Teaching and Research at Technische Universitaet Muenchen
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Technische Universität München
Arcisstr. 21
80333 München
Germany
Technische Universität München

TUM facts & figures:
- 13 faculties
- 23,000 students
- 18% international students
- 364 professors
- 3,600 teaching staff
- 2,900 non-teaching staff
The Department – Some Figures

- 2230 students
- 36 professorships
- 300 assistant lecturers and scientific staff, more than 50% third-party funded
- 100 technical staff and administration
- 30,000 m² floor space

Location: TUM inner city campus, München
Undergraduate Studies

Bachelor of Science
Elektrotechnik und Informationstechnik

Fundamentals
- Physics
- Information Technology
- Mathematics
- Electrical Engineering
- Signals & Systems

Special subject
- Optional Modules
- Bachelor Thesis

Professional skills
- Engineering Exercise
- Soft Skills (FIQ)

Duration: 6 semesters
Graduate Studies

Master of Science
Elektrotechnik und Informationstechnik

Core Subjects
- Mandatory Modules
- Optional Modules

Supplementary courses
- Optional Modules
- Voluntary Modules

Master Thesis
(possibly industry cooperation project)

Research Experience
- Research Project
- Team Project

Duration: 4 semesters

Institute for Electrical Drive Systems & Power Electronics
Prof. Dr.-Ing. Ralph Kernel
Arcisstr. 21, D-80333 Munich
International Study Course MSCE

- M.Sc. in Communications Engineering
- aimed at students from abroad
- instruction exclusively in English
- two specializations:
  - Communications Systems CS
  - Communications Electronics CE
- renowned guest lecturers
- 4 semesters course duration
- obligatory internship in industry
- ≈ 600 applicants p. y., intake 50
- students from more than 14 countries
Some highlights:
- Double master program with Georgia Institute of Technology
- Double diploma program with French Grandes Ecoles
- Chinese-German Lectures at Tongji-University Shanghai (CDHK)
- American European Engineering Exchange Programm
## Institutes and Fields of Research

### Power Engineering
- Energy Conversion Technology (EWT, Prof. Herzog)
- High Voltage Technology and Power Transmission (HSA, Prof. Kindersberger)
- **Electrical Drive Systems and Power Electronics (EAT, Prof. Kennel)**
- Energy Economy and Application Technology (EWK, Prof. Wagner)
- Power Transmission Systems (EEN, Prof. Witzmann)

### Information and Communication Technology
- Communications Engineering (LNT, Prof. Kötter)
- Data Processing (LDV, Prof. Diepold)
- Real-Time Computer Systems (RCS, Prof. Chakraborty)
- Communication Networks (LKN, Prof. Eberspächer)
- Human-Machine Communication (MMK, Prof. Rigoll)
- Communications and Navigation (NAV, Prof. Günther)
- Media Technology (LMT, Prof. Steinbach)
- Line Transmission Technology (LUT, Prof. Hanik)

### Electronics
- Physics of Electrotechnology (TEP, Prof. Wachutka)
- Technical Electronics (LTE, Prof. Schmitt-Landsiedel)
- Medical Electronics (LME, Prof. Wolf)
- Semiconductor Technology (WSI, Prof. Amann)
- Micro-Mechatronical Systems (MMS, Prof. Schwesinger)
- Gender Studies in Engineering (GEN, Prof. Ihsen)
- Bio-inspired Information Processing (BAI, Prof. Hemmert)

### Circuits and Systems
- Circuit Theory and Signal Processing (NWS, Prof. Nossek)
- Integrated Systems (LIS, Prof. Herkersdorf)
- Electronic Design Automation (EDA, Prof. Schlichtmann)
- High-Frequency Engineering (HFT, Prof. Eibert)
- Nanoelectronics (NANO, Prof. Lugli)
- Signal Processing Methods (MSV, Prof. Utschick)
- High Frequency Fields and Circuits (HFS, Prof. Detlefsen)
- Microwave Engineering (HOT, Prof. Biebl)

### Automation and Autonomous Systems
- Automatic Control Engineering (LSR, Prof. Buss)
- Measurement Systems and Sensor Technology (MST, Prof. Koch)
- Information-oriented Control (ITR, Prof. Hirche)
Rankings

Spiegel: TUM ranked best university in Germany, EE&IT ranked among the 5 best (11.12.06)

karriere: EE&IT among the 4 best departments (23.05.06)

FOCUS: TUM ranked best german EE&IT department (20.05.07)

ZEIT (CHE-Ranking): Study conditions among the 6 best universities (2007)
Cooperation Partners

SIEMENS
Infineon
RichWave
freescale
VATTENFALL
CLAAS
EPCOS
RWE
VERTILAS
D+E
TILL PHOTONICS
Linde
MunEDA
ZF
SPINNER
UE
MICRO-EPSILON
VBEW
Continental
BMW
VDE
ROHDE & SCHWARZ
DFS Deutsche Flugsicherung
continent

vodafone

Texas Instruments
EADS

Microsoft

Technische Universität München

Institute for Electrical Drive Systems & Power Electronics
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Arcisstr. 21, D-80333 Munich

and many more...
TUM is excellent!

The **Excellence Initiative** is the state-funded promotion of top-level research to improve the quality of German universities and research institutions.

Funding of:

- TUM – the Entrepreneurial University
- Research Cluster "Cognition for Technical Systems" (CoTeSys) lead-managed by the department
- TUM International Graduate School of Science and Engineering (IGSSE) with participation of our department

Institute for Electrical Drive Systems & Power Electronics
Prof. Dr.-Ing. Ralph Kennel - Arcisstr. 21, D-80333 Munich
Large-scale Research Funding

Funding by

- Federal Ministries and Agencies (BMBF, BMWi)
- European Union
- German Research Foundation (DFG)
- Bavarian Research Foundation

DFG Collaborative Research Centers (SFB) and Priority Programs (SPP)

- **SFB 631** Solid-State Quantum Information Processing
- **SFB 453** High-Fidelity Telepresence and Teleaction
- **SFB-TR 28** Cognitive Automobiles
- **SPP 1397** Communications in Interference Limited Networks (COIN)
- **SPP 1395** Information and Communication Theory in Molecular Biology (InKomBio)
- **SPP 1305** Control Theory for Digitally Networked Dynamic Systems
- **SPP 1202** Ultra-Wideband Radio Technologies for Communications (UKoLoS)
- **SPP 1183** Organic Computing
- **SPP 1163** TakeOFDM
Institute for Power Engineering
Prof. Dr.-Ing. Ulrich Wagner

- Analysis and Modelling of Energy Demand Structures
- Innovative Energy Conversion Systems
- Modelling & Evaluation of New Energy Supply Technologies
- Renewable Energies
- Life Cycle Analysis

Final energy demand by consuming sectors and types of use for the Federal Republic of Germany 2007

Building N8, 2nd floor
www.ewk.ei.tum.de
Power Transmission Systems

Prof. Dr.-Ing. Rolf Witzmann

- Integration of Renewable Energy Systems
- Power Quality with Distributed Fluctuating Generation
- Electromobility and Distribution Systems
- Network Connection of Large Offshore Windpower
- Stability of Large Interconnected Power Systems
- Modelling of Components and Systems

Building N2 / 3rd floor
www.een.ei.tum.de
High Voltage Technology
Prof. Dr.-Ing. Josef Kindersberger

- Polymeric Dielectrics for High Voltage Insulation
- High Voltage Apparatus and Switchgear – Diagnosis, Surface Charges, DC-Voltage-Stress
- High Current Joints
- Electromagnetic Compatibility in Power Engineering

Building N2 / 3rd Floor
www.hsa.ei.tum.de
Energy Conversion Technology
Prof. Dr.-Ing. Hans-Georg Herzog

- Energy Management
- Energy Storage
- Electric Drives in Medical Engineering
- Design and Optimization of Electro-Mechanical Actuators
- Transient Performance of Electro-Mechanical Actuators
- Multidimensional Field Calculation
- Using New Materials in Electro-Mechanical Actuators

Building N3, 1st floor
www.ewt.ei.tum.de
Electrical Drive Systems and Power Electronics
Prof. Dr. Ralph M. Kennel

- Dynamic Drives for Industrial Applications
- Drive Control
- Hardware-in-the-Loop Systems
- Non-identifier Based Adaptive Control of Mechatronic Systems

Building 9, Room Z904
www.eal.ei.tum.de
Institute for Electrical Drive Systems & Power Electronics

Prof. Dr.-Ing. Ralph Kennel
Prof. Dr.-Ing. Ralph M. Kennel

- 1984 Ph.D. at University of Kaiserslautern, Germany
- 1984 – 1997 Development of Industrial Servo Drives with Digital Control, Robert BOSCH GmbH, Erbach/Odw., Germany
- 1997 – 1999 Advanced Development of Electrical Drives for Automotive Applications, Robert BOSCH GmbH, Buehlertal, Germany
- 1994 – 1999 Visiting Professor at the University of Newcastle upon Tyne, UK
- 1999 – 2008 Professor for Electrical Machines & Drives at Wuppertal University, Germany
- since 2008 Professor for Electrical Drive Systems & Power Electronics at Technische Universität München, Germany
Prof. Dr.-Ing. Ralph M. Kennel

- 2007/08  German Reviewer (with UK colleagues) in the UNDP Program for Evaluating Universities in Arab Countries
  → University of Yemen, Sana‘a

- since 2008  Vice President Meetings
  IEEE-PELS

- since 2008  Treasurer
  IEEE Germany Section
Collaborations

Education
University of Newcastle upon Tyne, United Kingdom
Technical University of Warsaw, Poland

Research

- University of Stellenbosch, South Africa
  2 NRF/DFG funded collaboration research projects
- BAUMÜLLER, Nürnberg, Germany
- DLR, Oberpfaffenhofen, Germany
- MACCON, München, Germany
- hitex, Karlsruhe, Germany
Main Research Areas

1. Dynamic Drives for Industrial Applications
2. Drive Control (progressive concepts)
3. Hardware-in-the-Loop Systems
Dynamic Drives for Industrial Applications

- Sensorless Control for Synchronous and Asynchronous Machines → this is our main topic #1

- Ultra High Speed Drives (finished)
• Predictive Control of Inverters and Drives
  → this is our main topic #2

• Optimal PWM

• Adaptive Control of Mechatronic Systems
Hardware-in-the-Loop Systems

- High Power Current Source Inverters (finished)
- Multilevel Inverters
- Serial Connection of Inverter Switches (e.g. IGCTs)
- Driving High Power IGBTs with Shaped Gate Voltages and Currents → this is our main topic #3

- Virtual Machine
thank you for listening!!