# Research group
# “Control Renewable Energy Systems (CRES)”

Christoph Hackl

Technische Universität München (TUM)
Munich School of Engineering (MSE)
Research group “Control of Renewable Energy Systems (CRES)”

www.cres.mse.tum.de

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Technical University of Munich, Germany

# Outline

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# Technische Universität München (TUM)

## Main campuses

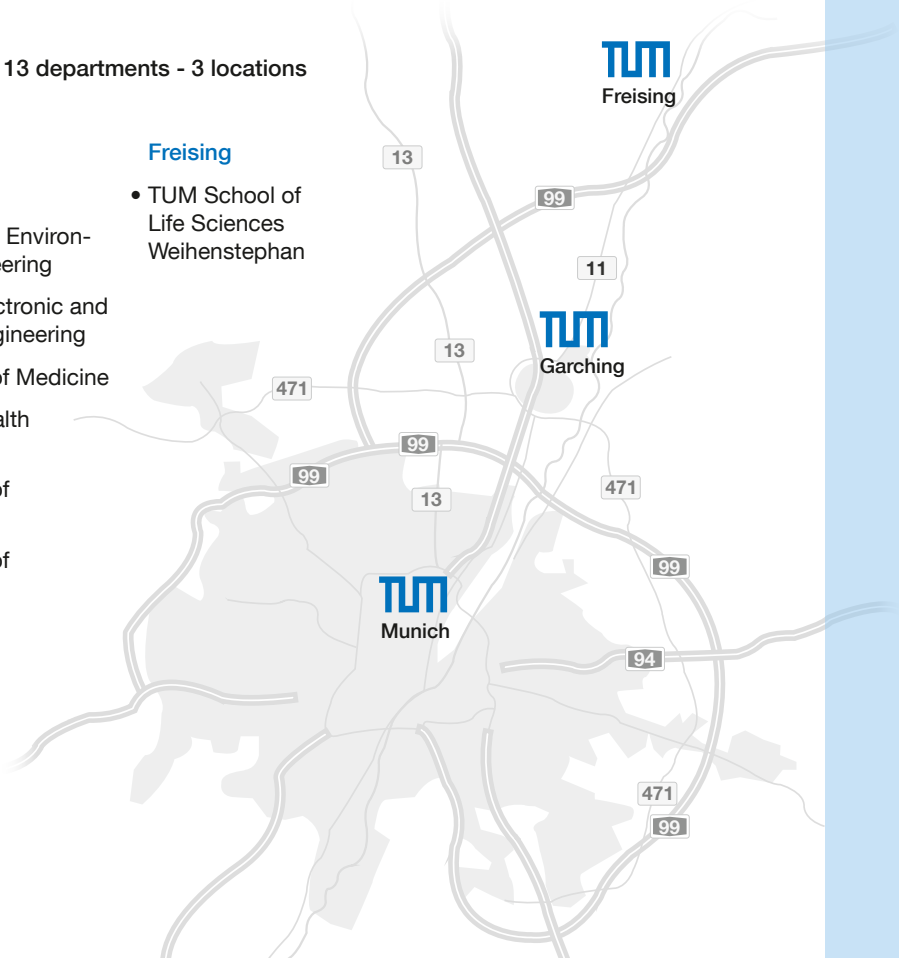
### Departments

**154 programs - 13 departments - 3 locations**

**Munich**
- Architecture
- Civil, Geo and Environmental Engineering
- Electrical, Electronic and Computer Engineering
- TUM School of Medicine
- Sport and Health Sciences
- TUM School of Education
- TUM School of Management

**Freising**
- TUM School of Life Sciences Weihenstephan

**Garching**
- Chemistry
- Informatics
- Mathematics
- Mechanical Engineering
- Physics



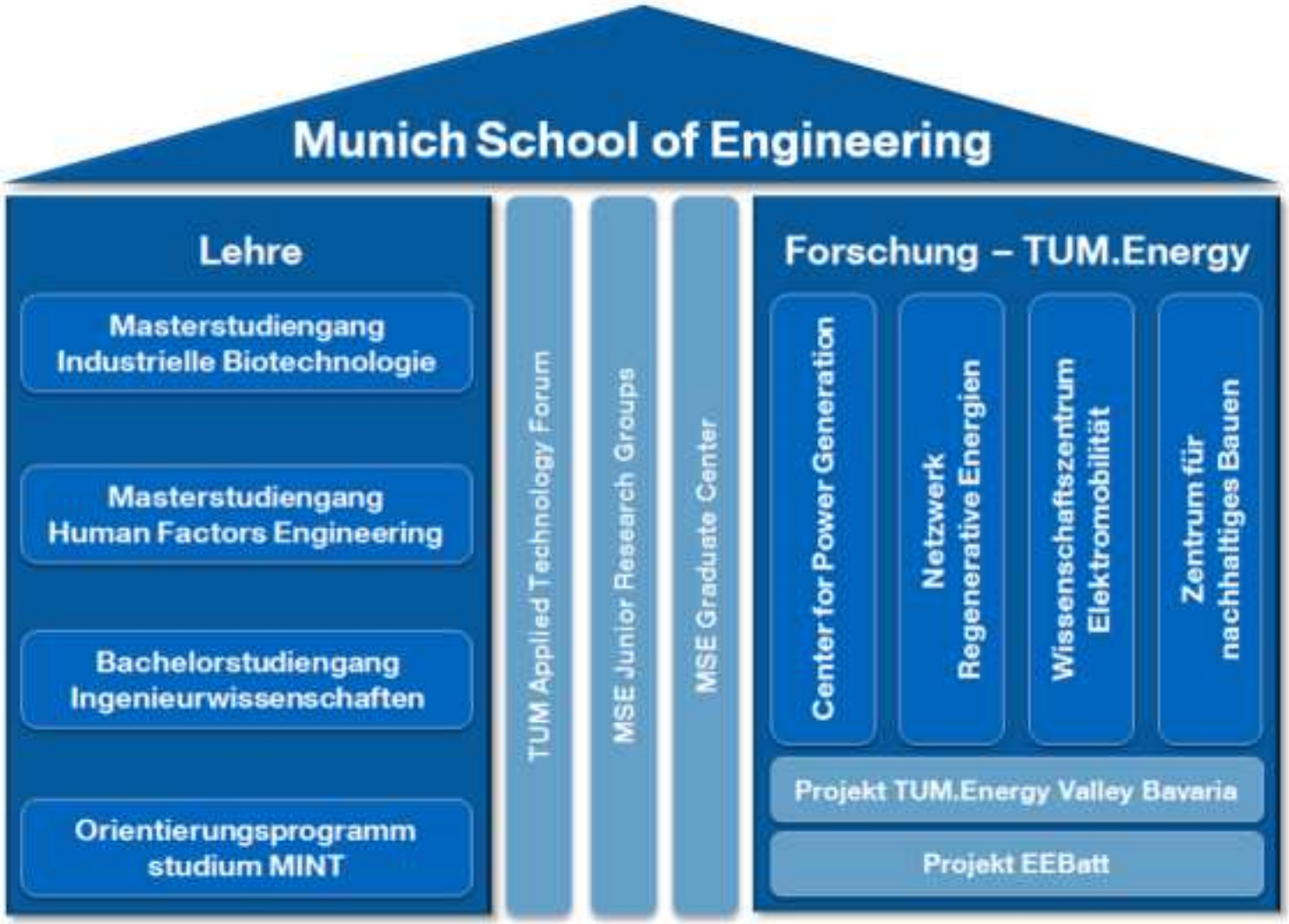

### Locations & Networks

**TUM science network**
- Max Planck Institutes: Garching Martinsried Munich
- Helmholtz Zentrum München
- iwb Anwenderzentrum Augsburg
- Fraunhofer Institutes: Holzkirchen Freising

**TUM locations**
- Munich
- Garching
- Freising
- Iffeldorf
- Obernach
- Straubing
- Wettzell
- Singapore: TUM Asia
- Beijing
- Brussels
- Cairo
- Mumbai
- São Paulo

# Munich School of Engineering (MSE)

## Integrative research center



# Group “Control of renewable energy systems (CRES)”

## Team

H. Eldeeb, M.Sc.
(CRES,09/2015)

C. Dirscherl, M.Sc.
(CRES,01/2014)

C. Hackl, Dr.-Ing.
(CRES,01/2014)

J. Kullick, M.Sc.
(CRES,10/2015)

K. Schechner, M.Sc.
(CRES,01/2014)

Z. Zhang, M.Sc.
(CRES/EAL,07/2015)

## External PhD candidates

S. Krüner, M.Sc.
(SINNPower,11/2015)

A. Birda, M.Sc.
(BMW,04/2016)

## . . . and collaborations with EAL (Prof. Kennel)

F. Bauer, M.Sc.
(EAL)

M. Abdelrahem,
M.Sc. (EAL)

# Group “Control of renewable energy systems (CRES)”

## Research projects

### Classical wind turbine systems

Focus: Efficiency and reliability

### Airborne wind energy systems

Focus: Fault-tolerant control

### Small-scale wind turbines

Focus: Use of RSMs ($\leqslant$ 50 kW)

### Wave converters (SINN Power)

Focus: Efficiency and reliability

### Geothermal power systems

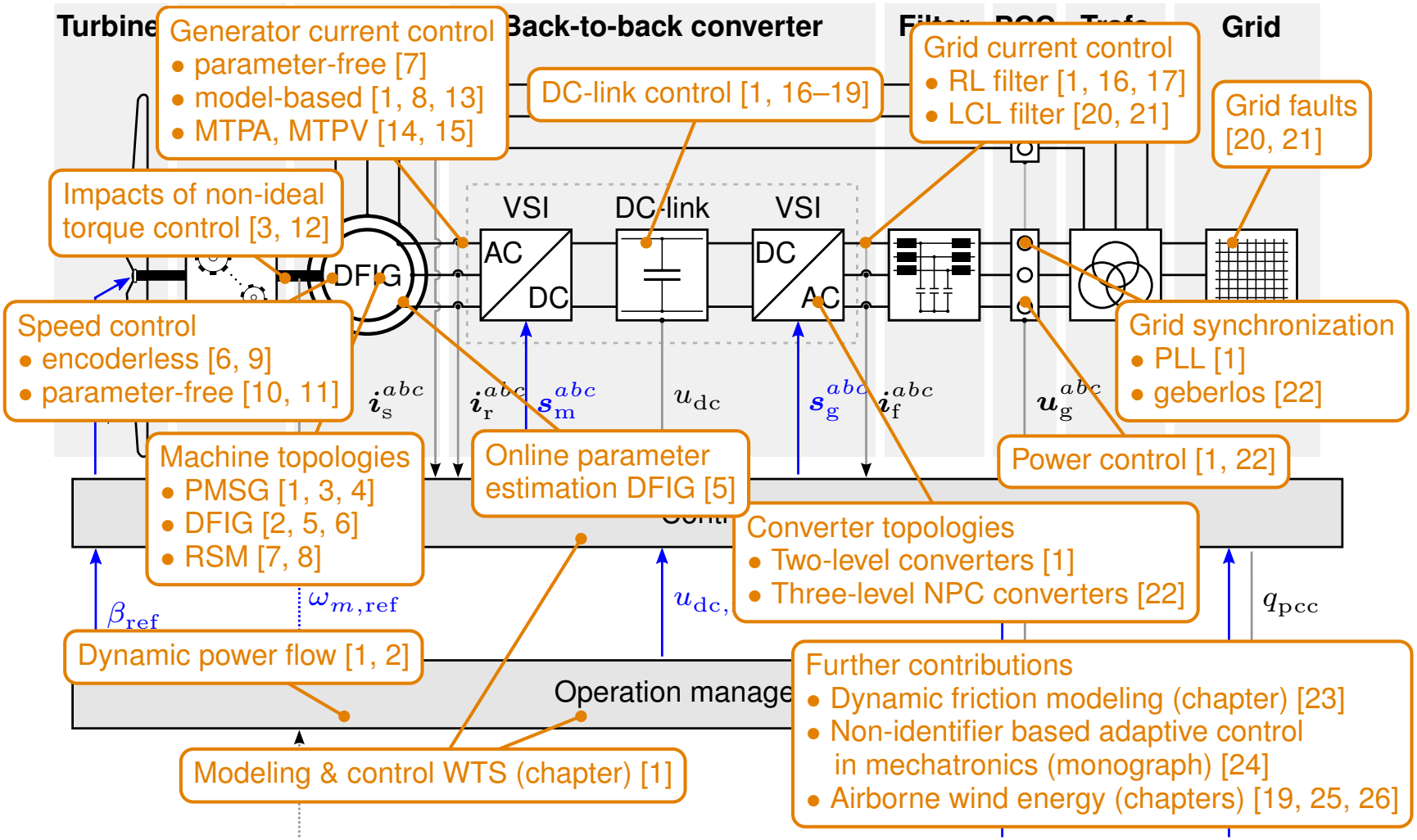

Focus: Fault-tolerant control

### Electric vehicles (BMW)

Focus: Optimal control

# Group “Control of renewable energy systems (CRES)”

Point of view and publications: **Electrical** components of e.g. large-scale wind turbine systems



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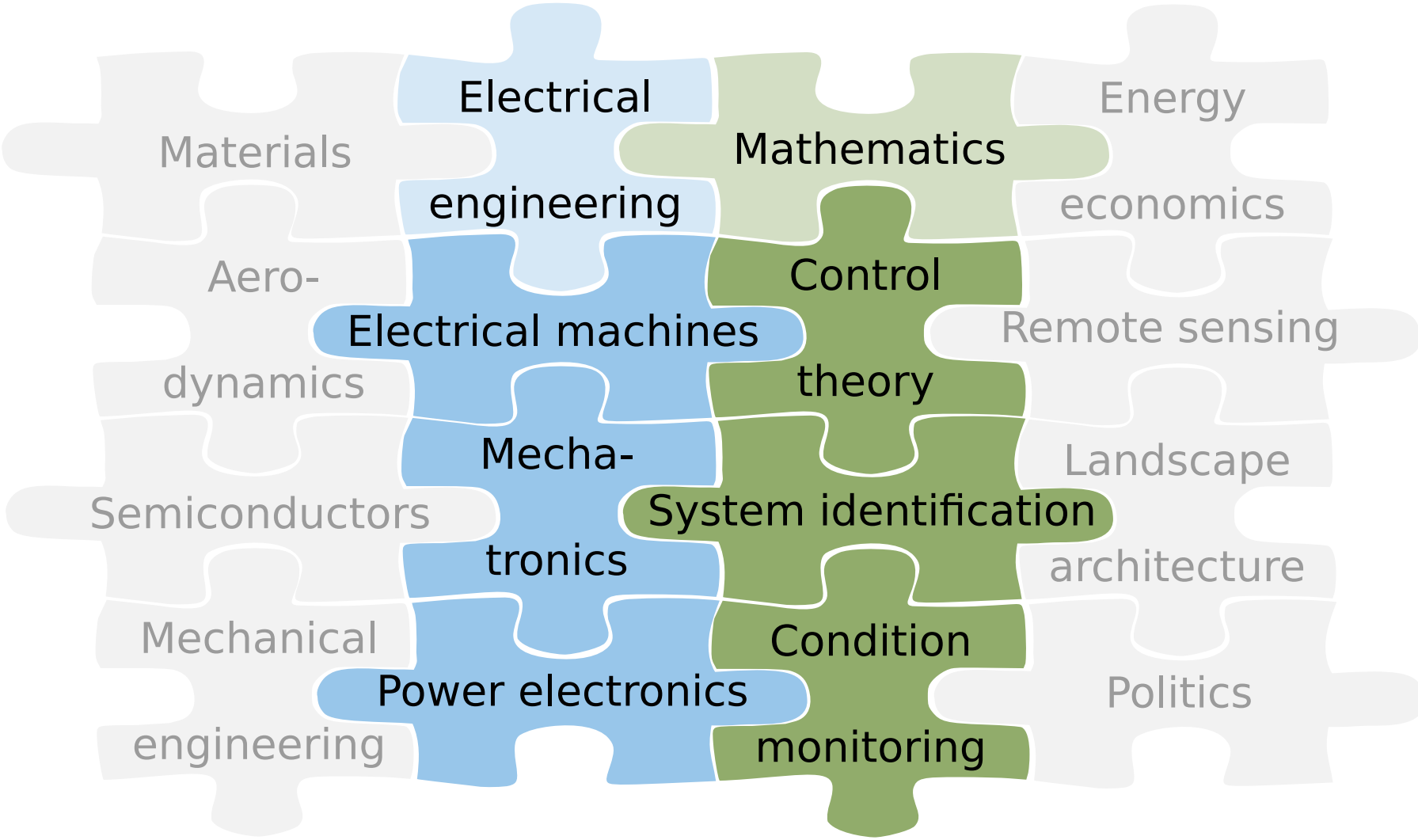
## Interdisciplinary approach



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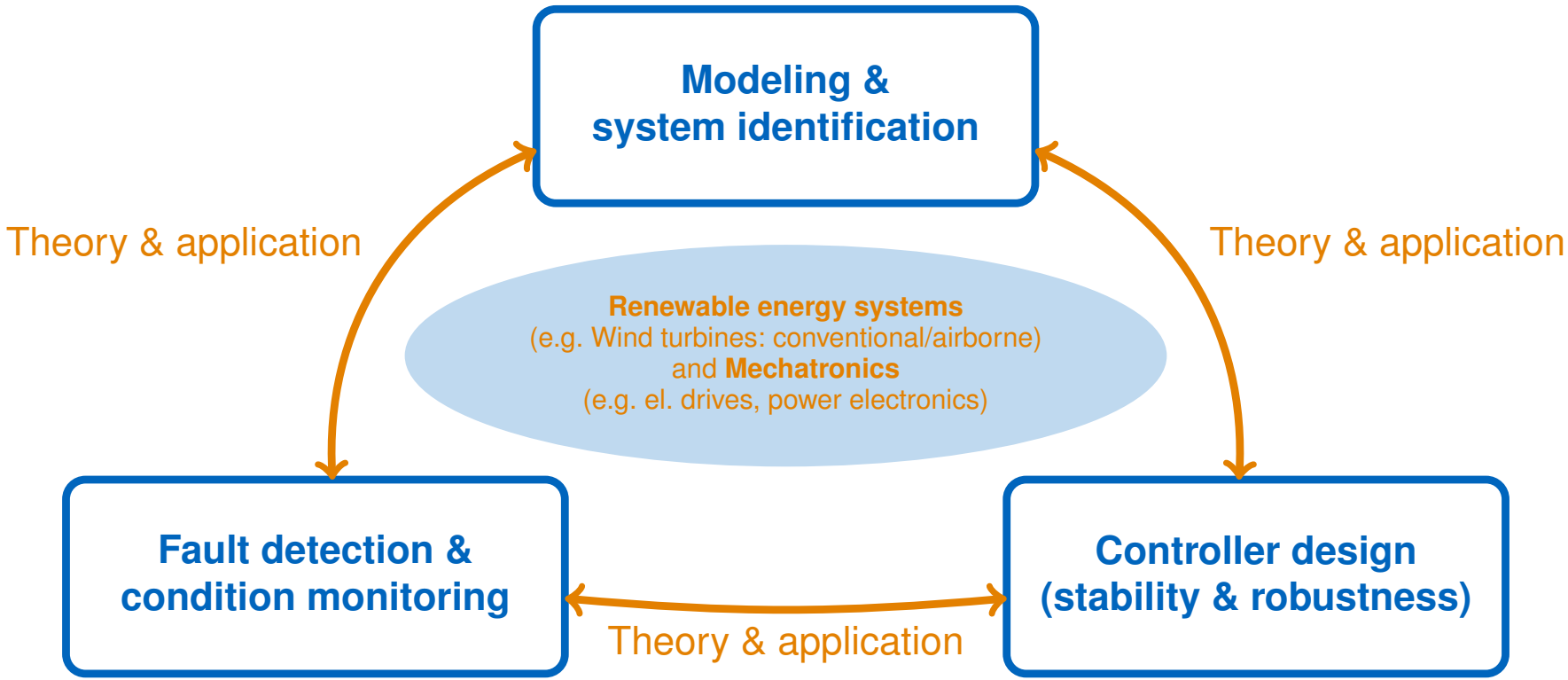
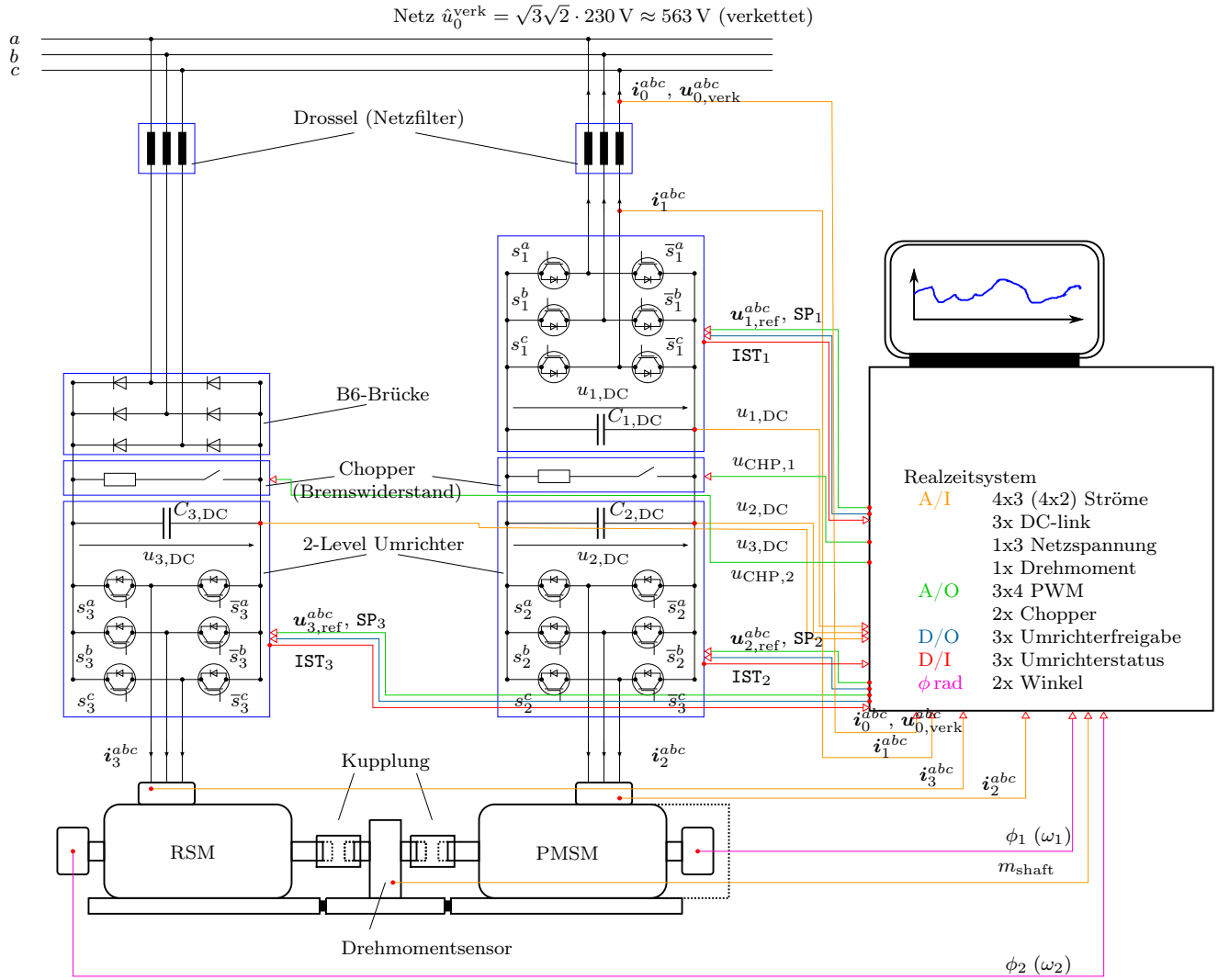
## Research concept



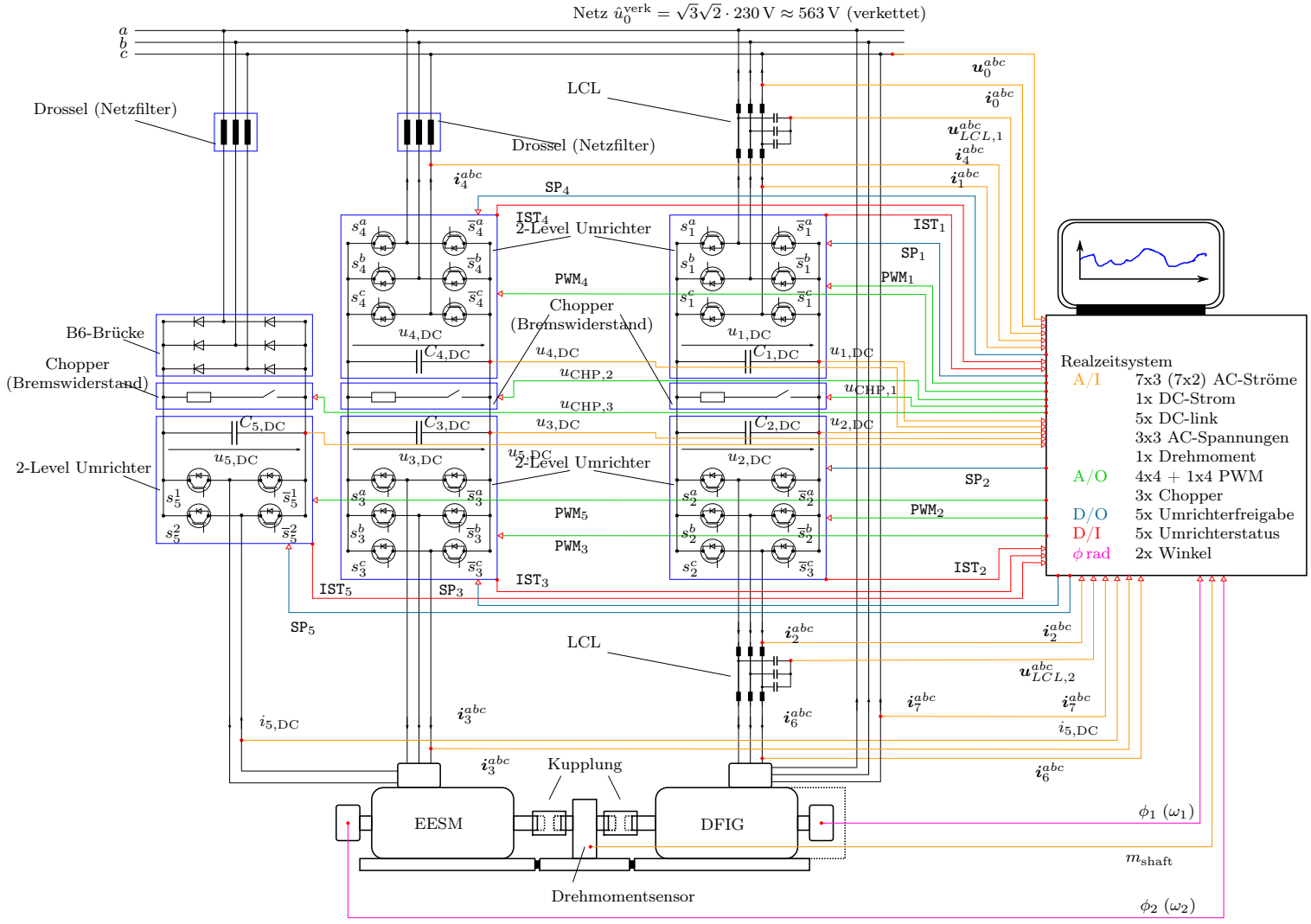
# Group “Control of renewable energy systems (CRES)”

## Laboratory setup 1: Reluctance and permanent-magnet synchronous machine



# Group “Control of renewable energy systems (CRES)”

## Laboratory setup 2: Electrically-excited synchronous machine and doubly-fed induction machine



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## Laboratory setup: Some photos

### Reluctance and Permanent-magnet SMs

### Electrically-excited SM and doubly-fed IM

### Real-time system and VSIs

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