

# INTERNATIONAL CONFERENCE

## WEARABLE TECHNOLOGIES & APPLICATIONS

### EMERGING TRENDS AND INNOVATIONS

26<sup>TH</sup> & 27<sup>TH</sup> JUNE 2020

Organized by  
Centre for Wearable Technology and Applications  
School of Electronics Engineering,  
Vellore Institute of Technology,  
Vellore

CONFERENCE E-SOUVENIR

Released in the Presence of

Dr. G. Viswanathan  
Chancellor

Mr. Sankar Viswanathan  
Vice President

Dr. Anand A. Samuel  
Vice Chancellor

Dr. S. Narayanan  
Pro-Vice Chancellor

Mr. Anilkumar Muniswamy  
Ex IESA Chairman  
MD at SLN Technologies Pvt Ltd



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## About conference

International Virtual Conference on “Wearable Technologies & Applications (WeTA 2020) - Emerging Trends and Innovations” is being organized online by the School of Electronics Engineering (SENSE), VIT Vellore from 26<sup>th</sup> to 27<sup>th</sup> June 2020. WeTA 2020 aims at providing a unique online interdisciplinary platform in bringing together academicians, researchers, industrialists and students across the world to highlight various emerging technologies and application trends as well as address various research challenges and latest innovations in the field of Flexible and Wearable Technologies. Conferences have a strong zest to bring researchers together to discuss and enhance their knowledge in the respective domain. WeTa 2020 is not just a conference but a great online meetup for all the technocrats. Such meetups always help us to collaborate with the people of interest.



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## **WeTA 2020**

### **Theme of the conference**

Innovation and proliferation of advance technologies in Engineering is the order of the day with rapid increase in demand for real time solutions with cutting-edge technologies. The International conference at Vellore Institute of Technology aims to spark discussion on the recent trends, practical issues and the solutions adopted in the field of Wearable Technologies by incorporating innovative ideas and employing advanced technologies. Emphasis is laid on the recent developments in Wearables for healthcare, navigation, Wearable sensors and advanced materials, Smart Fabrics, E-Textiles, IoT and wearables, Flexible, stretchable, printed & hybrid electronics, Fabrication, packaging and assembly techniques, Micro batteries, energy storage and energy harvesters.

The theme of this conference is Wearable Technologies and organized with the objective of bringing together academicians, scientists and experts, working in this area of research. WeTa 2020 provides the forum for researchers, practitioners to present their innovations, technological advances and provides a platform for academicians, researchers, engineers and industrialists from various disciplines to deliberate the latest trends, sustainability, practical challenges encountered and the solutions implemented.



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## About VIT

Vellore Institute of Technology (VIT) was established in 1984 as Vellore Engineering College by the Honourable Chancellor Dr. G. Viswanathan with the aim of providing quality higher education on par with international standards. VIT is recently recognized as Institution of Eminence (IOE) by Government of India. Having fully committed to its Vision - "Transforming life through excellence in education and research", VIT is focussing on quality teaching-learning process, research and innovation, which would make the institute distinct from others. Currently VIT has 4 campuses – in Vellore, Chennai, Amaravati (AP) and Bhopal (MP). The National Institutional Ranking Framework (NIRF) of the MHRD, Government of India, has identified VIT as the best Private Engineering Institution in India for 4 years in a row (NIRF-2016 2017, 2018 and 2019 rankings). VIT is Ranked No.1 Private Institution for Innovation (ARIIA 2019 award) by Govt. of India. VIT is the first and only in India to get 4 star rating from QS, the world universities ranking organization. VIT achieved 18th position among the engineering institutions in India by NIRF 2019, Govt. of India. In addition to this, the consortium of industries, FICCI conferred VIT with the “Excellence in Faculty award. VIT has consistently received “A” grade in the past three cycles of NAAC accreditation. In addition, VIT also has received the coveted ABET accreditation, which is widely recognized throughout the world. VIT has already been ranked by the major International rankings such as QS World University Ranking, QS BRICS University Ranking, QS Asia University Ranking, THE World University Ranking, THE Asia University Ranking, THE Emerging Economies University Ranking and US News Ranking. VIT is the first Institution in India to get 4 star rating by QS. VIT has A Grade accreditation from NAAC, Government of India. Further, 14 of its Engineering programmes have ABET- (USA) accreditation.



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## Organisers

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**Dr. G. Viswanathan**  
Chancellor



**Mr. Sankar Viswanathan**  
Vice President



**Dr. Sekar Viswanathan**  
Vice President



**Mr. G. V. Selvam**  
Vice President



**Ms. Kadhambari S. Viswanathan**  
Assistant Vice President



**Dr. Sandhya Pentareddy**  
Executive Director



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### Co Patrons



**Dr. Anand A. Samuel**  
Vice Chancellor



**Dr. S. Narayanan**  
Pro-Vice Chancellor



**Dr. K. Sathiyarayanan**  
Registrar



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**Chairman :** Dr.Harish Kitturr, Dean SENSE

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**Dr.Zachariah C Alex**  
Director SPORIC

**Dr.Elizabeth Rufus**  
Professor, SENSE

**Mr. Ganga Gopal**  
Sales Director, Xsens Netherlands

**Organizing Committee**

**Convenor:** Dr. Dharani Bai G, SBT, SENSE

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Dr. J. Kathirvelan, Asso. Professor, SBT, SENSE  
Dr. R. Prakash, Asso. Professor, SBT, SENSE  
Dr. Sharmila Nageswaran, Asst. Prof (Sr), SBT, SENSE  
Dr. S. Vidhya, Asso. Professor, SBT, SENSE  
Dr. C. Arunkumar, Asst. Prof (Sr), SBT, SENSE  
Dr. Debashis Maji, Asst. Prof (Sr), SBT, SENSE



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## Credentials of VIT - Accreditations / Rankings / Ratings



### NIRF (National Institutional Ranking Frame Work)

- No. 15 in Engineering Institution - 2020
- No. 16 in University Category - 2020
- No. 55 in Management Institution - 2020
- No. 28 in Overall - 2020
- No. 1 Among private players (Engineering) for 5 consecutive years



### NAAC (National Assessment and Accreditation Council)

- Accredited in 2015 - A grade
- Accredited in 2009 - A grade
- Completed 3 Cycles & GOING FOR 4<sup>th</sup> CYCLE



### ABET (Accreditation Board for Engineering and Technology), USA

- 3 Times Accredited
- 10 B.Tech Programs – Vellore Campus
- 4 B.Tech Programs – Chennai Campus



### IET (The Institution of Engineering and Technology), UK

- Accredited in 2005



### NBA (National Board of Accreditation)

- Accredited in 2009
- Accredited in 1998
- GOING FOR 3<sup>rd</sup> TIME ACCREDITATION



### FICCI ( Federation of Indian Chambers of Commerce & Industry)

- “Excellence in Enabling Research Environment” - 2019
- “Excellence in Internationalization of Edu.” - 2018
- “Excellence in Faculty” - 2017
- “University of the Year” - 2016





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## Credentials of VIT - Accreditations / Rankings / Ratings



**MHRD**  
Govt. of India

**UGC graded autonomy in 2018**  
Government endorsed recognition for VIT



**QS RATING 2016**

- First University in India to get QS 4 Star Rating
- QS 5 STAR Rating for 5 Categories  
(Teaching, Employability, Facilities, Innovation and Inclusiveness)



**THE WORLD and ASIA UNIVERSITY RANKINGS**

- Ranked in the Top 801-1000 in 2020 (World Ranking)
- Ranked in the Top 201-250 in 2020 (Asia Ranking)
- Ranked in the Top 251 – 300 in 2019 (Young University Ranking)



**QS WORLD, ASIA AND BRICS RANKINGS**

- Ranked in the Top 801-1000 in 2020 (World Ranking)
- Ranked in the Top 228 in 2020 (Asia Ranking)
- 176<sup>th</sup> in 2019 (BRICS)



**QS WORLD UNIVERSITY RANKING BY SUBJECT**

- Ranked in the Top 500 QS World University Ranking by Subject
- EEE, Chemical (Rank: 301-350) in 2020
- Computer Science and Information Systems , Mechanical (Rank: 401-450) in 2020
- Chemistry (Rank: 451-500) in 2020



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## **Message from Patron**

I am very much delighted about the conference on “Wearable Technologies and Applications - Emerging Trends and Innovations (WeTA2020)”, organised by School of Electronics Engineering on 26<sup>th</sup> & 27<sup>th</sup> June 2020. This conference is a step towards achieving our vision in becoming a world-class academic and research institution in order to produce graduates with employability skills. This forum will address various research challenges and latest innovations in the field of Flexible and Wearable Technologies.

I would like to congratulate the Center for Wearable Technology and Applications associated with School of Electronics Engineering, for their commitment and drive in organizing this online conference. It is my vision that through this conference we have laid a foundation for the growth of new ideas, as we always believe that VIT is a place to learn and chance to grow! I wish you all have a good learning experience in this conference!

**Dr. G. Viswanathan**  
Chancellor



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## Message from Technical Advisory Committee

Research in wearable electronics is exciting as it comprise of research areas in electronics engineering such as medical electronics, embedded systems, IoT, sensor system technology, micro and nano electronics. This conference on “**Wearable Technologies and Applications - Emerging Trends and Innovations (WeTA2020)**” will be a good starting point for VITians, other academicians and experts from industry to interchange knowledge and skills in the area of Wearable Technologies and Applications. We are looking forward to identify operational problems in this area and find new solution, which may be needed globally.

It is certain that this event will be a platform that would strengthen our relationships in sharing the knowledge besides providing the necessary thrust in collaborative researches and development of products.

Best wishes for the team, speakers and the participants!

Technical Advisory Committee

WeTa-2020



**International Virtual Conference on  
 Wearable Technologies and Applications: Emerging Trends and Innovations (WeTA2020)**

**Program Schedule  
 26 June 2020**

**Session I**

**Observer Dr. N Sharmila**

<b>10.30- 11.30 am</b>	<b>Keynote Address 1</b>
Topic	<b>Wearable Technologies in Medical Applications</b>
Speaker	<b>Dr. Mohan Kumar R</b> Country Head (India), Wearable Technologies AG
<p><b>Abstract:</b> Wearable Technologies are becoming an integral part of healthcare delivery systems and personalised medicine globally. Right from measuring one’s vitals and recording physiological parameters to providing personal analytics, from measuring critical parameters like blood glucose to offering therapeutics by pumping in insulin, wearables are graduating from simple fitness devices to complex implantables. They provide the critical human data that are important for any of the emerging IoT systems driven by AI/ML and real-time heuristic algorithms for critical care. It is thus essential to understand the basic medical device design principles, before embarking on developing such products.</p> <p>This talk starts with the emerging global opportunities that are available for India in the Wearables space – especially in post COVID19 scenario - and how we can leverage our academic and industrial ecosystems to capture a significant market share. With COVID19 bringing the healthcare systems to the verge of collapse, a paradigm shift towards remote healthcare systems is fast emerging. The talk then covers the basics of Medical Device Design (MDD), with some real-life examples, and converges onto illustrations of emerging product offerings. The talk concludes with some business innovations that are needed to improve market acceptability and stickiness of wearable products – be it in medical space or otherwise.</p>	
<b>11.30am- 12.30pm</b>	<b>Keynote Address 2</b>
Topic	<b>Recent Trends in Cloud Computing and Data Analytics</b>



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Speaker	<b>Mr. Dhakshinamoorthy</b> Principal Architect IoT - TCS
<b>Abstract:</b> Dhakshinamoorthy touches upon how a perfect storm of societal, industry and technology trends is driving transformational change. He covers a gamut of trends across Compute, Materials, Robotics, Security, Manufacturing, Life Science, Societal behaviour, technology is driving the changes. He dives deeper into trends impacting wearables, cloud and analytics. He also describes the architecture patterns in the cloud. He closes out with how wearables and applications are helping people and organizations during the COVID recovery.	
12.30- 2.00 pm	Break

### Session II

Observer: **Dr. Debashis Maji**

2.00 – 3.00 pm	<b>Keynote Address 3</b>
Topic	<b>Wearable Technology: Its Rapidly Changing Landscape and Xsens</b>
Speaker	<b>Mr. Arun Vydhyanathan</b> Director of Engineering at Xsens Enschede Area, Netherlands
<b>Abstract:</b> Sensory motion tracking enabled by smart sensors is at the forefront of our fourth industrial age, pushing the boundaries of artificial intelligence and machine learning further than we could have imagined. Already widely used in animation productions, elite athletes now use motion sensors to enhance their performance and sports enthusiasts to improve their tennis serve or golf swing. In healthcare, motion tracking is helping people to monitor their heart rates, sleep patterns and fitness levels. This ground-breaking technology is opening the possibilities for entrepreneurs and innovators to transform their own industries. Our physical, biological and technological worlds are merging like never before, and the potential of Wearable Technology is only restricted by the extent of our imagination.	
3.00 – 4.00 pm	<b>Keynote Address 4</b>
Topic	<b>Wearable Devices for Robotics Motion Capture</b>
Speaker	<b>Mr. Prabhanjana Rao</b> CEO, Galore Systems, Bangalore
<b>Abstract:</b> The presentation talks about Motion capture technology as a critical component of Autonomous Robotics design. The focus will be in Inertial motion capture technology. A full picture of some practical pipeline for robotics manipulation using mocap is provided including basic demo of motion tracking using Xsens and Manus mocap products.	



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<b>4.00 – 5.30 pm</b>	<b>Keynote Address 5</b>
Topic	<b>IoT: It's Usages and Future Targeting Wearables</b>
Speaker	<b>Mr. Nitin Awasthi</b> Director, Apsis Solutions Microchip Certified Trainer & Nasscom IoT Master Trainer
<b>Abstract:</b> Nitin Awasthi, introduced the world of IoT, related wearables, Product design & the various pertinent jargons of the IoT space. He spoke about the workings of the most common wearables like Google Glass, Fitbit etc. and their technical leanings. He also threw light on the DIY of these wearables. Mr. Nitin Awasthi explained the flow of product design and idea generation to IoT plus wearables. He urged the students to take up entrepreneurship, come up with the concepts, and bring them out into the market. His vision included to make Indian Economy strong with the tag “Made in India” going strong.	
<b>5.30 – 6.30 pm</b>	<b>Break</b>
<b>6.30 – 7.30 pm</b>	<b>Keynote Address 6</b>
Topic	<b>Data Management and Analytics</b>
Speaker	<b>Dr. Vijayan Sugumaran</b> Professor, Department of Decision and Information Sciences School of Business Administration, Oakland University, Rochester, Michigan, USA
<b>Abstract:</b> Wearable technologies are proliferating and are providing innovative solutions for healthcare problems. They are commonly being used for prevention of diseases, maintaining good health, patient and disease management. These devices generate lot of data which can be harnessed to improve clinical decision making and patient rehabilitation. This data is growing exponentially due to the popularity of wearable devices. Managing and analyzing this data will become a challenge due to the personal data explosion and require efficient data storage and management methods. This presentation will focus on the issues related to management and analysis of this sensitive personal data. The role of big data tools and techniques as well as artificial intelligence will be highlighted in analyzing and supporting clinical decision making.	

**Program Schedule**  
**27 June 2020**

<b>Session III</b>	<b>Observer Dr. Arun Kumar C</b>
<b>10.00- 11.00 am</b>	<b>Keynote Address 7</b>



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Topic	<b>Wearable Biosensors – A MEMS Perspective</b>
Speaker	<b>Dr. Soumen Das</b> Professor, School of Medical Science and Technology Head, Advanced Technology Development Centre, Indian Institute of Technology Kharagpur
<p><b>Abstract:</b> The recent advancement in medical technology and significant improvements in healthcare has increased life expectancy, however diseases like cancer, diabetes, heart attack etc. accounts for majority of deaths around the globe, mostly in dense populated countries. A major fraction of human population seriously lacks standard healthcare facilities with substantial scarcity of efficient diagnosis infrastructure. On the contrary present fast diagnostic techniques for clinical purposes are becoming essential for rapid screening of mass population. In this context noninvasive and fast detection, depiction and quantification of micro/nano scale objects such as cells, viruses, DNA molecules or proteins based on their characteristic biophysical and biochemical properties are of prime interest for disease diagnosis and monitoring, physiological–pathological research and cellular engineering study. Various miniature commercial devices are available for clinical purposes with superior quality, sensitivity and specificity with rapid turnaround time for disease analysis, user friendly, economic and portable with easy operational logistics for resource limited deployment. Over the last half a century people have appreciated the phenomenal success of computer industry and information technology that is attributed for constant downsizing of CMOS devices and circuitry for electrical signal processing with reduced cost, faster and denser systems with less power consumption and enhanced functionality. However, the world, we live in, deals more with mechanical, thermal, optical, chemical and biological rather than electrical domain only. This fact necessitates integration of 3-D miniature devices with integrated circuits for converting real-world nonelectronic parameters into electrical signals. Conceptualized from the laboratory research the MicroElectroMechanical Systems (MEMS) are essential components for tackling some of society's most pressing problems, including many in health care, environmental quality, food quality and nonconventional energy harvesting. The similarity in sizes and organization of common structures between the micro/nano scale devices and biological species makes this technology an obvious choice for creating many advanced ultrasensitive pathological tools for direct detection of biological entities. Size resemblance also facilitates to influence the various physical effects by enhancing their interaction resulting high functionality and performance. Exploiting multifunctional miniature integrated MEMS transducers it is expected to advance the diagnosis and treatment in medical healthcare with enhanced sensitivity and accuracy by interfacing more with cellular, molecular and atomic levels.</p> <p>Recent advancement in biomedical sensing technologies has resulted in the development of several novel sensor products and new applications. Modern biomedical sensors developed with advanced microfabrication and signal processing techniques are more accurate, cost effective, and reliable compared to their conventional counterpart. A broad range of sensing mechanisms is being explored utilising microscale version of the various transducers and has significantly increased the number of possible target measurands that can be detected. This rapid progress in miniature devices and its associated instrumentation will significantly impact the practice of medical care as well as future advances in the biomedical industry. A modern biomedical sensor is a device which consists of a biologically or biophysically-derived sensing element integrated with a physical transducer that transforms a measurand into a measurable output signal.</p> <p>In this perspective, the present talk will highlight development of miniature BioMEMS devices for diverse applications towards fast and affordable diagnostic process. Few examples of polymer based flexible biosensors will be cited for detection of biomedical signals in catheterisation process for precise diagnostics and therapeutics.</p>	



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<b>11.00am- 12.00pm</b>	<b>Keynote Address 8</b>
Topic  Speaker	<b>Triboelectric Nano-generators for Wearable and Portable Electronics</b>  <b>Dr. Vivekananthan Venkateswaran,</b> Principal Investigator- NRF Young Investigator Award, Department of Mechatronics Engineering, Jeju National University, Jeju, South Korea.
<p><b>Abstract:</b> Portable and wearable electronics are becoming most attractive and trending in the society and creating positive influences among the people. Sensors are the core components, mainly in the wearable electronic electronics implementing many of their functions. The existing sensor technology has advanced with the progress in nanotechnology and functional materials. However, they require external power supply such as batteries for their stable operation. The usage of battery has a problem of frequent charging or replacing batteries upon usage. Also, batteries have certain disadvantages such as recycling, heating over usage, disposal, environmental pollution and health hazards, which causes serious threat to the human lives. Nanogenerators such as triboelectric nanogenerator (TENG) and piezoelectric nanogenerator (PENG) converts external mechanical energy into useful electrical energy, having a potential to use as a promising power source replacing battery. With the reduction in the size, nanogenerators can be used to harvest energy from human body motions such as muscular movements, vibrations from body activity, and breathing and eventually be used to power the wearable electronic devices. Among the other energy harvesters, TENGs can have advantages of generating high output, easy fabrication and cost-effectiveness, enabling it to use for a wide range of applications such as sensing, actuating, and monitoring biomechanical motions without requirement of any external power source.</p>	
<b>12.00- 1.00 pm</b>	<b>Keynote Address 9</b>
Topic  Speaker	<b>Flexible Hybrid Electronics- Applications and Future</b>  <b>Dr. Bindu Salim</b> Professor, PSG- Institute of Advanced Studies, Coimbatore
<p><b>Abstract:</b> The discovery of conducting organic materials has made a transition in the device technology from confining to the conventional silicon technology. Solution processing of organic conducting and semiconducting materials has made a breakthrough in the fabrication of electronic devices. The challenges faced by the manufacturing industries are in terms of technology, scaling, design rules, yield, design for manufacturing and factory integration. Another pathway for the technology was to take up the challenge of factory integration defined by IR-4.0, which demands new designs for devices compatible for system integration incorporating cloud computing, cyber-physical systems, mobile technologies, and Internet of Things (IoT).</p> <p>Printing technology has taken the highest position in the device manufacturing process with more and more industries entered in producing conducting and semiconducting inks, new flexible materials for substrates. This has made a new genesis in the electronics industry referred to as printed flexible electronics. At the same time processes are matured to develop electronics on flexible substrates, textiles etc. using roll to roll printing systems which helps in mass production. Printed Electronics is</p>	





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one of the fastest growing technologies in the world and is of vital interest to industries as diverse as consumer goods, healthcare, mobility, electronics, media and architecture.

Looking at a different perspective, while conventional electronics remains to be the core of scaled down devices and printed flexible electronics supports the integration with wearable devices, health monitoring systems etc., a hybrid of these to would address many of the technology needs. The applications and the future of Flexible Hybrid Electronics is discussed here.

1.00 – 2.00 pm

Break

Session IV

Observer: Dr. S. Vidhya

2.00 – 3.00 pm

Keynote Address 10

Topic

**Graphene- A 2D Material for Gas/Bio Sensing Applications**

Speaker

**Dr. Rakesh Kumar Gupta**

Co-Founder of RIPTON Limited, UK.

National Graphene Institute (NGI), Manchester, UK

**Abstract:** The 2004 Nobel prize winning experiment of isolating a single layer of carbon atoms, called “graphene”, from the bulk graphite has sparked gold rush for graphene and other 2-dimensional materials (MoS<sub>2</sub>, WSe<sub>2</sub>, TaSe<sub>2</sub>, hBN etc) for sensing and electronic applications. In particular, graphene with its superlative properties has been explored extensively for the potential applications in electronic sensors and performance enhancing composite material. Pristine graphene with its unique electrical, mechanical, chemical and thermal properties has directed the academics and industrial focus to manufacture thinnest yet strongest, transparent and flexible electronic sensors for a variety of applications including chemical, bio, electromechanical sensors and energy storing devices.

In this virtual conference, the author will focus primarily on the first 2D material i.e., graphene and its superlative properties, graphene synthesis methods, characterisation techniques and its application in electronic gas and biosensors. Author shall also introduce the audience briefly with the birthplace of graphene i.e. The University of Manchester, where the pioneer work of graphene isolation was performed. Lastly, the author shall also shed light on various funding schemes for graduate and post-graduate students to acquire higher studies and research opportunities in the field of graphene at The University of Manchester or in other institutions in the UK.

3.00 – 4.00 pm

Keynote Address 11

Topic

**Robust, Flexible, and Humid-Resistant Triboelectric Nano-generators For Harnessing Biomechanical Energies**

Speaker

**Dr. Bhaskar Dudem**

Advanced Technology Institute,

Department of Electrical and Electronic Engineering,



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University of Surrey, Guildford, Surrey, UK.

**Abstract:** Energy harnessing from natural resources such as solar, wind, geothermal, and mechanical energies are emerging research areas to fulfil the globally rising energy demand owing to the enormous usage of various electronic systems. Among these various energy resources, mechanical energy is one of the abundantly available resources in everyday human life, which is rarely attended to convert into electricity. Triboelectric Nano generators (TENGs) attain a huge interest owing to their ability to convert ambient mechanical energies into electricity as well as hold great potential applications as self-powered wearable sensors. We targeted to develop the TENGs using the flexible, cost-effective, bio-waste, and eco-friendly triboelectric materials are employed to sense or harvest the human body motions and moderate wind flows. Typically, the performance of TENG is very sensitive to the humidity, since the water droplets or thin layers to form on the triboelectric materials can disperse the triboelectric charges developed across their surfaces. Such tends to significantly reduce the triboelectric surface charge density, thus reducing the output performance TENGs. Therefore, these TENGs are either developed with the superhydrophobic materials or entirely enveloped with an appropriate outer cover to protect it from the humid environment and to attain a stable electrical output performance.

4.00 pm

**Concluding Remarks**



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## Know the speakers

### CHIEF GUEST



**MR. ANILKUMAR MUNISWAMY**  
**EX- IESA CHAIRMAN AND MD AT SLN TECHNOLOGIES PVT LTD,**  
**BENGALURU**

Mr. Anilkumar is one of the founding directors and the driving force behind SLN Technologies Pvt. Ltd., a Bangalore based embedded systems company for Aerospace and Defense Industry. He started SLN technologies, along with his engineering classmate D.R Subramanyam in the year 1995, with a vision of building a world class embedded technology company in India. With the help of a good partner and team of highly dedicated engineers, he is leading his company towards translating his vision into reality. SLN Technologies today is one of the fast growing Aerospace & Defense companies in India and its major services include design and development of embedded systems for avionics, electronics manufacturing services, systems integration of rugged systems for aerospace and satellite applications, providing turnkey solutions to PCB manufacturing and electronics manufacturing services industries.

Anilkumar was responsible for establishing Genus' PCB manufacturing facility in the year 2006 from design stage to a complete manufacturing facility on a turnkey basis. Anil Kumar is one of the founding directors of Revismak Electronics Pvt. Ltd., which was founded in the year 2010. Inspired by the founder of Sony Corporation, Mr. Akio Morita, Anil Kumar started Revismak Electronics with a vision to build a strong brand like Sony in electronics industry in India. Revismak has enabled many Indian electronics companies to manufacture world class



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products by giving design consultancy in the areas of Printed circuit boards, electronics manufacturing services and embedded system design and manufacturing.

An Engineering graduate, majoring in Electronics and communication, Mr. Anil Kumar Muniswamy also has an International Masters in practicing Management from IIM, Bangalore and a diploma from INSEAD France along with an MBA from McGill University, Canada. Anilkumar Muniswamy, who is being called as Anil by his friends from the industry, has travelled to more than 35 countries from 1989 to 2019 on business, which includes visiting, industry trade fairs and industry delegations, manufacturing facilities, world class universities, R&D labs, innovation centers, etc. This experience has given him the ability to network, negotiate and collaborate with foreign companies and foreign nationals of different regions across the globe.

Anilkumar was the president of Indian Printed Circuits Association (IPCA) from 2006-2010 before serving as the Vice President of IPCA from 2000 to 2006. He was the founding president of IATC, a division of IPC, USA and IPCA India for training activities in India from 2007 to 2011. Anilkumar has represented India at World Electronics Circuit Council convention in Tokyo, Japan in 1999 and gave a keynote on Indian Electronics Industry at JPCA show. He also gave a keynote presentation on "State of Indian PCB Industry" at CPCA show in Shanghai, China in 2007. Anil Kumar was part of the Federation of Indian Chamber of Commerce and Industries (FICCI) delegation to Spain and Poland along with the then **President of India Ms. Prathiba Patil in 2008.**

Anilkumar was part of the MEITY delegation to Taiwan with Mr. R S Sharma, Secretary MEITY, Government of India, along with Mr Vidyashankar, president, IESA and other eminent government officials and CEOs of the Industry in March 2015. The objective of the delegation was to attract FDI in to the country in the field of Electronics Manufacturing as a part of make in India program of Government of India.



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Anilkumar as a vision group member of Government of Karnataka, participated in the delegation to China and Taiwan in November 2019 along with commissioner and director of Industries and commerce department. He was part of industry delegations to many countries in the last 33 years and represented the industry and India at many industry forums.

Anilkumar was the Chairman of IESA (India Electronics Semiconductor Association) for 2018-19 and prior to that, he was the Vice Chairman of IESA for 2017-18 and Treasurer & Executive Council member at IESA for 2016-17. He is also on the panel for IESA Aerospace and Defence core committee and IESA Manufacturing core committee.



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**PROF. VIJAYAN SUGUMARAN**  
**OAKLAND UNIVERSITY, MICHIGAN, USA**

Prof. Vijayan Sugumar received the Ph.D. degree in information technology from George Mason University, Fairfax, VA, USA. He is currently a Professor of management information systems, the Chair of the Department of Decision and Information Sciences, and the Co-Director of the Center for Data Science and Big Data Analytics at Oakland University, Rochester, MI, USA. He has published over 200 peer-reviewed articles and edited 12 books. He has published in top-tier journals, such as the Information Systems Research, the ACM Transactions on Database Systems, the IEEE Transactions on Engineering Management, Communications of the ACM, the IEEE Transactions on Education, the IEEE Transactions on Big Data, and the IEEE Software. His research interests include the areas of big data analytics, intelligent information technologies, ontologies and semantic Web. He is the Chair of the Intelligent Agent and Multi-Agent Systems mini-track for Americas Conference on Information Systems (AMCIS 1999–2018). He has served as the Program Co-Chair for the International Conference on Applications of Natural Language to Information Systems (NLDB 2008, NLDB 2013, and NLDB 2016). He is the Editor-in-Chief of the International Journal of Intelligent Information Technologies.



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**DR. VIVEKANANTHAN VENKATESWARAN**  
**JEJU NATIONAL UNIVERSITY, SOUTH KOREA**

**Dr. Vivekananthan Venkateswaran** is currently a Post-doctoral associate in the Faculty of Applied Energy Systems with major in Mechatronics Engineering, Jeju National University, South Korea. He is the recipient of Young Investigator Award (Principal Investigator) of project “Energy autonomous e-skins”, supported by National Research Foundation of Korea (NRF). He received his Ph.D. degree under the supervision of Prof. Kim Sang-Jae in Mechatronics Engineering at Jeju National University, South Korea. He has a Master of Technology degree in Nanoscience and Technology and Bachelor of Engineering degree in Electrical and Electronics Engineering from Anna University, India. His research interest includes synthesis of multifunctional nanomaterials, piezoelectric nanogenerators, triboelectric nanogenerators and electronic skin-based devices for application in wearable electronics.



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**DR. BHASKAR DUDEM**  
**UNIVERSITY OF SURREY, UK**

Dr Bhaskar Dudem is a Research Fellow at the Advanced Technology Institute (ATI), University of Surrey, UK. He received the Master of Technology (M.Tech.) degree from the Indian Institute of Technology (IIT) Kanpur, India. He received the Ph.D degree from Institute for Wearable Convergence Electronics (IWCE), Kyung Hee University, Korea, specializing in tribo/piezoelectric nanogenerators for wearable electronics. He also worked at K.L. University, India as a teaching faculty and IWCE as a postdoctoral fellow. His current research interest is focused on wearable and flexible piezo/triboelectric nanogenerators for energy harvesting & motion sensor applications, photovoltaic, and hybrid energy cells.





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**MR. ARUN VYDHYANATHAN**  
**XSENS NETHERLANDS**

Mr. Arun Vydhyathan is responsible for Business Management of the Wearable Sensors Business Line including the Shanghai site, and local Xsens engineering activities. Arun joined Xsens in March 2008, based in Xsens HQ Netherland office, prior to this role, he has been a Lead Engineer and a Research Engineer involved in developing multi-sensor fusion algorithms and leading technical developments for the Xsens Inertial Sensor Modules business line. Arun holds a M.S. Degree in Electrical Engineering from Ohio University, USA.



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**PROF. BINDU SALIM**

**PSG INSTITUTE OF ADVANCED SCIENCES**

Prof. Bindu Salim did her Bachelor's degree in Electronics and communication engineering from College of Engineering, Trivandrum, Kerala, India in 1987. She completed her Masters in Electronics and communication engineering with specialization in VLSI from BMS College of Engineering, Bangalore, India in 1995. She has done her Ph.D in Biomedical engineering at PSG College of Technology, Coimbatore India. She has been in academia since 1988 and currently she is a Professor at Nanotech Research Innovation and Incubation Centre, PSG Institute of advanced Studies, Coimbatore, India. Her research interests are MEMS based sensors, thin film transistors, wireless networks and VLSI design. She has executed several projects funded by various organizations of Government of India.

Bindu has 2 patents in her credit and is an awardee of Bill and Melinda Gates foundation award for GCTBC-2014. She is a Fellow of Institution of Engineers India, member of IEEE, ISTE, ISSS, MRSI, ISSE. She has published 18 papers in international journals and presented papers in international conferences held in US and Europe. She has done 6 months research on Thin film transistors in the University of Texas at Austin.



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**DR. RAKESH KUMAR GUPTA,  
UNIVERSITY OF MANCHESTER, UK**

Dr. Rakesh Kumar is currently working as Research Associate in National Graphene Institute (NGI) & School of EEE-University of Manchester (UoM), United Kingdom. Dr. Kumar has been a visiting research scholar to NASA, Ames research centre, CA, USA, in 2013 to date and working on a collaborative research project on fabrication and testing of carbon nanofiber-based biosensors for Astronaut's onboard cardiac health monitoring.

Dr. Kumar had been a President Doctoral Scholar at the UoM and completed a Doctoral degree in Engineering from School of Electrical and Electronics Engineering, UoM (2019). Dr. Kumar developed a unique suspended graphene-based array chip (Patent pending) for multiple sensing applications such as specific biosensor, gas sensor, pressure sensor and Humidity Sensors during his PhD research work. Before joining UoM, Dr. Kumar received M.Phil degree in Micro- and Nanotechnology from the University of Cambridge (UK) in 2009-10 and obtained a Master's in Electronics (Gold Medallist) from the University of Jammu (J&K, India) in 2002. Dr. Kumar has been working as faculty in Govt. Gandhi Memorial Science College, Higher Education Department of Union territory of Jammu and Kashmir since 2005.



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**PROF. SOUMEN DAS**  
**SMST, IIT KHARAGPUR**

Prof. Soumen Das currently works at the Department of Medical Science and Technology, Indian Institute of Technology Kharagpur, India. Soumen does research in Biomedical Engineering, Biosystems Engineering and Electronic Engineering. Their current project is 'Flexible sensor', organ on chip, biosensors. Soumen Das (Member, IEEE) received the M.Sc. and Ph.D. degrees from IIT Kharagpur, Kharagpur, India, in 1988 and 1996, respectively. He has been an Associate Professor with the School of Medical Science and Technology, IIT Kharagpur, since 2007. He is the principal investigator of several research and consultancy projects in microelectromechanical systems (MEMS) and microsystems funded by various Government and private agencies. He has authored or co-authored more than 50 research articles in reputed international journals and conference proceedings. His current research interests include biomedical and inertial MEMS transducers, bioMEMS, and microfluidic biochips for electrophysiological characterization of biospecies for clinical diagnostics and micro instrumentation, such as microvalve, microneedle, micropump, medical electronics, and very large scale integration unit processing.



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**DR. MOHAN KUMAR R**

**COUNTRY HEAD (INDIA) FOR WEARABLE TECHNOLOGIES (AG)**

Dr. Mohan obtained his Doctorate in EEE (with Biomedical Specialization) from Imperial College London in the domain of ‘Ultra Low Power Wearable Systems’. He has about 25+ years of experience in the Biomedical, Semiconductor & Healthcare industries. Mohan has worked extensively in product innovation ranging from Consumer to Healthcare Technologies. Most recently, he led a team at Philips Healthcare to launch a low-cost, portable ECG for emerging markets like India. Mohan currently serves as a Country Head (India) for Wearable Technologies (AG). Earlier, he was Vice President of Strategic Business at MegaChips Corporation where he focused on IoT devices for Healthcare and Smart grids. Mohan works on several innovations involving Wearables, Hearables, VR/AR and next generation eTextiles specific to Sports & Healthcare. As part of his volunteering work, Mohan is also an active member of the IEEE SIG on Communications Disability that supports technology development for the Speech & Hearing Impaired, Visually Challenged & other communication disorders. He is the Working Group Chair for an IEEE New Standard P2650 : Pre-Screening Audiometric Systems and also drives an Industry Connect programme on PLC Test Beds in India.

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**MR. PRABHANJAN RAO**  
**CEO GALORE SYSTEMS, BANGALORE**

Mr. Prabhanjan Rao is a seasoned engineer and a business executive with over 25 years of experience in Electronics Industry, spanning Design and development, Product management, Sales, Marketing and general management functions. The various industries he has worked in include Semiconductors, Electronic subsystems, T&M - Oscilloscopes, PCB testers, Protocol analyzers and certification equipment, Motion capture products and robotics. Technical Sales is his strength - Selling products that require thorough understanding of the underlying technology.

Currently, he heads Galore Systems as its Founder and CEO. His company is a distributor and system integrator of specialty Electronic equipment, Motion Capture products and Robotics. He has established business relationships with some of the most respected corporations in these segments.



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**MR. NITIN AWASTHI**  
**DIRECTOR, APSIS SOLUTIONS**

Mr. Nitin Awasthi is a R&D specialist with over 12 years of experience in the cutting-edge technologies. He has a passion for technology and automation. During his college days he had devised many innovative projects, which won awards across the country. After his graduation in Electronics & Communication Engineering from Bangalore University, he has worked in reputed organizations delivering mission-critical solutions. He is currently Founder-Director at Apsis Solutions, an organization dedicated to Training and Technology development. As a certified Microchip trainer, he is always looking for innovative methods to implement his projects. He holds a patent in the communication field, with several patents pending and has published an International paper on wireless USB technology also.



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**MR. R DHAKSHINAMOORTHY**  
**PRINCIPAL ARCHITECT - IOT, TCS**

Mr. R. Dhakshinamoorthy is a seasoned Digital Enterprise Architect, leader and IT strategist. He is also an experienced architect in Internet of Things (IoT), Big Data Solutions, Enterprise Architecture, Service Oriented Architecture (SoA), Integration, Legacy Modernization and Model driven application development. He has an extensive experience in Digital Technologies such as IoT, Big Data and architecting solutions for customers, IT Consulting developing IT Strategy and Enterprise Architecture, Architecting large transformation programs (each 100+ man year effort) and Engineering product to aid Model driven application development. He has a mix of top down strategic business view and hands on architecting experience which brings him an unique perspective.





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**MR. GANGA GOPAL**  
**SALES DIRECTOR, XSENS NETHERLANDS**  
**TECHNICAL ADVISORY COMMITTEE, WETA 2020**

Mr. Gangatharan Gopal currently working at Xsens Technologies B.V as Sales Director , responsible for South Asia Pacific region which includes India, Singapore, Malaysia, Thailand, Vietnam, Indonesia, Philippine, Bangladesh, Brunei etc., managing partners and direct clients projects in the area of Robotics, Drones / UAVs, Autonomous Driving Vehicles, 3D human motion tracking solutions for Ergonomics, Bio-mechanics, Rehabilitation and Sports Science / Sports medicine, Gaming, Animation and Live entertainment etc.,

Mr. Ganga Gopal (as called by the Industry) brings over 25 years of Semiconductor Industry experience and is well known for his contributions in the programmable logic industry and also wireless connectivity solutions, he worked at MNC companies such as Arrow, Altera, Pericom and Redpine Signals prior to this current role at Xsens and travelling all over the world for technology/Industry customer meetings, factory visits, conferences etc.,

Mr. Ganga Gopal started and established the India operation for Altera Corporation ( now part of Intel ) , an USA based semiconductor company, leader in FPGA-programmable logic solutions and served as Altera's India Country Head for a decade.

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Mr. Ganga Gopal also served as Field Applications Engineering Manager for Altera's South Asia Pacific Region which includes ASEAN, Australia, New Zealand and India. Prior to Altera, Mr. Ganga Gopal worked for Arrow Electronics Inc, USA based global semiconductor distribution Company, held several positions as Product Marketing Manager, FAE Manager etc., serving customers all over India in all major segments.

Mr. Ganga Gopal has published several articles on leading Asian electronics magazines about India markets, Programmable logic solutions/its applications etc., Ganga Gopal holds a master's degree in Business Administration, MBA from Anna University, Chennai and a bachelor's degree in Electronics and Communications Engineering, B.E from University of Madras.



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