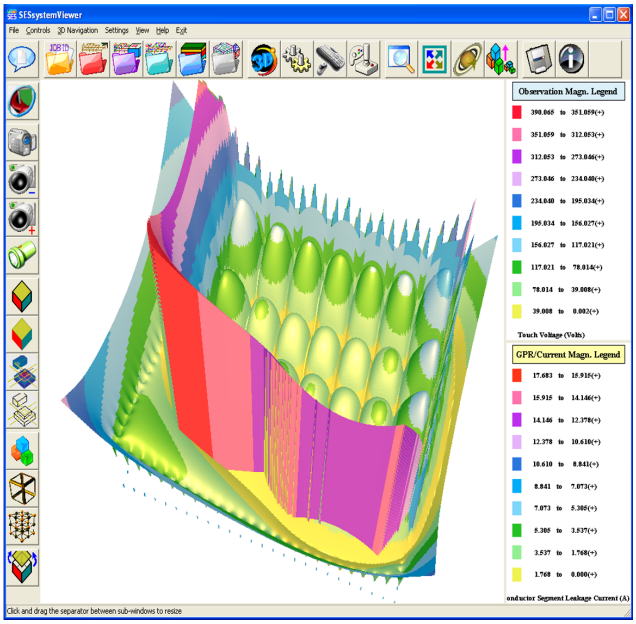
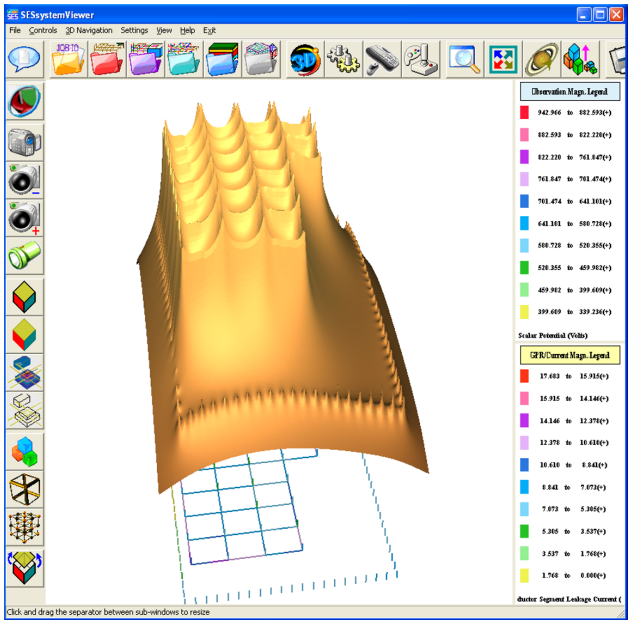
SES & technologies ltd.

Advanced Technical Seminar on Electrical System Grounding, Transient & Electromagnetic Interference Analysis with Level 1 Certification





Location	Dates		Course Fee
Webinar	Australia	November 7-17, 2023	CAD 3,850[1]
	Western Hemisphere	November 6-16, 2023	

Course Objective

This course provides attendees a unique opportunity to acquire practical and up-to-date engineering knowledge, from the world's leading specialists and researchers, on how to study and design efficient and economical grounding and lightning mitigation systems. Whether you wish to protect a power system, plant or a nearby utility subjected to electromagnetic interference from power system faults, lightning or switching surges, this course will present pertinent principles for utility, industrial and various public installations, during steady-state, fault and transient conditions, using realistic models of the environment.

The emphasis will be put on demonstrating scientific concepts using practical examples drawn from the extensive number of research projects and engineering studies conducted by SES researchers since 1978. Pertinent analytical derivations are included in the extensive Reference Manual made available to all course participants. One of the main goals of this course is to explain and eliminate many misconceptions, ambiguities and incorrect measurement, analysis and design techniques which still abound in the industry and are taught at some courses.

[1] Applicable sales tax not included.

Course Outline

This course takes place over a two-week period from Nov. 6-17, 2023, and is scheduled to accommodate clients in Australia and western North America. Each session begins at 5:00 pm and ends at 8:45 pm, EST. The schedule for other time zones is provided below.

For participants in Australia, the course begins on Tue., Nov. 7 and ends on Fri., Nov. 17. There is no session on Mon., Nov. 13. Each session begins in the morning:

- 9:00 am–12:45 pm, AEDT (Sydney)
- 8:00 am–11:45 am, AEST (Brisbane)
- 6:00 am–9:45 am, AWST (Perth)

For participants in western North America, the course begins on Mon., Nov. 6 and ends on Thu., Nov. 16. There is no session on Fri., Nov. 10. Every session begins in the afternoon:

- 2:00 pm–5:45pm, PST
- 3:00 pm–6:45pm, MST

Week 1

In Week 1, we cover the three modes of electromagnetic energization. Earth resistivity measurement and interpretation techniques will also be discussed, for uniform and multilayered earth (soils with two and more horizontal and vertical layers). The concept of soil model equivalence and soil layer resolution will be explained based on computer simulations. The analysis and design of simple and complex grounding systems made of arbitrarily oriented three dimensional conductors buried in multilayered soils will be discussed and illustrated with practical examples. The case of a grounding system partially buried in a finite volume (e.g., backfill) of heterogeneous soil will be explored. The scientific concept of earth impedance measurements using the Fall-of-Potential method will be clearly explained based on various realistic soil models. Transmission line, buried cable and buried pipeline parameters (self and mutual impedances) in layered earth will be analyzed and fault current distribution computation techniques will be described. Electrical safety concepts will be introduced, and issues related to body currents, body impedances and foot resistances will be discussed for power frequency and high frequency electric exposure.

Week 2

During Week 2, the focus is on demonstrating how to use SES's powerful input and output processors such as SESCAD, ROWCAD and SESShield-3D. Week 2 also includes conductive and inductive interference effects caused by energized conductors on overhead and buried bare or coated metallic structures and conductors, such as pipelines, fences and communication wires are introduced and investigated in detail. Mitigation methods and equipment are presented and their relative merits are discussed. Interaction between the sources of the interference and the victim lines or circuits will be examined in detail. Finally, electric and magnetic fields generated by energized overhead and buried conductors at low and high frequencies as well as during transient conditions, such as lightning strikes, will be described and typical analysis methods and computation results explained.

Course Schedule

Week 1
Fundamental Concepts, Power Frequency Analysis, Safety Concepts

Session 1

Fundamental Concepts	Soil Resistivity	SES Software Packages Structure
• Electric energization modes • Soil structure models and characteristics • Impedance concepts	• Return electrodes and buried structures • Soil resistivity measurement and interpretation	• Preview of SES software packages

Session 2

Grounding System Analysis and Design (Part 1 of 2)	
• Theory of grounding system analysis • Horizontal, vertical, hemispherical, cylindrical soil layering and finite volume soils • Soil structure models and characteristics	• Design optimization to reduce GPR, touch and step voltages • Electric energization modes

Session 3

Grounding System Analysis and Design (Part 1 of 2)	Earth Impedance Concepts,Measurement and Interpretation
• Introduction to electrically large grounding systems	• Fall-of-Potential measurement technique • Earth impedance measurement and interpretation • "How far is far enough?" • Noise analysis & suppresion

Session 4

Fault Current Distribution in Power System Networks and Line Parameters	Electrical Safety Concepts and Criteria
• Multiple terminal systems; modeling of shield wires, neutrals and counterpoises • Steady-state conditions, harmonics and unbalances • Fault current computation • Computation of self and mutual impedances and capacitances of overhead and buried conductors; uniform and layered soils • Modeling of transformers	• Electrical shock mechanisms • Body current thresholds, IEEE Std. 80; IEC 60479; effects of frequency; heart current factors • Soil structure models and characteristics • Body impedance, foot resistance and Thevenin concepts

Course Schedule

Week 2

HIFREQ Workshop

Graphical Input Environment (SESCAD), EMI, High Frequency & Transient Analysis, Lightning Shielding & Lightning Workshop

Session 5

HIFREQ Workshop

SES's Integrated Graphical Input Environment

and Other Graphical Software Packages & Tools

- Using SESCAD's basic features and tools
- Advanced features: Insert, Define, Display, Tools, Advanced
- Import and export functions
- Creating a right-of-way
- Transformers, cables, GIS and GIL
- Running computations
- Examining computation results
- SESSystemViewer, GRServer
- Other SES tools

Session 6

Electromagnetic Interference, Environmental and Mitigation Techniques

- Modeling of pipelines and buried metallic structures
- Design of valve and test stations
- Combined influence of inductive and conductive coupling and mitigation
- Effects of coating characteristics
- Mitigation techniques and cathodic protection issues
- Environmental impact assessment
- ROWCAD, GRSplits-3D

Session 7

Effects of Frequency & Conductor Characteristics on Grounding System Performance, and Comparison of Field & Circuit Models

- Description of the field approach
- Frequency dependence of conductors
- Performance at high frequency
- Comparison of circuit and field approaches
- Extensive grounding systems
- Effect of conductor characteristics on performance of grounding systems
- Effects of circulating current from local generators in grounding study of a large power plant. Examples of realistic modeling including cables, GIS, and aboveground infrastructure
- Induction to communication and protection circuits
- Stress voltage reduction

Electrical and Magnetic Fields and Transients

- Computation of electric and magnetic fields
- Capacitor switching in substations
- Lightning transient studies
- SESTransient lightning workshop

Session 8

Lightning Shielding

- Lightning shielding analysis
- SESShield-3D
- SESShield-3D workshop

Other Topics

- Additional topics selected by attendees
- Q&A for Level 1 exams

Course Instructors

The principal course lecturer will be Dr. Farid P. Dawalibi, an internationally recognized expert and authority in grounding and electromagnetic interference. In addition to his pioneering research work, Dr. Dawalibi was the project leader of the team that developed the GATL and ECCAPP software package (EPRI EL2699 and EL5472) and the AutoGrid Pro software package (CEA 249 D 541). He is presently the Director of Engineering and R&D and is responsible for the research department in charge of developing and maintaining CDEGS, the most advanced and powerful grounding and electromagnetic interference software package on the market. Dr. Dawalibi has published over 450 technical papers, research and engineering reports and has presented more than 150 technical seminars and short courses. He authored part of ANSI/IEEE Standard 80, has served as an expert witness at several challenging court hearings, and is a technical advisor and industry consultant to several leading power, pipeline and railway utilities.

Course Fee

The course fee is CAD 3,850. For residents of Canada, applicable sales tax applies. The course fee includes an extensive Reference Manual titled "Power System Interaction with Earth and Industrial Utility Installations", annotated copies of course display materials, and several copies of pertinent technical papers published by the instructors.

Certification

Those who elect to complete the optional Level 1 Certification exam and who receive a passing score will receive their SES Level 1 Certification by email, and will be eligible to enroll in Level 2 and Level 3 certification courses. Also, their names will be posted on the Certified Users List of the SES website (unless the participant or their organization requests otherwise).

Education Credit

Participants will be issued a certificate of completion and awarded the equivalent of 3.0 CEU (Continuing Education Unit) or 30 PDH (Professional Development Hour). The CEU and PDH are recognized units for recording participation in non-credit educational programs.

Cancellation Policy

SES reserves the right to cancel or change the date of the webinar at any time. If this occurs, participants will be notified immediately and any fee received will be refunded in full.

Participants may cancel their registration by notifying SES in writing prior to the webinar start date. Cancellation requests received more than 2 weeks prior to the webinar start date will be refunded in full. There are no refunds for cancellation requests received less than 2 weeks prior to the webinar start date, or for failure to attend the webinar.

Registration

Online:	Online Registration
Email:	info@sestech.com
Call:	North America (toll free): 1 800-668-3737 Other locations: 1 450-622-5000