

## Registration (Fax Reply)

To: ECPE e.V.  
Att.: Ingrid Bollens

Fax: +49 (0)911 / 81 02 88 – 28

Register before **23 July 2009**

### Participation fee:

Part I 28-29 July	Part II 13 – 14 Oct.	Both Tutorials	
.. 680.00 €	.. 580.00 €	.. 990.00 €	Industry
.. 580.00 €	.. 480.00 €	.. 850.00 €	University

The fee includes the tutorial dinner, lunch, coffee/soft drinks and handouts.

With the confirmation of seminar registration you will receive the invoice. (\* plus 19 % VAT); 50 % discount for ECPE Member Companies. In case of cancellation after 23 July 2009 or non-attendance 50 % of the participation fee are payable.

Number of participants is limited to 30 attendees.

Sender:

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title, given name, name

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company, department

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full address

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phone, fax

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e-mail

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date, signature

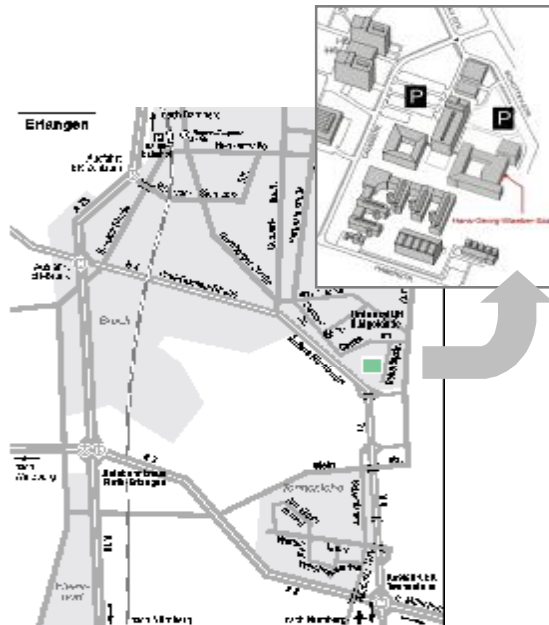
## Organisational information

Organiser: ECPE e.V.  
90443 Nuremberg, Germany  
[www.ecpe.org](http://www.ecpe.org)

Course instructor: Dr. Martin März  
Fraunhofer Institute IISB  
Dr. Uwe Scheuermann  
Semikron

Organisation: Ingrid Bollens, ECPE e.V.  
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[ingrid.bollens@ecpe.org](mailto:ingrid.bollens@ecpe.org)

Place of seminar: Fraunhofer Institute IISB  
Schottkystraße 10  
91058 Erlangen, Germany



Further information (hotel list and maps) will be provided after registration.



**ECPE European Center for  
Power Electronics e.V.**

## ECPE Tutorial

### Thermal Engineering of Power Electronic Systems

#### Part 1: Thermal Design and Verification

**28 - 29 July 2009  
Fraunhofer Institute IISB  
Erlangen, Germany**

## Introduction

### ECPE Tutorial “Thermal Engineering of Power Electronics Systems” Part I: Thermal Design and Verification

28 - 29 July 2009  
Erlangen, Germany

Thermal engineering of power electronic systems is a key to achieve high performance and reliability. In the focus of the new ECPE tutorial is the thermal simulation and verification of the SEMIKUBE IGBT converter which is equipped with thermal sensors for verification.

**Part 1:** At first the topology of the IGBT converter and it's components are described as well as the data sheet. Then the results of the electrical simulation are presented in regard to performance and thermal losses. The following sections deal with basics of heat conduction, convection and exchange. Practical examples will be used for a good understanding of cooling the hot parts in the system. After an introduction to analytical and FEM methods five groups are formed to exercise thermal simulations and measurements.

**Part 2:** After a detailed description of the results of the first part the impact of thermal behavior of the converter on the reliability is discussed in detail. The knowledge of functional requirements, mission profiles, physics of failure, thermal measurements (thermal images and impedance) are needed for building-in reliability and for the robustness validation process.

All presentations and discussions will be in English.

## Programme

### Tuesday, July 28, 2009

- 9:30 *Start of Registration*
- 10:00 **Welcome, Opening**  
T. Harder, ECPE e.V.
- 10:15 **Introduction:  
Programme of Tutorial**  
M. März, Fraunhofer IISB
- 10:30 **Description of SEMIKUBE IGBT  
Converter**  
A. Wintrich, Semikron Elektronik
- 12:30 *Lunch*
- 13:30 **Heat: Basics, Examples, Heat-  
Exchange**  
M. März, Fraunhofer IISB
- 15:30 *Coffee Break*
- 16:00 **Cooling**  
E. Wolfgang, ECPE e.V.
- 16:40 **Introduction to Finite Element  
Simulation**  
E. Rudnyi, CADFEM
- 17:20 **Wrap up 1<sup>st</sup> day**
- 17:40 **End of 1<sup>st</sup> Day**
- 19:30 *Dinner*

## Programme

### Wednesday, July 29, 2009

- 08:30 **Thermal System Simulation**  
E. Rudnyi, CADFEM
- 09:15 **Examples; Comparison between  
Analytical Calculation and FEM  
Simulation**  
E. Rudnyi, CADFEM
- 10:00 *Coffee Break*
- 10:30 **Experiments and Simulations**  
(in 5 groups I)  
E. Rudnyi, CADFEM  
M. Billmann, Fraunhofer IISB
- 12:00 *Lunch*
- 13:00 **Experiments and Simulations**  
(in 5 groups II)  
E. Rudnyi, CADFEM  
M. Billmann, Fraunhofer IISB
- 15:00 **Wrap up 2<sup>nd</sup> day**
- 15:30 **End of Tutorial**