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Electronics Cooling Thermal Design

Start date
19-05-2027

Location
Multiple locations

Price per participant
€2,050.00 excl. VAT.

Duration
If online: 5 half-day sessions / In person: 3 days

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Introduction

As industry pushes for more functionality, performance, miniaturization, and lower costs, heat densities rise—leading to higher temperatures that harm performance, reliability, and lifespan. This makes thermal design increasingly critical.

Optimizing thermal design is essential across applications like consumer electronics, semiconductors, power electronics, LEDs, automotive, data centers, and the Internet of Things.

This training stands out due to:

- Model-based system-level thermal design, with emphasis on integration of electronics and mechanical design.
- Learning by doing: live, interactive practical exercises and two case studies of modelling and analyzing a thermal system design.
- International peer group fostering global knowledge exchange and cross-industry insights.
- Worked exercises provide how-to examples of common engineering calculations for future reference.
- Taught by renowned expert Wendy Luiten, extensive domain knowledge through decades of industry experience.

Origin of the course
The famous 20+year old 3-day classroom course, originally intended for inexperienced as well as experienced participants, has been replaced by two modules to meet the requirements of modern times.

- Electronics cooling thermal design
- Advanced thermal management of electronics

We kept the excellent and high-quality contents. We addressed feedback from our previous trainings to change the original course:

- split up the thermal design part and the advanced cooling topics part;
- add much more time to digest the theory;

Practical information

Location
Multiple locations

Duration
If online: 5 half-day sessions / In person: 3 days

Frequency
Twice per year

Price
€2,050.00 excl. VAT.

Included
Course binder

Certification
HTI Certificate Microcredentials

Delivery
Open enrollment (for individual participation)
In-company (for a group of employees)

Your trainer

Wendy Luiten

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- provide more opportunities for hands-on practice;
- spend more time on current and future electronic cooling solutions.

The thermal design module allows for sufficient opportunities for practicing and achieving an active skill level for designing new thermal applications, evaluating existing thermal applications, and assessing computational simulation models.

The advanced part builds on this foundation and is scheduled several weeks later. This provides more time to get familiar with the material and facilitates the uptake of the advanced material.

We strongly advice not to attend only the thermal design part since the advanced thermal management course gives very valuable additional information to assist in preventing thermal problems.

Both trainings are available for open enrollment as well as for in-company sessions. For in-company sessions, the training can be adapted to your situation and specific needs.

Target audience

This thermal training course is intended for engineers (electronic, mechanical/mechatronic, reliability) directly involved with thermal design and cooling of electronic components, modules and systems, engineers confronted with thermal problems/issues, Thermal Engineers, System Architects, or those who want to understand and learn more about this subject of growing importance due to the electronification of society, be it automotive, LEDs, Internet-of-Things or data centers.

Prerequisites: technical college/university education.

Objective

The thermal training course focuses on recognition and prevention of thermal problems through optimal thermal design and architecture choices in all stages of the industrial product creation process - avoiding

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re-design, delayed time-to-market and associated costs in time and resources. It gives concrete guidelines to make the right thermal design choices on component, module and system level.

After the thermal (online) course, the participant:

- has obtained a basic understanding of heat transfer phenomena;
- knows how to apply this knowledge in practice;
- is able to make the right thermal design choices on component, module and system level;
- knows how to estimate when a thermal expert needs to be consulted;
- is able to communicate with thermal experts;
- is able to estimate the impact of system architecture, mechanical dimensions, material properties and heat dissipations on critical temperatures;
- is able to assess in-house or outsourced thermal computer simulations;
- knows the embedding of 'thermal design and cooling of electronics' in a system engineering context;
- has obtained an active skill level in thermal system design.

Method

In-depth Physics Lectures, Industry examples, Step-by-step methodology and many worked exercises and guided practice sessions on the theory (physics) of heat transfer, but also on identification of thermal requirements and how to design and calculate thermal systems, sub-systems and parts, how to verify a design by measurement or computer simulation, and how to optimize a thermal design. Two hands-on case studies from industry are included as guided team exercises.

Course material: 200+ page theory reader containing a copy of the slides of 17 modules, 60+ page exercise reader containing all exercises, worked exercises and worked case studies on thermal system models, board level and component level cooling fan-less air cooling or with fan and heatsinks.

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A copy of relevant papers on the topics is available on request.

Program

To allow for sufficient time to digest new information and to gather hands-on experience, the course has been enriched with homework assignments that can be attempted in the evening and will be discussed and demonstrated during the following lesson.

The content is based on cooling of electronics in a system engineering context, following the well-known V model of system level – subsystem level - component level, requirements flow down and capabilities flow up. Application of the system engineering concepts to the thermal domain and physics of heat transfer will be demonstrated and practiced.

Training time is divided roughly equally over theory and practice. Practice sessions will take the form of try-it-yourself exercises, followed by step-by-step guidance and demonstration.

Participants do not need to be familiar with thermal simulation or to have access to simulation software. All training exercises are spreadsheet (Excel) based. Thermal simulation will be demonstrated using commercially available CFD (Computational Fluid Dynamics) codes, but the concepts are also applicable to FEM (Finite Element Method) thermal codes.

The training material includes worked versions of the exercises.

The program of the training is as follows:

- Introduction, Thermal design plan, Training set-up;
- Specifications and Thermal requirements. Thermal requirements (Safety, Functionality/Performance, Reliability), Ideal and not-ideal thermal specifications;
- Steady State heat transfer. Heat and temperature, Thermal resistance (Conduction, convection, radiation), Heating a flow;
- Fins and Sinks. Rectangular, radial. Boxes;

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- Introduction to Thermal measurements. Thermal rules of Thumb. Transient heat transfer. Thermal ways of working. Step-by-step thermal problem solving. Guided exercise and demonstration of step-by-step plan;
- Step-by-step strategy for new thermal designs. Limitations of spreadsheet models. Thermal simulation. Guided exercise on thermal system design, followed by a demonstration of the same case using computer simulations. Question and Answer. Introduction of a case study;
- Cooling solutions. Discussion of the case study. Guided step-by-step solution of the case study. CFD verification;
- Summary.

What participants say

"If I describe the course in one sentence, I'd do this way: the course goes all the way from the physical terms definitions to the details of what cell in the Excel Sheet you have to use to find the fan's operation point."

Dzmitry Kushner

"Very good to see thermal engineering from a different perspective; It was also very much appreciated that the lecturer has much actual hand-on working experience in the field!"

Philipp Hager

"Overall, training was really good & informative. Got to learn many things from case study. Exercises helped to get more practical knowledge of this training."

Jinsha Ravindran - Philips Medizin Systeme Böblingen GmbH

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Ready to register?

Reserve your seat via our website or make a provisional reservation to hold your place while you finalize your plans.

Have questions?

We are happy to help you find the right course. Reach us at training@hightechinstitute.nl or call us at +31 85 401 3600.

About High Tech Institute

For more than 15 years, High Tech Institute has been helping engineers and tech professionals develop the skills needed to succeed in the high-tech industry. Through expert-led training programs, in-company courses, and industry events, we combine deep technical expertise with practical application.