lengths and waveform periods can be modulated from a few microseconds to several milliseconds using the timer prescaler and the RCC clock controller prescalers.

The advanced-control (TIM1&TIM8) and general purpose (TIMx) timers are completely independent, and do not share any resources. They can be synchronized together as described in Section 13.3.20.

13.2 TIM1&TIM8 main features

TIM1&TIM8 timer features include:

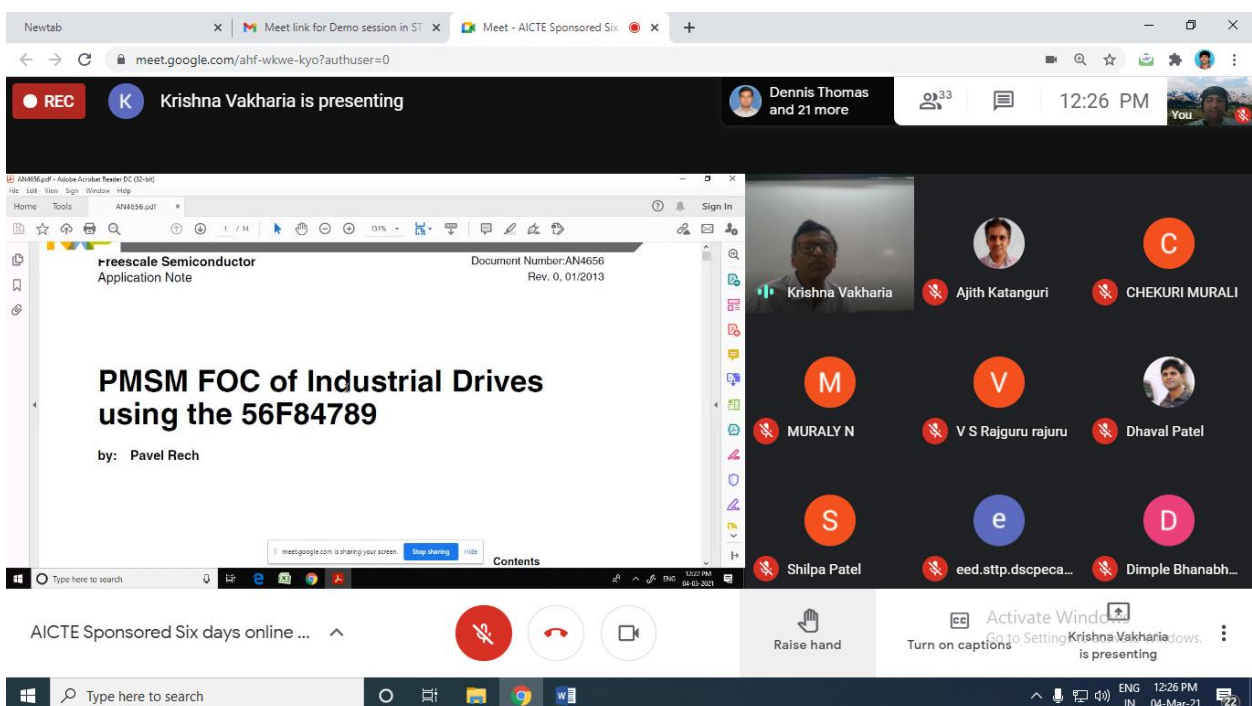
- 16-bit up, down, up/down auto-reload counter.
- 16-bit programmable prescaler allowing dividing (also 'on the fly') the counter clock frequency either by any factor between 1 and 65535.
- Up to 4 independent:
 - Input Capture
 - Output Compare



Glimpse of day-4 session-I by Prof. Jasmin Patel, S & S. S. Gandhi 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.



The screenshot shows a Google Meet interface. At the top, the browser tabs include 'Newtab', 'Meet link for Demo session in ...', 'Inbox (63) - eed.stp.dscpeca@...', 'Sarvajani College of Engineer...', and 'Meet - AICTE Sponsored ...'. The address bar shows the URL 'meet.google.com/ahf-wkwe-kyo?authuser=0'. The top bar of the Meet window displays 'REC', 'Manan Chevli is presenting', a profile icon for Dhaval Raval with '24 more' participants, a group icon for 36 people, a chat icon, the time '1:11 PM', and a small video feed of the user 'You'.

The main content area is split. The left pane shows a MATLAB script in the 'Editor' window. The script defines a function 'function varargout = FFT_GUI(varargin)' and includes comments in Hindi. The right pane shows a gallery of participants: Manan Chevli (grey icon), Dimple Bhanabh... (red X), CHEKURI MURALI (red X), eed.stp.dscpeca... (red X), Krishna Vakharia (red X), Dhaval Patel (video), Mukur Gupta (red X), V S Rajguru rajuru (red X), and Prasanna Kumar ... (red X).

At the bottom, there is a search bar with the text 'AICTE Sponsored Six days online ...', a microphone icon, a red phone icon, a video camera icon, a 'Raise hand' icon, and a 'Turn on captions' icon. The bottom right corner shows a Windows taskbar with 'Activate Windows' and 'Go to Settings' prompts, and a small video feed of 'Manan Chevli is presenting'.

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, Bengaluru on “Rapid Control Prototyping – MicroLabBox”. In the beginning of the session, Mr. Amandeep Singh presented about dSPACE, MicroLabBox 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. Pushadkar 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.

The image displays two screenshots of a Google Meet session titled "Meet - AICTE Sponsored Six days online ...".

Top Screenshot: The presentation slide is titled "dSPACE Hardware's" by Dynafusion. It lists the following hardware categories:

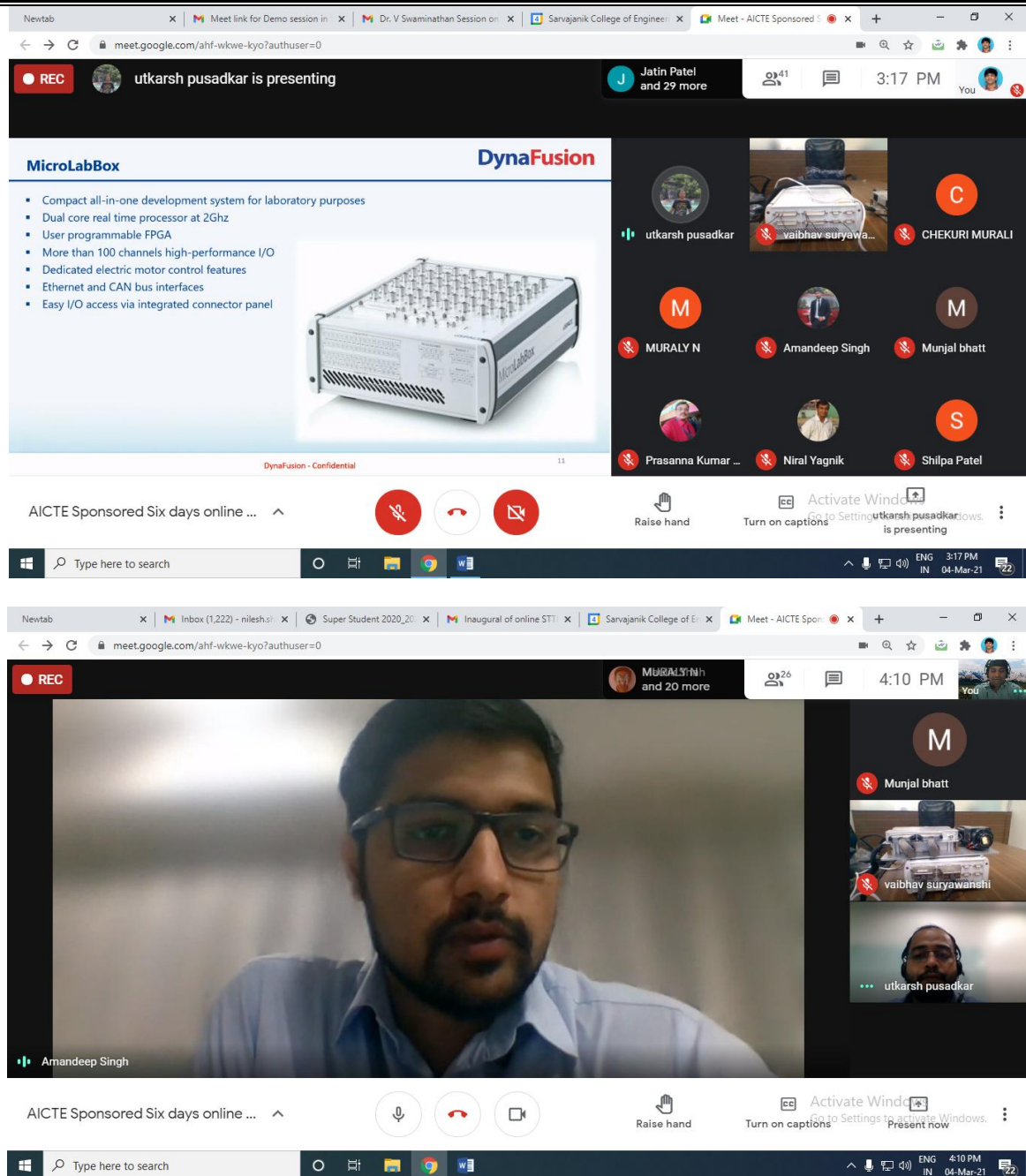
- Laboratory**
 - Compact
 - Single-board Hardware
 - MicroLabBox
 - Modular
 - SCALEXIO LabBox
- In-Vehicle**
 - Compact
 - MicroAutoBox II/III Hardware
 - Modular
 - SCALEXIO AutoBox
- RapidPro**

The slide also shows images of various hardware units. The participant list on the right includes: utkarsh pusadkar, vaibhav suryawa..., CHEKURI MURALI, MURALY N, Amandeep Singh, Munjal bhatt, Prasanna Kumar ..., Niral Yagnik, and Shilpa Patel. The time is 2:51 PM.

Bottom Screenshot: The presentation slide is titled "Rapid control prototyping (RCP)" by Dynafusion. It illustrates the workflow:

- Design, simulation and analysis on a PC** (using MATLAB/Simulink)
- I/O connection via library**
- Implementation on RT hardware**
- Real-time simulation and verification in a real environment**
- Monitoring, tuning**

The participant list on the right is the same as the top screenshot, plus Jignesh Patel and 30 more. The time is 3:01 PM.



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

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.

meet.google.com/ahf-wkwe-kyo?authuser=1

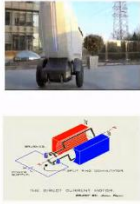
REC Dipankar Debnath is presenting Jignesh Patel and 25 more 10:10 AM

SCET, Surat

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.

AICTE Sponsored Six days ...

Activate Windows
Go to Settings to activate Windows.
To switch input methods, press Windows key+Space.

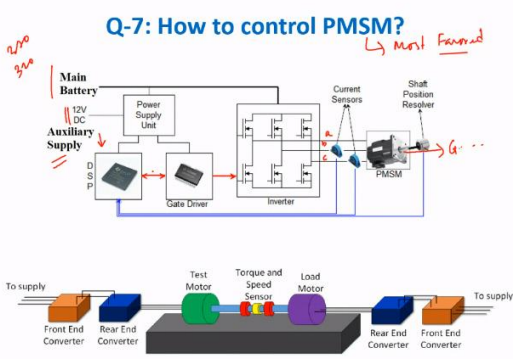
Windows taskbar: Type here to search, 10:10 AM, 05-Mar-21

meet.google.com/ahf-wkwe-kyo?authuser=1

REC Dipankar Debnath is presenting MUJAHIDMAHEDI MIRCHI... and 38 more 10:35 AM

Q-7: How to control PMSM?

Handwritten: 2nd 3rd, Main Battery, L to Motor Forward



AICTE Sponsored Six days ...

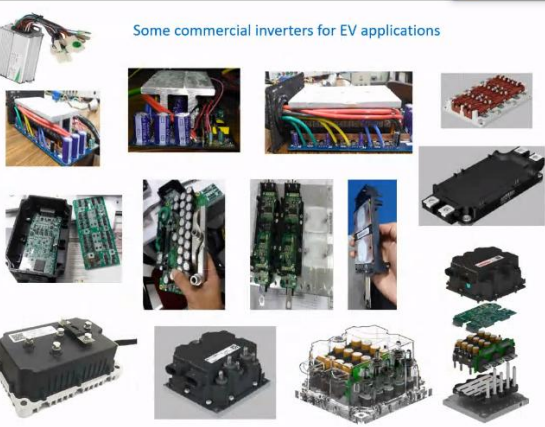
Activate Windows
Go to Settings to activate Windows.
Dipankar Debnath is presenting

Windows taskbar: Type here to search, 10:35 AM, 05-Mar-21

meet.google.com/ahf-wkwe-kyo?authuser=1

REC Dipankar Debnath is presenting Bhumiika Pambh... and 41 more 10:40 AM

Some commercial inverters for EV applications



AICTE Sponsored Six days ...

Activate Windows
Go to Settings to activate Windows.
Dipankar Debnath is presenting

Windows taskbar: Type here to search, 10:40 AM, 05-Mar-21

meet.google.com/ahf-wkwe-kyo?authuser=1

REC Dipankar Debnath is presenting CHEKURI MURALI and 38 more 11:16 AM

Levels in EV Charging Stations

AC Charging Station: Level 1 & 2

DC Charging Station: Level 3

| EVSE Type | Power Supply | Charge Power | Charging time (Approx.) for a 24kWh Battery |
|---------------------------------------|---|------------------------|---|
| AC Charging Station: L1 Residential | 120/240VAC & 12 A to 16A (Single Phase) | ~1.4kW to ~1.9kW | >17 Hours |
| AC Charging Station: L2 Commercial | 208 ~ 240VAC & 15 A ~ 50A (Single/ Split Phase) | ~3.3kW to ~19.2kW | ~6 Hours |
| DC Charging Station: L3 Fast Chargers | 300 to 600VDC & Max 400A (Poly Phase) | From 120kW up to 240kW | ~30 Minutes |

electric vehicle supply equipment

Shukla Abhay

M

MURALY N

Dipankar Debnath

AICTE Sponsored Six days ...

Raise hand Turn on captions Activate Windows

Go to Settings Dipankar Debnath is presenting

meet.google.com/ahf-wkwe-kyo?authuser=1

REC Dipankar Debnath is presenting Unknown: 11:27 AM and 37 more

Dynamic inductive wireless charging

Concept

- Roadway embedded coils: energize sequentially
- Receiving coils on the vehicle
- Reduces battery size on EVs and allows hybrid EVs to operate with zero emissions

Technical targets

- 50 kW per receiver coil, scalable to multiple coils for trucks
- Continuous power to the vehicle at highway speeds
- Target 90%+ average efficiency, grid to battery

Grid impact

- Continuous & controllable load by averaging over
- long roadway sections of coils
- Off-peak loading
- Local load for wind and solar power

Safety and Compatibility

- Meet ICHRP standards for safety
- Compatible with light to heavy duty vehicles

Dr. Regan Zane, Utah State University

Dhaval Patel

M

MURALY N

Dipankar Debnath

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Raise hand Turn on captions Activate Windows

Go to Settings Dipankar Debnath is presenting

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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.

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REC Dr. Krishna Vasudevan is presenting Shalni Chandan and 29 more 11:51 AM

Control of Inverters for Grid Connected Photovoltaic Systems

Krishna Vasudevan
Department of Electrical Engineering
Indian Institute of Technology Madras
5/3/2021

Control of Inverters for Grid Connected Photovoltaic Systems
Krishna Vasudevan
Introduction
Output Filter
L Filter
Control with L Filter
LCL Filter
Control with LCL Filter
Control in ABC Frame
PLL
Islanding
Summary & Outlook

Dr. Krishna Vasudevan
Prasanna Kumar S.C.
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REC 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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REC 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!!

$L_a = 2 \text{ mH}$
 $L_1 = L_2 = 1 \text{ mH}, C = 50 \mu\text{F}$

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

Dr. Krishna Vasudevan
Prasanna Kumar S.C.
eed.sttp.dscpeca SCET

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Dr. Krishna Vasudevan is presenting

Islanded Operation

Methods of Detection

Active Methods

- Frequency Drift
 - Inverter frequency is allowed to drift
 - Reset at next zero crossing if grid is present
 - Else frequency continues to drift (OFP/UFP)
- Grid Impedance measurement
 - Loss of grid is likely to result in a sudden change of impedance
 - Look for *Sudden* Change of impedance.

Navigation sidebar:

- Control of Inverters for Grid Connected Photovoltaic Systems
- Introduction
- Output Filter
- PLL
- Islanding
- Summary & Outlook

Windows taskbar: Type here to search, 05-Mar-21

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, Bengaluru on “dSPACE Solution for Generic topology-oriented Modelling: Electrical Power Systems Simulation”. Mr. Tejas from 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.

Tejas MK is presenting

Motivation

New electric vehicle concepts and renewable energy sources are mega trends for future mobility.

Class List (28 of 43):

- Ranish Kumar B.S.
- Arjun Kumar
- Salman
- Arumugam
- Chaitanya
- Bhavya Brahman
- Sagar Chakraborty
- Dipak
- Prateek Chandra
- Manan Chevli
- Dynafusion Events
- Gitan Jacob George
- Hirani
- Rajib Kumar Kar

VEHICLE

CHARGING

POWER GRID

Storage systems, power electronics and electric drives will be the key players in powertrains.

DynaFusion - Confidential

Windows taskbar: Type here to search, 18-Dec-20

Tejas MK is presenting

Application Areas

- Charging stations
- Onboard chargers
- DC/DC converters
- Rectifiers and inverters
- Wind and solar converters
- Electric power industry systems
- Smart grids

People (37)

- eed.sttp.dscpeca SCET
- ELIAS ABRAHAM ROY
- Hardik Pandya
- Hiren Jariwala
- Janak Patel
- K S Ravi Kumar (MVGR ...)
- Kalpesh Patil
- Mrs.Manisha Gohil SVNIT

Tejas MK is presenting

RCP Systems for Vehicle DC/DC Controllers

Developing converter functions

Tejas MK is presenting

dSPACE Electrical Power Systems Simulation Package

FPGA-Based Approach
Real-Time Simulation with
Simscape Electrical Specialized Power Systems

Demo: Push-Pull Converter (Offline)

Description: Push-Pull Converter with a full-wave rectifier and center tapped transformer

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

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.

Transformation of Electricity system

Breaking myths

Key trends

- Electrification of large sectors of the economy such as transport and heating
- Decentralization, spurred by the sharp decrease in costs of distributed energy resources (DERs) like distributed storage, distributed generation, demand flexibility and energy efficiency
- Digitalization of both the grid, with smart metering, smart sensors, automation and other digital network technologies, and beyond the meter, with the advent of the Internet of Things (IoT) and a surge of power-consuming connected devices

ELECTRIFICATION
Critical to long term carbon goals and will be a relevant distributed resource
Key technologies: Electric vehicles, smart grids, smart energy, smart power

DECENTRALIZATION
Makes customers active elements of the system, though requires significant coordination
Key technologies: Energy storage, smart grids, smart power, smart energy, smart power

DIGITALIZATION
Allows for open, real time, automated communication and operation of the system
Key technologies: Network technologies, smart metering, smart sensors, automation, smart power, smart energy, smart power

One common technology thread...binding them all is...

Electronics..DSC..010101

REC Vijay Shah is presenting

ranjith kumar .B.... and 26 more

32 You

Electrification of Energy Demand

Mobility Applications

Environmental Control

Financial Sector

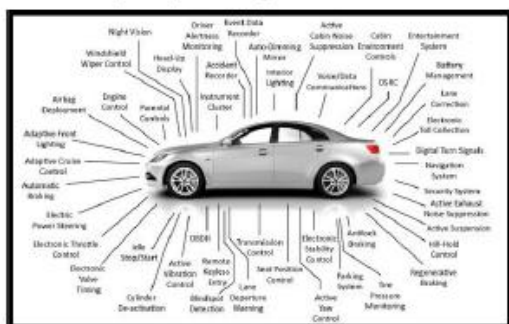
Communication

AICTE Sponsored one week online...

Raise hand Turn on captions

Vijay Shah is presenting

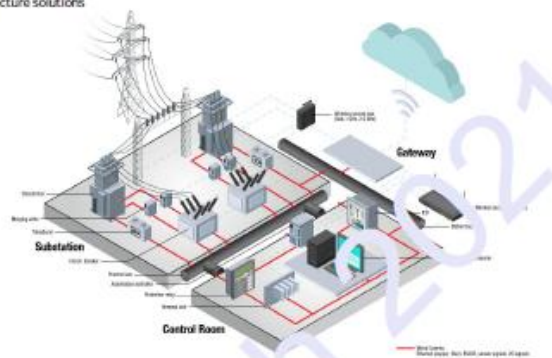
Large variants involving intelligent sensing and control



March 7, 2019

Slide 44

Grid Infrastructure solutions



March 7, 2009

Slide 69

March 7, 2017 | Slide 23

Day-6 Session-II

Pramod Agarwal is presenting

Niral Yagnik and 20 more

You

You

Pramod Agarwal

MURALY N

Mukur Gupta

Dhaval Patel

V S Rajguru rajuru

Saifee Kanjetawala

Munjai bhatt

Jatin Patel

Raise hand

Turn on captions

Pramod Agarwal is presenting

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REC Pramod Agarwal is presenting Hermant Kelagadi and 37 more 1:09 PM You

Microcomputer Control of Voltage Source Inverters - PowerPoint (Product Activation Failed)

Regular Sampled Asymmetrical SPWM

$$\frac{t_{p1}}{T_c/2} = \frac{1 + m \sin \omega_m t_1}{2}$$

$$\frac{t_{p2}}{T_c/2} = \frac{1 + m \sin \omega_m t_3}{2}$$

$$\therefore t_p = \frac{T_c}{2} \left\{ 1 + \frac{m}{2} (\sin \omega_m t_1 + \sin \omega_m t_3) \right\}$$

Click to add notes

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da6 screenshots.d... feedback link of S... thank you to spea... Schedule of STTP...

1:09 PM 3/6/2021

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REC Pramod Agarwal is presenting Niraj Yagnik and 36 more 1:20 PM You

Microcomputer Control of Voltage Source Inverters - PowerPoint (Product Activation Failed)

Algorithm for SPWM- 4 Timer

Int $T_c/2$ $T_c/2$

Int t_{p1} t_{p2}

Sub t_{p1} t_{p2}

Sub t_{p1} t_{p2}

Sub t_{p1} t_{p2}

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1:20 PM 3/6/2021

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REC Pramod Agarwal is presenting

Microcomputer Control of Voltage Source Inverters - PowerPoint (Product Activation Failed)

Concept of Space Vector

$$v_{as} = V_m \cos \omega t$$

$$v_{bs} = V_m \cos(\omega t - 2\pi/3)$$

$$v_{cs} = V_m \cos(\omega t + 2\pi/3)$$

$$\vec{V} = \frac{2}{3} [v_{as} + v_{bs} e^{j2\pi/3} + v_{cs} e^{-j2\pi/3}]$$

$$\vec{V} = \frac{2}{3} [v_{as} + a v_{bs} + a^2 v_{cs}]$$

$$a = e^{j2\pi/3}$$

$$a^2 = e^{-j2\pi/3}$$

$$\vec{V} = V_m (\cos \omega t + j \sin \omega t) = V_m e^{j\omega t}$$

Click to add notes

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Series-II Meet - AICTE S... da6 screenshot... feedback link o... thank you to sp... feedback email... Schedule of ST...

1:22 PM 3/6/2021

AICTE Sponsored Six days online STT...

People (39) 0 Chat

Let everyone send messages

ashutosh kumar singh 1:03 PM
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>

Feedback link for Session 2 Day-6

Send a message to everyone

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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REC Sabha Raj Arya SVNIT is presenting Shalni Chandan and 31 more 2:36 PM You

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Circuit Configuration

Fig.1 Schematic Diagram DSTATCOM in four wire supply system

March 6, 2021 EED, SVNIT Surat 8

Participants: sudhansu ranjan Dwivedi, Sabha Raj Arya SVNIT, Mukur Gupta

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REC Sabha Raj Arya SVNIT is presenting VISWANATHAN T and 33 more 3:07 PM You

Viswanathan T is sharing your screen. Stop sharing Hide

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 81

Participants: sudhansu ranjan Dwivedi, Sabha Raj Arya SVNIT, eed.sttp.dscpeca SCET

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REC Sabha Raj Arya SVNIT is presenting MUJAHIDMAHEDI MIRCHI... and 37 more 3:21 PM You

Mujahidmahedi Mirchi is sharing your screen. Stop sharing Hide

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

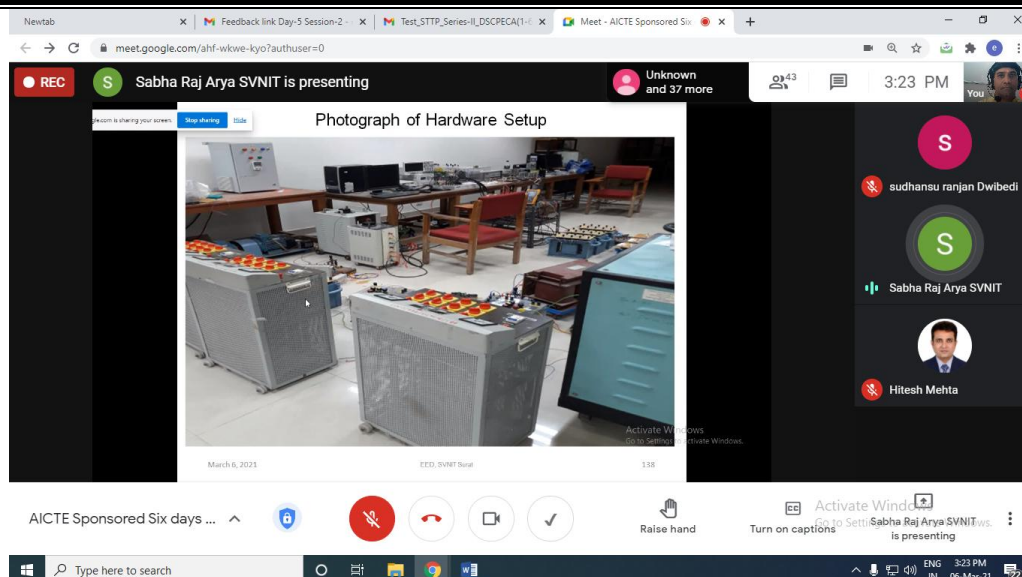
Fig 3 star delta configuration of three phase transformer for neutral current compensation

March 6, 2021 A.K.Giri (D16EL000) PhD Viva Voice at SVNIT, Surat 88

Participants: sudhansu ranjan Dwivedi, Sabha Raj Arya SVNIT, Hitesh Mehta

AICTE Sponsored Six days ...

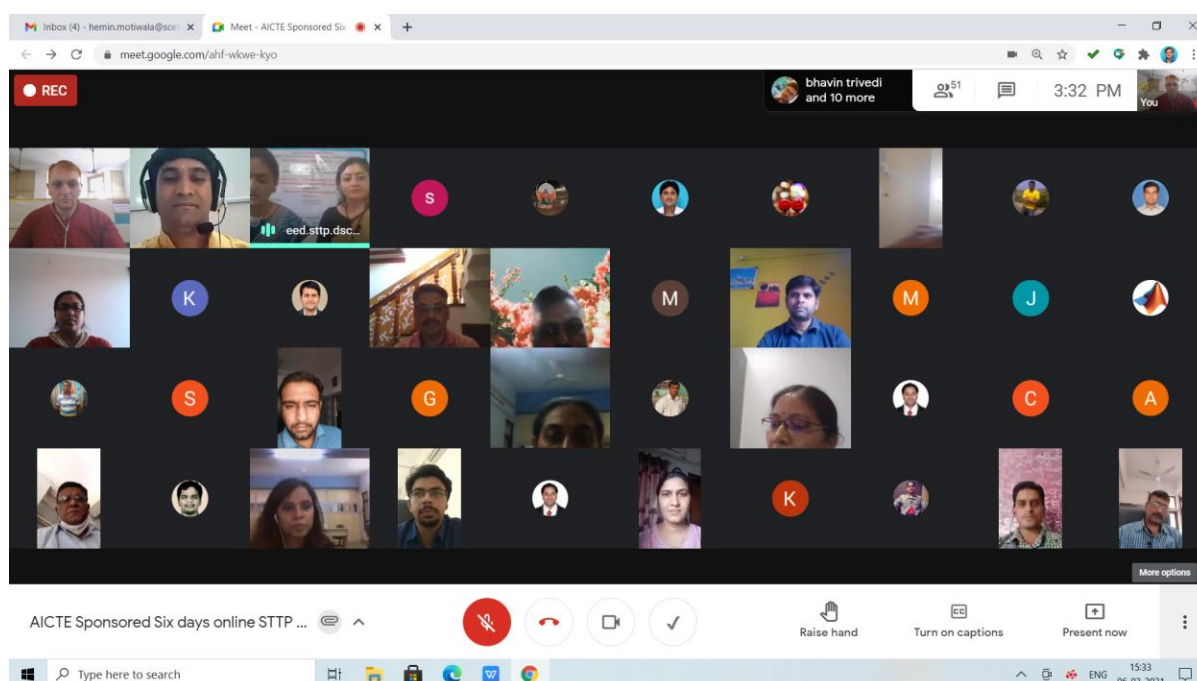
Windows Taskbar: Type here to search, Task View, File Explorer, Google Chrome, Microsoft Word, System Tray (Network, Volume, Power, Date/Time: ENG 3:21 PM IN 06-Mar-21)



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

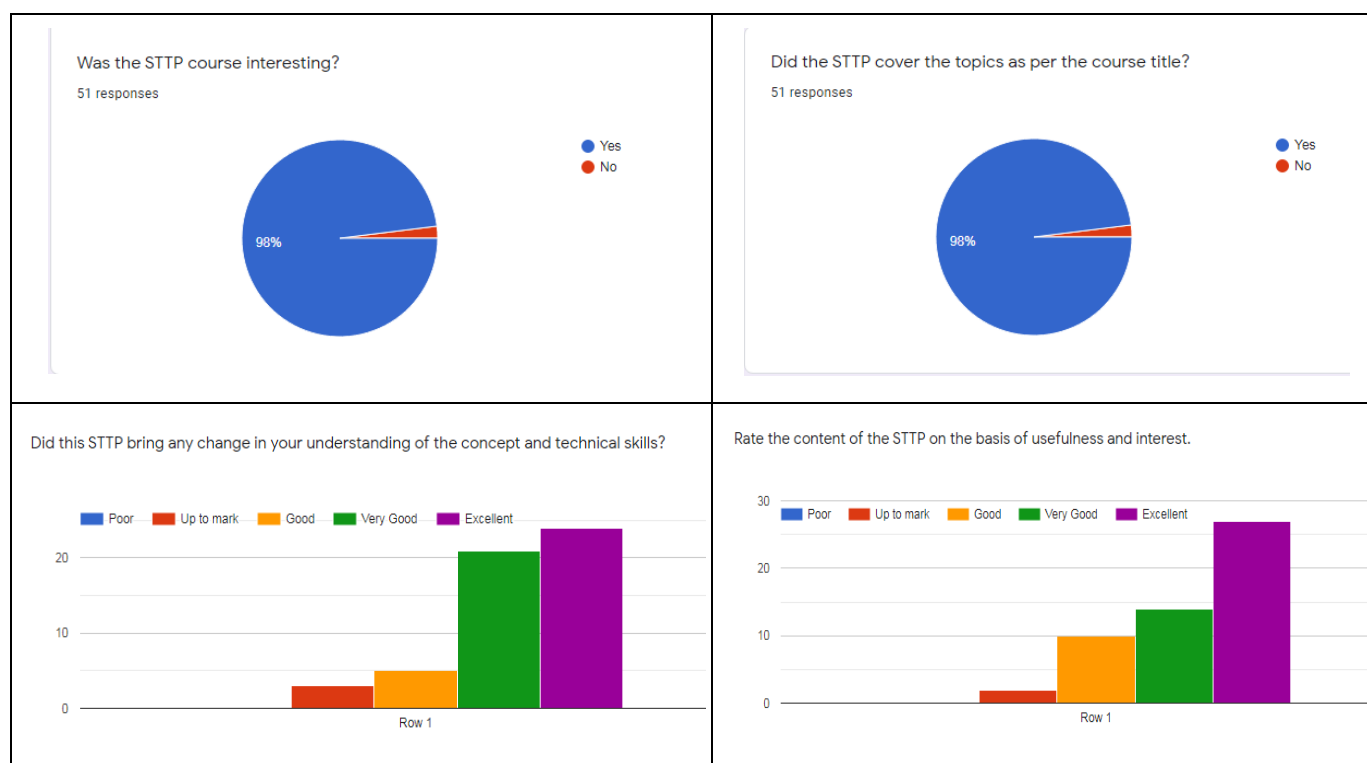
Thus series-II of the one week AICTE sponsored STTP has been successfully completed and ended with Joy and Happiness of learning the course on “Digital Signal Controllers for control of Power Electronic Converters and Applications” amongst participants as well as organizing team.

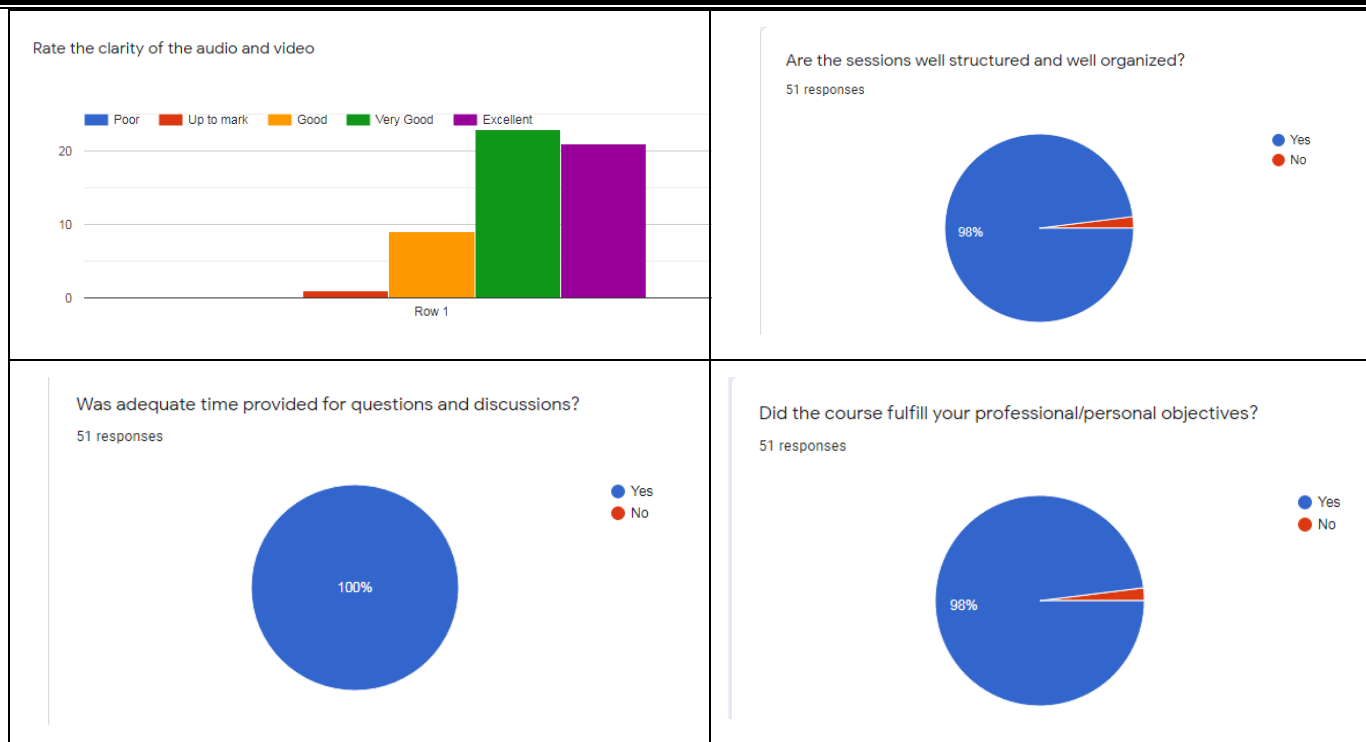
Outcomes of the STTP

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-coordinator

Organizing committee members:

Prof. S. B. Patel, Prof. Dimple Bhanabagwanwala,

Prof. Krishna Vakharia, Prof. Hemin Motiwala
