Prof. Thomas Mikolajick (Dean of Studies)
Manuela Tetzlaff (Study Advisor)

Welcome and Information Meeting Master's Program Nanoelectronic Systems (NES)

Dresden, 22 October 2020

Welcome and general information

Get to know each other

Useful information for your studies

Welcome by dean of studies

Prof. Dr.-Ing. Thomas Mikolajick

Initiated by Cool Silicon cluster

Cool Silicon: Leading-Edge Cluster with the goal of energy efficiency in the information and communications technology (ICT) sector

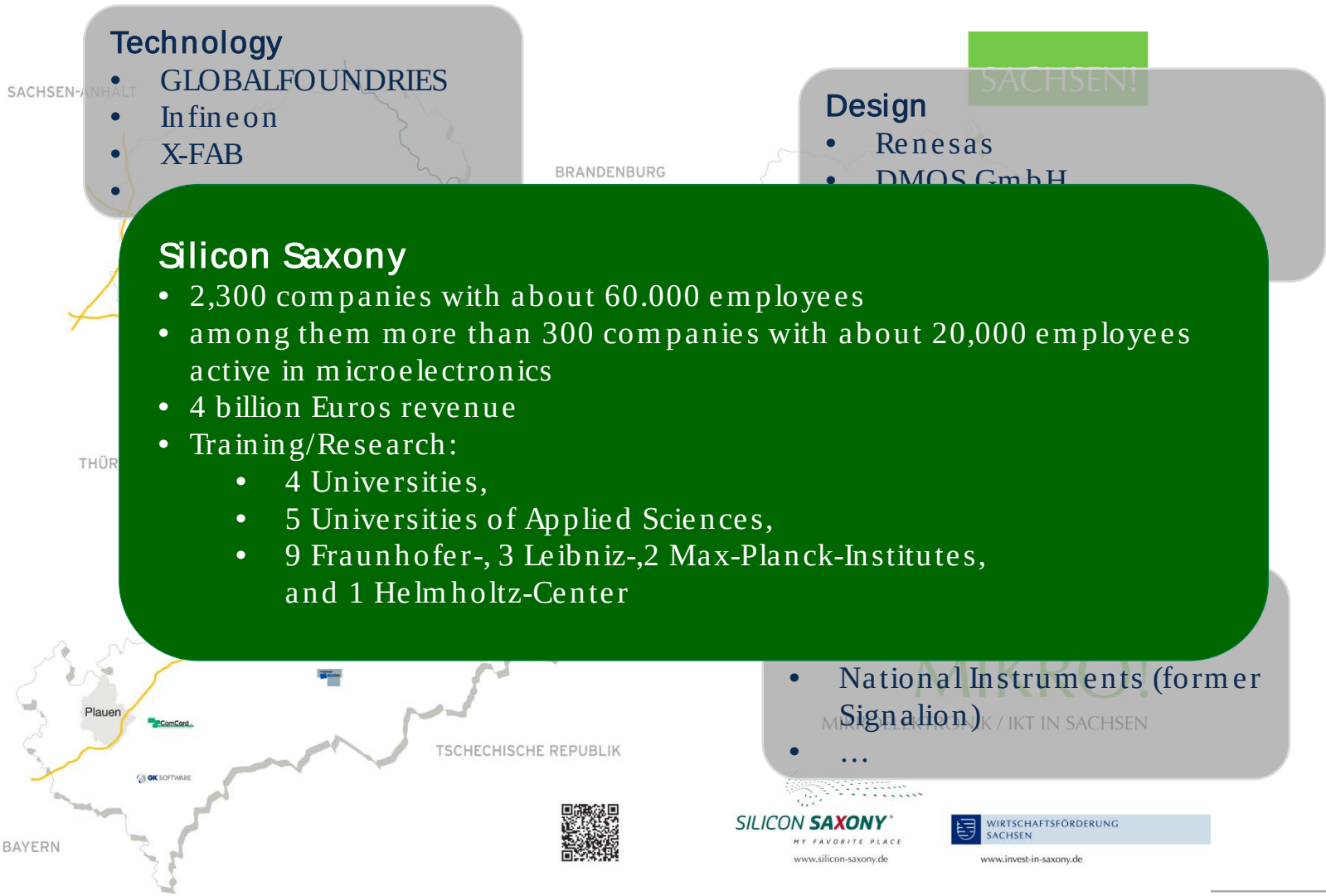
COOL SiLiCON

COOL Computing

COOL Reader

COOL Sensornet

Nanoelectronics in Saxony



Technology
- GLOBALFOUNDRIES
- Infineon
- X-FAB
-

Design
- Renesas
- DMOS GmbH

Silicon Saxony
- 2,300 companies with about 60.000 employees
- among them more than 300 companies with about 20,000 employees active in microelectronics
- 4 billion Euros revenue
- Training/Research:
  - 4 Universities,
  - 5 Universities of Applied Sciences,
  - 9 Fraunhofer-, 3 Leibniz-,2 Max-Planck-Institutes, and 1 Helmholtz-Center

- National Instruments (former Signalion)
- …

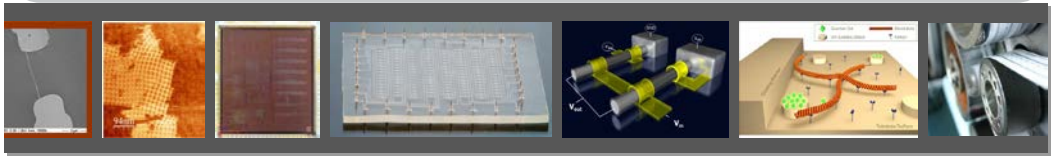
Nanoelectronics in research

cfaed CENTER FOR ADVANCING ELECTRONICS DRESDEN

„Advancing Electronics“

→ New perspectives for modern electronics

→ Overcoming the CMOS bottlenecks with complementary technologies



Electrical Engineering | Computer Science

Expertise:

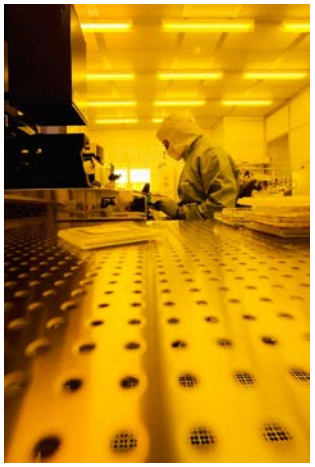
Physics | Chemistry | Biology | Mathematics

Engineering and natural sciences

Nanoelectronics at TU Dresden

- **Micro-, Opto- and Nanoelectronics** is one research focus of TU Dresden

- **Faculty of Electrical and Computer Engineering**
  - one of the oldest faculties for electrical engineering in Europe
  - one of the largest faculties for electrical engineering in Germany
  - Prof. Barkhausen was the founder of the first Low Power Technology Institute



- **Institute of Semiconductors and Microsystems** (IHM)
  - 411 m^2 Clean Room Laboratory (built 2006, extended 2013)
  - NaMLab gGmbH (2009)
  - Chair of Nanoelectronics
- **Institute for Applied Physics** (Photo Physics, Semiconductor Physics)

- **Institute for Material Science**

Faculty of Electrical and Computer Engineering

Faculty Facts

- 28 full professors
- 4 junior professors
- 420 PhD Students
- 400 scientific employees
- 2.300 Students
- approx. 25 million Euro third party funding every year

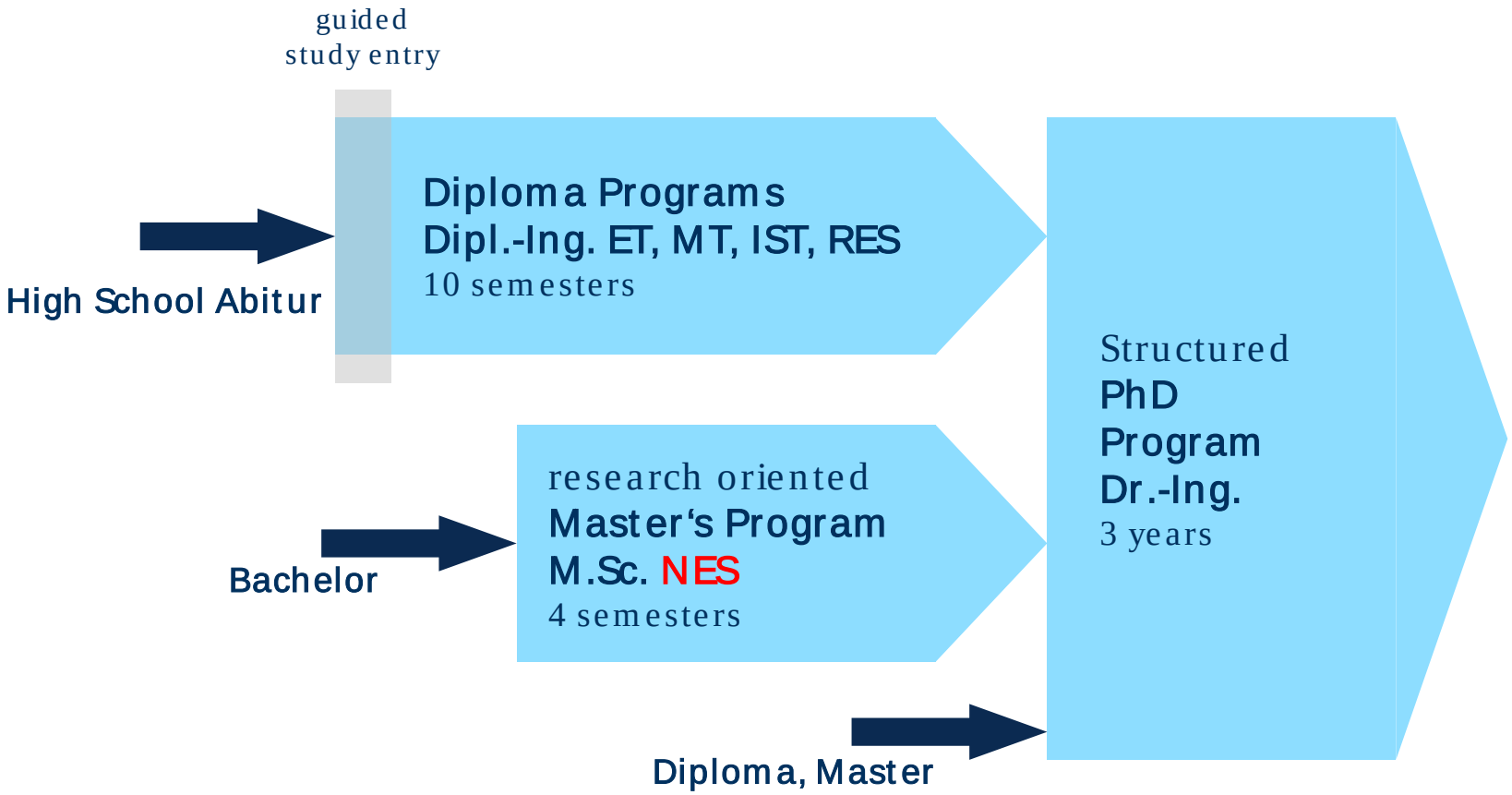
Research Fields

- Automation, Measurement & Control
- Communications Engineering
- Electrical Power Engineering
- Electromechanical and Biomedical Systems
- Information Electronics
- Micro-Opto-Nano Electronics

FAKULTÄT ELEKTROTECHNIK
UND INFORMATIONSTECHNIK

Faculty of Electrical and Computer Engineering

Scientific and research oriented education



Welcome and general information

Get to know each other

Useful information for your studies

Get to know each other

Sort by given name

- Short information about your person (name, age, family, hobbies…)

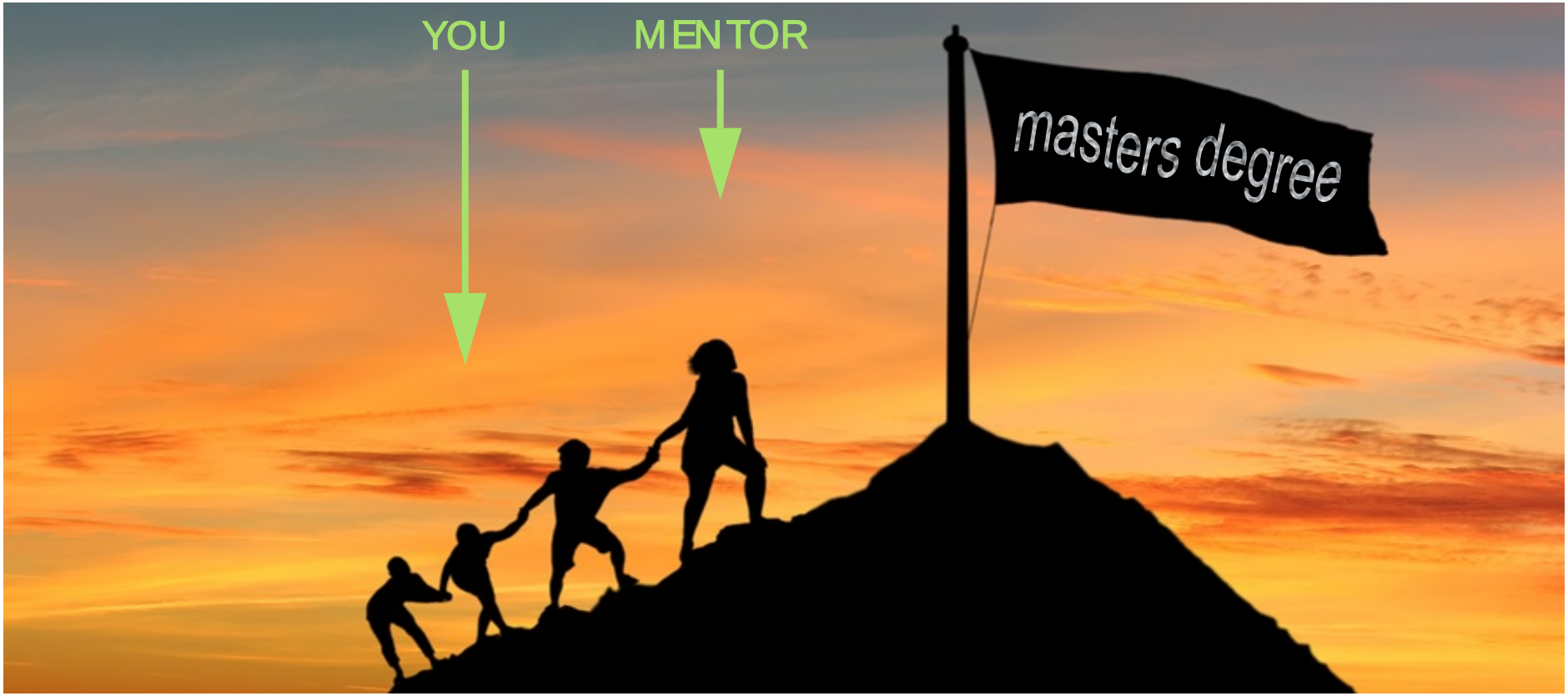
Sort by distance of your home town from the TU Dresden

- Where do you come from?
- Why did you come to Dresden?
- What did you do before (School, Studying, Work)?

What is your interest in the master‘s program?

- What is your motivation for studying Nanoelectronic Systems?
- What is your main interest?

NES student mentoring program



Welcome and general information

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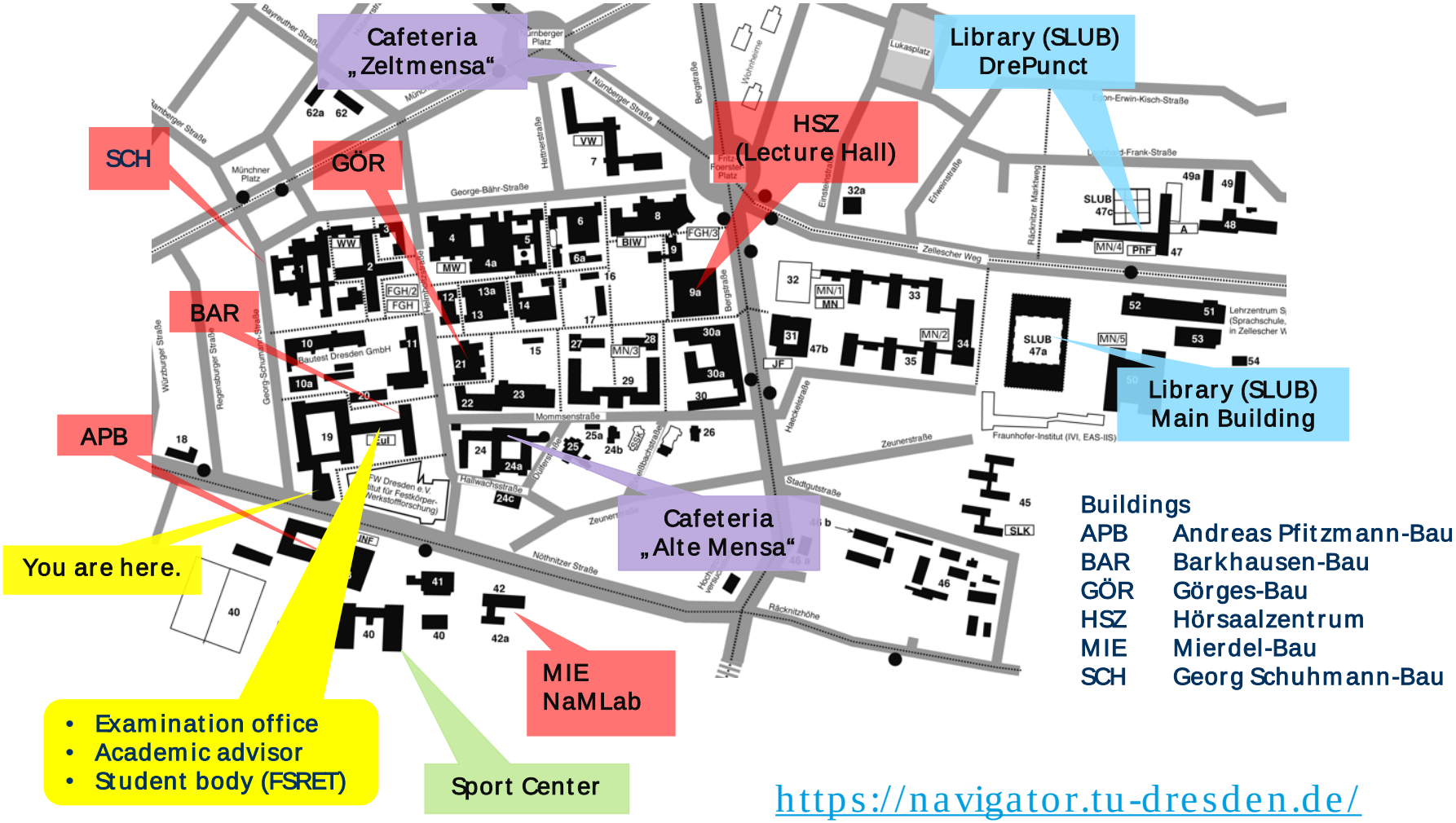
Useful information for your studies

Orientation on TUD main campus



https://navigator.tu-dresden.de/

Important dates of the academic year

Winter Semester 2020/2021

01.10.2020 - 31.03.2021

- Courses and lectures: **26.10.2020 - 19.12.2020**
  04.01.2021 - 06.02.2021

- Lecture-free periods and bank holidays:

31.10.2020	Reformation Day
18.11.2020	Day of Prayer and Repentance
20.12.2020 - 03.01.2021	Turn of the year
08.02.2021 - 31.03.2021	Lecture-free period

- **Main examination period: 08.02.2021 – 06.03.2021**

Time Pattern at the TU Dresden

Standard class times at TU Dresden

DS: „Doppelstunde“, double period

1 DS = 90 min

1. DS: 07:30 - 09:00 am
2. DS: 09:20 - 10:50 am
3. DS: 11:10 - 12:40 am
4. DS: 01:00 - 02:30 pm
5. DS: 02:50 - 04:20 pm
6. DS: 04:40 - 06:10 pm
7. DS: 06:30 - 08:00 pm
8. DS: 08:20 - 09:50 pm

SWS: „ Semesterwochenstunden”, weekly lecture hours

1 SWS = 45 minutes

1 DS = 2 SWS = 90 minutes

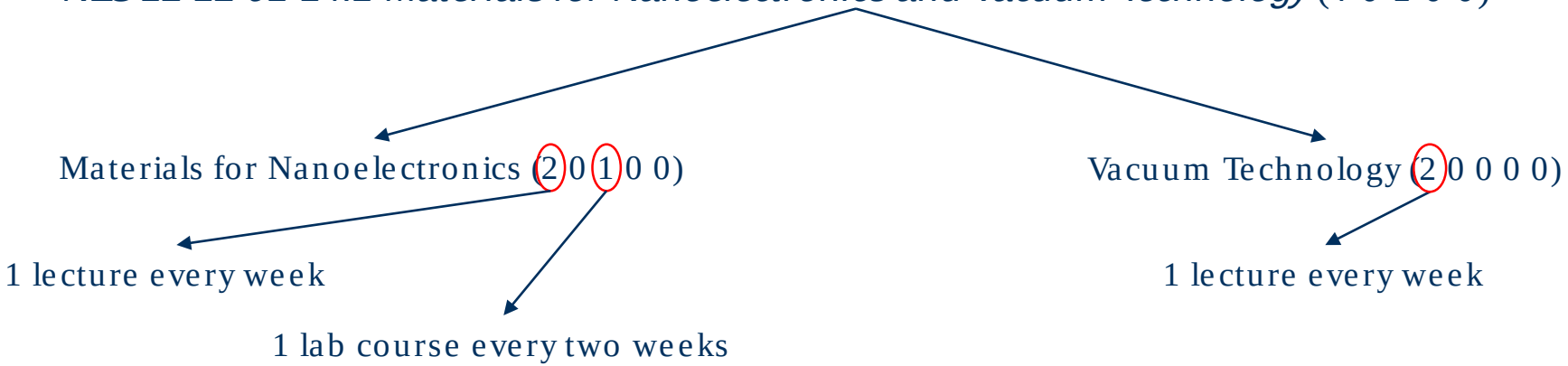
1 SWS equals a lesson of 45 minutes per week for one semester; however, most courses at the TU last 90 minutes (double lesson = 2 SWS)

Modules

NES-00 00 00 MODULE NAME (lectures/tutorials/seminars/language courses/labs)

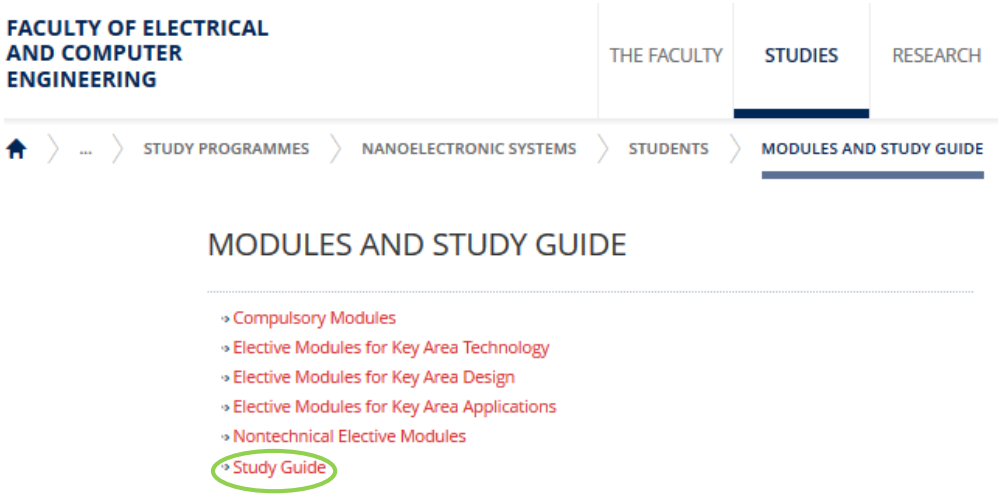
Example:

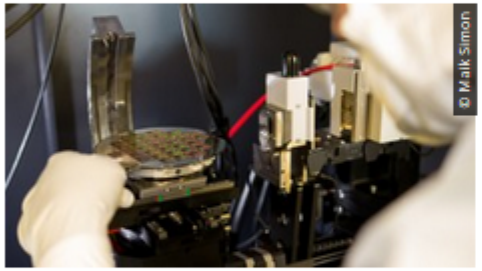
NES-12 12 01-14.1 Materials for Nanoelectronics and Vacuum Technology (4 0 1 0 0)



Module number	Module name	Lecturer in charge
NES-12 12 03-14.1	Memory Technology	Prof. Dr.-Ing. T. Mikolajick
Contents and objectives	This module covers memory concepts in the market and in research respectively development stage: - Magnatic memories - Optival memories - Semiconductor memories (SRAM, DRAM, nonvolatile Memories (EPROM, EEPROM, Flash)) - Innovative semiconductor memories (e.g. ferroelectric, magnetoresistive, resisitive, organic, and single molecule memories) Qualification goals: After completion of the module the students have the comeptences to optimize and develop new generetions of existing memory concepts. Based on the physical effects they will also be able to devolpe new memory concepts. Furthermore the students are able to evaluate areas of application for the memory concept and are aware of their limitation.	
Modes of teaching and learning	The module consists of 4 hours per week lectures, 2 hours per week seminars and self-study.	
Prerequisites	Requirements are necessary , which can be obtained in the first part of module Semiconductor Technology and in the module Materials for Nanoelectronics and Vacuum Technology for example.	
Usability	The module is a required elective module of the branch of study Nanoelectronics in the master's program Nanoelectronic Systems and a required elective module in the main study of the degree program Elektrotechnik.	
Requirements for the award of credit points	The credit points are awarded when the module assessment is passed. The module assessment consist of a written exam in the amount of 90 minutes, if the number of registered students exceeds 20. With up to 20 registered students the witten exam will be replace by an oral exam as an individual exam worth 15 minutes. The nature of the specific exam is announced at the end of the registration period as usually known from the faculty.	
Credit points and grades	7 credit points can be obtained by the module. The module grade is the grade of the module assessment.	
Frequency	The module is offered every academic year beginning in the summer semester.	
Workload	The total effort is 210 hours.	
Duration	The module takes two semester.	

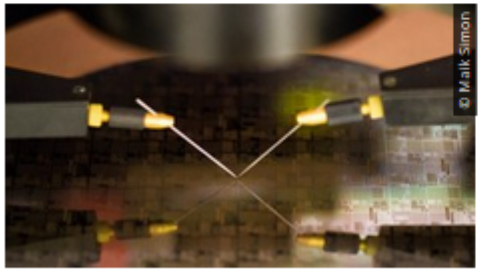
All modules are listed in the current study guide !





MASTER'S PROGRAMME NANOELECTRONIC SYSTEMS

The ongoing miniaturization in the microelectronics industry leads to systems that are now being referred to as nanoelectronic systems. Such systems offer a variety of applications, but their design and implementation is becoming increasingly complex.



The Master's programme Nanoelectronic Systems focuses on three key areas:

- Technologies for nanoelectronic systems
- Design of nanoelectronic systems
- Applications of nanoelectronic systems

LEARN MORE

Class Schedules

Due to the corona virus most classes will be offered as e-learning courses. Exception may be some practical courses. Please check your e-mail and these websites on a regular basis. ›More information

- **Timetable for 1nd semester students in the winter semester 2020/2021**
- **Timetable for 3rd semester students in the winter semester 2020/21**
- **›Timetable for ERASMUS Mundus students**
- **List of courses** → List of all lectures with OPAL-Links !

Important Websites

- › Modules and Study Guide
- › Living and Studying in Dresden
- › Re-registration
- › Exams
- › Project work / Master's theses
- Slides on 2nd meeting NES Master's programme: Tutorial on exams, Project Work, Master's Thesis

Time/Day	Monday	Tuesday	Wednesday	Thursday	Friday
1 DS 7:30 - 9:00		**E: German Language and Culture** TUDIAS *NES-30 GLC-14.1 German Language and Culture* *(tba)*			
2 DS 9:20 - 10:50	**P: Materials for Nanoelectronics** Richter *NES-12 12 01-14.1 Materials for Nanoelectronics and Vacuum Technology* (Face-to-face teaching)		**L: Principles of Dependable Systems** Fetzer *NES-11 06 02-14.1 Principles of Dependable Systems* *APB/E008/U* *(tba)*	**L: Semiconductor Technology 1** Bartha *NES-12 12 02-14.1 Semiconductor Technology* *BAR/0106/H* *(hybrid)*	
3 DS 11:10 - 12:40	**L: Systems Engineering 1** Fetzer *NES-11 06 06-14.1 Distributed Systems Engineering* *APB/E23/U* *(tba)*			**L: Materials for Nanoelectronics** Richter *NES-12 12 01-14.1 Materials for Nanoelectronics and Vacuum Technology* *GÖR/0127/U* *(hybrid)*	**E: Systems Engineering 1** Fetzer *NES-11 06 06-14.1 Distributed Systems Engineering* *APB/E23/U* *(tba)*
4 DS 13:00 - 14:30		**L: Semiconductor Technology 1** Bartha *NES-12 12 02-14.1 Semiconductor Technology* *BAR/0106/H* *(hybrid)*	**E: Stochastic Signals and Systems** Kortke *NES-12 09 01-14.1 Stochastic Signals and Systems* *GÖR/0229/U* *(hybrid)*	**E: Principles of Dependable Systems** Fetzer *NES-11 06 02-14.1 Principles of Dependable Systems* *APB/E008/U* *(tba)*	
5 DS 14:50 - 16:20	**P: Materials for Nanoelectronics** Richter *NES-12 12 01-14.1 Materials for Nanoelectronics and Vacuum Technology* *(Face-to-face teaching))*	**L: Stochastic Signals and Systems** Kortke *NES-12 09 01-14.1 Stochastic Signals and Systems* *GÖR/0127/U* *(hybrid)* **E: Hardware Modelling and Simulation** Göhringer *NES-11 20 20 Hardware Modelling and Simulation* *(online)*		**E: German Language and Culture** TUDIAS *NES-30 GLC-14.1 German Language and Culture*	
6 DS 16:40 - 18:10	**V: Hardware Modelling and Simulation** Göhringer *NES-11 20 20 Hardware Modelling and Simulation* *(online)*	**L: Vacuum Technology** Bartha *NES-12 12 01-14.1 Materials for Nanoelectronics and Vacuum Technology* *BAR/0218/U (Q&A)* *(online)*	**L: Fundamentals of Estimation and Detection** Rave *NES-12 10 01-14.1 Fundamentals of Estimation and Detection* *(online)*	**E: Fundamentals of Estimation and Detection** Rave NES-12 10 01-14.1 Fundamentals of Estimation and Detection (online)	

Compulsory Modules	
NES-11 06 01	Lab Sessions (still to be determined)
NES-11 06 02	Principles of Dependable Systems
NES-12 10 01	Fundamentals of Estimation and Detection
NES-12 12 02	Semiconductor Technology

Curriculum – compulsory modules

		1st Sem.	2nd Sem.	3rd Sem.	4th Sem.
Compulsory Modules					
NES-11 06 01 - 19.1	Lab Sessions	5 CP			
NES-11 06 02 - 14.1	Principles of Dependable Systems	6 CP			
NES-12 10 01 - 14.1	Fundamentals of Estimation and Detection	6 CP			
NES-12 12 02 - 14.1	Semiconductor Technology	9 CP			
NES-12 08 02 - 14.1	Radio Frequency Integrated Circuits		7 CP		
NES-12 10 03 - 14.1	Hardware/Software Co-design		4 CP		
NES-12 ASW - 14.1	Academic and Scientific Work			4 CP	
NES-12 PW - 14.1	Project Work			10 CP	
	Master Thesis and Defense				30 CP
Elective modules		6 CP	17 CP	16 CP	
Total credits		30 CP	30 CP	30 CP	30 CP

Curriculum – compulsory modules

EMM-nano students

Nanoscience and Nanotechnology

		1st Sem.	2nd Sem.	3rd Sem.	4th Sem.
Compulsory Modules					
NES-12 ASW - 14.1	Academic and Scientific Work			4 CP	
NES-12 PW - 14.1	Project Work			10 CP	
	Master Thesis and Defense				30 CP
Elective Modules				16 CP	
Total credits		30 CP	30 CP	30 CP	30 CP

Leuven

Curriculum – elective modules

NES students

- 30 elective modules with 185 credit points
- You have to select modules with at least **39 credit points**
- You can choose modules of the catalogue by your own choice.
  The classification of modules (Application, Technology, Design) is a guideline for you only

Register at the beginning of the semester for all the modules you take on SELMA !

German language and culture

German Language and Culture (Module NES-30 GLC-14.1)

TUDIAS
TECHNISCHE UNIVERSITÄT DRESDEN INSTITUTE OF ADVANCED STUDIES

https://tu-dresden.de/ing/elektrotechnik/studium/studienbeginn/ese

Solving problems

- Visit the website of the program

  https://tu-dresden.de/ing/elektrotechnik/studium/studieren-an-der-fakultaet/master-nes
- Ask fellow students or your mentor

- Contact the academic advisor (study course, general problems,...)

  Manuela Tetzlaff, BAR 161, phone: +49 351 37363
  Tuesday: 13:00 – 14:00 (via ZOOM-Meeting, phone)
  Thursday: 13:00 – 14:00 (via ZOOM-Meeting, phone)

  Email: master-nes@mailbox.tu-dresden.de

- Contact the examination office (questions about exams, (de-)registration, grades, ...)

  Denise Hartfiel, BAR 177a
  Telephone Advice Service: tba

- Contact the international office (questions about enrollment, visa, leave of absence, ...)

  Email: studium.international@mailbox.tu-dresden.de

Examination regulations and procedures

Additional meeting in December/January

→ Manuela will send around an invitation

Studying in Germany

- 15 weeks lectures, tutorials and lab courses, 4 weeks exams afterwards
- Learning during the exam weeks only is not enough!
  → attend all classes every week, participate actively and start working on problems during the semester
  → treat your study like a 40hour, full-time-job

Workload for each module is given in the module description

- Rule of thumb: 1 credit point is earned through 30 hours of work!
- Example: 180 hours (6 CP) for „Fundamentals of Estimation and Detection“

Lectures (2 hours x 15 weeks)	30
Tutorials (2 hours x 15 weeks)	30
Preparation for exam (38 hours)	38
Exam (2 hours)	2

- Rework transcript after lecture
- Read transcript before next lecture
- Solve exercises
- Discuss issues with fellow students
- Studying related books
- etc.

German culture

- What do you consider as typical characteristics of Germans, which have you heard about?
- Which German characteristics have you encountered?
- Choose one German characteristic and explain the difference to the culture of your home country?

German culture

- Come to appointments and lectures in time (and observe deadlines!)
- Salutation with title and surname
  (especially for people that are hierarchically higher than you)
- More subject- and work-oriented than people-oriented
- Direct criticism → no loss of face
- If you have any questions: don‘t be afraid to ask!

Study commission

Prof. Thomas Mikolajick
(Dean of Studies)

Prof. Gerhard Fettweis

Prof. Kambiz Jamshidi

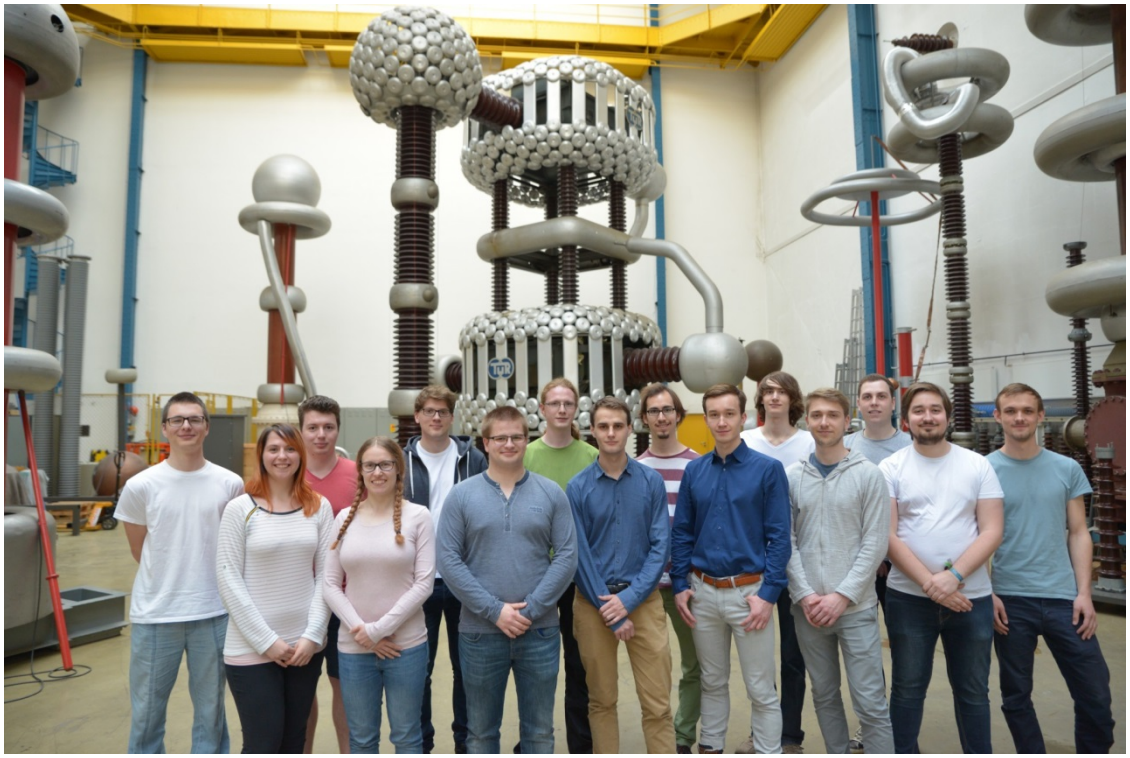
<u>Student representatives</u>

- Jonas Reinhardt
- Eashika Gosh
- Shambhavi Balamuthu Sampath

<u>Consulting members (without a vote)</u>

- Prof. Christof Fetzer
- Ellen Töpfer (Examination Office)
- Manuela Tetzlaff (Study Advisor)

Student body of the faculty



www.fsret.de

Miscellaneous

TUD Email

- xxx@tu-dresden.de
- IMPORTANT: check this Email on a regular basis (at least once a week)
  → forward this to your regular mail account
- Important for OPAL (ask your mentor or corresponding professor for further details)

Faculty PC Pool

- BAR I/61

Wireless LAN

- www.tu-dresden.de/zih → A-Z → WiFi networks (WLAN)

Library

- Zellescher Weg 18, 01069 Dresden
  www.slub-dresden.de

Have a good start!