



**IEEE**

**Ottawa  
Section**



**Webinar by the IEEE Ottawa Section, Power and Energy Society Ottawa Chapter (PES), Reliability Society and Power Electronics Society Joint Chapter (RS/PELS) and IEEE Ottawa Educational Activities (EA)**

*The IEEE Ottawa Section is inviting all interested IEEE members and nonmembers to a webinar*

## ***Advanced Phase-Locked Loop Algorithms for Modern Power System Applications***

*by*

***Houshang Karimi, Ph.D., P.Eng., SMIEEE***

***Associate Professor, Department of Electrical Engineering, École Polytechnique de Montréal, Montréal, Québec, Canada***

**DATE:** Wednesday, July 21, 2021

**TIME:** Webinar: 6:30 p.m. – 7:30 p.m.

**LINK:** Free. Registration required at: [https://events.vtools.ieee.org/tego\\_/event/manage/276249](https://events.vtools.ieee.org/tego_/event/manage/276249)

### **Abstract**

Modern control and protection systems of smart grids rely on the estimation of frequency, amplitude and phase-angle of voltage/current signals. It is known that estimation of the parameters of such signals is crucial for seamless operation of electronically-coupled distributed generation (DG) systems and advanced measurement sensors such as phasor measurement units (PMUs). Moreover, many robust control and islanding detection methods in microgrids, as well as grid synchronization schemes for power electronics systems, depend on accurate estimates of the frequency and phase-angles. Estimation of voltage/current signal parameters has attracted a lot of attention. Various methods have been proposed to improve the parameter estimation in the presence of measurement noise, harmonics, and DC offset. Kalman filtering (KF), discrete Fourier transform (DFT) and Phase-locked loop (PLL) systems have been widely used in communication and power systems. The KF requires an accurate state-space model, the knowledge of the initial covariance matrix, the variance of the process, and that of the measurement noise. On the other hand, frequency variations, inter-harmonics, and spectral interference are challenges to the DFT-based methods. Unlike the KF and DFT based methods, the PLL provides a stable and accurate reference for synchronization despite the system oscillations and distortions. Moreover, the PLL has a simple and robust structure for implementations in digital platforms. Noise immunity and disturbance rejection capabilities of a PLL can be enhanced at the cost of computation time and stability characteristics. To overcome such challenges, new and advanced PLLs have been proposed that improve the parameter estimation by utilizing different filtering techniques.

In this talk, several PLL structures will be presented and discussed. In particular, the conventional single-phase PLL, synchronous reference frame PLL (SRF-PLL), enhanced PLL (ePLL), and unified three-phase signal processor (UTSP) will be studied in details, and their performances are compared using MATLAB simulations. This presentation will be suitable for researchers and engineers from power systems and control disciplines.

### **Speaker's Bio**



**Houshang Karimi** (M'07–SM'12) received the B.Sc. and M.Sc. degrees from Isfahan University of Technology, Isfahan, Iran, in 1994 and 2000, respectively, and the Ph.D. degree from the University of Toronto, Ontario, Canada, in 2007, all in electrical engineering. He was with the Department of Electrical Engineering, Sharif University of Technology, Tehran, Iran, from 2009 to 2012. From June 2012 to January 2013, he was a Visiting Professor in the ePower lab, Department of Electrical and Computer Engineering, Queens University, Kingston, Ontario, Canada. In 2013, he joined the Department of Electrical Engineering, Polytechnique Montreal, Quebec, Canada, where he is currently an Associate Professor. His research interests include microgrid control, control systems, and smart grids.

**Admission:** Free. Registration required at [https://events.vtools.ieee.org/tego\\_/event/manage/276249](https://events.vtools.ieee.org/tego_/event/manage/276249)  
For any additional information, please contact: [shamsodin.taheri@uqo.ca](mailto:shamsodin.taheri@uqo.ca) or [ajit.pardasani@ieee.org](mailto:ajit.pardasani@ieee.org).