

# IEEE INDICON 2015

INDICON is annual conference conceptualized by IEEE India Council in the field of Electrical Engineering, Electronics and Communication Engineering and Computer Science & Engineering in general. This has been a metamorphic version of Annual Convention and Exhibitions (ACE) which was the annual meeting of IEEE India Council, renamed as INDICON.

IEEE INDICON 2015 was held from 17<sup>th</sup> and 20<sup>th</sup> December 2015 with theme of E<sup>3</sup>- C<sup>3</sup> covering the research areas in the field of Electronics, Energy, Environment, Communication, computer, Control. The very first INDICON was organized by IEEE Kharagpur Section at IIT Kharagpur during 2004. Subsequent INDICON conferences were organized by IEEE Madras Section (2005), IEEE Delhi Section (2006), IEEE Bangalore Section (2007), IEEE UP Section (2008), IEEE Gujarat Section (2009), IEEE Calcutta Section (2010), IEEE Hyderabad Section (2011), IEEE Kerala Section (2012), IEEE Bombay Section (2013) and IEEE Pune Section (2014). Over the past few years, INDICON has emerged as a well recognized and an eagerly anticipated event in the country because of its high quality technical sessions and the networking opportunities it provides.

INDICON 2015, which is the 12<sup>th</sup> of the series, was organized by Department of Electrical Engineering, Jamia Millia Islamia in collaboration with IEEE Delhi Section, at Jamia Millia Islamia, New Delhi.

INDICON 2015 showed a meteoric growth this year with 2195 papers registered and having 1807 active papers for review. Finally, 945 papers were accepted out of which around 780 have finally registered and will be presented during the conference.

This year INDICON showcased **EIGHT Tutorials** by eminent experts from across the world on a variety of topics and a **Plenary Session** on "*Key Industry/ Societal Trends in the Future of Smart Grid for India*", which features **FIVE Expert speakers**. **SIX Keynote Slots** featuring **FOURTEEN Renowned Speakers** and **FOUR Industry Panel Sessions** with **FIFTEEN Speakers**, mostly from Industry, makes INDICON 2015 a truly international conference.

INDICON 2015 featured a whopping **90 Oral Paper Presentation Sessions** (16 in parallel) spread over 3 days and **13 Poster Presentation Sessions**. Each session was evaluated by a minimum of two session chairs and a best paper was selected for each session, to encourage young researchers. Special awards for specific achievements in research are also being planned.

INDICON 2015 also featured an exhibition showcasing the latest equipment and books

## The Host Institution: Jamia Millia Islamia

Jamia Millia Islamia came into existence in 1920 through the tireless efforts of its founders, such as Shaikhul Hind Maulana Mahmud Hasan, Maulana Muhammad Ali Jauhar, Hakim Ajmal Khan, Mukhtar Ahmad Ansari, Jenab Abdul Majeed Khwaja and Zakir Husain. It symbolizes the unflinching and resolute commitment of these great visionaries in bringing about socio-economic transformation of common masses, in general, and Muslims, in particular through the vehicle of education. The distinct identity of Jamia Millia Islamia has been eloquently explicated by Zakir Husain Sahib.

In 1962, the University Grants Commission declared the Jamia a 'deemed to be University'. Soon thereafter, the School of Social Work was established in 1967. In 1971, Jamia started the Zakir Husain Institute of Islamic Studies, to honour Zakir Husain, who had passed away in 1969. BE course in Civil Engineering commenced in 1978; in 1981, the faculties of Humanities and Languages, Natural Sciences, Social Science, and the State Resource Centre were founded. In 1983, it started the Mass Communication Research Centre and the Centre for Coaching and Career Planning. In 1985, it established the Faculty of Engineering & Technology and the University Computer Centre. Academic Staff College and the Academy of Third World Studies followed in 1987 and 1988.

By a Special Act of the Parliament, Jamia Millia Islamia was made a central university of India in December 1988. In the list of the Faculties, i.e. Education, Humanities & Languages, Natural Sciences, Social Sciences, Engineering & Technology, one more Faculty-Faculty of Law, was added in 1989. Many new courses and programmes at UG and PG levels have since been added.

Besides its Nine faculties, the Jamia has a number of centres of learning and research, like AJK-Mass Communication Research Centre (MCRC), Academy of International Studies etc. The Jamia is also marching ahead in the field of Information Technology (IT). Apart from this, the Jamia has a campus wide network which connects all the departments and offices.

Jamia is situated on the banks of Yamuna, in south Delhi, with a beautiful 220 acre lush green Campus, runs around 220 courses and has around 19,000 students. Jamia has four schools and runs a variety of under-graduate, Post-graduate, PhD and Post-Doctoral programs. Jamia students excel in extracurricular activities and have won laurels in sports and cultural festivals.

## **Department of Electrical Engineering, JMI**

The Department of Electrical Engineering at the Faculty of Engineering & Technology of Jamia Millia Islamia, New Delhi is one of the premier electrical engineering education and research departments of the Country and is also one of the SAP departments of UGC and FIST departments of DST. Since its inception in 1985 along with the inception of Faculty of Engineering & Technology of Jamia Millia Islamia, New Delhi, it has grown leaps and bounds and continuously striving for excellence. Apart from offering regular four-year under graduate programmes, i.e. B.Tech. in Electrical Engineering and B.E. (evening) in Electrical Engineering, the department has been serving to the specialised needs of the industry by running two regular M.Tech. Programmes, One in Electrical Power Systems Management (EPSM) started in 2003–04 and another in Control and Instrumentation Systems (CIS) started in 2012. The Department of Electrical Engineering has been successfully achieving its research endeavors through its very well structured and disciplined Ph.D. programme in five major areas, i.e. Power Systems; Electrical Machines, Power Electronics and Drives; Electronics & Communication and Computer Technology; Control and Instrumentation System. The Department of Electrical Engineering is committed to grow further as a socially responsible and research oriented centre of learning. The faculty members at Department of Electrical Engineering lead by examples and are highly motivated to achieve excellence in research and development and publish their research in internationally peer reviewed journals, patenting their research findings, and bringing generous research grants from Govt. research funding agencies like AICTE, MHRD, MNRE, UGC, DRDO, DST, DOE etc. to upgrade the research facilities at the department and to provide innovative solutions to engineering problem

To augment the teaching, learning and research, department has very well established laboratories for graduate and post graduate programmes, where students can experiment and test the electrical engineering concepts. Department also has laboratories in some specialized areas like SCADA Systems, Substation Automation Systems, Power Systems and Sensors & Instrumentation etc. Besides these laboratories, there are many other state-of-the-art experimental set-ups/ hardware and sophisticated software being used for teaching and research in the thrust areas related to electrical engineering. Graduate and post-graduate students of the Department of Electrical Engineering easily find employment in the leading government, public or private organizations either through campus placement or through all India recruitment process. Many of the students are regularly getting opportunity to go abroad either for better employment or for higher studies in the reputed universities. There exist loads of avenues, besides academics, for students to hone their creativity, cultural and entrepreneurial skills.

## **IEEE Delhi Section**

Delhi Section is one of the 11 Sections in India coming under Asia-Pacific Region, the Region 10 of IEEE. It covers entire northern part of the country consisting of the National Capital Territory of Delhi, Union Territory of Chandigarh and the five states of Rajasthan, Haryana, Punjab, Himachal Pradesh and Jammu & Kashmir. IEEE Delhi Section, which started on May 13, 1976.

The IEEE Delhi Section was initiated on May 13, 1976 (after remaining as a Sub-section since 1974),

and is celebrating the 40<sup>th</sup> year of establishment in 2016. As per December 2015 statistics Delhi Section has 4,520 active Members, consisting of 1 Honorary Member, 7 Life Fellows, 4 Fellows, 25 Life Senior Members, 204 Senior Members, 4 Life Members, 1,239 Members, 39 Associate Members, 422 Graduate Student Members, and 2,575 Student Members.

Delhi Section has two subsections, one being Chandigarh and the other Rajasthan, formed in 2015. Delhi Section has Fourteen Society/ Council Chapters and three Affinity Groups, Women in Engineering (WIE), Young Professionals (YP) and Consultants Network (CN). The Section has got more than hundred Student Branches and Branch-Chapters out of which, Jamia Millia Islamia is one of the active student branches. IEEE Delhi Section alone or with the support of its Chapters, affinity groups and the local units of other institutes, like, IET (UK), IETE, IE (India), etc. organizes from time to time activities for:

- Dissemination of knowledge in the broader fields of Electrical, Electronics and Computer Engineering through holding of technical talk, seminar, symposium, workshop, tutorial, etc.
- Bringing Industry-Academia collaboration and cooperation.
- Provide support to Student Branches to conduct paper contest, quizzes, web design, hardware and software design contests and industrial visits.
- Humanitarian activities to advance technology for the betterment of members and non members
- Organise international conferences at regular intervals to create an platform for international collaborations and dialogue
- Coordination International distinguished lecturer visits to Delhi and the areas under Delhi section
- Liaison with the governmental agencies and sister societies for better cooperation and enhancement of knowledge.

## JAMIA MILLIA ISLAMIA

(A Central University by an Act of Parliament)

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### Professor Talat Ahmad

FNA, FASc., FNASc., J.C. BOSE Fellow  
Vice Chancellor

## جامیاء میلیا اسلامیاء

(संसदीय अधिनियमानुसार केन्द्रीय विश्वविद्यालय)

मौलाना मुहम्मद अली जौहर मार्ग, नई दिल्ली-११००२५

## جامعہ ملیہ اسلامیہ

(پارلیمانی ایکٹ کے تحت ایک مرکزی یونیورسٹی)

مولانا محمد علی جوہر مارگ، نئی دہلی-۱۱۰۰۲۵

### پروفیسر تلات احمد

एफएनए, एफएएससी, एफएनएएससी, जे.सी. बोस फेलो  
कुलपति

### پروفیسر طلعت احمد

ایف این اے، ایف اے ایس سی، ایف این اے ایس سی، جے سی۔ بوس فیلو  
شیخ الجامعہ



جامعہ  
ملیہ  
اسلامیہ

November 12, 2015



### Vice Chancellor's Message

I am pleased to learn that the Department of Electrical Engineering is organizing an International Conference IEEE INDICON 2015 from 17-20th December 2015.

I understand that the deliberations during the event would cover all aspects of technological development in the field of electrical and electronics engineering. Innovations in the field of engineering and technology are key to socio economic development of any country. I am confident that this conference will offer an opportunity for mutual sharing of knowledge, expertise, and experience among all stakeholders including the participants from industry, academic, and research institutions globally.

I take this opportunity to congratulate the organizers of IEEE INDICON 2015 for their efforts in bringing such an important international event to Jamia. I extend my good wishes and all success to the conference in achieving its laid down objectives.

I welcome all the delegates to Jamia Millia Islamia.

(Professor Talat Ahmad)

## Message from IEEE President and CEO 2014



Roberto De Marca  
IEEE President and CEO 2014

I congratulate the Department of Electrical Engineering, Jamia Millia Islamia, for organizing IEEE INDICON 2015 from 17–20<sup>th</sup> December 2015.

IEEE INDICON covers a wide variety of topics ranging from Electronics, Nanotechnology, Environment, Electrical Power Engineering, Computers, Control and Communication. The large number of papers, as well as plenary and keynote sessions, should become forums for change, where young minds will debate appropriate technologies for the betterment of our world.

IEEE is committed to advancing technology for humanity, and conferences such as IEEE INDICON create vitally necessary interactions between technology leaders from around the world, and across the breadth of the IEEE fields of interest.

I am certain that IEEE INDICON 2015 will achieve the objectives set. I would like to express my gratitude to all those who played a role in bringing IEEE INDICON 2015 about, and to extend my sincere best wishes for the success of the conference.

Roberto De Marca  
IEEE President and CEO 2014

## Message from IEEE MGA Vice President



Lawrence W.C. Wong  
IEEE VP and Chair, MGA  
Professor of Electrical Engineering  
NUS, Singapore

It is a matter of immense pleasure to note that the Department of Electrical Engineering, Jamia Millia Islamia, New Delhi has taken the lead to organize the 12th IEEE annual international Conference INDICON-2015 from 17<sup>th</sup>-20<sup>th</sup> December 2015.

With a broad spectrum of topics chosen, INDICON 2015 will provide a platform to researchers, academicians, scientists, and system engineers to get exposure to new technologies emerging in the field of E3-C3 (Energy, Electronics, Environment, Computer, Communication, and Control). The excellent technical program covering plenary, tutorials and keynote sessions will provide adequate opportunities for networking. I express my appreciation to the organizing committee members who worked hard to make INDICON 2015 conference a memorable event.

I wish the deliberations will provide opportunities for the participants to expand their horizons of research and technical exchanges, and I wish the conference a resounding success.

## Message from IEEE R10 Director



Ramakrishna Kappagantu  
IEEE RIO Director

We see IEEE INDICON 2015 emerged as a large conference that provides several opportunities to exchange ideas and interact with technology top leaders. International conferences like this provide a platform for research scholars, academicians, entrepreneurs and practitioners to network in sharing the new and upcoming technologies for the betterment of humanity.

The wide conference theme areas chosen this year ranging from Energy, Power, Electronics, Nanotechnology, Environment, Communication, Computer and Control is an indication of the future directions of technology, where the amalgamation of fields is the key to National Development and progress.

I extend warm greetings and support to the IEEE INDICON 2015 organizing team, wish a packed schedule during the conference and all the very best in this learning process provided by IEEE's great networking platform and do make best use of this opportunity.

Thanks for being here in big numbers with large number of paper submissions and making this a grand success.

## Message from General Chair



**Mini Shaji Thomas**  
Chair, IEEE Delhi Section  
Honorary Director,  
Centre for Innovation and Entrepreneurship  
Professor, Department of Electrical Engineering  
Jamia Millia Islamia, New Delhi, INDIA

Greetings!

It was a privilege to shoulder the responsibility of “General Chair, INDICON 2015”! When we started work in September 2014, the expectation was of a medium size conference with around 500 paper submissions. The sheer volume of papers which crossed 2000 mark, surprised us. The review process was tedious and the team at Jamia rose to the occasion to complete this task by end of August 2015, with dedicated volunteers working round the clock.

Our invitation for tutorial, plenary, keynote and panel sessions was very well received by the international technical fraternity and we have around 30 expert speakers from all over the world coming to the event to enlighten us of the latest technological developments and inspire us to scale new heights. I am sure this will be a golden opportunity for young researchers to rub shoulders with International and national stalwarts. I am thankful to each one of them and all other speakers who accepted our invitation to come and participate in INDICON 2015.

With 90 paper and 13 poster sessions, in conjunction with 8 tutorials, 1 plenary, 6 keynote and 4 Industry panel sessions, INDICON 2015 has set a new benchmark for the conference series. I am thankful to our honorable Vice Chancellor, Prof. Talat Ahmad, and the administration for all the support. My team comprising of Organising Chair, Prof. Majid Jamil, Organising Secretary Dr. Iqbal Ali, Track chairs Prof. Z A Jaffery, Prof. Munna Khan, Prof. Anwar Shehzad Siddiqui, Prof. Tariqul Islam, Prof. Shakeb A Khan, Dr. Shabana Mehfuz deserve all the praise for their efforts. I applaud the contributions of the team of Ph.D Scholars and M.Tech Students who did exceptional work to bring the event to this level.

We welcome each one of you to INDICON 2015 at Jamia Millia Islamia, which has 95 years of history behind it with great traditions of brotherhood and impeccable hospitality. I hope you will enjoy your time with us at JMI and I wish you a memorable event and stay in Delhi.

**Mini Shaji Thomas**  
General Chair & Technical Programme Committee Chair,  
INDICON 2015

# JAMIA MILLIA ISLAMIA

(A Central University by an Act of Parliament)

## Faculty of Engineering and Technology

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### Office of the Dean



## Message

It is a matter of pride for me as the Dean of the Faculty of Engineering & Technology that our Department of Electrical Engineering is organizing an International Conference "IEEE INDICON-2015". On behalf of the Faculty of Engineering & Technology, JMI, I feel privileged to welcome all speakers, delegates and dignitaries to this prestigious event. I perceive that this event should be a prominent milestone for Faculty of Engineering and Technology.

Our Faculty has been regularly organizing various Conference, Workshops, Symposia both at the National and International level. Several international conferences have been organized by various Departments of the Faculty of Engineering & Technology. Each of them have received overwhelming response and have been attended by eminent scientists, scholars, and academicians apart from experts from industrial and government sectors.

The present Conference "INDICON 2015" should provide a substantial input into the quality research and technology. I hope that the conference will reflect the evolution of specialties, including state-of-the-art presentations on various emerging trends in the field of engineering and technology. This conference should also bring together the scholars across the globe, and should be an excellent chance for networking amongst institutes and industries.

I am sure that the participants and guests will enjoy their stay at Jamia and shall be benefitted by various sessions of the Conference.

Prof. Mohammad Shakeel

Dean



## Message from Organizing Chair



Majid Jamil  
Professor and Head  
Department of Electrical Engineering, JMI  
And  
Organizing Chair, INDICON 2015

On behalf of Department of Electrical Engineering, Jamia Millia Islamia, I, take this privilege to extend a cordial and warm welcome to the distinguished speakers, delegates and participants of INDICON 2015. I welcome you all to this great university which has been serving the Nation by producing technical professionals for more than 95 years. The department of Electrical Engineering, Jamia Millia Islamia, which was established in 1985 with B. Tech programme, started Ph.D. and two M. tech programmes about 15 years ago. Since then Department is actively engaged in teaching and research. The Department has produced 60 Ph.D.s during past 15 years and has published more than 1000 papers in refereed international reputed journals and conferences during past five years. The Department has also received several crore rupees grant from different funding agencies and has successfully completed more than 30 research projects during last five years. Presently more than 100 students are doing Ph.D. in the Department.

The conference is aimed to motivate young budding engineers who have got extra spark and flare for research. The conference would provide the researcher a unique platform to hear from their peers in the field of applied research while presenting their own innovative ideas as beginners. Hope you will enjoy your stay on this picturesque campus and take maximum advantage of this opportunity to interact and share your ideas and thoughts with the experts as well as other students working in different parts of the country which would give a fantastic boost to the level of research.

I am thankful to the Vice Chancellor for extending all guidance and support in making this conference a great success. I am also grateful to invited experts who have kindly consented to deliver talks in the fields of their respective expertise in order to motivate the participants. I am also thankful to all delegates for their participation in the INDICON 2015. A great thank to all sponsors for their kind cooperation in the organization of this conference.

And the last but not least great thanks to all my team members who have been working very hard for the last one year, IEEE Delhi council, General chairs of the conference, organizing secretary, track chairs, reviewers, Ph.D. students and my office staff.

I look forward to meeting you all in INDICON 2015 and wish the event a grand success.

## Message from Organizing Secretary



Dr. Iqbal Ali  
Assistant Professor  
Department of Electrical Engineering  
F/o Engg. & Technology, Jamia Millia Islamia, New Delhi  
Organizing Secretary, 12<sup>th</sup> IEEE INDICON 2015

It is my proud privilege and honour to welcome you all to this 12<sup>th</sup> IEEE INDICON 2015, being organized by the very vibrant, DST FIST and UGC SAP supported Department of Electrical Engineering, F/o Engg. & Technology, Jamia Millia Islamia (JMI), [NAAC Grade-A University]. We at the JMI, in general, and department of Electrical Engineering, in particular, are delighted to play as host this year to the well recognized and an eagerly anticipated event in India by the teaching & research community worldwide related to the field of engineering because of its high quality technical sessions and the networking opportunities it provides.

I, on behalf of the organizing committee, acknowledge your active participation and contributions which has resulted INDICON 2015 receiving and completing review of a record number of 2000 plus research articles from across all major technical institutes of the country including all IITs, NITs, Central Universities and research organizations etc. It has also received research articles from around 19 foreign countries. The organizing committee has left no stone unturned to ensure that the INDICON 2015 turns out to be an occasion from which all of you carry back long lasting memories of not just scientific excellence but also warm hospitality and the culture of brotherhood prevailing across JMI.

Since INDICON is intended as a conference to serve all the IEEE members and associated industries, the theme of INDICON 2015 is spanning the spectrum of Electronics and Nano-technology, Energy and Power, Environment and Electrical Engineering, Communication and signal processing, Computer and Information Technology, and Control & Instrumentations or E<sup>3</sup>C<sup>3</sup>. Considering the theme of the conference, the deliberations during the planned tutorials, keynote speeches, plenary sessions and technical sessions are designed to address the state-of-the-art research, developments and trends related to the conference theme and hopefully will feed and stimulate the intellectual faculties of every participant. I sincerely hope that this event will help us all to find opportunities in establishing new collaborations for research and mutual learning.

I also acknowledge and appreciate the cooperation and support extended by the honourable Vice Chancellor, JMI, Prof. Talat Ahmad, my esteemed colleagues, members of the IEEE Delhi section and our student volunteers in making this INDICON 2015 happen in such a grandiose way.

Looking forward to meeting you all during INDICON 2015 and wish the event turns out to be a great success story.

## Message from General Chair



Bhim Singh  
Professor and Head  
Department of Electrical Engineering, IIT-D  
and General Chair, INDICON 2015

Dear Authors, Delegates, Speakers, Invited Guests and Partners:

It gives me great pleasure to welcome you to 12<sup>th</sup> IEEE India Conference i.e. the IEEE INDICON 2015, an annual conference on Power and Energy, Data mining, Electronics, Devices, Software and Database System and related areas. This IEEE India flagship conference organized by IEEE Delhi Section was a blend of technical rigor and the unique ambience of the Jamia Millia Islamia, Delhi.

We have power packed program with eminent national and international experts for plenary & invited talks as well as for tutorials. All the sessions are expected to have high attendance and the quality of interaction. A well organized proceeding will also be provided at the time of registration. A large exhibition with wide spectrum participation from industry, education, publications and career growth companies are the USP of this conference.

This conference is expected to bring together national and international community of experts to discuss the state-of-the-art, new research results, perspectives of future developments, and innovative applications relevant to Big data and Data mining, Cloud Computing, Emerging trends in Engineering, High Performance Computing, Information and network security, Power and Energy, Software and Database System and related areas.

We would like to express our sincere appreciation in advance to members and volunteers of various committees of INDICON 2015. A big 'Thank You' in advance to Gold, Silver and Exhibitor partners; you enabled us to take the conference to greater heights.

We hope you will enjoy the trip to Delhi. There are lots of tourist attractions in Delhi, do find some time to check out some of them. We expect **INDICON 2015** become fruitful and a truly memorable conference.

With best wishes,

Prof. Bhim Singh  
General Chair

## Message from Technical Programme Committee Chair



Shibban Koul  
Deputy Director, IIT Delhi

It is my great pleasure to welcome you to the IEEE International Conference INDICON 2015 which is dedicated to the area of Electrical & Electronics Engineering in general. The theme of INDICON 2015 has been chosen as E3-C3 and the conference includes cutting edge research papers in all the 6 tracks: Energy and Power, Electrical Engineering and Environment, Electronics, Computers & Information Technology, Control & Instrumentation, and Communications. The conference represents one of the largest gatherings of researchers and industry professionals in the field of Electrical & Electronics Engineering worldwide. More than thousands delegates from around the globe will gather to discuss the latest advances in this vibrant and constantly evolving research field.

It has been a great privilege for me to be a part of INDICON-2015 and I am sure that all the participants will find the conference stimulating, fulfilling and successful.

## Message from Chair, IEEE India Council



Deepak Mathur  
Chair, IEEE India Council  
IEEE—Advancing Technology for Humanity

I am delighted that IEEE Delhi Section is organizing INDICON 2015 at Jamia Millia Islamia, New Delhi. INDICON is annual conference of IEEE India Council. The conference provides an excellent opportunity to professionals and students working in the fields of Computer Science and Engineering, Electrical Engineering, and Electronics and Communication Engineering in general.

INDICON is a premier technical conference in the country as well as of IEEE because of its high quality technical sessions and the networking opportunities. We are striving hard to make it more useful for our members in view of fast changing global technical scenario. I appreciate the efforts of IEEE Delhi Section in making it an international conference by inviting several world renowned experts and speakers.

I would like to compliment the Delhi Section for efficient planning and thoughtful selection of conference topics and speakers. This will reaffirm the commitment of India Council in keeping high standards of its premier conference INDICON.

I wish INDICON 2015 all the best.

## Message from Plenary Speakers



John D. McDonald  
P.E. Director, Technical Strategy & Policy Development  
GE Grid Solutions

Welcome to INDICON!

INDICON is an annual conference conceptualized by the IEEE India Council in the field of Computer Science and Engineering, Electrical Engineering, and Electronics and Communication Engineering. This has evolved from the Annual Convention and Exhibitions (ACE), the annual meeting of the IEEE India Council, which was renamed as INDICON. Initially, INDICON was organized by the IEEE Kharagpur Section at IIT Kharagpur during 2004. Subsequent INDICON conferences were organized by the IEEE Madras Section (2005), the IEEE Delhi Section (2006), the IEEE Bangalore Section (2007), the IEEE UP Section (2008), the IEEE Gujarat Section (2009), the IEEE Calcutta Section (2010), the IEEE Hyderabad Section (2011), the IEEE Kerala Section (2012), the IEEE Bombay Section (2013) and the IEEE Pune Section (2014).

Over the past few years, INDICON has emerged as a well-recognized and eagerly anticipated event in India because of its high quality technical sessions and the networking opportunities it provides. This conference is the 12<sup>th</sup> in the series and is organized by the Department of Electrical Engineering at Jamia Millia Islamia University in collaboration with the IEEE Delhi Section. The Delhi Section is one of the 11 IEEE Sections in India, part of IEEE Region 10 (Asia-Pacific Region).

Jamia Millia Islamia University came into existence in 1920 through the tireless efforts of its founders. The Department of Electrical Engineering, Jamia Millia Islamia University, will be hosting INDICON 2015 from 17–20<sup>th</sup> December which has a record number of papers submitted, and accepted. The conference will have tutorial sessions by renowned IEEE Fellows, paper and poster sessions, keynotes, panel sessions and an exhibition.

I congratulate the organizing team for putting together a great technical program!

I wish you a very productive INDICON!

Very truly yours,

A handwritten signature in black ink that reads "John D. McDonald". The signature is written in a cursive, slightly slanted style.

John D. McDonald, P.E.

## Message from Plenary Speakers



**Professor Saifur Rahman**

Director, Advanced Research Institute  
Virginia Tech, USA  
President-elect 2016 and 2017  
IEEE Power & Energy Society

As the incoming President-elect of the IEEE Power & Energy Society for 2016 and 2017, it gives me immense pleasure to welcome over one thousand delegates and authors from India and around the world at Indicon 2015. It is particularly gratifying to note that the hosts of this conference at Jamia Millia Islamia were able to attract almost 2,200 papers for this conference, of which they have accepted about 800. This is very selective for a conference of this size. It shows the confidence prospective authors have with IEEE and the conference organizers at the university. As a part of our society's mission to provide support to local and regional organizations to hold conferences, meetings and workshops, we are happy to work with conferences like Indicon, which play a valuable partnership role. As our technically cosponsored conference, papers presented at Indicon will be published by IEEE in the archival electronic publication platform, IEEE Xplore. With over 3.5 million articles in our Xplore repository and more than eight million downloads a day, it is a very highly-accessed platform for technical literature. Articles presented at this conference are expected to get wide circulation through our electronic library.

I am particularly pleased to see that the 2015 Indicon features several tutorials and keynote speeches offered by leaders in academia and industry. This is especially important for the young generation of engineers and research students here who can meet so many well-known professors and technical professionals from industry and government.

I wish great success for this conference and hope to meet many of you personally while I am here at Jamia Millia Islamia.

## Message from Track Chairs



Munna Khan  
Track Chair, Electronics and Nano-technology  
INDICON 2015

Electronics and Nanotechnology as TRACK 1 of 12<sup>th</sup> IEEE India International Conference INDICON 2015 brings together researchers, technologists, academicians, developers and practitioners from Industry and academia; those are carrying out research and development works in various areas related to Electronics and Nanotechnology. The TRACK 1 spans across 12 sessions and 3 poster sessions having 109 full length papers from various countries of the World. The full length papers were carefully selected from total 260 received papers from different research fields of Electronics and Nanotechnology. I hope that the discussions among researchers from academia and industries present in the conference would give rise to fruitful results and outcomes enabling better understanding of Electronics and Nanotechnology.

I would like to thank all the authors for submitting their research works for publications, the members of the program committee for assessing the technical qualities, originality, and relevance of scientific research articles, and the external reviewers for providing their expertise.

I hope that all of you would enjoy knowledge and experience sharing at the INDICON 2015.



Anwar Shahzad Siddiqui  
Track Chair, Energy and Power  
INDICON 2015

Electrical Energy is the primary need of the society. To cater ever-growing demand, innovations and advancements in this field are necessary. Presently, whole world is working in this direction and hence it poses a high-voltage challenge before us how to get into this tandem in India as well. To address this gist, the International conference "IEEE INDICON 2015" is being organized at Jamia Millia Islamia and it makes me glad to be a part of this grand occasion. This conference is likely to be one of the finest opportunities for scientists, engineers, technocrats, researchers and students from all around the globe to participate and to share ideas over the same dais.

I profoundly acknowledge that the organizers have spent all needful corpus of sweat and have appreciably networked with the advisory board members and all others associated with the event. I also acknowledge that a plenty of sponsors have come forward to fund this grand occasion which has noticeably boosted up the morale of the organizers. I would like to extend my good wishes to all participants. I believe the conference will surely prove conducive to all in equal length. I wish the conference a fabulous success.

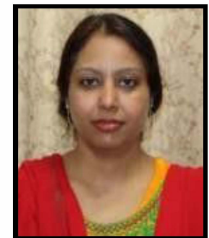


Z.A. Jaffery  
Track Chair, Communication and Signal Processing  
INDICON-2015

It is my great pleasure to welcome you to the INDICON 2015, which takes place in the capital city of India at Jamia Millia Islamia. It has been a real honor and privilege for me to serve as the Track Chair of this prestigious conference.

The overwhelming response to our call-for-papers indicates the popularity of this conference and confirms that INDICON has become the world-wide forum for all aspects of engineering and technology. I would like to express my thanks to all authors for their outstanding contributions. My special thanks and appreciations to members of the technical program committee and reviewers for their competent evaluation of the large number of submissions.

We look forward to an exciting week of insightful presentations, discussions, and sharing of technical ideas with colleagues from around the world. I thank you for attending the conference and I hope that you enjoy your visit to the Jamia Millia Islamia.



Shabana Mehfuz  
Track Chair, Computer and Information Technology  
INDICON 2015

With the rapid growth in computing and information technology the past decade has witnessed a proliferation of powerful and ever increasing demand for practice of computer and information technology. This is the mainstream of computing and has become a key technology in determining future research directions and development activities in many academic and industrial branch.

It is our great pleasure to welcome you all for INDICON 2015. The track for Computer and Information and Technology contain 145 peer reviewed papers. The accepted papers cover a wide range of themes like Computational Intelligence, Mobile and Pervasive Computing, Parallel, Distributed and Cloud Computing, Information Technology & Software Computing, Data Mining & Warehousing and Visualization & Computer Graphics. We wish to thank all the authors of all submitted papers for choosing INDICON 2015 to present their high quality research. We would also like to thank the technical Programme Committee who invested a lot of effort in reviewing the papers thoroughly and timely. Hope that you will find the papers in this track informative, interesting and useful.





Prof. Tarikul Islam  
Track Chair, Control and Instrumentation  
INDICON 2015

It gives me immense pleasure to be associated with 12<sup>th</sup> IEEE India International Conference on “**Electronics, Energy, Environment, Communication, Computer, Control, (E<sup>3</sup>-C<sup>3</sup>)**” (INDICON 2015) during 17–20 December 2015, organized by the Department of Electrical Engineering, Jamia Millia Islamia (Central University, New Delhi-110025, India.

As we know control and instrumentation are some of the most important subjects for measurement, monitoring and control of key information for the benefit of industries, human and living being. The papers focus on the emerging issues and the recent trends in the area of control and instrumentation technologies.

I am sure that the experts from academia and industry would benefit the participating researchers, students and the faculty to a great extent. I am certain that the contents of the proceedings of the track will be helpful for the scientists and researchers for their future endeavours.

I wish this conference a grand success.



Subrata Mukhopadhyay  
Publication Chair  
INDICON 2015

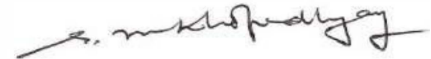
It is indeed a pleasure to be involved with the IEEE India Conference INDICON which for the year 2015 is being held from December 17 to 20, 2015 in New Delhi, the capital city of India. This time IEEE Delhi Section is associated with the IEEE India Council to organize the Conference that has six tracks that more or less encompass almost every field that IEEE covers. We in Delhi in the name of INDICON are having this for the second time after 2006, after having it earlier, of course during my association with Delhi Section, in 1995 (actually held in March 1996 with me as Executive Chair when I was Section Vice Chair) and then in 2001. That time it used to be called Annual Conference and Exhibition or ACE in short. Over the years with various Sections in India whole-heartedly supporting, INDICON has grown to a large extent as evident from attendance and number of papers submitted and the ones accepted. The enhancement of figure for the

latter has been possible due the wise decision at some point of time to tag the conference for sending accepted and then presented papers to go to IEEE Xplore.

Now coming on to the last issue as Publication Chair I draw kind attention to some useful points based on experience. As organizers of the Conference we are bound to send finally the papers for publication in IEEE Xplore compatible format so as to reach IEEE Conference Publications within 30 days from the last date of Conference, i.e., this time by January 19, 2016 (Tuesday). Therefore, in this context we request your utmost cooperation to fulfill the requirement. I am sure with the Author's Kit available you must have followed the suggestions given for formatting the papers as per the requirement of IEEE Conference along with conference identifier right in the first page at appropriate place. If not I am sure Conference Secretariat and/ or volunteers involved would be helping you in the matter. Please try to do the job before the conference itself so that we do not waste time on account of these things and can send presented papers for IEEE Xplore in time.

With these words I am concluding with a hope that you all would be having nice time in Delhi and definitely gaining through interaction with the participants, whether authors or session chairs or distinguished speakers or dignitaries of IEEE and its Societies.

Sincerely yours



(Subrata Mukhopadhyay)