Organisational Information

Sign up at: www.ecpe.org/events

Registration Deadline:

14 February 2024

Participation Fee:

€ 670,- *	for industry
€ 520,- *	for universities/institutes
€ 180,- *	for students/PhD student (limited spaces; copy of students ID required; dinner 50,-*)

* plus VAT

- The participation includes dinner, lunches, coffee/soft drinks and digital proceedings. The reduced (PhD) students fee includes all except for dinner (can be booked for an extra fee of € 50,-*)
- Digital proceedings will be provided by download link latest one day before start of the event. A printed handout is available on request (€ 50,-*).
- Upon receipt of registration confirmation via email you are signed-up for the event. The invoice will be sent via email.
- 25 % discount for participants from ECPE member companies.
- 10% discount on university/institute fee for participants from ECPE competence centres.
- Further information (hotel list and maps) will be provided after registration and can be found on the ECPE web page.
- Cancellation policy: Full amount will be refunded in case of cancellation upon to 2 weeks prior to the event. After this date 50 % of the fee is non-refundable (replacement is possible).

26/01/24

Organisational Information

Organiser	ECPE e.V. Ostendstrasse 181 90482 Nuremberg, Germany www.ecpe.org
Technical Chair	Prof. Francesco Iannuzzo, Aalborg University Dr. Johannes Jaeschke, Fraunhofer IZM Dr. Olaf Wittler, Fraunhofer IZM Dr. Saeed Peyghami, Aalborg University Prof. Huai Wang, Aalborg University
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Venue	Hannover Congress Centrum conference room: “Neuer Saal” Theodor-Heuss-Platz 1-3 30175 Hannover, Germany

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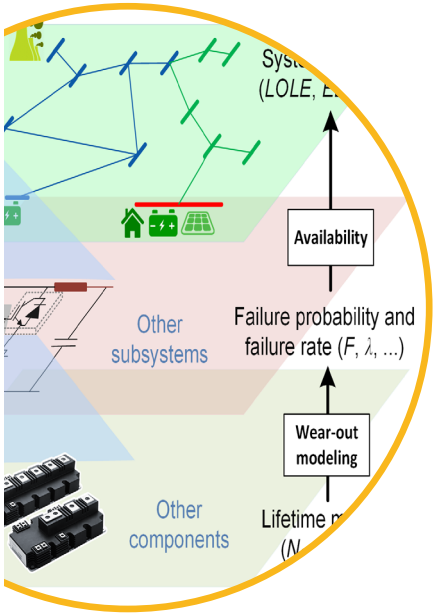
European Center for Power Electronics e.V.

ECPE Tutorial

Reliability of Power Electronics - Part 2: Robustness and System Reliability



20 – 21 February 2024
Hannover, Germany

ECPE Tutorial

Reliability of Power Electronics - Part 2: Robustness and System Reliability

20 – 21 February 2024
Hannover, Germany

Electrifying the world is one of the pragmatic solutions for reducing carbon footprint. Electric transportation, renewable energy generation, electric storage, smart and micro grid technologies, as well as digitalization are essential parts of sustainable electricity systems. These technologies are underpinned by power electronics as the core of their energy conversion process. The overall performance of modern energy systems relies on the reliable operation of power electronics which needs accurate and optimized design, planning and control of power converters.
This tutorial is divided into two parts: This second part “Reliability in Power Electronic Systems” briefly repeats some basics on reliability covered in part one “Reliability in Power Electronic Converters” and then goes on with specific aspects for systems reliability. Here, also fundamentals in artificial intelligence are introduced, case studies which use artificial intelligence for condition monitoring and intelligent maintenance are presented.
It aims to present the latest advances in physics-based reliability modelling and analysis in modern power electric based power systems (PEPS). Furthermore, the model-based techniques to cost-effectively enhance the reliability of power electronic systems will be addressed. Several examples will be provided illustrating the importance of power electronics reliability in overall power system performance as well as the effectiveness of the techniques in enhancement of overall system reliability.
The main goals as:
- Understanding reliability engineering and probabilistic analysis application in PEPS
- Model-based hierarchical reliability assessment in PEPS from device to power system level
- Model-based reliability management and enhancement in PEPS including design for reliability, control for reliability, and maintenance planning

This tutorial covers comprehensive concepts of reliability modelling, analysis and enhancement in power electronic based power systems. Therefore, it would be fruitful for graduate students and senior researchers both from industry and academia who are interested in converter design, grid modernization, reliability modeling and enhancement in power electronics based power systems.

Prerequisite: Visiting Part one “Reliability in Power Electronic Converters” is strongly recommended.

All presentations and discussions will be in English.

Programme

Tuesday, 20 February 2024

09:30 **Registration & Welcome Coffee**

10:00 **Welcome, Opening**
Gudrun Feix, ECPE e.V.

10:10 **Wrap-up Part 1**
- Basic Terms and Definition
- Failure Mechanism
- Module/ Device Reliability Models

Olaf Wittler

11:00 **Fundamental Concepts of Reliability Engineering**
- Definition of Reliability
- Device Level Reliability
- Converter Level Reliability
- System Level Reliability
- Fundamentals of Artificial Intelligence

Francesco Iannuzzo, Huai Wang

13:00 **Lunch**

14:00 **Case study on mission profile based lifetime and reliability analysis**
- Scope and purpose of the case study
- Accelerated degradation testing and data analysis for obtaining lifetime model parameters
- Mission profile modeling
- Lifetime prediction
- Reliability analysis
- Hands-on exercises based on provided template
- Discussions on lifetime and reliability analysis (assumptions, uncertainties, and limitations)

Huai Wang

15:15 **Coffee Break**

15:45 **Case study on mission profile based lifetime and reliability analysis - cont.**

16:30 **End of 1st Day**

19:00 **Dinner**

Programme

Wednesday, 21 February 2024

09:00 **Start of 2nd Day**

09:00 **Reliability and Availability Enhancement by Condition Monitoring in PES**
- Basics of physics-of-failure and data based monitoring approaches
- Strategies for RUL (Remaining Useful Lifetime) Calculation
- Condition monitoring based on damage sensitive indicators

Johannes Jaeschke

10:15 **Coffee Break**

10:40 **Model-based Hierarchical Reliability Analysis in PES**
- Introduction to power system reliability
- Incorporating power electronics reliability into power system reliability
- Model-based design for reliability

Saeed Peyghami

12:30 **Lunch**

13:30 **Reliability in PV Applications**
Daniel Clemens, Wolfram Dege, SMA Solar Technology

14:30 **Reliability in Railway Applications**
Oliver Schilling, Infineon Technologies

15:30 **Wrap up 2nd Day, Final Discussion, Feedback**

15:45 **End of Tutorial**

Course Instructors:
Daniel Clemens, Wolfram Dege,
SMA Solar Technology (DE)
Prof. Francesco Iannuzzo, Aalborg University (DK)
Dr. Johannes Jaeschke, Fraunhofer IZM (DE)
Dr. Saeed Peyghami, Aalborg University (DK)
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