

# Welcome @ M.Sc. Power Engineering (MSC-PE)

Dr. Markus Eblenkamp

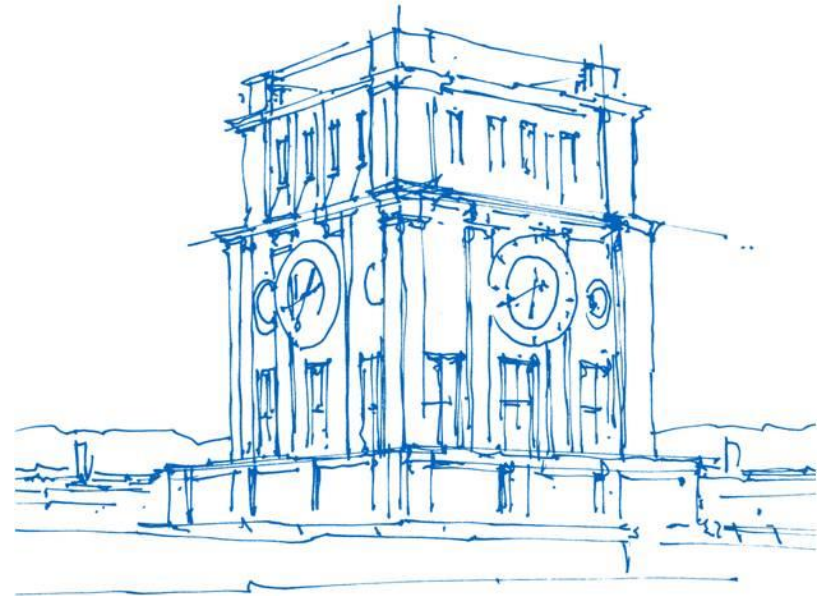
Program Manager MSC-PE

Technische Universität München

School of Engineering and Design

Study & Teaching

Garching (Munich), 21 June 2024



*Uhrenturm der TUM*

# M.Sc. Power Engineering (MSC-PE)

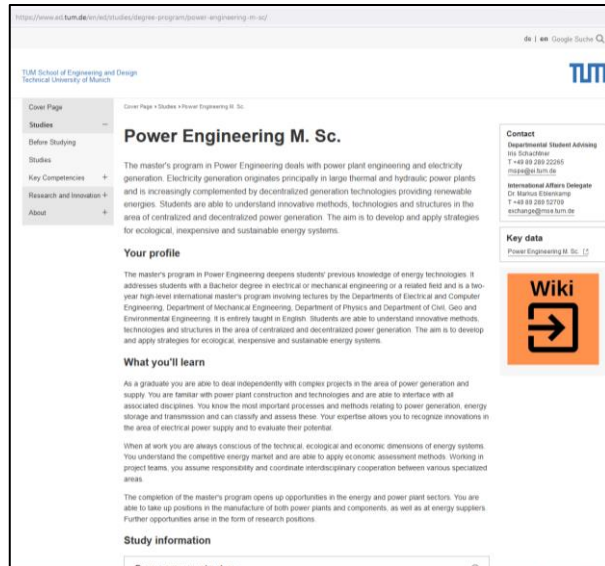


- Entirely taught in English  
→ Highly international
- Ecological, affordable and sustainable  
**energy systems of the future**
- USP: Electrical & Mechanical  
Engineering

# Web Presence

## Homepage

<https://www.ed.tum.de/ed/studium/studienangebot/power-engineering-m-sc/>

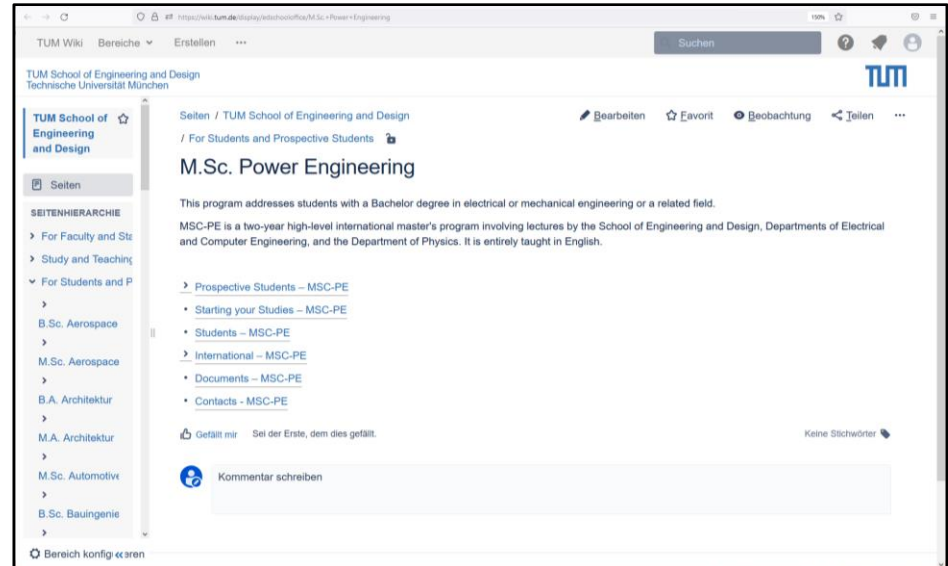


The screenshot shows the homepage for the M.Sc. Power Engineering program. It features a navigation menu on the left with options like 'Cover Page', 'Studies', 'Before Studying', 'Research and Innovation', and 'About'. The main content area includes the program title 'Power Engineering M. Sc.', a brief description of the program, contact information for the department, and a 'Wiki' button. A large plus sign is positioned to the right of the page.



## Wiki

<https://wiki.tum.de/display/edschooloffice/M.Sc.+Power+Engineering>



The screenshot shows the Wiki page for the M.Sc. Power Engineering program. It features a navigation menu on the left with options like 'TUM School of Engineering and Design', 'Seiten', and 'SEITENHIERARCHIE'. The main content area includes the program title 'M.Sc. Power Engineering', a brief description of the program, and a list of links to related pages such as 'Prospective Students - MSC-PE', 'Starting your Studies - MSC-PE', 'Students - MSC-PE', 'International - MSC-PE', 'Documents - MSC-PE', and 'Contacts - MSC-PE'. A comment box is visible at the bottom.

# Core Team MSC-PE



**Prof. Dr.  
Marcelo Lobo Heldwein**  
Program Director



**Dr. Markus Eblenkamp**  
Program Manager  
International Affairs



**Heike Wetzstein-Duesing**  
Program Manager

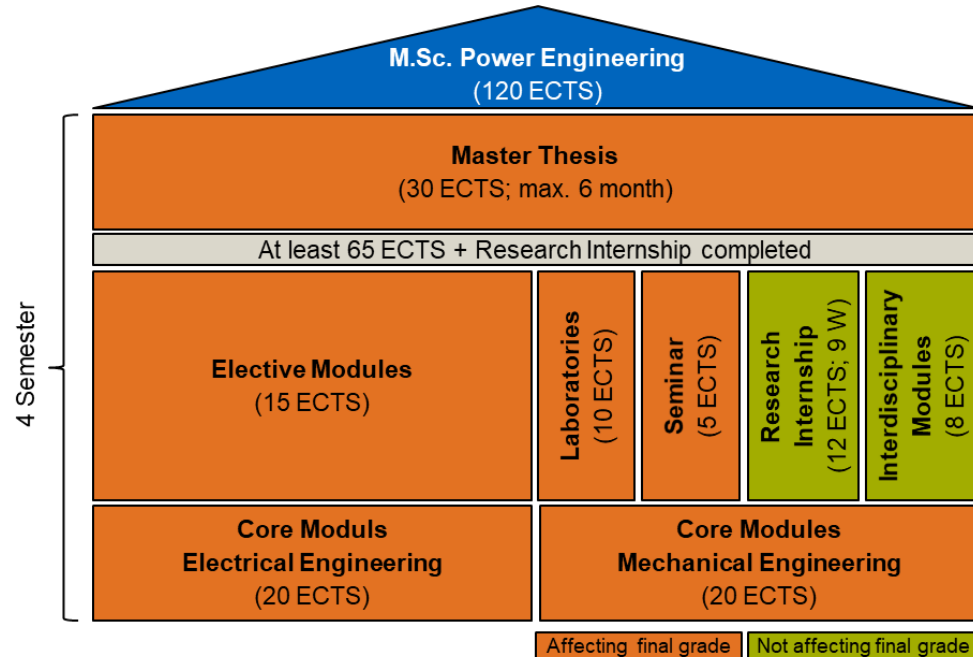


**Cornelia Götze**  
Lead Study & Teaching Office

# MSC-PE Program Design - Institutions

- TUM School of Engineering and Design
- TUM School of Computation, Information and Technology
- TUM School of Natural Sciences (Physics)
- TUM School of Management

# MSC-PE Program Design



# Core Modules Electrical Engineering

Source: Wiki page „Students – MSC-PE“ (Status 30 June 2023)

Semester	Module ID	Module name Module Description	Homepage	Responsible for the module	Lecturer(s)	School	Credits	Format (P = In presence H = Hybrid O = Online)	Additional information
Winter	EI8028	<a href="#">Electrical Machines</a>	<a href="https://www.epe.ed.tum.de/ewf/lehre/mscei/ei8028/">https://www.epe.ed.tum.de/ewf/lehre/mscei/ei8028/</a>	Herzog		ED	5	In presence	
Winter	EI8029	<a href="#">Energy Systems and Energy Economy</a> Energy Systems and Energy Economics (from SS 2023)		Goebel	Dr Tzscheuschler	ED	5		
Winter	EI8030	<a href="#">High Voltage Technology - Fundamentals</a>		N.N.		ED	5		
Winter	EI8031	<a href="#">Power Electronics for Distributed Energy Systems</a>	<a href="https://www.epe.ed.tum.de/eal/courses/veranstaltungen/pe/">https://www.epe.ed.tum.de/eal/courses/veranstaltungen/pe/</a>	Heldwein		ED	5		
Winter	EI8032	<a href="#">Power Transmission Systems</a>		Witzmann		ED	5		
Winter + Summer	EI80004	<a href="#">Sustainable Mobility</a>		Hamacher		ED	5		
Summer	EI8033	<a href="#">Energy Storage</a> now Battery Storage		Jossen		ED	5		

- 20 ECTS
- Free choice
- Repeatable
- Substitutable
- More than 4 courses  
→ as Elective Modules

# Core Modules Mechanical Engineering

Source: Wiki page „Students – MSC-PE“ (Status 30 June 2023)

Semester	Module ID	Module name Module Description	Homepage	Responsible for the module	Lecturer(s)	School	ECTS	Format (P = In presence H = Hybrid O = Online)	Additional information
Winter	MW1420	<a href="#">Advanced Control</a>	<a href="https://www.epc.ed.tum.de/en/it/study-teaching/lectures/advanced-control/">https://www.epc.ed.tum.de/en/it/study-teaching/lectures/advanced-control/</a>	Kotyczka		ED	5	P	
Winter	MW1421	<a href="#">Dynamics of Mechanical Systems</a>	<a href="https://www.mec.ed.tum.de/en/am/courses/">https://www.mec.ed.tum.de/en/am/courses/</a>	Rixen	Daniel Rixen, Arian Kist	ED	5	H	
Winter	MW1419	<a href="#">Thermodynamics in Energy Conversion</a>	<a href="https://www.epe.ed.tum.de/en/es/education/lectures/thermodynamics-in-energy-conversion/">https://www.epe.ed.tum.de/en/es/education/lectures/thermodynamics-in-energy-conversion/</a>	Splithoff		ED	5	P	
Summer	MW1532	<a href="#">Thermal Power Plants</a>	<a href="https://www.epe.ed.tum.de/en/es/education/lectures/thermal-power-plants/">https://www.epe.ed.tum.de/en/es/education/lectures/thermal-power-plants/</a>	Splithoff		ED	5	P	
Summer Summer 2023	MW1581 ED110101	<a href="#">Fluid Machinery</a> Turbomachinery		Gümmer		ED	5		
Winter + Summer	MW1354	<a href="#">Renewable Energy Technology I &amp; II</a>	<a href="https://www.epe.ed.tum.de/en/es/education/lectures/renewable-energy-technology-i/">https://www.epe.ed.tum.de/en/es/education/lectures/renewable-energy-technology-i/</a> <a href="https://www.epe.ed.tum.de/en/es/education/lectures/renewable-energy-technology-ii/">https://www.epe.ed.tum.de/en/es/education/lectures/renewable-energy-technology-ii/</a>	Splithoff		ED	6	P	
Winter + Summer	MW2152	<a href="#">Modeling, Control and Design of Wind Energy Systems</a>		Bottasso		ED	5	P	

- 20 ECTS
- Free choice
- Repeatable
- Substitutable
- More than 4 courses  
→ as Elective Modules



# Elective Modules

Source: wiki page „Students – MSC-PE“ (Status 09 Oct 21)

Semester	Module ID	Module name Module Description	Homepage	Responsible for the module
WS	E17060	<a href="#">Integration of Renewable Energies</a>		Hamacher
SS	E17490	<a href="#">Mathematical Modelling of Complex Systems in the Field of Energy</a>		Hamacher
WS	MW0799	<a href="#">Introduction to Nuclear Energy</a>		MacIán-Juan
until WS 22/23	MW1354	<a href="#">Internal Combustion Engines</a>	<a href="https://www.mos.ed.tum.de/mos/lehre/lehreveranstaltungen/vorlesungen-kommersemester/internal-combustion-engines/">https://www.mos.ed.tum.de/mos/lehre/lehreveranstaltungen/vorlesungen-kommersemester/internal-combustion-engines/</a>	Jensson
WS	E17040	<a href="#">Nanotechnology for Energy Systems</a>		Gagliardi
WS SS2024	MW1808	<a href="#">Nonlinear Control</a>	<a href="https://www.epc.ed.tum.de/en/study-teaching/lectures/nonlinear-control/">https://www.epc.ed.tum.de/en/study-teaching/lectures/nonlinear-control/</a>	Kotyczka
SS	PH2068	<a href="#">Fuel Cells in Energy Technology</a>		Schindler
WS suspended	EGU4210	<a href="#">Civil Engineering in Energy Technology</a>		Mensinger, Fischer, Cudmani
WS-SS	MW2228	<a href="#">Aeroelasticity</a>		Bottasso
SS	E171913	<a href="#">System Design for the Internet of the Things</a>	<a href="https://www.cs.cit.tum.de/es/lehre/kommersemester-2022/vorlesung-system-design-for-the-internet-of-things/">https://www.cs.cit.tum.de/es/lehre/kommersemester-2022/vorlesung-system-design-for-the-internet-of-things/</a>	Steinhorst
WS	E170140	<a href="#">Optimal Control and Decision Making</a>	<a href="https://campus.tum.de/monline/ws/uedshow/Detail/?id=63914-860671002&amp;sprache=1">https://campus.tum.de/monline/ws/uedshow/Detail/?id=63914-860671002&amp;sprache=1</a>	Bus
WS suspended	W1001255	<a href="#">Lecture Series Renewable Energy Systems in the Global South</a>		Beiz
SS	IN2305	<a href="#">Cyber-Physical Systems</a>		Althoff
SS	MW0868	<a href="#">Modeling and Reduction of Complex Systems</a>	<a href="https://www.epc.ed.tum.de/en/study-teaching/lectures/modeling-and-reduction-of-complex-systems/">https://www.epc.ed.tum.de/en/study-teaching/lectures/modeling-and-reduction-of-complex-systems/</a>	Kotyczka
WS	BV40017	<a href="#">Hydro Power and Energy Storage</a>		Rüher
WS/SS	E171069	<a href="#">Reliability of Electric Drives</a>	<a href="https://www.epe.ed.tum.de/en/lehre/mos/e17110/">https://www.epe.ed.tum.de/en/lehre/mos/e17110/</a>	Kammermann / Bokashevov
WS	E176172	<a href="#">Renewable Energy Systems: Power Electronics, Modeling and Control</a>		Hadi
WS	E180009	<a href="#">Active Distribution Grids</a>		Hamacher
WS	ED180001	<a href="#">New Technologies in the Energy Transition of Shipping</a>		Dr. Lehner
WS	ED180003	<a href="#">Mathematical Modeling for expansion and dispatch planning in modern energy systems</a>		Hamacher
from SS2023	ED150013	<a href="#">Sustainable Mobile Powertrains</a>		Jensson
from SS2023	E17495	<a href="#">Power Electronics and Drives for Electric Vehicles</a>		Heldwein
WS-SS	ED180013	<a href="#">Energy Informatics</a>		Goebel

+ Core Modules Electrical Engineering  
 + Core Modules Mechanical Engineering

- 15 ECTS
- Free choice
- Repeatable

# Laboratories („Labs“)

Source: wiki page „Students – MSC-PE“ (Status 09 Oct 21)

Semester	Module ID	Module name Module Description	Homepage	Responsible for the module
WS	MW2134	<a href="#">Computational Thermo-Fluid Dynamics</a>		Poifke
suspended	MW2267	<a href="#">Design of Wind Turbines</a>	<a href="https://www.epe.ed.tum.de/wind/education/praktikum-on-design-of-wind-turbines/">https://www.epe.ed.tum.de/wind/education/praktikum-on-design-of-wind-turbines/</a>	Bottasso
SS	EI73631	<a href="#">Electrical Energy Storage Lab</a>		Jossen
SS	EI78050	<a href="#">Project laboratory Electrochemistry and Biosensors</a>	<a href="https://www.ee.cf.tum.de/en/teaching/project-laboratory-electrochemistry-and-biosensors/">https://www.ee.cf.tum.de/en/teaching/project-laboratory-electrochemistry-and-biosensors/</a>	Wolfrum
suspended	EI78020	<a href="#">Embedded Control Systems Laboratory</a>		Müller-Gritschneider
WS	EI7467	<a href="#">Interdisciplinary Project Internship Concept Development of a Renewable Energy System in a Developing Country</a>		Hamacher
suspended	EI8035	<a href="#">Laboratory Course High Voltage Technology</a>		Koch
WS/SS	MW1869	<a href="#">Laboratory Course Energy Systems for MSPE</a>	<a href="https://www.epe.ed.tum.de/en/education/laboratory-courses/laboratory-course-energy-systems-for-mspe/">https://www.epe.ed.tum.de/en/education/laboratory-courses/laboratory-course-energy-systems-for-mspe/</a>	Spliethoff
suspended	EI8037	<a href="#">Power Generation Lab</a>		Goebel
WS/SS	EI78019	<a href="#">Practical Course Control of Low-Power Automotive Drives</a>	<a href="https://www.epe.ed.tum.de/eal/courses/veranstaltungen/jccbpad/">https://www.epe.ed.tum.de/eal/courses/veranstaltungen/jccbpad/</a>	Heldwein
WS/SS (offered SS2023)	EI80006	<a href="#">Practical Course Power Electronics DC/DC Converter</a>		Heldwein
WS/SS	EI80003	<a href="#">Practical Course Simulation and Optimization of Mechatronic Drive Systems</a>	<a href="https://www.epe.ed.tum.de/eal/courses/veranstaltungen/jcsodmspe/">https://www.epe.ed.tum.de/eal/courses/veranstaltungen/jcsodmspe/</a>	Heldwein
WS/SS	EI7417	<a href="#">Project Course Drive Systems and Power Electronics</a>		Heldwein
SS	EI80008	<a href="#">Project Laboratory on Distribution Grid Simulation</a>		Witzmann
WS/SS	EI74831	<a href="#">Project Lab Renewable and Sustainable Energy Systems</a>		Hamacher
WS/SS	EI78022	<a href="#">Simulation and Commissioning of Electrical Actuators</a>	<a href="https://www.epe.ed.tum.de/ew/lehre/msce/ei710900/">https://www.epe.ed.tum.de/ew/lehre/msce/ei710900/</a>	Kammermann
WS/SS	MW1277	<a href="#">Simulation of Thermofluids with Open Source Tools</a>		Poifke
WS	MW2265	<a href="#">Wind Tunnel Testing of Wind Turbines</a>		Bottasso
WS/SS	ED180012	<a href="#">Design of Wind Farms</a>		Bottasso

- 10 ECTS
- Free choice
- Centralized allocation of places
  - Number of credits
  - Number of semesters
  - Choice prioritization
  - ...
- Focus on core modules recommended in semester 1

# Seminar

Source: wiki page „Students – MSC-PE“ (Status 09 Oct 21)

Seminars (5 ECTS credits required)					
Semester	Module Number	Module name	Professor	Dep.	ECTS
WS/SS	EI8040	<a href="#">Seminar on Energy Systems and Energy Economy</a>	Hamacher	ED	5
WS/SS	EI8044	<a href="#">Seminar on Renewable and Sustainable Energy Systems</a>	Hamacher	ED	5
WS/SS	EI8016	<a href="#">Seminar on Electrical Actuators</a>	Herzog	ED	5
WS/SS	EI8041	<a href="#">Seminar on High Voltage Technology</a>	Koch	ED	5
WS/SS	EI8038	<a href="#">Seminar on Power Transmission</a>	Witzmann	ED	5
WS/SS	EI8039	<a href="#">Seminar on Intelligent Methods in Mechatronics</a>	Kennel	ED	5
WS/SS	EI8042	<a href="#">Seminar on Energy Storage Technologies</a>	Jossen	ED	5
WS/SS	EI77001	<a href="#">Seminar on Embedded Systems and Internet of the Things</a>	Steinhorst	EI	5
WS/SS	MW1813	<a href="#">Seminar on Thermal Energy Systems</a>	Spliehoff	ED	5
WS/SS	MW2089	<a href="#">Seminar on Nuclear Safety Principles</a>	Macián-Juan	ED	5
WS/SS	EI7770	<a href="#">Seminar on Electrophysical Problems in Microsystem Technology</a>	Schrag	EI	5

- 5 ECTS
- Free choice
- Substitutable

# Interdisciplinary Modules

Source: wiki page „Students – MSC-PE“ (Status 14 Oct 21)

## **Interdisciplinary Modules (8 ECTS Credits)**

You have to earn eight credits from non power-engineering subjects. The choice is yours. In particular, modules from other departments / schools and also language courses are accepted, too.

Some suggestions are:

- Language Courses
- EI04004 Strategic Management for Engineers, Prof. Sauerbrey
- MW2223 Soft Skills Training within the lab "Simulation of Thermofluids with Open Source Tools" Prof. Polifke
- POL67000 or POL67001 Digital Sustainability, Transformation of, by and for the TUM, Prof. Wurster, Dr. Siewert

# Research Internship

Source: wiki page „Students – MSC-PE“ (Status 04 Oct 21)

## Research Internship (12 ECTS Credits)

The nine-week research internship has to be carried out at a **chair of TUM expert examiners**. For MSC-PE these are **all university professors, lecturers and junior fellows who teach a Core Module or a Elective Module**. Furthermore, the following professors are nominated as expert examiners for MSC-PE by the Examination Board: **Prof. Kreupl, Prof. Alexander Koch, Prof. Lienkamp, Prof. Sattelmayer, Prof. Zäh, Prof. Armanini, Prof. Oksanen, Prof. Rudolf Neu.**

More information and relevant forms can be found on the wiki page [Documents – MSC-PE](#).

- In industry with an agreement of a professor
- During second or third semester (usually during the semester break)
- Full-time
- Written report
- Presentation of the results
- Only one Research Internship can be counted

# Master Thesis

Source: wiki page „Students – MSC-PE“ (Status 09 Oct 21)

## Master Thesis (30 Credits)

The **six-month** Master Thesis concludes the MSC-PE Program and it also has to be carried out at a **chair of TUM expert examiners**. For MSC-PE these are **all university professors, lecturers and junior fellows who teach a Core Module or a Elective Module**. Furthermore, the following professors are nominated as expert examiners for MSC-PE by the Examination Board: **Prof. Kreupl, Prof. Alexander Koch, Prof. Lienkamp, Prof. Sattelmayer, Prof. Zäh, Prof. Armanini, Prof. Oksanen, Prof. Rudolf Neu**.

Students can start the master thesis if they have passed **65 credits** from course work **plus the research internship**. For the registration of the Master Thesis students have to contact the Study & Teaching Office ([Contacts - MSC-PE](#)). The designated **form** can be found on the wiki page [Documents – MSC-PE](#).

- In industry is also possible with the agreement of a professor
- Maximum duration: Six months
- Written thesis of about 60 to 100 pages
- Presentation of the results
- May be repeated once with a different topic if not passed

# Academic Progress Check

- 10 ECTS from Core Modules Electrical Engineering
  - 10 ECTS from Core Modules Mechanical Engineering
  - 30 ECTS by end of 3<sup>rd</sup> semester
  - 60 ECTS by end of 4<sup>th</sup> semester
  - 90 ECTS by end of 5<sup>th</sup> semester
  - 120 ECTS by end of 6<sup>th</sup> semester
- } → by end of the 2<sup>nd</sup> semester

Maximum 45 credits per semester

# Application & Aptitude Assessment

## Stage 1

- Grade Bachelor degree (from best 150 ECTS !) → max. 25 points; at least 2,5
- Subjects during your Bachelor degree → max. 30 points
  - Mathematics → max. 12 point ( $\geq 30$  ECTS)
  - Electrical Engineering → max. 9 points ( $\geq 45$  ECTS)
  - Mechanical Engineering → max. 9 points ( $\geq 45$  ECTS)
- $\geq 45$  points → direct admission
- $\geq 39$ , and  $< 45$  → Stage 2 (interview)

## Stage 2 (interview):

- Motivation for MSC-PE (max. 15 points)
- Expertise and ability to do scientific work (max. 30 points)
- Communication skills in the English language (max. 10 points)

Mean value interview and score stage 1 →  $\geq 40$  points: admission

For B.Sc. Engineering Science graduates:

→ Good chance of entering at least Stage 2

→ Highly qualified (mathematics + electrical engineering + mechanical engineering)



# Plans for further program development

- Targeted internationalization
  - European (e.g. guided Erasmus+, EuroTeQ)
  - Intercontinental (e.g. guided TUMexchange)
- Project and challenge based learning (e.g. Academic Energy Cooperative @ TUM, EuroTeQ Collider)
- Women @ MSC-PE



- Integration of innovative technologies (e.g. hydrogen, smart grids)

# Welcome @ MSC-PE

Dr. Markus Eblenkamp

Program Manager

Garching (Munich), 21 June 2024

