Research Colloquium/EED PG block seminar hall/24th -25th March 2017

# Department of Electrical Engineering

## National Institute of Technology Calicut

# Research Colloquium

24th to 25th March 2017

(Sponsored by TEQIP II)

## Report

Department of Electrical Engineering has organized a Research Colloquium at NIT Calicut under the aegis of TEQIP on 24th to 25th of March 2017. The sole purpose of the event is to provide a platform for the young research scholars of the department to expose their research ideas/titles in front of an experienced audience and share their expectations to pursue the research ideas into a project. The research community was divided into five major streams of Electrical engineering and esteemed professors who are experts in their field of research had been invited for keynote lectures as well as resource persons for each of the groups.

There are 69 participants for the programme from five main thrust areas, namely, Control and Instrumentation, Biomedical & Signal Processing, Power and Energy Systems, Power Electronics & Drives and High Voltage Engineering. Hence there were five presentation sessions on each area and all 69 participants presented and interacted with the expert in the respective area. Those who are doing multi-area research works, presented in both sessions to get more inputs for their research work. Eminent experts from IIT's/IISc were invited to give keynote address and chair the presentation sessions. The success of the event lays with the presence of Dr. S A Khaparde, IIT Bombay; Dr. A G Ramakrishnan & Dr. Udayakumar, IISc Bangalore; Dr. Arun D Mahindrakar, IIT Madras; Dr. Sivakumar K & Dr. Ravikumar Bhimasingu, IIT Hyderabad in different sessions and interaction of participants with them. The detailed profiles of the experts are attached along with this report.

## Inaugural Ceremony:

The event started with a prayer at 9.30. The chief guest for the inauguration was Prof. S A Khaparde from IIT Bombay. He has mentioned his dream of conducting such research gatherings among NITs, IITs in Southern India and IISc frequently to enhance the research quality of the

country in the inaugural address. The event was graced by Prof. Sivaji Chakaravorti, Director, NIT Calicut who delivered the Presidential Address. Dr. Ashok S., Professor and Head Department of Electrical Engineering has welcomed all the guests and participants to the program. In his welcome address, he stressed on the very purpose of the colloquium is to improve the quality of research rather than quantity. A brief about the Research Colloquium was given by Dr. Sunil Kumar T. K., Asst. Professor & PhD Coordinator. Finally, the vote of thanks was performed by Mr. Ravishankar A. N., Student Coordinator. The participants included all the research scholars as well some PG students and all faculty from the Department and the hall was packed.

## Keynote Lecture:

Expert : Prof. Sivaji Chakaravorti, Director, NIT Calicut

Topic : **Moisture Dynamics in Transformers**

Venue : EED PG Seminar hall I

The first keynote address of the programme was given by Prof. Sivaji Chakaravorti, Director, NIT Calicut, on "**Moisture Dynamics in Transformers**". He was very keen on interacting with the research scholars of the department. He pointed out the importance of a transformer at a substation and the practical difficulties encountered in the transformer design. The importance of moisture content analysis in transformers and the role of transformer oil in the analysis were also discussed. He portrayed how his team developed the technology to measure and reduce the moisture content in solid insulators. The inspiring talk was followed by a tea break and then by keynote lectures by two experts in the field of Power and Energy and control systems as detailed below.

## Power & Energy Systems:

## Keynote Lecture 1:

Topic : Smart Grid Challenges & Issues

Experts : Prof. S A Khaparde, IIT Bombay and

Venue : EED PG Seminar hall I

A keynote lecture on "Smart Grid Challenges & Issues" was delivered by Prof. S. A. Khaparde of IIT Bombay on the 24$^{th}$ of March 2017. In the talk he outlaid the essentials of Smart Grid and its functionalities. He also spoke briefly about Indian Smart Grid Forum (ISGF), and the Pilot Projects in India being run by BESCOM, Bangalore and about his involvement in the initiatives.

## Keynote Lecture 2:

Topic : Improving resiliency in the Grid Integrated Renewable Energy based microgrids

Experts : Dr. Ravikumar Bhimasingu, IIT Hyderabad

Venue : EED PG Seminar hall I

On the second day of research colloquium, Dr. Ravikumar has given a nice keynote presentation on "Improving resiliency in the Grid Integrated Renewable Energy based microgrids" which ignited many minds in the area of renewable energy and microgrids, issues and challenges, especially the role of power electronics to behave as a synchronous machine called as "Virtual Synchronous Machines". The speaker talked about how resiliency in renewable integrated microgrid can be improved starting from its architecture. He pointed out how the inertia in microgrids can be maintained by injecting inertia. He also talked about the machine modelling and then moved on to control schemes related to Microgrid. He had opened a wide range of research opportunities through the work he purse at IIT Hyderabad.

## Presentation by Research Scholars:

The presentation by the research scholars of the Power and Energy was chaired by Prof. S A Khaparde, IIT Bombay and Dr. Ravikumar Bhimasingu, IIT Hyderabad. A total of 16 research scholars presented their work with introduction, key papers from literature survey, research objectives and methodology. Areas like Adaptive relaying for smart grid applications, Analysis of subsynchronous resonance in wind farms, stability of hybrid renewable energy resources ,reliability and resiliency of microgrids, security assessment of power systems, dynamic security assessment of microgrids, Wide Area Monitoring of Power Systems, Optimal Control of Power grid consisting of Renewable Energy Sources and storage, Transactive Energy Framework for Microgrid Management, Robust Fractional Order Control for Dynamic Stability Enhancement of Power Systems, Optimization of droop controller for microgrid, Environmental Economic Power Dispatch in Deregulated Power Systems, Optimal Allocation of FACTS devices for Reactive Power Management in Deregulated Environment, Energy Recovery from Wind, Congestion Management in Transmission Systems and Voltage Stability Improvement and Reactive Power Compensation in wind Energy based Microgrid were covered in the presentations.

Prof. Khaparde told that the scholars should always raise to the level of the reviewers when they work and present. In writing paper, the introduction should be kept as precise and small as possible and the main contribution of the work should be highlighted in the introduction itself. Discussions with the Supervisor should be frequent. He also highlighted about the importance of interdisciplinary research. Research objectives should be such that it can be carried forward by the juniors as there is always a scope of improvement in any work.

Dr. Ravikumar told that the research should be practically applicable and to keep the number of assumptions minimum. He also suggested that a fresh idea may be initially submitted to a Conference with minimum data and then given to Journals as there are chances of your work being copied elsewhere, to be safe in those cases where the review takes a long time. He classified the presentations by the research scholars into three levels. One which is having a mature literature survey and new idea, then rare literature available and new idea and work in the area of saturated area. The meet wrapped up with this feedback from the eminent professors at 5.30 PM. A feedback was also taken from the participants and it is sure that all of them benefited from this endeavor.

The experts interacted actively with the research scholars bringing out their weak points and strengths of their work. They also gave suggestions and specific inputs during the discussions. It was the first time that the scholars had an open presentation among their peers which would have benefited each other and to analyze their work so far. Surely it would have given an impetus to the newbies in the research as well as further inspiration for the seniors to bring out a quality research.

## Control and Instrumentation:

## Keynote lecture:

Topic : Formation Control of Mobile Inverted Pendulum Robots

Expert : Dr. Arun D Mahindrakar, Associate Professor, IIT Madras.

Venue : EED PG Seminar Hall II

Dr. Arun D Mahindrakar, Associate Professor, IIT Madras was invited to deliver an expert talk on "**Formation Control of Mobile Inverted Pendulum Robots**" as part of the programme for control and instrumentation group on 24$^{th}$ March 2017. Dr. Jeevamma Jacob, Professor, Dept of Electrical Engineering welcomed the honorable expert, Dr. Arun D Mahindrakar to the programme. He delivered his keynote lecture to the audience which includes M Tech students

and Research Scholars from Electrical and Electronics department. He started with the basic concepts of Decentralized and distributed control. He later moved on to Multi agent systems, Characterization of achievable formation, Formation Control and attitude synchronization, Formation control and trajectory tracking. He also presented the experimental results on Mobile Inverted Pendulum Robots.

## Presentation by Research Scholars:

All the research scholars made a presentation of their ongoing research work in front of the technical expert. There were 16 research scholars working in various areas like Intelligent controllers, Interval systems, Nonlinear optimal control, MIMO systems, Model Predictive Control, Control of Aerodynamic Systems, Control of Helicopter, Robotics, Fractional order controllers, Sliding mode controllers etc.

At the end of session, the expert gave several valuable suggestions like novelty of work should be considered while doing the research. He emphasized the need of mathematics during research and he recommended conducting reading seminars among the research scholars who are doing research in similar areas. He also suggested the research scholars to maintain proper interaction among them so that more inter disciplinary works can be carried out. The whole session had been very interactive and informative. After vote of thanks by Mrs. Rajashree Ragavan, Research Scholar, EED the session came to an end.

## Power Electronics & Drives:

## Keynote Lecture:

Topic : Power electronic converters for renewable application

Expert : Dr. K. Sivakumar, IIT Hyderbad

Venue : EED PG Seminar Hall II

The keynote lecture by Dr. K. Sivakumar, IIT Hyderbad was attended by some faculty members, all the research scholars and M.Tech students of power electronics and drives and power system stream.

He started his talk with the early difficulties in using renewable energy sources and the evolution of distributed generation to meet the power crisis. Then moved to the solar energy

conversion process, General steps involved in solar power conversion like extracting maximum power from solar panels using best MPPT technique. He was discussing about the different types of solar panel arrangement and the general MPPT algorithm. How different DC- DC converter topologies have been selected based on the MPPT algorithm. Then he discussed about the current scenario of replacing the buck or boost converter with the Z source inverter, which is capable of buck or boost the input voltage along with its inversion in a single stage. He also described about the use of Z source inverter during the shoot through conditions. Several improvements have been made in the Z source inverter recently like Switched boost converter which makes use of third order harmonics and the reduction in the usage of passive elements in the Z source inverter. He is also discussed about the single stage conversion using boost inverter, which is developing currently. The emergence of DC micro grid was also a part of his presentation. He has given a brief theory behind the grid tied PV generation system which is a current research work going on at IIT Hyderabad, the development of Z source inverter for micro grid applications and how Z source inverters can be extended to multilevel inverters. After his lecture, research scholars clarified their doubts regarding the application of power electronic converter for microgrids.

## Presentation by research scholars:

After the tea break the research scholars started presenting their work in front of the resource person. The presentation started with the Distributed Co-ordination DMPPT algorithm for Grid Connected PV system operating under Partially Shaded Conditions and Real Time Implementation of Distributed Maximum Power Point Tracking for Grid Connected PV Systems for which he could ask many doubts and the discussion continued for 15-20 minutes. Then the discussion was moved on to the different DC-DC converter development and their control strategies, control strategies for LVDC Nano grid, performance enhancement of drives connected to plug in vehicles. The expert was involved continuously in the discussion with the research scholars and was giving suggestions to many of them. The discussion continued till lunch break including the modular multilevel converters for medium voltage applications, Hybrid Converters for Microgrid and Nanogrid applications and Virtual Synchronous Machine based Control of Power Converters for Microgrid Application.

After the lunch break the session started at 2.00 p.m. started with the topic Cascaded Multilevel Inverter Topologies for FACTS Devices and continued with the topics including

Development of Solid State Transformer for Integration of Wind Energy Based Microgrids, Design Space Exploration in SPWM Technique, Bus clamping Strategies for Reducing Current Harmonics in Multilevel Inverters, Generalized Space Vector Pulse Width Modulation Technique for Diode Clamped n-level Inverters, Fault Detection of Inverter Fed Induction Machine, Switch Fault Detection in cascaded multilevel inverter fed induction motor drives, Switch Fault Detection and Diagnosis in Inverters, Direct Torque Control of Brushless DC Motor Drive, Indirect Matrix Converter Fed PMSM Drives and Constant switching frequency Hysteresis controlled VSI fed Induction motor drive. The expert had made good interaction with the research scholars who was presenting their work and he was good enough to give suggestions to many of them. After the tea break at 3.15p.m., the presentation on Torque ripple analysis in constant switching frequency hysteresis controlled IM drives was went on. He commented on the problem formulated by different research scholars for their work.

At the end of the presentation, Dr. K. Sivakumar was invited for the concluding remarks. He is saying that every research scholar is taking their work as a child to their parent and no one likes a person from outside to comment on that, but develop courage to face the criticism of our work. Every judgment is giving something additive to us or a new idea to each of us. He is also sharing the words by his professor that the knowledge required by every person is same except the effort and sincerity. Also how we look at the problem is also important; make a concise look at the problem. Always showcase the contribution to the problem and it will identify by someone, someday. In future it will get identified.

## Biomedical & Signal Processing:

## Keynote lecture:

Topic : Medical Signal and Image Processing-Problems and Challenges

Expert : Prof. Ramakrishnan A.G, IISC, Bangalore

Venue : EED PG Seminar Hall I

Prof. Ramakrishnan A.G, Professor & Chairman, Dept. of Electrical Engineering, IISC, Bangalore, was invited to deliver the keynote lecture for Biomedical & Signal Processing group on 25th March 2017. Dr.Sunilkumar T.K, Assistant Professor, Dept of Electrical Engineering welcomed the hounourable expert to the programme. The expert delivered a lecture on "**Medical**

**Signal and Image Processing-Problems and Challenges**". The audience consisted of both MTech students and research scholars from department of Electrical Engineering and Electronics Engineering. He started with the basic concepts of vector algebra covering projections, inner product, orthogonal and non-orthogonal transformations. He later moved on to scalar and vector quantisation techniques with illustrations. He also discussed the recent research trends in speech processing, image processing and biosignal processing with reference to EEG, ECG and ERP signals. He also clarified doubts raised from the audience.

## Presentation by research scholar:

All the research scholars of biomedical stream made a small presentation of their ongoing research work in front of the technical expert. There were a total of twelve research scholars working in various areas like analysis of bio-signals (EEG,ECG, ERP), processing of medical images to detect heart diseases and brain tumour, robotics, industrial automation, control applications in biomedical systems and wirelessly networked cyber physical systems.

In the concluding session, the expert emphasized the significance of clarity of thesis title. He also gave several other valuable suggestions to improve the quality of research work. The research scholars were able to utilize his immense knowledge in the concerned area for their study. The whole session had been very interactive and informative.

## High Voltage Engineering:

## Keynote lecture:

Topic : Electric Field in Insulation and Modeling of Transformer for surges

Expert : Dr. Udayakumar, IISc Bangalore

Venue : ECED Seminar Hall

The session began at 1.30 pm, with a talk by Dr. Udayakumar, IISc Bangalore. The first part of the talk was about modelling of transformers for surges. In this, he explained the various stresses on transformers, surge propagation on lines, explained about the surge distribution in transformer windings, Classical approach & Field based approaches, and Distributed circuit based modelling approach and also the Salient aspects of parameter extraction. The next part of the talk was about electric field in insulation. In this, the importance of the electric field in

insulation was briefly discussed, some concern about the spatial resolution was briefed, influence of temperature and non-linearity on field distribution was discussed, and also some basic guidelines for the field solution were enumerated. During the talk faculty members, M.Tech students of High Voltage Engineering and research scholars were present. The session ended with a good interaction between the expert and the students present. Queries of the students were cleared at the end of the session.

## Presentation by research scholars:

The this session all research scholars of high voltage stream of department of electrical engineering presented their abstract and identified problem infront of the technical expert. The various topics presented were Condition Monitoring of underground cables, Transient Electric Field Computation and Flashover Voltage Prediction of Polymer Insulators, Characterization of polymer nanocomposites, EMI Shielding with nanocomposites, Analysis and Mitigation of EMI Issues due to Power Electronic Switching, Development and Characteristic study of nanoparticle Based transformer oil with improved economic aspects, Investigations into the electromagnetic interference of devices in Power system.

At the end of each presentation, there was an interaction during which suggestions regarding the work were made and doubts were cleared. At the end of the session, Dr. Udayakumar made his concluding remarks in which his assessment about each of the works and his suggestion about the future scope of the work were clearly made.

## Concluding Remarks:

The programme could support the research scholars in the following ways

1. Provided a better start for newly research scholars with proper guidance with the content to be investigated, the clear objectives, final outcomes etc.
2. Provided on-going research scholars who stuck with specific issues and better ways to tackle problems of same kind.
3. Provided research scholars who reached the final stages with how to present their results and possibilities of publishing the work in reputed journals or scope for applying for patents or even converting the results into more usable form for fellow beings or for the society.

4. Provided a platform for networking and encourage interdisciplinary thinking.
5. Participants got an opportunity to gain public speaking experience in front of large technical audience and gain expertise in effective technical communication skills to present their research ideas clearly.

The event was well appreciated by external experts as well as faculty members of the department. Also all the participants were extremely happy because of the interaction and the platform they got. It is requested to conduct such events once in a year by most of the participants since they utilized the opportunity well. The certificates of the programme were distributed to all the participants with appreciation from session experts.

**Profiles of Experts**

**Dr.Sivaji Chakravorti – Director**

Dr. Shivaji Chakravorti is the Director of NIT Calicut. He completed his Bachelor of Electrical Engg., Master of Electrical Engg. (Specialization in Electrical Engineering: High Voltage Technique) and Ph.D. (Engg) from Jadavpur University, Kolkata. He was a full-time faculty member of Electrical Engineering Department of Jadavpur University from 1985till he joined NITC. In 1984 he worked at the Indian Institute of Science, Bangalore, India, as Indian National Science Academy Visiting Fellow. He did postdoctoral research at the Technical University Munich, Germany, as Humboldt Research Fellow in 1995-96 and 1999, respectively. In 1998 he served as Development Engineer in the Power Transmission and Distribution Department of Siemens AG in Berlin, Germany. He further worked as Humboldt Research Fellow in ABB Corporate Research at Ladenburg, Germany, in 2002. He was US-NSF guest scientist at the Advanced Research Institute of Virginia Tech, USA, in 2003, AvH Guest Scientist at the Technical University Hamburg-Harburg, Germany, in 2005 and again at the Technical University Munich, Germany in 2007. He has published more than 67 research papers in peer-reviewed international journals including 41 papers in IEEE Transactions, 26 papers in refereed Indian journals and presented more than 80 papers in different international and national conferences/seminars. He has one US patent and two software copyrights to his credit. He has authored three books and edited three books. He has developed three online courses on numerical electric field computation. Prof. Chakravorti is Fellow of the Indian National Academy of Engineering, Fellow of National Academy of Sciences, India, Senior Member of IEEE (USA), Fellow of West Bengal Academy of Science & Technology and Fellow of the Institute of Electronics and Telecommunications Engineers. He is an Associate Editor of IEEE Transactions on Dielectrics and Electrical Insulation. He is Chairman-Elect of

IEEE India Council for 2015-2016, was the Chairman of IEEE Kolkata Section during 2011-2012, Chairman of its Power Engineering Chapter during 2003-2006 and the founder Chairman of its Dielectrics and Electrical Insulation Society Chapter in 2012-2015. In 2001 he was the Vice-Chairman of IEEE India Council. He was the Asia Pacific West Representative of IEEE Power and Energy Society in 2008 and is the Global Chapter Secretary of IEEE PES in 2013-2015. He is an IEEE Power and Energy Society Distinguished Lecturer since 2005. He was a member of The Court of Jadavpur University during 2006-2010. He is a regular referee for many international journals like IEEE Transactions on Power Delivery and on Dielectrics and Electrical Insulation, IET Proceedings etc. He is the recipient of 'Technical University-Munich Ambassador Award' in 2013, 'Technology Day Award' from All India Council for Technical Education (AICTE) in 2003 and the 'Outstanding Chapter Engineer Award' from IEEE Power & Energy Society in 2007. He is also the recipient of several other awards like the Jadavpur University Gold Medal for standing first in order of merit in both Bachelors and Masters examinations, The Pandit Madan Mohan Malaviya Memorial Medal of the Institution of Engineers (India) in 1995-96, The Indian Ministry of Energy: Department of Power Prize in 1994-95 and the Third Millennium Medal of IEEE Calcutta Section in 2000. He is actively involved in several sponsored projects funded by DST (Govt. of India), US-NSF, AICTE, MHRD (Govt. of India) and the World Bank. His current fields of interest are high voltage field computation, condition monitoring of transformers, optimization of high voltage systems and lifelong learning techniques.

**Prof. S. A. Kharparde, IIT Bombay**

Shrikrishna A. Khaparde is working as Professor, at Department of Electrical Engineering, Indian Institute of Technology, Bombay, India. He received the Ph.D. degree (1981) from the Indian Institute of Technology, Kharagpur. He has co-authored a book, "Computational methods for large sparse power systems analysis: An Object oriented approach" published by Kluwer academic publisher, 2001. He has also co-authored a book, "Transformer Engineering" published by Marcel Dekker Publisher, 2004. He is member of Advisory committees to Maharashtra

electricity regulatory commission, India and Indian Energy Exchange, India. He is Editor of International Journal of Emerging Electrical Power Systems. He is consultant to MERC, Indian Energy Exchange, and Power Grid Corporation of India Ltd etc. He is member of IEC TC57 for working groups 13 and 16 representing India. He is BIS LITD-10 Committee Member, and Chair of Working Group (WG3) on CIM. He received the prestigious DSK Energy Award 2009 in 2009, The Institute of Engineers (India), Pune Local Centre for Outstanding Contribution in Energy Sector**.** He has published more than 40 research papers in peer-reviewed international journals and presented more than 58 papers in different international and national conferences/seminars. His research interests include deregulation in Power Industry: optimal bidding, and congestion management, Object Oriented Power System Analysis, Controlled series compensation using SSSC, Harmonic Distortion in Distribution systems, Design and Operation of small tidal power plant, Modeling and Design of transformer. He has a work experience of 39 years as a faculty at Department of Electrical Engineering IIT Bombay. His current research areas are restructured power systems, distributed generation, renewable energy policies and CIM Implementation in India.

**Dr. Arun D. Mahindrakar, IIT Madras**

Dr. Arun D. Mahindrakar is the faculty at Department of Electrical Engg., Indian Institute of Technology Madras. He pursued his B.E. from KLESCET(KLE Dr. M.S.Sheshgiri College of Engineering and Technology), Belgaum in 1994, his M.E. in Control Systems from VJTI(Veermata Jijabai Technological Institute) -Mumbai, 1997 and Ph.D. in Systems & Control Engg., from IIT Bombay in 2004. He was a Post- Doctoral fellow at Laboratory of signals and systems, Supélec, Gif-sur-Yvette, Paris from Sept. 2004-June 2005. He worked as an Engineer Trainee at Tata Consulting Engineers, 1997-1998. He also served the position of Lecturer and Assistant Professor in Electrical and Electronics Engg. Dept., at different engineering colleges after his Post-Doctoral fellowship. He joined IIT Madras in 2006 as an Asst. professor. He has published more than 20 research papers in international journals and presented more than 20

papers in different international and national conferences/seminars. He was also the co- author of the book titled “Deterministic Attitude Estimation”, by CRC Press 2016. His research area includes Controllability and stability of nonholonomic systems, Sliding mode control for robust stabilization of nonholonomic systems, Formation control of multi-agent robotic systems, Stability analysis of time-delay systems, and Attitude estimation of UAVs. He is also the project advisor of the ongoing DST funded project “Obstacle avoidance and formation control of mobile inverted pendulum robots”.

**Dr. Ravikumar Bhimasingu**

Dr. Ravikumar Bhimasingu is the faculty at Dept. of Electrical Engineering, Indian Institute of Technology, Hyderabad. He completed his B.Tech in Electrical and Electronics Engg.) from Nagarjuna University, Andhra Pradesh and both his M.Sc. (Engg..) and PhD from Indian Institute of Science (IISc), Bangalore. He worked as Junior Research Associate (JRA) and Senior Research Associate (SRA) at Indian Institute of Science (IISc), Bangalore, during the year 2009 and 2010 respectively. He also served the position of Senior Executive –Technology, Global R&D Center, Crompton Greaves Ltd. (CG), Mumbai for three years. He is a reviewer of IEEE Transactions on Power Delivery, IET Generation Transmission and Distribution Journal, Ain Shams Engineering Journal (ELSEVIER) etc. His research interest includes Computer-aided power system analysis and modeling, AI techniques applications for power systems security improvement, Power System protection and optimization, Distribution system automation and Wide Area Monitoring.

**Dr. K. Sivakumar, IIT Hyderabad**

Dr. K. Sivakumar is working as an Associate Professor, Department of Electrical Engineering, IIT Hyderabad. He completed his B.Tech in Electrical and Electronics Engineering from Sri Venkateswara University, Tirupati (2004), his M.Tech (Power Electronics and Drives) from NIT Warangal (2006) and Ph.D. from Centre for Electronics Design and Technology (CEDT, Presently DESE), Indian Institute of Science Bangalore (2010). He started his career as an Adhoc faculty in the Department of Electrical and Electronics Engineering, NIT Warangal for six months, then he joined American Power Conversion (India) Pvt. Ltd., Bangalore (December 2010 - March 2011) as a Design Engineer. He started his teaching career as an Asst. Professor at IIT Hyderabad in 2011. He has published more than 20 research papers in international journals and presented more than 20 papers in different international and national conferences. He also worked as a part of various projects including "A fault tolerant multilevel inverter configuration for islanded mode photovoltaic generation system"-SERB, GOI and "Investigation on novel multilevel inverter topology for induction motor drive". He was awarded for excellence in teaching at IIT Hyderabad and has won best paper award for conferences. His research area includes multilevel inverters, open-end winding induction motor drives, Switched Mode Power Conversion, microgrids, Power quality and control.

**Prof. RamKrishnan A.G., IISC Banglore**

Prof. Ramakrishnan is the Professor and Chairman at Dept. of Electrical Engineering IISC Bangalore. He pursued his B.E. (Honors) in Electronics and Communication Engineering from University of Madras in 1980, his M.Tech in Electrical Engg. from I.I.T., Madras in 1982. He

had done his Ph.D. in the Faculty of Engineering, I.I.T., Madras. He worked as the Post-Doctoral Fellow at John E Fetzer Institute, Kalamazoo, MI, USA for a period of one year and served as Post-Doctoral Research Associate at Indian Institute of Science, Bangalore for two years. He started his teaching career as an Asst. Professor at IISc Bangalore from 1994. He had won various research awards like Thangam Vasudevan award for 1985 for the best paper from the Indian Association of Biomedical Scientists, selected as a Young Scientist (1994) and awarded Research Grant by the Department of Science and Technology, Government of India, received the Sir Andrew Watt Kay Young Researcher's Award (1992) from the Royal College of Physicians and Surgeons, Glasgow for outstanding original work in the field of medical and biomedical sciences etc. He served as the President, Biomedical Engineering Society of India, from 2002 – 2008 and Chair of International Conference on Biomedical Engg, Bio Vision 2001, IISc. He is an active member of various societies like Indian Association of Biomedical Scientists, Technical Member, Kanithamizh Sangam (Association for Tamil Computing), Chennai, Fellow, Institution of Electronics and Telecommunication Engineers, India. He was mentioned in the Marquis Who's Who in the World, 1999 and 2001,Marquis Who's Who in Science and Engineering, 2005-06 and Mentioned in 31-st Edition of Dictionary of International Biography, Cambridge, England. He had won outstanding Volunteer Award for the Kalamazoo County, Michigan, U.S.A. for 1990-91 by the Internal Revenue Service, Dept. of the Treasury, Government of U. S. A. He is the Reviewer for the IEEE Trans. on Biomed. Eng., IEEE Trans, on Info. Technology in Biomedicine, IETE Journal, Trans. on Systems, Man and Cybernetics, Sadhana, International Journal on Document Analysis and Recognition (IJDAR). His current Research area includes Machine Listening, Camera Captured Document Image Analysis and Recognition, Bio inspired Strategies for Online Handwriting Recognition in Indian Languages and Analysis of Fundus images of Diabetic Retinopathy.

**Prof. Udayakumar, IISc Bangalore**

Dr. Udayakumar is working as professor in Dept. of Electrical Engineering, IISc Bangalore. He pursued his BE (in Electrical) from University Visveshwaraih College of Engineering, Bangalore University, his ME (in High Voltage) and Ph.D. from Indian Institute of Science, Bangalore. He had won Tag Corporation Medal of the department of High Voltage Engineering for the ME degree and Prof. D.J. Badakas Medal and Cash Prize of the department of High Voltage Engineering for the doctoral work. He worked as Senior Analyst, (1997-1998), Electromagnetic group, EMRC, Bangalore and started his career as a lecturer at the Department of High Voltage Engineering, IISc. He is a Senior Member of IEEE & member of CIGRE, Steering Committee Member of Asia Pacific Lightning Conference. He was a member in the Editorial board of Journal of Lightning Research and Reviewed manuscript for IEEE Trans. on Power Delivery, IEEE Trans. on Industrial Application, IEEE Trans. on Electromagnetic Compatibility, IEE Science Measurement & Technology, IEE Generation, Transmission & Distribution, IEE Electronics Letters, Journal of Electrostatics, Journal of Physics-D, Atmospheric research, IEE (India), ETEP, Journal of Emerging Technologies in Electrical Engineering, Sadhana, Iranian Journal etc. He has published more than 40 research papers in international journals and presented more than 60 papers in different international and national conferences. His research area includes Electromagnetics, Lightning, Measurements, Correlation between the actual stroke current to the current sensed at the ground end of towers/conductors and Performance studies on Rogowski coil for higher frequencies, branched currents and non-cylindrical conductors.

## Schedule

| **Day 1: 24th March 2017-Friday, EED PG Block** |
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| 08.30AM-09.30AM: **Registration** |
| 09.30AM-10.00AM: **Inauguration**<br>Presidential Address- **Prof.Shivaji Chakaravorti**, Director, NIT Calicut<br>Inaugural Address- **Prof.S.A Kharparde**, Professor, IIT Bombay |
| Keynote Address : **"Moisture Dynamics in Transformers"**<br>**Prof.Shivaji Chakaravorti**, Director, NIT Calicut |
| 11.00AM-11.15AM Tea Break |
| 11.15AM-12.00PM: **Keynote Lectures** |

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| **"Smart Grid-Challenges & Issues"**<br>**Prof.S A Khaparde, IIT Bombay**<br><br>Venue: EED PG Seminar Hall | **"Formation Control of Mobile Inverted Pendulum Robots"**<br>**Dr. Arun D Mahindrakar, IIT Madras**<br>Venue: EED PG Seminar Hall 2 |
| 12.00PM-01.00PM: **Presentations by Research Scholars** | |
| **Presentations by Research Scholars**<br>Group: **Power and Energy** | **Presentations by Research Scholars**<br>Group: **Control & Instrumentation** |
| 01.00PM-02.00PM: Lunch Break | |
| 02.00PM-05.00PM: **Presentations by Research Scholars** with Tea Break @ 03.30PM | |
| **Concluding Remarks:**<br>**Prof.S A Khaparde , IIT Bombay**<br>**Dr. Ravikumar Bhimasingu, IIT Hyderabad** | **Concluding Remarks:**<br>**Dr.Arun D Mahindrakar, IIT Madras** |
| **Day 2: 25th March 2017-Saturday, EED PG Block** | |
| 09.00AM-09.45AM: **Keynote Lectures** | |
| **"Improving resiliency in the Grid Integrated Renewable Energy based microgrids"**<br>**Dr. Ravikumar Bhimasingu, IIT Hyderabad**<br><br>Venue: EED PG Seminar Hall | **"Power Electronic Converters for Renewable Application"**<br>**Dr. Sivakumar K, IIT Hyderabad**<br><br>Venue: EED PG Seminar Hall 2 |
| 09.45AM-03.30PM: **Presentations by Research Scholars**<br>Group: **Power Electronics and Drives** | |
| 12.30PM-01.30PM: **Lunch Break** | |
| 01.30PM-02.15PM: **Keynote Lectures** | |
| **"Medical Signal and Image Processing - Problems and Challenges"**<br>**Prof. Ramakrishnan A G, IISc Banglore**<br>Venue: EED PG Seminar Hall | **"Electric Field in Insulation and Modeling of Transformer for surges"**<br>**Prof. Udayakumar, IISc Banglore**<br>Venue: ECED Seminar Hall (Old Architecture Block) |
| 02.15PM-05.00PM **:** **Presentations by Research Scholars** with a Tea Break @ 03.30PM | |

| Group: **Biomedical and Signal Processing** | Group: **High Voltage Engineering** |
|---|---|
| **Concluding Remarks by the Experts for Power Electronics & Drives, Biomedical and Signal processing & High Voltage Engineering Groups** | |