

ICIT 2023

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## **ICIT 2023 Special Session Proposal**

### **Title of the Proposal:**

Advanced Control of Grid-Connected Converters for Distributed Generation and Power Quality

### **Technical Outline of the Session and Topics:**

Outline of the Session:

Renewable sources, such as photovoltaic panels, wind generators and fuel cells, are usually connected directly to the grid for cogeneration. This connection is made through power electronics interfaces that should ensure high stability, voltage regulation, power flow control, and low electromagnetic emission, along with high power density, low cost and high reliability. In some applications where high power level is required, the switching frequency of the power semiconductors is limited and the use of multilevel or interleaved converters becomes mandatory in order to get an acceptable power quality. This session addresses the issues of advanced control techniques applied to such converters to improve their performance, efficiency, reliability and cost-effectiveness.

Topics of the Session:

- Advanced control of multilevel inverters
- Advanced control of power electronics in DC grids
- Grid-connectivity control requirements
- Control of paralleled or interleaved topologies
- Modeling and model-based control of switch-mode power converters
- Optimal control in hybrid cogeneration systems
- Predictive control of power converters
- Intelligent control of power converters
- Direct power control of power converters
- Power quality control in renewable energy systems
- New PWM techniques for power electronics control
- Real-time control and simulations of high-power converters

## IEEE IES Technical Committee Sponsoring the Special Session (if any):

TCPE (Control in Power Electronics subcommittee)

## Short bio, contact details and IEEE IES membership of the Session Organizers

- Prof. Hadi Y. KANAAN



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Full-time Professor, Head of the Department of Graduate Studies  
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**Hadi Y. Kanaan** (S'99-M'02-SM'06) received the diploma in electromechanical engineering from Saint-Joseph University of Beirut, the Ph.D. degree in electrical engineering from the *Ecole de Technologie Supérieure* (ETS), Montreal, Canada, and the *Habilitation à Diriger des Recherches* (HDR) from the *Université de Cergy-Pontoise*, Paris, France, in 1991, 2002 and 2009 respectively. He is currently a Full-Professor and Head of the Electrical and

Mechanical Department at the *Ecole Supérieure d'Ingénieurs de Beyrouth* (ESIB) of Saint-Joseph University of Beirut, which he joined in 2001. He is a visiting researcher at ETS since 2004, and associate member of the Canada Research Chair in Energy Conversion and Power Electronics since 2001. His research interests concern modeling and control of switch-mode converters, modern rectifiers, power factor correction, active power filters, and grid-connectivity of renewable energy systems. He is an author of 1 book, 3 book chapters, 1 patent and more than 250 technical papers published in international journals and conferences. He is an Associate Editor of the IEEE Journal of Emerging and Selected Topics in Industrial Electronics (JESTIE), and member of the IEEE Power Electronics Society (PELS), Industrial Electronics Society (IES) and Industry Applications Society (IAS). He is also the vice-president of the IEEE Lebanon Section and member of the IE/PE/CAS/PEL Joint Chapter in Lebanon. He is the vice-chair of the Control in Power Electronics track in the IES Technical Committee of Power Electronics (TCPE).

- Prof. Kamal AL-HADDAD



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**Kamal Al-Haddad** (S'82-M'88-SM'92-F'07) received the B.Sc.A. and M.Sc.A. degrees from the University of Québec à Trois-Rivières, Canada, in 1982 and 1984, respectively, and the Ph.D. degree from the Institute National Polytechnique, Toulouse, France, in 1988. Since June 1990, he has been a Professor with the Electrical Engineering Department, École de Technologie Supérieure (ETS), Montreal, QC, where he has been the holder of the Canada

Research Chair in Electric Energy Conversion and Power Electronics since 2002. He has supervised more than 130 Ph.D. and M.Sc.A. students working in the field of power electronics. He is a Consultant and has established very solid link with many Canadian industries working in the field of power electronics, electric transportation, aeronautics, and telecommunications. Dr Al-Haddad and his team have transferred 23 technologies to the industry in the form of industrial product and integrated technologies along with 3 patents. He has coauthored more than 500 transactions and conference papers. His fields of interest are in high efficient static power converters, harmonics and reactive power control using hybrid filters, switch mode and resonant converters including the modeling, control, and development of prototypes for various industrial applications in electric traction, renewable energy, power supplies for drives, telecommunication, etc. Prof. Al-Haddad is a fellow member of the Canadian Academy of Engineering. He is IEEE- IES President Elect, Associate editor of the Transactions on Industrial Informatics, and IES Distinguished Lecturer. In 2015, he received the prestigious the Dr.-Ing. Eugene Mittelmann Achievement Award.

- Dr. Fadia SEBAALY



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**Fadia Sebaaly (S'14–M'16)** received the B.Sc. degree in electrical engineering from the Faculty of Engineering (II), Lebanese University, Beirut, Lebanon, in 2009, and the M.Sc. degree in electrical engineering in 2012, and the Ph.D. degree in electrical engineering/power electronics in 2016 both from the Faculty of Engineering-Ecole Supérieure d'Ingénieurs de Beyrouth, Saint-Joseph University, Beirut. She also received the Doctoral degree from the School of Science and Technology, Lebanese University.

In summer 2014 and 2015, she was a Trainee with the Groupe de Recherche en Electronique de Puissance et Commande Industrielle, Ecole de Technologie Supérieure, University of Quebec, Montreal, QC, Canada. She is currently a Research Engineer with IREQ, Hydro-Quebec, in Montreal, Canada. Her research interests include power electronics multilevel converters topology, control (predictive and sliding mode controllers) and modulation techniques, power quality, and their applications into renewable energy systems.