

ASC SHORT COURSES

Pre-registering for these Short Courses is required. Sign up for these Short Courses conveniently while registering for the ASC'14 Conference by August 1, 2014.

1. Superconducting Magnet Design – Two Day Short Course

Date: Saturday, August 9 – Sunday, August 10, 2014

Time: 8:00 a.m. – 5:00 p.m.

Location: Westin Charlotte Hotel (exact location will be emailed to registrants and posted online as soon as determined)

Cost: Full Conference Participant Early, \$375; Regular \$475; On-Site \$575
Student Early \$225; Regular \$300; On-Site \$380

Description: This course covers the design of superconducting magnets for particle accelerators, fusion, and MRI applications. The lectures are intended for physicists and engineers working in the areas of magnet technology and applied superconductivity, and interested in basic principles, physical parameters, analytical and numerical tools used for superconducting magnet design. For each of the applications considered, the courses will start by presenting the properties and characteristics of *superconducting strands and cables*. The main concepts related to *magnetic design and coil lay-outs* will be then outlined. In addition, the lectures will deal with the *mechanics and fabrication techniques* of a superconducting magnet, focusing in particular on coils and the structural components aimed at containing the electro-magnetic forces and managing the stresses. Finally, a description of the different systems devoted to *protect a magnet* after a quench will be provided.

Superconducting Dipoles and Quadrupoles for Particle Accelerators

[Paolo Ferracin](#) (CERN)

Superconducting Magnets for MRI Applications

[Timothy Havens](#) (GE Healthcare)

Detector Magnets

Herman ten Kate (CERN, University of Twente)

Superconducting Magnets for Fusion Applications

Joseph V. Minervini (MIT), [Alfredo Portone](#) (Fusion for Energy)

2. Superconducting Power Devices – One Day Short Course

Date: Sunday, August 10, 2014

Time: 8:00 a.m. – 5:00 p.m.

Location: Westin Charlotte Hotel (exact location will be emailed to registrants and posted online as soon as determined)

Cost: Full Conference Participant Early, \$225; Regular \$300; On-Site \$375
Student Early \$150; Regular \$200; On-Site \$250

Description: Many power applications are being developed that use high temperature superconducting materials. Designs have been proposed to take advantage of their unique properties and to achieve higher performance standards than conventional power devices. This short course is focused on the use of HTS materials for power applications, and will cover Superconducting Fault Current Limiters, Superconducting Transformers, Superconducting Machinery, and Superconducting Cables. It will touch the basics of each application and describe the latest developments and ongoing projects. The course will also focus on modeling, simulations, as well as impact and integration of the power devices.

Overview of Conductors

P. Masson, University of Houston, Houston (TX), USA

Power Devices Design and Optimization

P. Masson, University of Houston, Houston (TX), USA

3.Superconducting Electronics – Half Day Short Course (morning)

Date: Sunday, August 10, 2014

Time: 8:00 a.m. – 12:00 p.m.

Location: Westin Charlotte Hotel (exact location will be emailed to registrants and posted online as soon as determined)

Cost: Full Conference Participant Early, \$175; Regular \$225; On-Site \$300

Student Early \$100; Regular \$150; On-Site \$200

Description: This short course will introduce the fundamentals of superconductor electronic devices and circuits, as well as describe their applications. Both low-temperature and high-temperature superconductors will be included. The course will comprise five parts. In the first part, Josephson junctions and magnetic flux quantization will be described from the point-of-view of electrical circuits and systems. The next three parts will focus on analog, digital, and mixed-signal circuits. Basic analog circuits, such as filters, oscillators, mixers, and amplifiers will be discussed in the second part along with their applications. Next, sensors and detectors of magnetic field and electromagnetic energy, ranging from X-rays to low frequencies, will be described. The third part will concentrate on single-flux-quantum (SFQ) digital circuits and their applications to digital signal processing and computing. Integrated circuit design will be described for state-of-the-art fabrication technology. The fourth part will focus on mixed-signal data converters, in particular analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). Different ADC architectures, including oversampled modulators and parallel flash designs, will be described from the perspectives of different application requirements. Primary voltage standards, essentially low-frequency DACs, will also be addressed. Finally, a brief introduction to cryocooled systems comprising superconductor electronics will be presented along with discussions of the system's size, weight, power consumption, thermal budget, and functionality.

Introduction to Superconducting Circuits

Alan Kadin

Analog Devices: Detectors, Amplifiers, and Filters

Alan Kadin

Digital Circuits: SFQ Integrated Circuits and Systems

Deep Gupta

Mixed-Signal Data Converters: ADCs and DACs

Deep Gupta
Introduction to Cryogenic System Design
Deep Gupta

Reference Text: “Introduction to Superconducting Circuits”, Alan Kadin (1999).

4. Superconducting Quantum Computation – Half Day Short Course (afternoon)

Date: Sunday, August 10, 2014

Time: 1:00 p.m. – 5:00 p.m.

Location: Westin Charlotte Hotel (exact location will be emailed to registrants and posted online as soon as determined)

Cost: Full Conference Participant Early, \$175; Regular \$225; On-Site \$300
Student Early \$100; Regular \$150; On-Site \$200

Description: This half day course will introduce the fundamentals of quantum computation and gating operations, discuss the different types of superconducting qubits, and cover practical aspects of building, operating and measuring qubits. The use of cavity QED microwave techniques to read out the qubit state will be discussed, including key aspects of microwave measurement systems and resonant microwave cavity behavior. Measurement of qubit relaxation time T_1 , coherence times T_2 , and dephasing time T_f , will be covered. The underlying causes of relaxation and dephasing in superconducting qubits will be discussed as well as how qubits are designed and operated to reduce decoherence.

Instructors:

[Fred Wellstood](#) (University of Maryland)

Ben Palmer (Laboratory for Physical Science)

[Steve Anlage](#) (University of Maryland)

5. Cryogenic Systems Engineering with Cryocoolers – Half Day Short Course (morning)

Date: Sunday, August 10, 2014

Time: 8:00 a.m. – 12:00 p.m.

Location: Westin Charlotte Hotel (exact location will be emailed to registrants and posted online as soon as determined)

Cost: Full Conference Participant Early, \$175; Regular \$225; On-Site \$300
Student Early \$100; Regular \$150; On-Site \$200

Description: This short course will provide an overview of how to apply systems engineering techniques to the design of a cryogenic system that is cooled by a cryogenic cooler (refrigerator) instead of by liquid cryogenes. The course will start with discussing the requirements for cryogenic systems, and then cover the basic features inherent in their design: material properties, time constants, thermal isolation, and safety. The constraints and

opportunities created when a cryocooler is used to cool a system instead of a liquid cryogen will then be discussed. Examples will be provided ranging from simple material property measurement systems to space based cryogenic systems.

Instructor:

Melora Larson (Jet Propulsion Laboratory)

6. Effective Technical Presentations & Papers Educational Short Course

Date: Sunday, August 10, 2014

Time 1:00 p.m. – 5:00 p.m.

Location: Westin Charlotte Hotel (exact location will be emailed to registrants and posted online as soon as determined)

Cost: \$25

Description: This course will provide professional guidance for preparing clear and well-stated abstracts and making effective presentations at technical conferences. The preparation of technical journal manuscripts that conform to the highest standards will also be addressed. The course is recommended for any student/researcher/scholar who would like to improve their communications skills. The course is being provided through the IEEE Professional Communications Society and is sponsored by the IEEE Council on Superconductivity. The instructor is Professor Julia M. Williams.

Instructor:

[Julia M. Williams](#) (Rose-Hulman Institute of Technology)