

## Course program

### Fundamentals of drying technology

- Goals of drying: product quality and process efficiency
- Relevant material properties (sorption, water activity, glass transition etc.)
- Particle / product formulation by drying
- Drying methods, types of dryers, dryer selection

### Properties of wet air, capacity of convective dryers

- States and processes on psychrometric charts
- Adiabatic saturation temperature
- Air conditions in and capacity of convective dryers

### Moisture measurement techniques

- Gas moisture, particle/solids moisture

### Drying kinetics of single particles or droplets

- Wet bulb temperature, drying curve, drying periods
- Methods of measurement or of indirect determination
- Normalization, second drying period models
- Understanding drying with the help of pore networks

### Major drying processes: Equipment, dryer design, scale up

- Generic examples of convective dryer design
- Fluidized bed drying
- Spray drying
- Vacuum contact drying, freeze drying

### Special drying processes and applications, energy demand

- Atmospheric freeze drying, microwave and high-frequency drying, microwave vacuum / freeze drying, superheated steam drying, impingement drying, supercritical drying
- Energy use and savings

### Laboratory work (guided exercises and demonstrations)

- Various equipment for moisture measurement, particle characterization, drying
- Drying kinetics of droplets in the acoustic levitator
- Drying kinetics of particles in the magnetic suspension balance
- Batch and continuous fluidized bed drying

### Tutorials (guided practical computations and simulations)

- Exercises on material properties, wet air, dryer capacity
- Evaluation of drying kinetics for single droplets and particles
- Fluidized bed dryer design and scale-up (batch, continuous)
- CFD simulation of spray dryers

### Date and venue

**Otto von Guericke  
University Magdeburg**  
Bld. 10-110 and various labs  
Universitätsplatz 2  
39106 Magdeburg, Germany

**Start** Monday, 18<sup>th</sup> March, 2024, 1:00 p.m.

**End** Thursday, 21<sup>st</sup> March, 2024, 1:30 p.m.

### Contact

Prof. Dr.-Ing. Andreas Bück  
Phone +49 913185 29403  
Email [andreas.bueck@fau.de](mailto:andreas.bueck@fau.de)

## Attendance

Please register online, or by message to

**ovgu.gmbh**  
Mr. Felix Dieckmann  
Universitätsplatz 2  
39106 Magdeburg, Germany

**Online registration**  
[www.tvt.ovgu.de/Drying](http://www.tvt.ovgu.de/Drying)

Phone +49 391 67 52 773  
Mobile +49 176 433 70 666  
**Email: [operations@ovgu.gmbh](mailto:operations@ovgu.gmbh)**  
Subject: Professional Course Drying  
Required: Name, contact address,  
employer, billing address, online or  
on site participation

## Course fee

**1650 Euro (plus VAT, if applicable)**

The participation fee includes comprehensive course materials (lecture slides, notes on laboratory work and tutorials), refreshments, lunches, and dinner at the 3<sup>rd</sup> evening. Videos of lab work will be provided to online participants.

Please do not remit the course fee before receiving confirmation of attendance and the invoice. Upon cancellation before **March 4<sup>th</sup>, 2024**, we remit the fee less 50 Euro handling costs. Upon later cancellations no remittance is possible, however, the course documents will be sent. Furthermore you may nominate a substitute participant.

## Privacy policy

You have the right to withdraw the consent to use your data at any time.

Contact: Andreas Bück, [andreas.bueck@fau.de](mailto:andreas.bueck@fau.de).

## Accommodation

Hotel Ratswaage Magdeburg (15 min. walking distance) offers single rooms with breakfast and use of wellness facilities for a special rate upon availability.

Keyword: Professional Course Drying

Phone +49 391 5926192

E-mail: [reservierung@ratswaage.de](mailto:reservierung@ratswaage.de)

[www.ratswaage.de](http://www.ratswaage.de)



**THERMISCHE VERFAHRENSTECHNIK**  
OTTO-VON-GUERICKE UNIVERSITÄT MAGDEBURG

# Professional Course Drying

## Fundamentals and Applications



**March 18<sup>th</sup> – March 21<sup>st</sup>, 2024**  
**Hybrid event**  
**on site in Magdeburg, Germany**  
**and online**

### Organized by

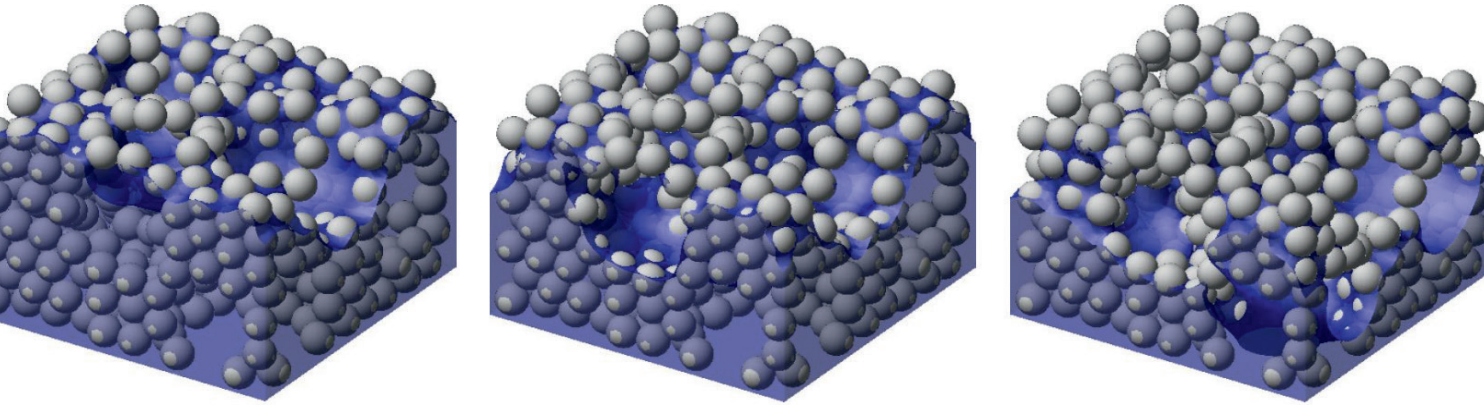
Prof. Evangelos Tsotsas, Otto von Guericke University Magdeburg,  
Chair of Thermal Process Engineering

Prof. Stefan Heinrich, Hamburg University of Technology,  
Institute of Solids Process Engineering and Particle Technology  
[ovgu.gmbh](http://ovgu.gmbh)



## Target audience

The course is designed for people from various backgrounds (engineers, chemists, food and pharmaceutical technologists) and with different levels of experience, who need to understand the fundamentals of modern drying technology and apply them to produce better solid / particulate products with more efficient drying processes. The course language is English.



## Topic

Almost every material used in solid form (from foods to pharmaceuticals, from minerals to detergents, from polymers to paper, from raw materials and commodities to highly formulated specialties) is dried during production. Drying technology is, therefore, a continuously developing field with various challenges referring to process design, development, operation and automation, to equipment selection, development and use, as well as to the preservation or even creation of desired product properties.

The purpose of the course is to provide the essentials of modern drying technology to the participants in a broad but compact way, at a high but understandable level close to practice. The course starts at the very beginning (why shall materials be dried and how can this be done?), and then discusses: elementary approaches and methods (how does the drying medium used relate to the capacity of the process and to the achievable product moisture?); drying kinetics (why are certain materials more difficult to dry than other ones?); dryer design and scale up methods (how long will drying of a specific product take, how big will the dryer need to be?);

instrumentation (how can gas moisture or even product moisture be measured and monitored in my equipment?); options and alternatives (why shall I use a certain drying method and the respective equipment, instead of another one?); and opportunities (how can I use drying for particle formulation, how can I reduce the energy demand of my process?).

This is done in three complementary ways: Lectures, laboratory work (demonstration of experimental methods and equipment in one of the leading laboratories in drying technology), and tutorials (ranging from simple exercises to solidify the understanding of principles, and the guided evaluation of data measured in the lab, to the application of modern computational tools for dryer design). Beginners in drying will take with them from the course the broad overview and the sound basis of skills that they need for their every-day work; experienced people will refresh their knowledge and renew their point of view up to the cutting-edge of drying technology in experimentation and modeling.



## Speakers

### From the Otto von Guericke University Magdeburg

Prof. Evangelos Tsotsas

Priv.-Doz. Dr.-Ing. Abdolreza Kharaghani

### From the Hamburg University of Technology

Prof. Stefan Heinrich

### External speakers

Prof. Andreas Bück, University Erlangen

Dr.-Ing. Michael Jacob, Glatt Ingenieurtechnik GmbH, Weimar

M. Sc. Arne Teiwes, Glatt Ingenieurtechnik GmbH, Weimar

Prof. Mirko Peglow, IPT-Pergande GmbH, Weißandt-Görlzau

Dr. Roland Wernecke, Dr. Wernecke Feuchtemesstechnik GmbH, Potsdam

Prof. Maciej Jaskulski, University of Lodz

