

Lecture Notes in Networks and Systems

Volume 11

Series editor

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The series “Lecture Notes in Networks and Systems” publishes the latest developments in Networks and Systems—quickly, informally and with high quality. Original research reported in proceedings and post-proceedings represents the core of LNNS.

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Industry Interactive Innovations in Science, Engineering and Technology

Proceedings of the International Conference,
I3SET 2016

 Springer

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Foreword



International Conference on Industry Interactive Innovations in Science, Engineering and Technology (I3SET) 2016 is scheduled to be held during October 25–26, 2016. The proceedings of the conference will be published in *Lecture Notes in Networks and Systems* (LNNS), Springer. This is the fourth consecutive international conference in successive years that the Institution has been hosting under Technical Education Quality Improvement Program (TEQIP). Previously, our Institution hosted International Conference in Computation and Communication Advancement (IC3A) in the year 2013; the proceedings of which were published in *McGraw Hill*, International Conference on Non-Conventional Energy (ICONCE) 2014 published in *IEEE Xplore* and International Conference on Advancement in Medical Electronics (ICAME) 2015 published in *Lecture Notes in Bioengineering*, Springer.

I3SET is convergently focused on encouraging and escalating innovations in a demand driven way as desired by industry. From very inception of hosting this conference, the idea was to make a tripartite collaboration between academia, industry and research in a think-pair-share mode.

Influenced and inspired by the global trends in expansive application and intensive research opportunities in industry interactive innovation, the institution

has been expediting and exploring avenues in science, engineering, technology and management, with dual objective of strengthening research & development activities as well as industry institute partnership. I3SET 2016 is a collective initiative focused on specialized as well as interdisciplinary research opportunities.

I3SET provides versatile domains, viz. nonconventional energy & advanced power systems, nanotechnology and applications, pattern recognition and machine intelligence, digital signal and image processing, modern instrumentation, control, robotics and automation, civil engineering and structural design, real-time and embedded systems, communication and devices, advanced optimization techniques, biotechnology, biomedical instrumentation and bioinformatics extended to outcome-based education. In spite of the versatility, the objective of the Conference is convergent on annexing innovations and applications to visualization and conceptualization of emerging topics uplifting “ideas embedded with innovations”.

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JIS College of Engineering (An Autonomous Institution)
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India

Preface



I3SET 2016 focused on to bring together innovative academicians and industrial experts in the field of science, engineering and technology to a common forum. The conference is sponsored by *Technical Education Quality Improvement Programme (TEQIP)*.

The idea of the conference is for the scientists, scholars, engineers and students from the universities all around the world and the industry to present ongoing research activities on the relevant topics and hence to foster research activities between the universities and the industries. I3SET provides a valuable opportunity for them to exchange their ideas face to face together. I3SET is very special for its strong organization team, dependable reputation and wide sponsors from all around the world. It will bring you an unexpected harvest. In the future, you may be a member of our big family. Therefore, it will be a good opportunity to share your innovative thoughts with other renowned researchers in respective research fields across the world.

In this International Conference, a total of 79 papers were accepted for presentation against submission of 139 papers overall. All presented papers will be available online in Springer Link. We have the privilege to invite research-based papers, articles on the broad theme of the conference in relevant track areas from esteemed Institutions in the country and abroad. English is the official language of the conference. The conference proceedings are published in Springer—Lecture Notes in Networks and System (LNNS).

The I3SET 2016 has the following announced Tracks:

Track 1: Nonconventional Energy and Advanced Power Systems

Subtrack 1.1 Solar Energy:

Solar photovoltaic technology, Solar-thermal energy, Solar energy technology, Solar architecture

Subtrack 1.2 Hydro Energy:

Sea Energy, Wave energy, Wave energy system, Tidal energy, Tidal sea current, Turbo machinery, Mini hydro

Subtrack 1.3 Bio Energy:

Bio Fuels, Energy from waste, Bio mass & Bio gas

Subtrack 1.4 Hydrogen Energy:

Hydrogen and energy storage and transportation, Hydrogen and fuel cell, Carbon sequestration

Subtrack 1.5 Energy from Depth of Earth:

Geothermal energy, Ocean-thermal energy

Subtrack 1.6 Wind Energy:

Wind turbine, Wind mill, Wind farm, Wind potential assessment (including offshore)

Subtrack 1.7 Energy & Solar Passive Architecture:

Energy conservation in built in system, Solar heating & cooling, Zero energy building

Subtrack 1.8 Energy Conservation Measures:

Optimization techniques, Application of artificial intelligence in energy system, Grid interactive system, Micro grid and smart grid, Energy storage, Fuel cell, Electric and hybrid vehicles, Efficiency in irrigation

Track 2: Nanotechnology and Applications

Subtrack 2.1 Nanomaterial Particles and Applications:

Nanofabrication technologies, Carbon nano-tubes and grapheme technologies, Nanocomposites, Characterization and properties of nanomaterials, Simulation Modelling of nano-materials

Subtrack 2.2 Nano Science and Technology:

Nano electronics, Nano medicine, Medical nanotechnology

Subtrack 2.3 Molecular Nanotechnology:

Nano robotics, Advanced grapheme science, Metal nanocrystal, Nano molecular material design

Subtrack 2.4 Nanotechnology for Energy Systems:

Nano-optimization for fuel cell and solar cell, Nano-membrane and nanosieve

Subtrack 2.5 Emerging Areas of Nanotechnologies:

Sprintonics, Nanomagnetism, Nanoprinting, Nanopacking

Track 3: Pattern Recognition and Machine Intelligence**Subtrack 3.1 Biometrics:**

Biometric systems and applications, Multi-biometrics, Forensic biometrics and its applications, Fingerprint recognition, Face recognition, Iris recognition, Soft biometrics

Subtrack 3.2 Human Computer Interaction:

Human computer interaction, Display hardware, Character and text recognition, Handwriting recognition, Graphics recognition, Human body motion and gesture based interaction, Affective computing, Facial expression recognition, Group interaction: analysis of verbal and non-verbal communication, Gate recognition, Speaker recognition

Subtrack 3.3 Computational Intelligence:

Fuzzy computing, Rough computing, Granular computing, Evolutionary computing, Neural computing, Case based reasoning

Subtrack 3.4 Machine Learning:

Statistical, Syntactic and structural pattern recognition, Machine learning and data mining, Symbolic learning, Active and ensemble learning, Deep learning, Cognitive science, Formal concept analysis, Brain modeling, Uncertainty analysis, Common sense reasoning, Natural language processing, Natural computing

Subtrack 3.5 Neural Network:

Artificial neural networks, Dimensionality reduction and manifold learning, Classification and clustering, Representation and analysis in pixel/voxel images, Support vector machines and kernel methods, Transfer learning, Semi-supervised learning and spectral methods, Model selection, Reinforcement learning and temporal models

Subtrack 3.6 Knowledge Discovery in Database:

Data mining & knowledge discovery, Image mining, Text mining, Computing with words, Web intelligence & semantic web, Social media mining, Crowd sourced computing

Subtrack 3.7 Cryptography:

Cryptography, Cryptology, Crypt-arithmetic, Visual cryptography, Steganography and Digital water marking

Track 4: Digital Signal and Image Processing**Subtrack 4.1:**

Signal, image and video processing

Subtrack 4.2:

Audio and acoustic processing and analysis

Subtrack 4.3:

Multimedia analysis, indexing and retrieval

Subtrack 4.4:

Sensor array & multichannel signal processing

Subtrack 4.5:

Segmentation, features and descriptors

Subtrack 4.6:

Texture and color analysis

Subtrack 4.7:

Enhancement, restoration and filtering

Subtrack 4.8:

Image and video analysis and understanding

Subtrack 4.9:

Automatic speech and speaker recognition

Track 5: Modern Instrumentation, Control, Robotics and Automation

Subtrack 5.1 Networked and Distributed Control:

Intelligent control, Real time supervisory control, Adaptive control systems, Mobile autonomous systems

Subtrack 5.2 System Integration:

Embedded systems, Manufacturing systems, Sensors, Actuators, Modeling and simulation, MEMS and NEMS

Subtrack 5.3 Control Systems:

Real-time control, Intelligent control, Monitoring and supervision, Observers, Estimation and identification, Machine learning and pattern recognition, Nonlinear control, Robust control, Adaptive control, Optimal control, Digital control, Distributed and networked control, Control applications

Subtrack 5.4 Robotics:

Agriculture and field robotics, Robotic service and security, Entertainment and rescue robotics, Novel robotic locomotion

Subtrack 5.5 Multiagent and Collaborative Systems:

MACS, Biorobotics, Biomechatronics, Amphibionics, Aerobatics-UMV, Telerobotics.

Subtrack 5.6 Mechatronics:

Mechatronics applications for control and automation of renewable energy, Mechatronics education, Virtual labs, e-learning in mechatronics, Bio-mechatronics, Autotronics, Mechanism design and applications

Track 6: Civil Engineering and Structural Design

Subtrack 6.1 Civil and Urban Engineering:

Structural & construction engineering, Road and bridge engineering, Geotechnical engineering, Hydraulic engineering, Coastal engineering, Earthquake engineering, Materials engineering

Subtrack 6.2 Architecture and Design:

Urban planning and design, Building technology science, Art design and Landscape architecture, Aesthetic and landscape energy, Ecological control and intelligent control, Sustainable infrastructure

Subtrack 6.3 Architecture and Design:

Urban planning and design, Building technology science, Art design and Landscape architecture, Aesthetic and landscape energy, Ecological control and intelligent control, Sustainable infrastructure

Subtrack 6.4 Environmental Engineering:

Environment and climate change—Global warming, Green construction and environment protection, Environment science and health, Environment and social development, Environment and economic restructuring, Environment and pollution cost, Water supply and sewage processing

Subtrack 6.5 Transportation Engineering:

Acquisition, Processing and publishing of traffic information, Traffic guidance and forecast, Urban traffic control and congestion pricing, Vehicle safety and emission, Automatic incident detection, Intelligent transportation and logistics

Track 7: Real-time and Embedded Systems, Communication and Devices

Subtrack 7.1 Real-time Systems:

RTOS, RT scheduling, Middleware Systems, Media processing and transmission, RT aspects of wireless sensor network

Subtrack 7.2 Embedded Systems:

Embedded systems architecture, Multi-core embedded systems—Dual core/core, Embedded software and compilers, Ubiquitous and distributed ES, Reconfigurable computing architecture- Android

Subtrack 7.3 Cloud Computing:

X as a Service, Big data management and analysis, Virtualization technology, Cloud security and privacy, Cloud programming model and tools, Service oriented architecture

Subtrack 7.4 Embedded Systems and its Application in Healthcare:

DSP based medical devices and implants, Body sensor network, Wearable sensors and systems, Fuzzy systems and signals in medical electronics, Medical electronics

miniaturization and design, Smart materials and medical electronics, Artificial support for rehabilitation

Subtrack 7.5 Modern Communication Systems

Track 8: Advanced Optimization Techniques

Subtrack 8.1 Multiobjective Optimization:

Multiobjective programming (MOP), Multi Criterion Decision Making (MCDM), Minsum/Priority based goal programming

Subtrack 8.2 Hierarchical Decision Making:

Bi-Level Programming (BLP), Multi-Level Programming (MLP)

Subtrack 8.3 Decision Making in Imprecise environment:

Stochastic programming—CCP and DCP, Fuzzy programming- Fuzzy Decision, Fuzzy multiobjective programming, Fuzzy goal programming, Interval programming

Subtrack 8.4 Evolutionary Computation:

Evolutionary strategy, Evolutionary algorithm, Genetic algorithm, Multiobjective genetic algorithm (MOGA), Genetic optimization

Track 9: Biotechnology, Biomedical Instrumentation and Bioinformatics

Subtrack 9.1 Biotechnology:

Pharmaceutical biotechnology, Therapeutic drug, Nonobiotechnology, Plant biotechnology: cross breeding, green revolution, Animal biotechnology: cloning and genetic engineering, Boitech health care: transgenic animals and clinical therapy, Biopharmaceuticals, Inoculation and incubation, Molecular modeling, Genome analysis

Subtrack 9.2 Biomedical Image Analysis:

Medical image mining, Vascular imaging, Structural biology, Computer aided detection and diagnosis, Medical imaging and diagnosis

Subtrack 9.3 Biomedical Instrumentation and Measurement:

Bio-sensors and bio MEMs, Medical robotics, Biosystem modeling, Biotelemetry and telemedicine, Brain Computer Interface (BCI)

Subtrack 9.4 Bioinformatics:

Computational biology, Genomics and proteomics, Sequence analysis, Structural bioinformatics, Immuno- and chemo-informatics, Transcriptomics, Next generation sequencing

Track 10: Outcome Based Education

Subtrack 10.1:

Preparing students for governance and leadership

Subtrack 10.2:

Industry academy partnerships

Subtrack 10.3:

Entrepreneurship and innovation

Subtrack 10.4:

Formulation of outcome based curriculum and syllabus

Subtrack 10.5:

Innovative methods in teaching and learning

Subtrack 10.6:

On-line engineering education

Subtrack 10.7:

Women in engineering

Subtrack 10.8:

Student voice in the transformation process

Subtrack 10.9:

Stakeholders feedback and satisfaction survey

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About the Editors



Dr. Swapan Bhattacharyya (M'06) received his B.Sc. (Hons.) degree in Physics from the University of Calcutta in 1982, the Integrated M.Tech. (B.Tech & M.Tech) degree in Radio Physics and Electronics in 1987 and the Ph.D. degree, all from the University of Calcutta. In 1988, he joined the Tata Group of Companies (TGC) at Jamshedpur, India as a Senior Customer Support Engineer, where he became the Branch Manager (Customer Support) in 1998 and in the next year he joined the Corporate Office—Mumbai as a Corporate Manager.

In May 2004, he joined the Asansol Engineering College (India) as a System Manager, where he became the Head of the Department of Computer Science and Engineering since December 2004. At present, he is the Head of the Department of Electronics and Communication Engineering at JIS College of Engineering (An Autonomous Institution). He is continuing his research in the field of semiconductor nanostructures with special focus on quantum dots for information and communication applications. He has also special interest in natural language processing, and use of IT for rural development. Since 2013, he has been one of visiting faculties in Radio Physics and Electronics Department of Calcutta University. Dr. Bhattacharyya was a recipient of a National Scholarship from Government of India. He worked in academic administration of several reputed technical institutes and universities in India. He has published many technical research papers in international journals, in national and international conferences. He served as the convener of technical committee for several national conferences and seminars. He is also the reviewer of IEEE, Journal of Applied Physics. He is a member of IEEE, IEEE Photonics Society and life member of IE (Institute of Engineers, India).



Dr. Sabyasachi Sen received his Bachelor, Masters and Ph.D. degree from the prestigious University of Calcutta. He has been associated with academics for nearly 15 years and with research and development activities for 13 years. Over these years, he has served the institute at the various administrative position including HOD, Physics and Nanoscience and Technology; Dean R&D, Secretary Academic Council of Autonomous JIS College of Engineering. He has 21 publications in reputed journals which include premier journals like Physical Review Letters (Phys. Rev. Lett. 109, 257204 (2012); Impact factor: 7.5), Journal of American Chemical Society (J. Am. Chem. Soc. 132 (2010) 15334; Impact factor: 11, Research Highlight in Nature India, entitled 'Electron spin memory'), Journal of Physical Chemistry C (Impact factor: 4.8), Physical Review B (Impact factor: 3.69), Chem Phys Chem (Impact factor: 3.349), Physical Chem. Chem. Physics (Impact factor: 4.493) and many more. He has published one book chapter in the Hand of Book of Nanophysics. He is presently supervising three research projects funded by DST. In 2008, he received Sir Acharya Prafulla Chandra Roy Award (2007–08) from University of Calcutta for contribution in research activities. Apart from this he along with HOD, Chemistry of the JIS College of Engineering has initiated Masters' Program in Nanoscience and Technology, the technology of next generation.



Dr. Meghamala Dutta is presently with JIS College of Engineering as Examination Controller and Senior Faculty in the Department of Biomedical Engineering. Dr. Dutta was formerly the Head, Department of Biomedical Engineering and successfully completed 4 years. She is multifaceted leader, who has worked in diverse field across the academia in managing several cutting-edge research projects funded by Government of India, organizing national and international level conferences with participation from Harvard Medical School and other organizations of repute, authoring several papers in national and international journals including a book chapter. She has over 12 years of experience in industry and academia and has played a key role in technical course design, implementation of new courses, identification of thrust areas essential for industry academia interfacing, governance and research. A member of IEEE, Dr. Dutta is also the Nominee Chairman under MHRD run Kendriya Vidyalaya. Dr. Dutta has been associated with several industries in developing technical projects, in undergraduate students beneficial for placement. She has been the Nodal Officer for EAP (Equity Action Plan) the prestigious World Bank funded TEQIP Project and is involved with establishing finishing schools, soft skills and communication skills development training programs.



Dr. Papun Biswas received his M.Tech and Ph.D. degree from the University of Calcutta and University of Kalyani, respectively. Dr. Biswas is presently the Teacher in-Charge of the Department of Electrical Engineering, JIS College of Engineering. He has been associated with academics for nearly 12 years and with research and development activities for 9 years. He has 28 publications in international journals, book chapters and international conference proceedings which include Elsevier, Springer and IEEE. He is also the reviewer of IEEE Transactions on Power Systems, International Journal of Electrical Power and Energy Systems, Applied Mathematics and Computation, European Journal of Operational Research. He is a member of IEEE and IEEE CSI Society. He has been the Nodal Officer for Procurement of the prestigious World Bank funded TEQIP Project. He is continuing his research on application of soft computing techniques in the field of electrical engineering.



Prof. Himadri Chattopadhyay is currently working as Associate Professor, Department of Mechanical Engineering, Jadavpur University, Kolkata, West Bengal, India. He received his Ph.D. degree in the year of 2002. Professor Chattopadhyay has more than 70 publications in various reputed international journals and international conferences. He has received fellowship and reinvention fellowship from DAAD in the year of 1997 and 2003, respectively. His areas of research interest include transport phenomena/convection, turbulence, heat transfer, augmentation, biofluid dynamics and material processing.

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About JIS College of Engineering



JIS College of Engineering was established in the millennium year 2000 by JIS Foundation and over the last decade grown in rapid strides to transform it into an Autonomous Institute. **JIS Group Educational Initiative** is the largest educational conglomerate in the state of West Bengal and leading private-sector educational group dedicated to impart demand-driven education in science, engineering, technology, management and medical science with highly laudable quality.

In the direction of thought of the honourable Chairman's dream—***Igniting Minds, Empowering Lives***—the institute has taken several new educational initiatives in the recent past. The prime focus continues to drive us towards achieving increased standard of technical education and wider research outreach programme. It is imperative, therefore, to be both creative and innovative in the approach to lead the institute towards a ***Centre of Excellence***.

The Institution is declared Autonomous by the University Grant Commission in 2011. The autonomous status conferred with qualification of 2(f) and 12(b). The Institution is approved by *All India Council for Technical Education (AICTE)* and affiliated to erstwhile *West Bengal University of Technology (WBUT)* renamed *MAKAUT*. The Institution was accredited by *National Assessment and Accreditation Council (NAAC)* in 2009 and qualified in Grade—'A' in its 2nd cycle in 2015. Its eligible technological departments are accredited by *National Board of*

Accreditation (NBA) or under reaccreditation process. Further, the Institution has qualified for the World Bank Grant under *Technical Education Quality Improvement Programme (TEQIP)* Phase II in the Subcomponent 1.2, for PG and Demand-driven Research & Development & Innovation, as the only private self-financed institution from the State of West Bengal.

Located in its sprawling 17.5 acres lush ‘Green Campus’ at Satellite Township of Kalyani, 55 km north of Kolkata, the college has intake of 3000+ students pursuing various degree engineering courses along with computer application and management programs. The campus is an ideal educational ambience with classrooms, laboratories, smart classrooms, seminar halls, conference halls, computer centre, central library, gymnasium, store and canteen with campus Wi-Fi connectivity.

The institution is moving ahead by allying, hand-holding and hand-shaking with leading universities and institutions of both the nation and the state. The institution is a learning-centric environment with authority always having a careful concern towards pedagogical aspects of the learning–teaching and making the faculty members up-to-date with high-end standard. Regular pedagogical training by IITs, technical training institute (viz. NITTTR) and by the corporate (viz. WIPRO Mission 10X) is a continuous process. The faculty members are trained in every available opportunity under NMEICT programme, ISTE workshops and are always encouraged to use global academic repositories like Massive Open Online Courses (MOOC) etc.

Being an engineering college, the institution is equally concerned for close networking and tie-ups with industry. Regular industrial events in mother-engineering as well as soft-engineering are phenomena. The setting up of “Collaborative Learning and Innovation Centre (CLIC)” with Tata Technologies in the recent past is a vibrant illustration. Collaboration with Texas Instruments or events like Infosys Campus Connect, IBM TGMC, Microsoft Faculty Connection, MSDN Academic Alliance, WIPRO Mission 10X Learning Approaches, and Oracle University from time to time are some illustrations. The AICTE funded Industry Institute Partnership Cell (IIPC) is recognition of the effort. Under autonomous framework, industry personnel have direct say in the curriculum design as Experts in the Board of Studies (BOS).



The institute has got a special bonding with national institutes especially with IITs. The overwhelming participation of the students in the ongoing initiative of National Project on Technology Enhanced Learning (NPTEL) in collaboration with IIT Kharagpur is worth mentioning. In Quality Circle, the institution has a set up of Quality Enhancement in Engineering Education (QEEE) frame-worked by MHRD and resourced by IIT Madras. The institution has an established Remote Centre (RC1335) of IIT Bombay and Resource Centre of IIT Kharagpur. The students could attend live classes from the teachers across the nation through Design Lab, Blended MOOC, Spoken Tutorial and Course Pack.

A numbers of value-added centers are set up recently to prepare the students in a role-ready/industry ready way. The Confederation of Indian Industry (CII) Innovation Centre, the British Council Library and Training Centre and collaboration initiative with BCC&I are illustrations.

Moreover, the students get opportunity to tune themselves by the Institutional Skill Development Programs. The IPC and Finishing School have pro-active views regarding technical, communication and soft skills of the students. The students are provided with the programs like advanced (GATE coaching), remedial teaching to address the concerned of the advanced and weak students. Entrepreneurship has also been encouraged with eCell and AICTE sponsored Entrepreneurship Development Cell (EDC) in place.

The members of the Institution have enriched their experience and knowledge base through sharing and exchanging with all possible stake holders, viz. students, faculty, guardian, alumni, authority, employer and in extent with experts and regulatory bodies. This has facilitated our effort to improve institutional governance, networking and services to community and economy. The scrutiny, analysis, monitoring and evaluations of its programmes with community and self-appraisal are consistently practiced so as to identify the educational policies in a dynamic process.

The Research and Development is another strong aspect with faculty members receiving their Ph.D. award during their stay in the institution largely due to nurturing vision of the authority. Some more faculty members are on the avenues of getting their awards. Hosting and arranging R&D events like national and international conferences, workshops, symposiums and seminars are regular phenomena. In the recent past, the institution has hosted back-to-back international conferences, viz. IC3A2013 in the area computation and communication the proceedings of which have been published by the McGraw-Hill publication. This is followed by ICONCE 2014 in the area of Non conventional Energy technically cosponsored by IEEE regional section, the papers of which are available at IEEE Xplore. The experts, delegates and participants of event include stalwarts from USA, Germany, Japan, UK, the Netherlands and SAARC countries. The most recent ones ICAME 2015 in the area of medical electronics attended by the stalwarts from Harvard M.S the proceedings of which have been published by the Springer.