

Title: Communication Networks for Industrial Automation

Organizer: Salman Mohagheghi, Colorado School of Mines

Time: Tuesday (20-Oct) 2:00 PM – 6:00 PM

Abstract – Global competition and reduced profit margins often push modern manufacturing systems towards automated solutions to increase operational efficiency and reduce idle time of workstations. To achieve this, distributed sensors and actuators are employed to enable remote monitoring and control. The backbone of this system is a communication infrastructure that enables efficient, reliable and secure transmission of data. This tutorial focuses on design of a communication network suitable for factory automation. As the first step, data flow requirements will be studied in terms of throughput, reliability, quality of service (QoS), and security needs for different monitoring, regulation and control applications. When designing a communication network, focus on the right network architecture is essential. This will be the core aspect of the tutorial, as various layers and their functionalities will be reviewed. In doing so, emphasis will be put on topics such as pros and cons of selecting connection-oriented vs. connectionless models, wired vs. wireless solutions, when to use acknowledgements, how to implement multi-access, how to prioritize different data classes for routing purposes, how/where to perform error detection and correction, and so forth. With the latest trend towards decentralized and distributed control of automation systems, the tutorial will also discuss routing and connection control approaches in multi-agent systems, interacting based on machine-to-machine (M2M) communications. The concept of ad hoc wireless networks and SANETs for distributed control and monitoring will also be briefly discussed.

Title: High Power Si & SiC Module Technology and Application Considerations

Organizer: John Donlon, Powerex, Inc.

Time: Wednesday (21-Oct) 1:30 PM – 5:30 PM

Abstract – High Power Semiconductor modules are the workhorse power switch for industrial applications. This tutorial will discuss the issues a designer must deal with in using these devices including interpretation of device ratings, gate drive requirements, and providing device and system protection. The intent of this tutorial is to aid the designer in choosing and applying a power module to a new product. Questions and concerns a designer might have will be addressed by the various techniques and circuit examples that will be presented. Chip technology and packaging options will be discussed with special attention given to the tradeoffs between silicon and silicon carbide. The practical application of SiC power devices today and in the future will be discussed. The attendee should leave the course with a better understanding of the power module, specifically as a device and how it functions in an application. The goal will be to impart an understanding of desirable features, characteristics, and limitations. This will include the application in power circuits, protection from internal and external disturbances, and an understanding of thermal design, handling, and reliability considerations. The tutorial is intended to be of interest to those who use, apply, procure, or specify power electronic products based on the IGBT as the power switch.

Title: Line-Ground and Unsymmetrical Fault Currents: Considerations, Calculations and Symmetrical Components Method

Organizer: Rasheek Rifaat, Jacobs, Canada

Time: Thursday (22-Oct) 8:00 AM – 12:00 PM

Abstract – The majority of distribution system faults start as line-ground (L-G) faults. Accordingly, attention has been given to grounding or isolation of neutral points of sources and transformers and L-G fault protection. Understanding L-G faults is indispensable for achieving the correct balance between different protection aspects such as coordination, selectivity, speed and economics. Continuity of power supply is critical for many industrial systems, meanwhile, quick fault identification and quick protection tripping reduces the risk of fault advancement into multiple phase faults with damaging currents, arc flash energies and associated hazards. Several computer programs provide great tools for short circuit calculations and relay coordination. However, It is important for electrical engineers and system designers to augment the use of computer programs with comprehensive understanding of their systems. One of the brilliant calculation methods, introduced in 1917 and still being used, is the symmetrical components method. In addition to the introduction of symmetrical components, this tutorial includes discussion on system neutral grounding, medium and low voltage cable and system capacitances, high and low resistance grounding and protection for L-G faults. Relevant IEEE Standards for Recommended Practices in Industrial and Commercial Power Systems (Series 3000) will be identified and discussed.

Title: Electrical Safety Management

Organizer: H. Landis (Lanny) Floyd

Abstract – These two tutorials will use ANSI Z10-2012, Occupational Safety & Health Managing Systems (harmonized with CSA Z1000) as the framework for benchmarking existing programs and for designing and implementing a state of the art electrical safety management system. It will show how the requirements of NFPA 70E, Standard for Workplace Electrical Safety (harmonized with CSA Z462) and other recognized industry standards can be aligned to achieve a comprehensive program based on proven safety management principles. The attendee will be provided the knowledge and tools to develop a business case to help enable management support, assess existing programs, identify improvement opportunities, and develop implementation plans. This tutorial was first introduced at ESW 2009, and is the basis for the Introduction to Electrical Safety Management professional studies online eLearning course offered by the University of Alabama at Birmingham. Target audience: individuals concerned with the design and/or improvement of their occupational electrical safety program, its sustainability, and its integration into an overall occupational safety & health management system. This includes safety professionals, managers, and electrical safety leaders.

Part 1: Introduction and Objectives

Time: Thursday (22-Oct) 8:00 AM – 12:00 PM

Part 1 will show how the requirements of NFPA 70E, Standard for Workplace Electrical Safety (harmonized with CSA Z462) and other recognized industry standards can be aligned to achieve a comprehensive program based on proven safety management principles. The attendee will be

provided the knowledge and tools to develop a business case to help enable management support, assess existing programs, identify improvement opportunities, and develop implementation plans.

Part 2: Planning and Implementation

Time: Thursday (22-Oct) 1:00 PM – 5:00 PM

Part 2 includes an interactive workshop to help attendees create a plan for engaging management support for designing an effective electrical safety program and integrating it into an overall Safety, Health, & Environmental management system. The knowledge will help attendees to assess and design real, sustainable improvements in how electrical safety is managed in their organizations.