

# Workshop: Advanced Modeling and Simulation of Power Electronic Systems

Swissnex Boston, Cambridge, MA, USA, November 18 & 19, 2010

**Speaker** Dr. John Schönberger, Applications Engineer, Plexim GmbH

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**Nov 18** 09:00 **Beginning of workshop: welcome and introduction**

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**Introduction into PLECS**

- General use of PLECS
  - Instantaneous switching
  - Variable and fixed step operation
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10:00 Coffee break

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**Thermal modeling of power electronic systems**

- Combined electrical and thermal simulation using lookup tables
- Thermal loss descriptions of conduction and switching losses
- Electrical feedback of thermal losses

**Exercise:** Thermal modeling of a buck converter

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12:30 Lunch

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**Numerical simulation of dynamic systems**

- Stiff vs. non-stiff solvers, stability domains
  - Accuracy considerations, step-size control
  - Proper handling of discontinuities, zero-crossing detection
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3:30 Coffee break

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**Advanced features of PLECS**

- AC sweep and impulse response analysis
- Advanced modeling techniques for increasing simulation speed
- Implementing of custom components

**Example:** Doubly-fed induction generator

**Exercise:** Implementing a custom PV string model

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5:30 **End of first day**

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**Nov 19** 08:30 **Second day of workshop**

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## **Use of the C-script block**

- Function call interface
- Time settings and macros
- High speed logic emulation

**Example:** Space vector control of a three phase boost rectifier

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10:00 Coffee break

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10:30 **Exercise:** Implementing a digital PI controller with control delay

**Exercise:** Using a state machine for sequence generation

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12:30 Lunch

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1:30 **Control system design and advanced modeling techniques**

- Introduction to the flyback converter
- Design flow using PLECS tools
- Use of the state-space extraction tool

**Exercise:** Control design for a flyback converter

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3:30 Coffee break

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**Exercise:** Control design for a flyback converter (continued)

**Discussion and outlook**

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5:00 **End of workshop**

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**Venue** Swissnex Boston, Cambridge, MA, USA

The workshop contains hands-on exercises. Please bring your own computer with you. PLECS licenses may be obtained in advance from [www.plexim.com](http://www.plexim.com).

**Contact** Courtney Phillipps; +1 (617) 209-2151; [phillipps@plexim.com](mailto:phillipps@plexim.com)

**Cost** **\$750**