ICIT 2023

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ICIT 2023 Special Session Proposal

Title of the Proposal:

Advanced Power Electronics and Control for Hybrid EV Charging and Drive Systems

Technical Outline of the Session and Topics:

Outline of the Session:

Electrical Vehicles (EVs) manufacturing is nowadays an increasingly growing industry. Tremendous work is being performed to improve their performance in terms on charging capacities, speed and power. The storage devices remain a major handicap in these systems where most EV-related research activities are currently focussing on reducing the size of these devices without compromising their capacity, their charging time and their life cycle. One proposed solution was to adopt a hybrid storage system combining batteries with fuel cells. Supercapacitors could be also useful in some applications. This special session focusses on recent developments in power electronics topologies and control for hybrid storage devices used in EV drives. In addition, it covers cogeneration solutions using renewable energy sources in charging systems. Control algorithms ensuring a compliance with grid requirements, especially regarding power quality and V2G connectivity, and EV-related standards are also considered as major topics in this session.

Topics of the Session:

- Multilevel converters in chargers
- Fuel cells for EV drives
- Battery charging systems
- PV-assisted charging systems
- Power quality in V2G systems
- Model-based control design

- Artificial-intelligence-based control
- Energy management in V2G systems
- Open-winding motor drives

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

Technical Committee on Power Electronics (TCPE)

Short bio and contact details of the Session Organizers

- Organizer 1: Prof. Hadi Y. KANAAN, hadi.kanaan@usj.edu.lb

Hadi Y. Kanaan (S'99-M'02-SM'06) received the diploma in electromechanical engineering from Saint-Joseph University of Beirut (USJ), 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, Head of the Department of Graduate Studies at the *Ecole Supérieure d'Ingénieurs de Beyrouth* (ESIB) and Director of the Doctoral School of Sciences, Engineering and Technology at USJ, which he joined in 2001, and executive member of the USJ Research and Technology Transfer Office since 2019. He is an Associate Professor at ETS since 2021, 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 served as an Associate Editor of the IEEE Transactions Industrial Electronics, and is currently an Associate Editor of the IEEE Journal of Emerging and Selected Topics on Industrial Electronics (JESTIE). He is a member of the IEEE Power Electronics Society (PELS), Industrial Electronics Society (IES), Industry Applications Society (IAS), Transportation Electrification Community and Smart Grid Community. He is also the vice-chair of the IEEE Lebanon Section, an active member of the IE/PE/CAS/PEL Joint Chapter in Lebanon, and the counselor of IEEE USJ Student Branch. He co-founded two international conferences (REDEC and IMCET) an organized more than 140 successful special sessions in major IEEE conferences. He is the recipient of the 2016 Excellence Award from the Lebanese National Council for Scientific Research.

- Organizer 2: Dr. Jean SAWMA, jean.sawma@usj.edu.lb

Jean Sawma was born in Beirut, Lebanon, in 1988. He received the Engineering and Master's degrees in electrical engineering from the Ecole Supérieure d'Ingénieurs de Beyrouth, Beirut, in 2011 and 2012 respectively, and the Ph.D. degree in electrical engineering from the Ecole Supérieure d'Ingénieurs de Beyrouth and the University of Cergy-Pontoise, Cergy-Pontoise, France, in 2016. His current research interests include model-predictive control, control of power electronics and electrical motors, and field-programmable gate array system-on-chip-based embedded control.