BEMP Welcome

April 13, 2026
10:00 a.m.

MIBE lecture hall (5701.EG.026)

Academic Counseling

Dr. Marianne Köpf
M.Sc. QST/M.Sc. BEMP

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Dr. Katja Block
Management

LabCourses, BEMP,
Disadvantage Compensation

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Prof. Dr. Julia Herzen
Speaker of the Degree Program

@: julia.herzen@tum.de
Tel.: +49 (0)89 289 14532

Munich Institute of Biomedical Engineering

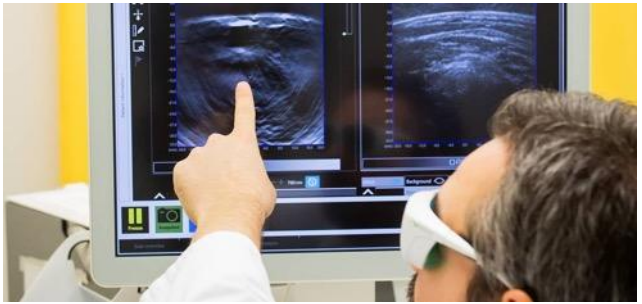
A TUM Integrative Research Center

Bringing together transdisciplinary excellence into research, teaching and entrepreneurship

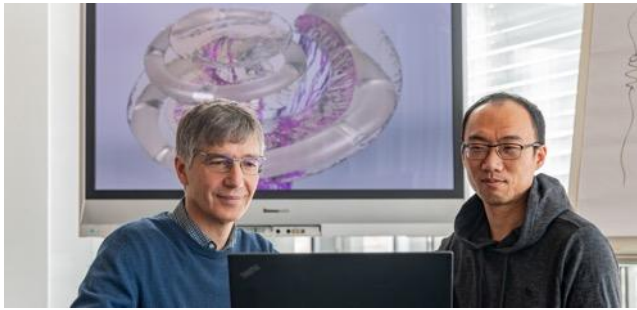
Uli Benz / TUM

Research @ MIBE

**Medical Imaging &
Radiation Oncology**



**Biomedical Microscopy
& Virtual Pathology**

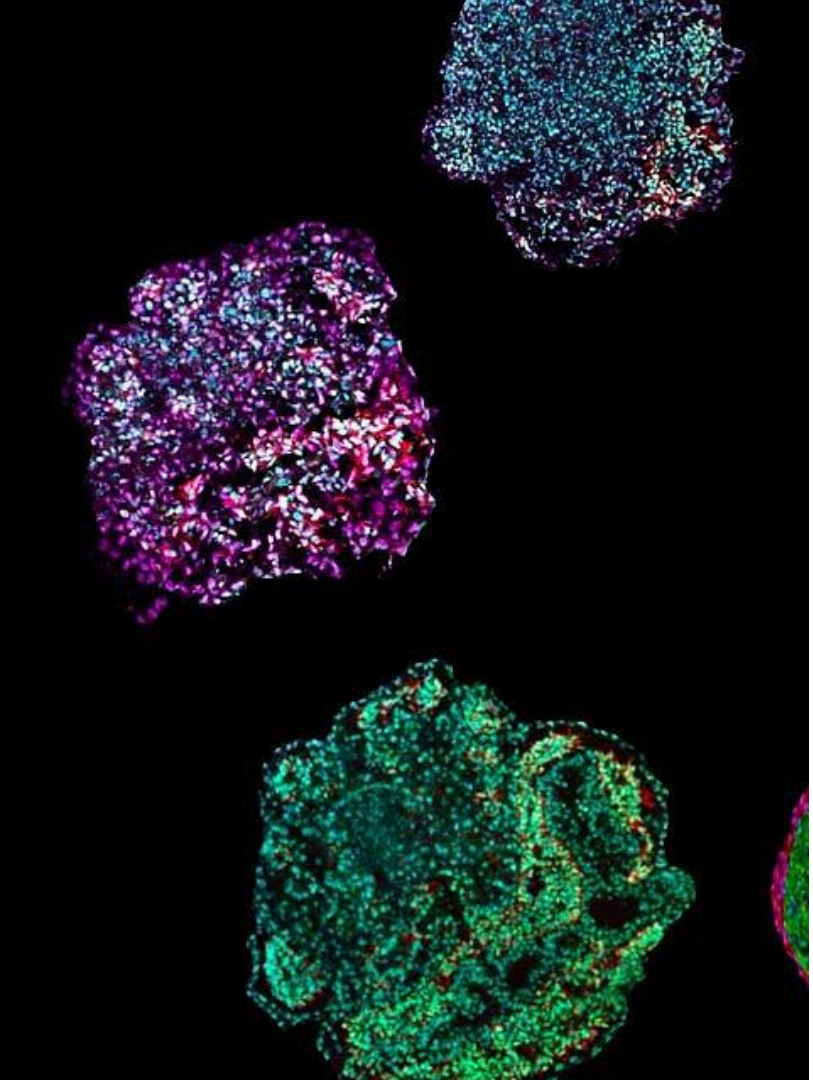


**Biosensors &
Smart Medical Devices**

**Biomaterials
& Biomolecular Systems**

**Medical Image Processing
& Artificial Intelligence**

**Organoids &
Biological Model Systems**



A mini-heart in a Petri dish

Prof. Dr. Alessandra Moretti

Professorship of Regenerative Medicine in Cardiovascular Disease

nature > nature biotechnology > articles > article

Article | Open access | Published: 03 April 2023

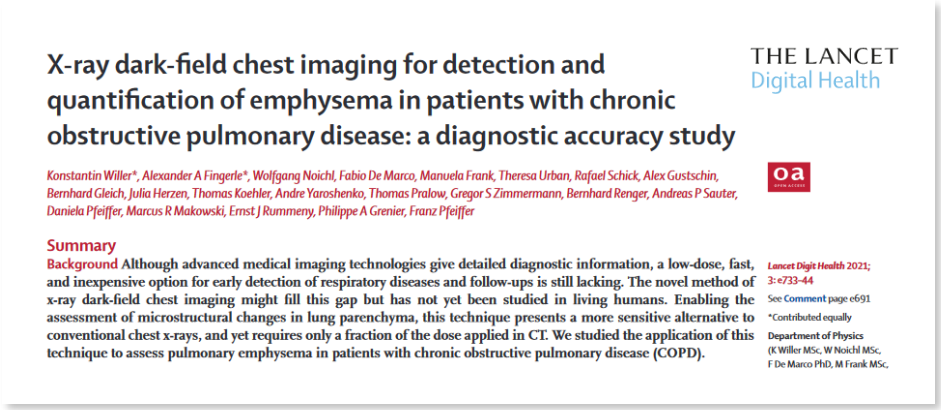
Epicardioid single-cell genomics uncovers principles of human epicardium biology in heart development and disease

Anna B. Meier, Dorota Zawada, Maria Teresa De Angelis, Laura D. Martens, Gianluca Santamaria, Sophie Zengerle, Monika Nowak-Imialek, Jessica Kornherr, Fangfang Zhang, Qinghai Tian, Cordula M. Wolf, Christian Kupatt, Makoto Sahara, Peter Lipp, Fabian J. Theis, Julien Gagneur, Alexander Goedel, Karl-Ludwig Laugwitz, Tatjana Dorn & Alessandra Moretti

X-ray dark-field chest imaging

Prof. Dr. Franz Pfeiffer

Professorship of Biomedical Physics



X-ray dark-field chest imaging for detection and quantification of emphysema in patients with chronic obstructive pulmonary disease: a diagnostic accuracy study

THE LANCET Digital Health

oa

Konstantin Willer, Alexander A Fingerle*, Wolfgang Noichl, Fabio De Marco, Manuela Frank, Theresa Urban, Rafael Schick, Alex Gustschin, Bernhard Gleich, Julia Herzen, Thomas Koehler, Andre Yaroshenko, Thomas Pralow, Gregor S Zimmermann, Bernhard Renger, Andreas P Sauter, Daniela Pfeiffer, Marcus R Makowski, Ernst J Rummeny, Philippe A Grenier, Franz Pfeiffer*

Summary

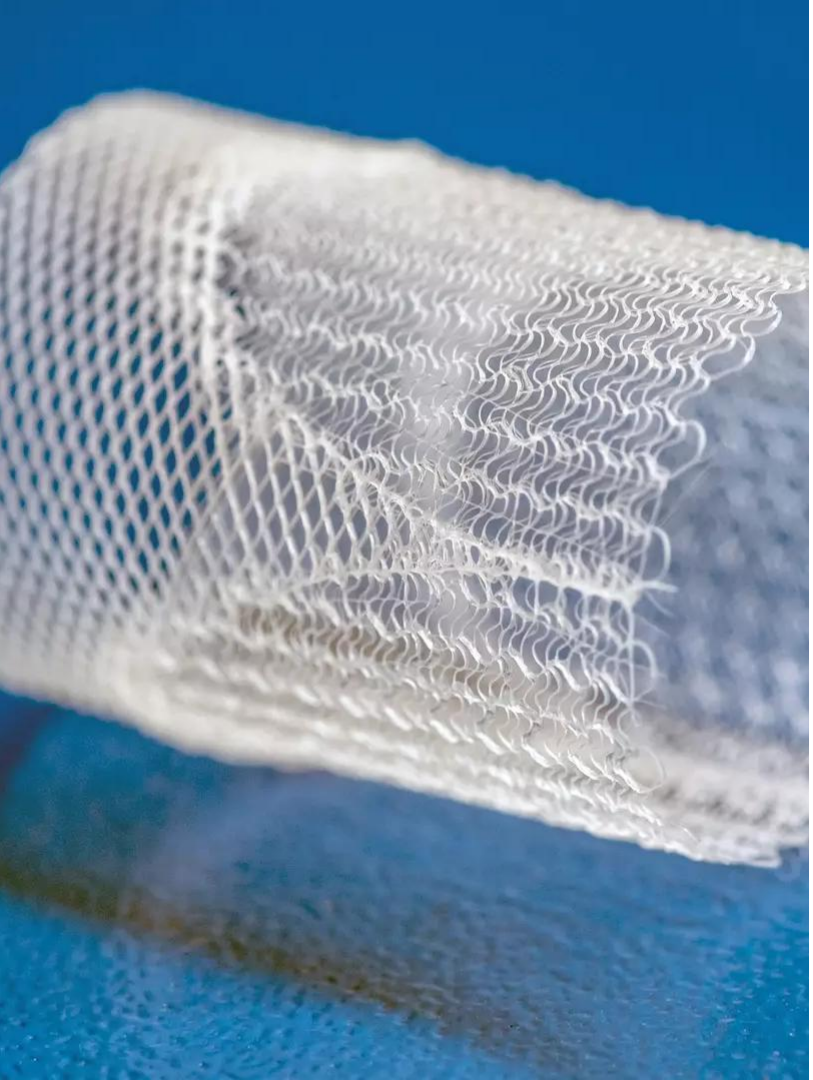
Background Although advanced medical imaging technologies give detailed diagnostic information, a low-dose, fast, and inexpensive option for early detection of respiratory diseases and follow-ups is still lacking. The novel method of x-ray dark-field chest imaging might fill this gap but has not yet been studied in living humans. Enabling the assessment of microstructural changes in lung parenchyma, this technique presents a more sensitive alternative to conventional chest x-rays, and yet requires only a fraction of the dose applied in CT. We studied the application of this technique to assess pulmonary emphysema in patients with chronic obstructive pulmonary disease (COPD).

Lancet Digit Health 2021; 3: e733–44

See Comment page e691

*Contributed equally

Department of Physics (K Willer MSc, W Noichl MSc, F De Marco PhD, M Frank MSc,



3D printed, bioinspired heart valves

Prof. Dr. Petra Mela

Professorship of Medical Materials and Implants

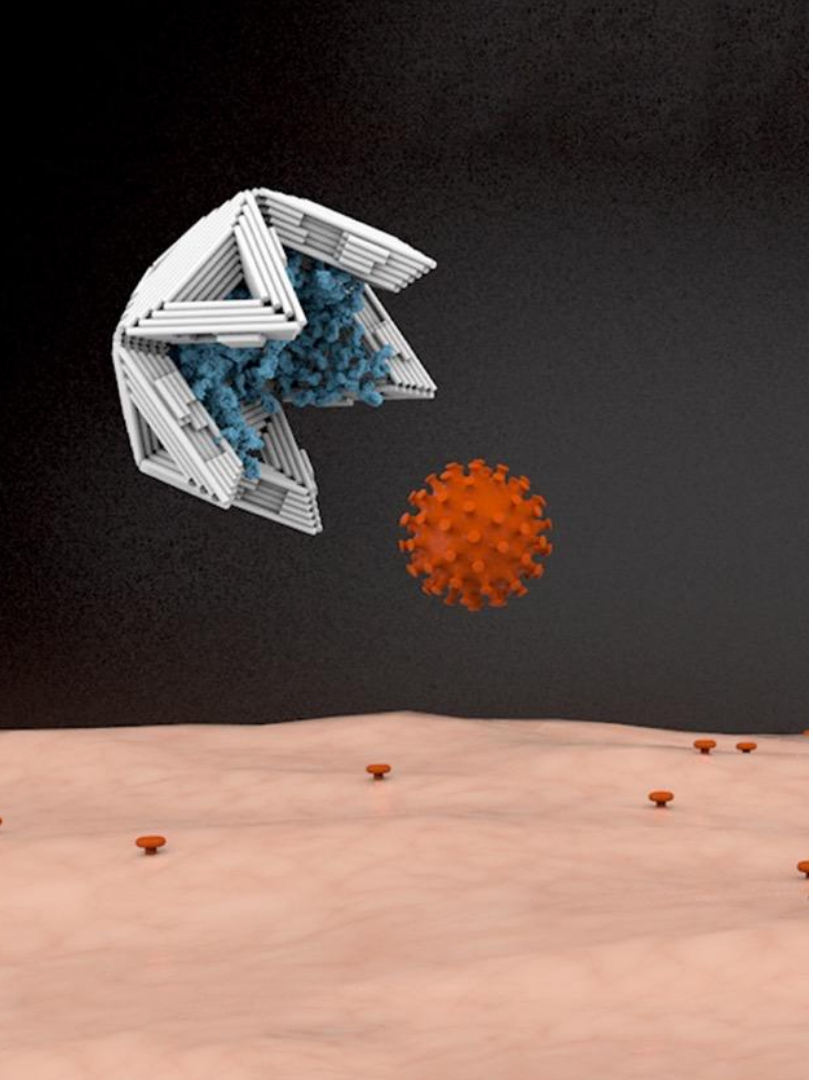
ADVANCED FUNCTIONAL MATERIALS

Research Article | Open Access

Spatially Heterogeneous Tubular Scaffolds for In Situ Heart Valve Tissue Engineering Using Melt Electrowriting

Navid Toosi Saidy, Alicia Fernández-Colino, Behzad Shiroud Heidari, Ross Kent, Michael Vernon, Onur Bas, Shane Mulderrig, Andreas Lubig, José Carlos Rodríguez-Cabello ... See all authors

First published: 15 February 2022 | https://doi.org/10.1002/adfm.202110716 | Citations: 37



The virus trap

Prof. Dr. Hendrik Dietz

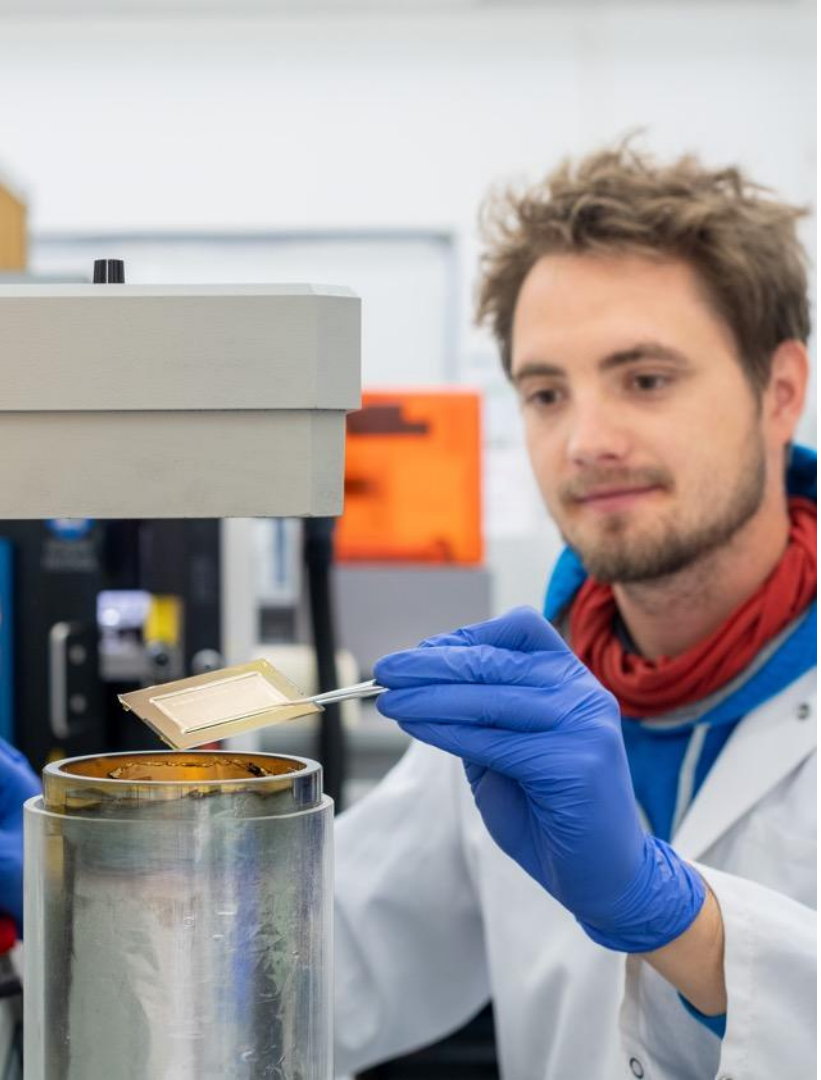
Professorship of Biomolecular Nanotechnology

Article | Published: 14 June 2021

Programmable icosahedral shell system for virus trapping

Christian Sigl, Elena M. Willner, Wouter Engelen, Jessica A. Kretzmann, Ken Sachenbacher, Anna Liedl, Fenna Kolbe, Florian Wilsch, S. Ali Aghvami, Ulrike Protzer, Michael F. Hagan, Seth Fraden & Hendrik Dietz

Nature Materials **20**, 1281–1289 (2021) | Cite this article



4D printing for nerve stimulation

Prof. Dr. Bernhard Wolfrum

Professorship of Neuroelectronics

ADVANCED MATERIALS

Research Article | Open Access

4D-Printed Soft and Stretchable Self-Folding Cuff Electrodes for Small-Nerve Interfacing

Lukas Hiendlmeier, Francisco Zurita, Jonas Vogel, Fulvia Del Duca, George Al Boustani, Hu Peng, Inola Kopic, Marta Nikić, Tetsuhiko F. Teshima, Bernhard Wolfrum

First published: 02 January 2023 | https://doi.org/10.1002/adma.202210206 | Citations: 2

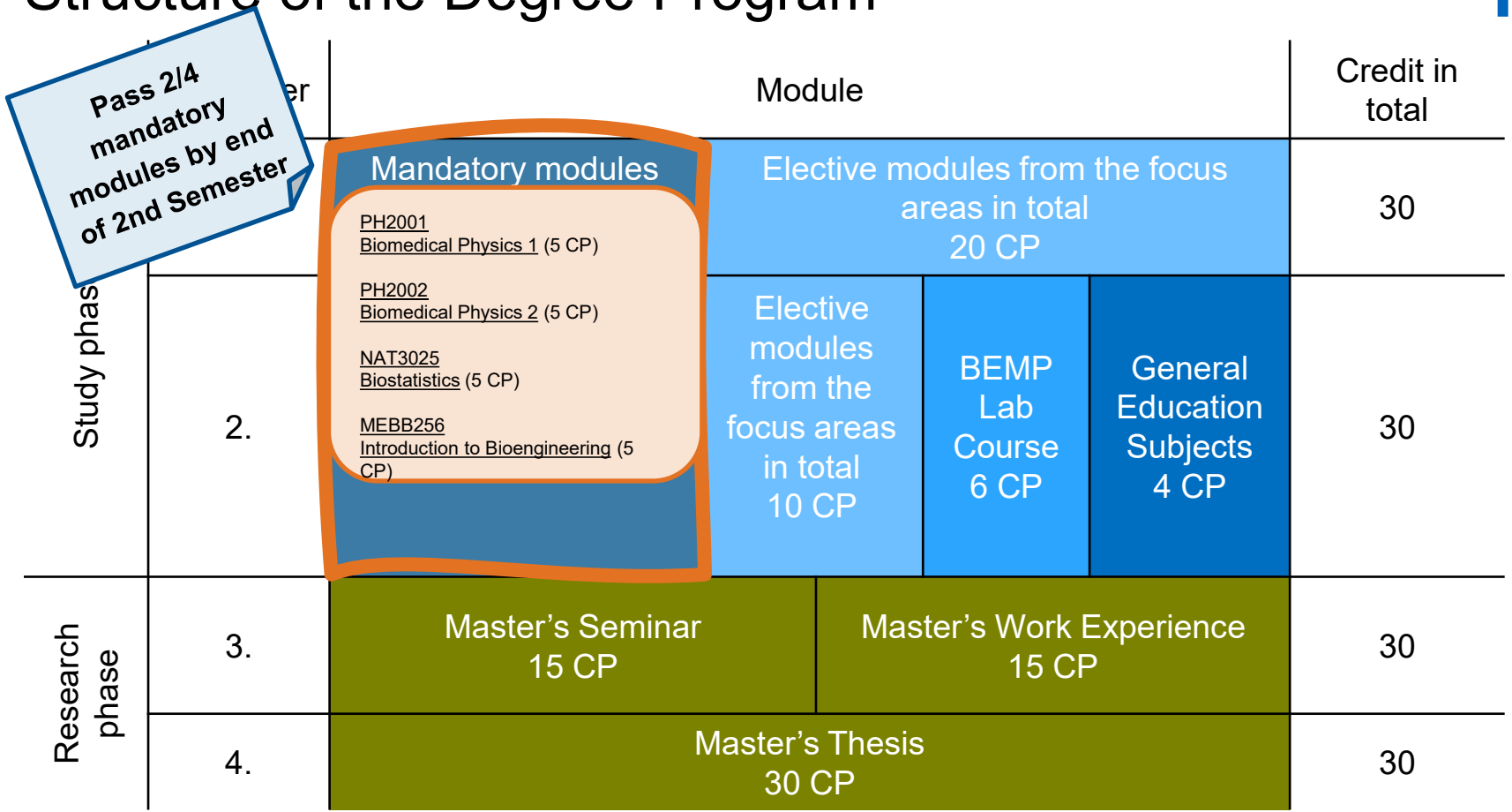
Finding A Common Language

Foster interdisciplinary work

Prepare for research in academia and industry

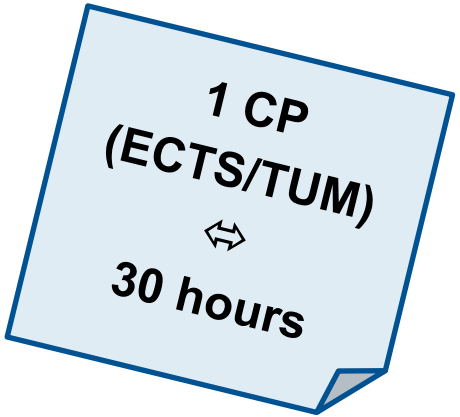
Highly flexible curriculum – focus on imaging & biosensors

Structure of the Degree Program



Workload

At TUM one credit point values one ECTS credit point.



- For a 5 CP module the workload is 150 hours!
- for 14 weeks of lecture time (25S) it is 10 hours/week and additional 10 hours for exam preparation.

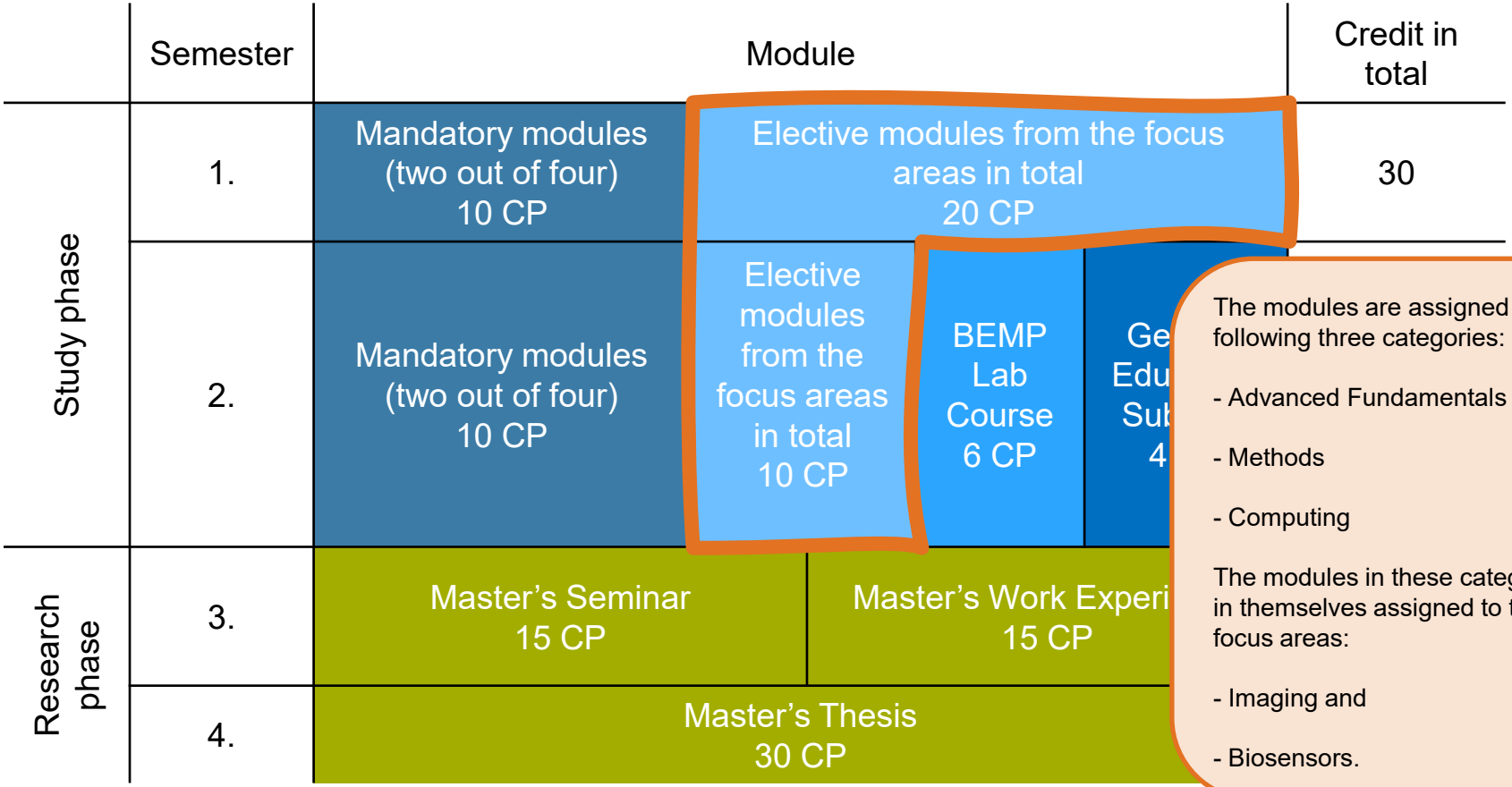
Example: Biostatistics

- 5 ECTS x 30 h / ECTS = 150 h
- 90 min lectures + 45 min exercise every week → 14 x 3 x 1 h = 42 h
- 90 min final exam

→150 h – 42 h – 1.5 h = 106.5 h

→106.5 h / 14 weeks = 8 h / week self study, exercise for this course

Structure of the Degree Program



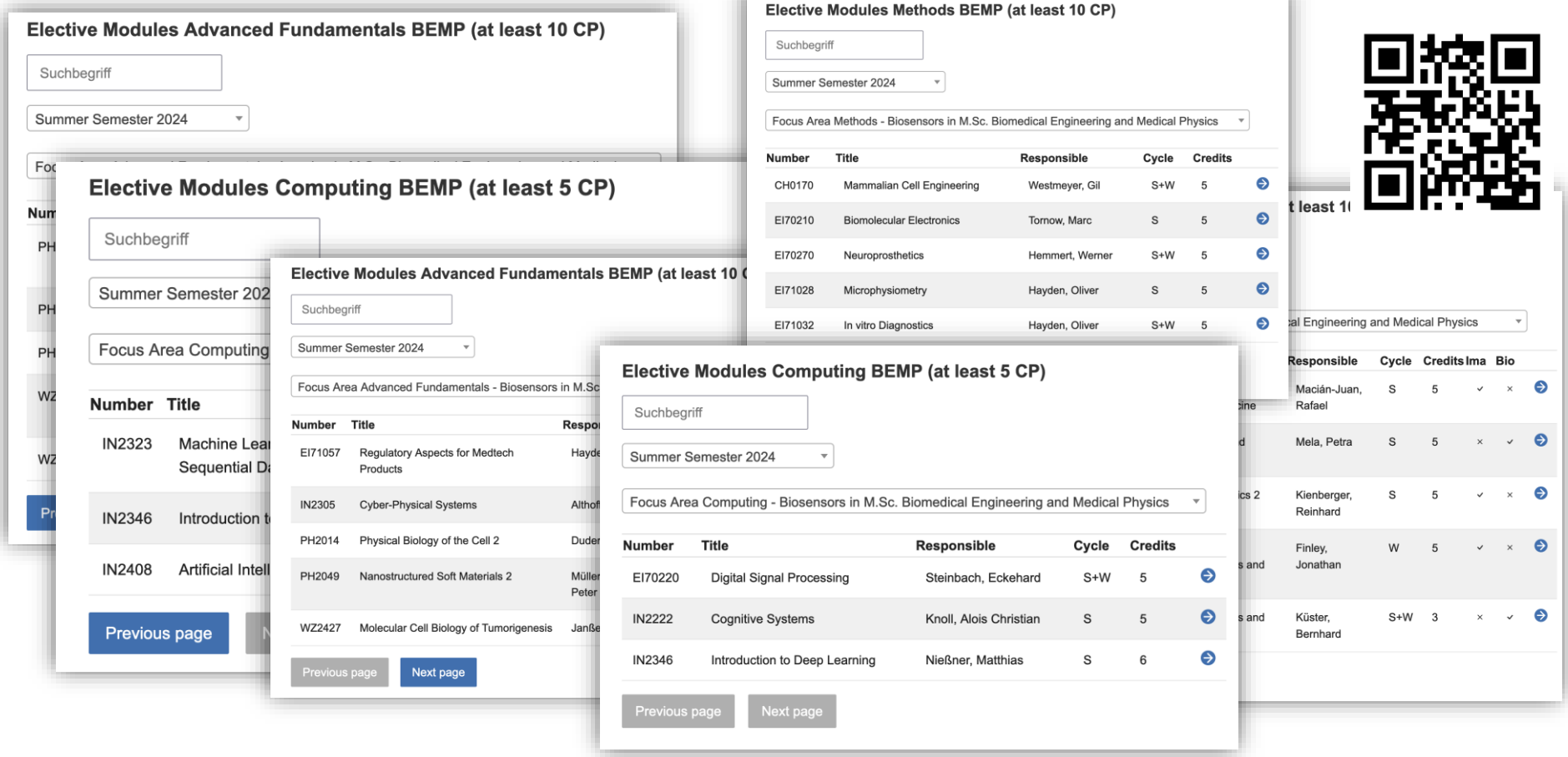
The modules are assigned to the following three categories:

- Advanced Fundamentals
- Methods
- Computing

The modules in these categories are in themselves assigned to the two focus areas:

- Imaging and
- Biosensors.

Elective Modules



Biomedical Engineering and Medical Physics

Information about the BEMP Master's degree program can be found on our website. Here in this Wiki you will find additional i

Legal Basis of the BEMP Master's degree program

You can find information on the academic and examination regulation in the Academic and Examination Regulations (Fachprüf
Studienordnung): https://academics.nat.tum.de/en/msc/bemp/legal-basis

The most important points are as follows:

- You must take all four mandatory modules and at least pass **two of the four mandatory** modu
- Academic progress check ("not more than one year behind"). The credit points have to be from
  - by the end of the 3rd semester: 30 credit points
  - by the end of the 4th semester: 60 credit points
  - by the end of the 5th semester: 90 credit points
  - by the end of the 6th semester: 120 credit points*

  there is only one exemption, if you do not have 120 credit points at the end of the 6th semeste
  have to finalize your studies. See FAQ: Academic Progress Check

Please remember that the degree program is intended to have 30 CP per semester. You also can do less or more as you indivi

FS (Fachschaft) MPIC

Sommer Semester 2026

Fachschaft?

What is a good translation of the German word "Fachschaft" to english?

The best translation of *Fachschaft* depends on the context:

1. **Student Association / Student Council** – If referring to a student-led organization within a university department.
2. **Departmental Student Committee** – A more precise term for a student group representing a specific subject or faculty.
3. **Student Body of [a Subject]** – If referring broadly to all students in a particular department.

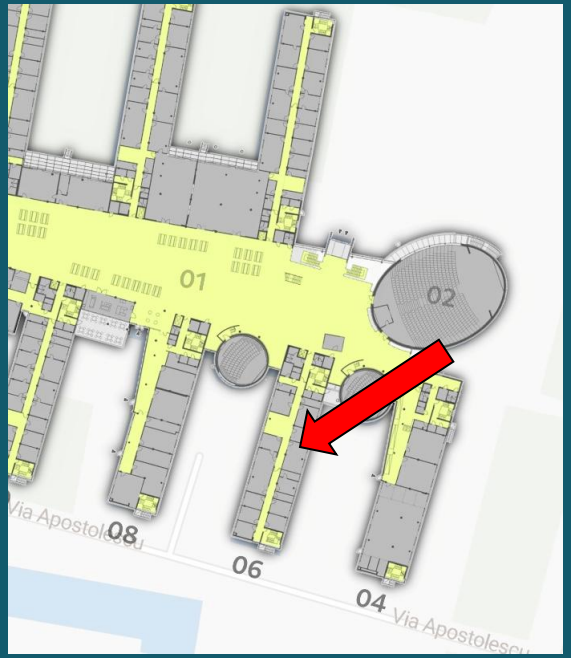
There's no perfect one-to-one translation, so the best choice depends on how formal or informal the context is.

German lessons woooo :)

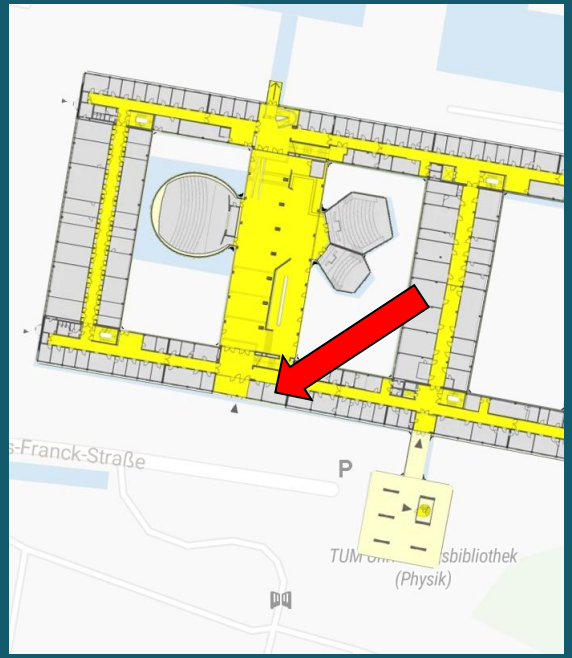
What is the Fachschaft?

- Fachschaft = all of us?!
- Active Fachschaft: motivated students who work on improving all student´s lives
- The next thing you can do to improve your fellow student's life I'll tell you at the end

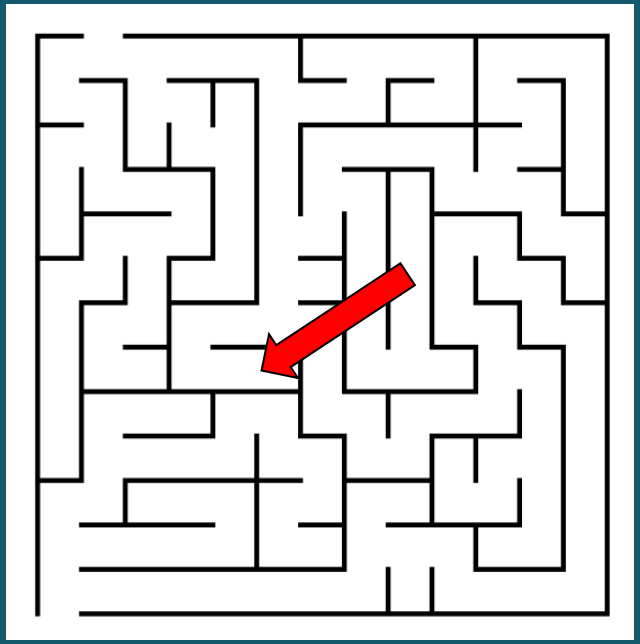
Where can you find us?



Maths-Computer Science Building

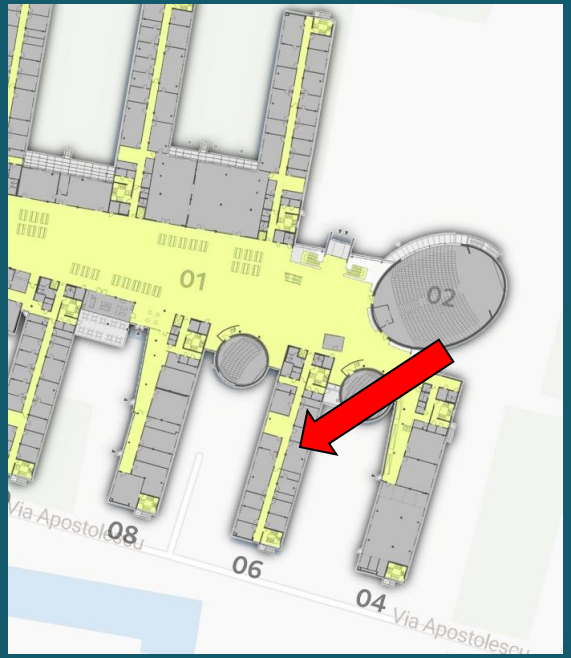


Physics Building

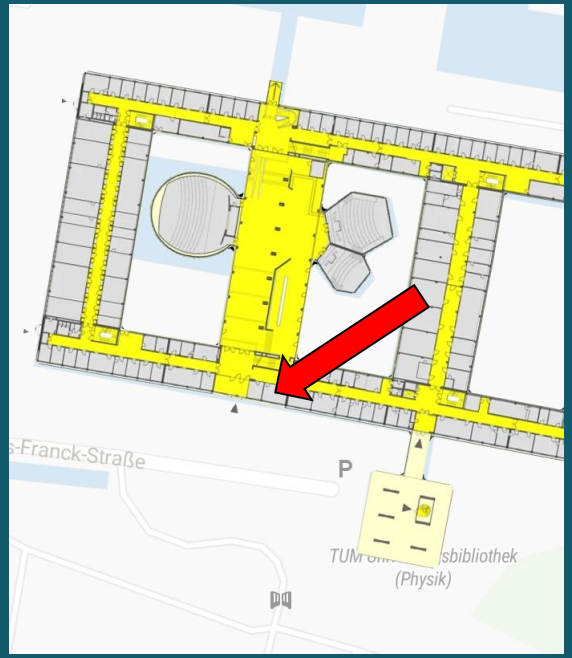


Chemistry Building

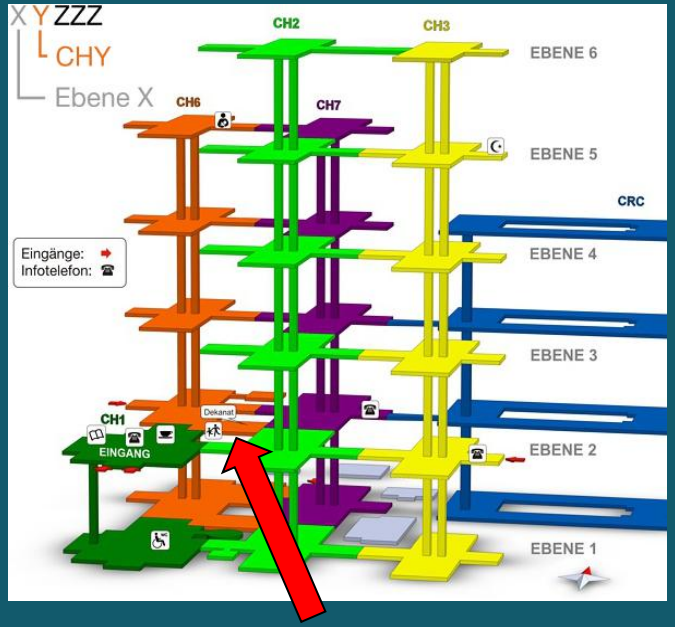
Where can you find us?



Maths-Computer Science Building



Physics Building

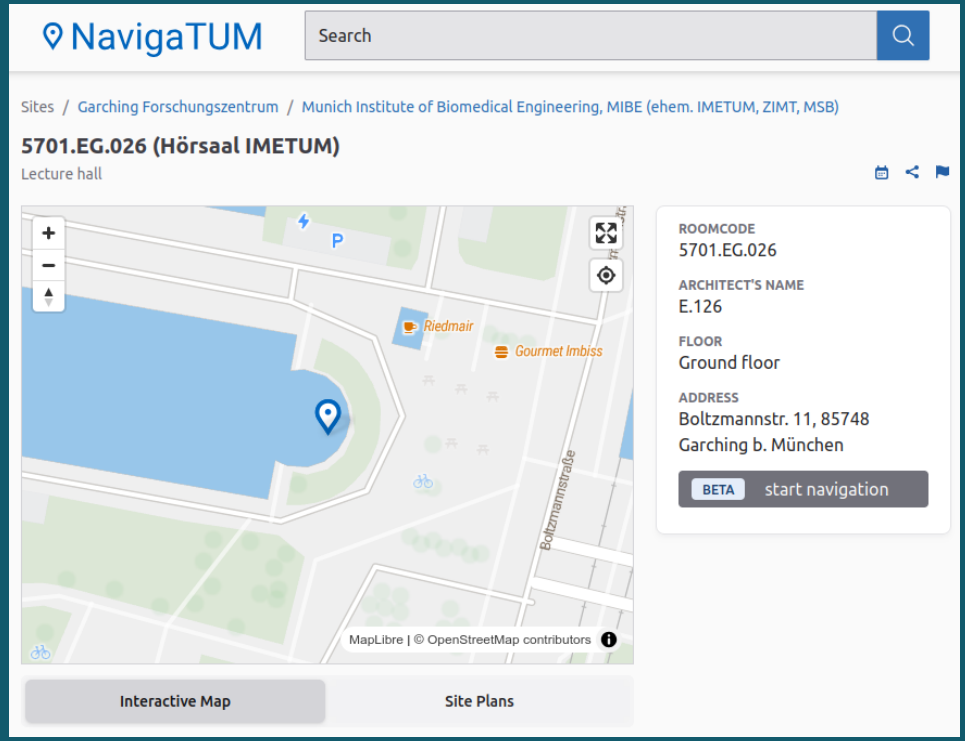


Chemistry Building

In any case for roomfinding

https://nav.tum.de/

Use it, it's really good!



Our Services for You

-Rentals-

Maths-Computer Science-Building:
- Ping-pong paddles (and balls)
- Volleyballs
- Basketballs
- Calculators
- Piano

Physics-Building:
- Ping-pong paddles (and balls)
- Calculators

Chemistry-Building:
- Volleyballs
- Basketballs
- Safety-goggles
- Molecule construction kits

Our Services for You

Maths-Computer Science Building:
- Use of the kitchen
- Printing of thesis
- Printing 3D-Objects

Physics Building:
- Use of the kitchen
- Use of coffee machine and kettle

Chemistry Building:
- Sale of lab coats
- Operating a vending machine for drinks

How do we shape the university?

- Representation on committees
- Co-writing the study regulations
- Distributing funds for teaching
- Carrying out the teaching evaluations
- Co-Decision-Making in the appointment of professors

How can you reach us?

Website: mpic.fs.tum.de
E-Mail: fsmpic@fs.tum.de
Instagram: mpic_tum
Telegram: t.me/fsmpic

Phone:
MI: 089 289 18545
Physics: 089 289 12664
Chemistry: 089 289 13006

Just drop by for our services, if you have questions or for just hanging out.
We´re there for you!

Election of semester speakers

Your Tasks as Semester Speaker

- Communication between your semester and the Fachschaft
- Lots of freedom in the organization of events in your semester
- Communications with professors and lecturers

The Election Process

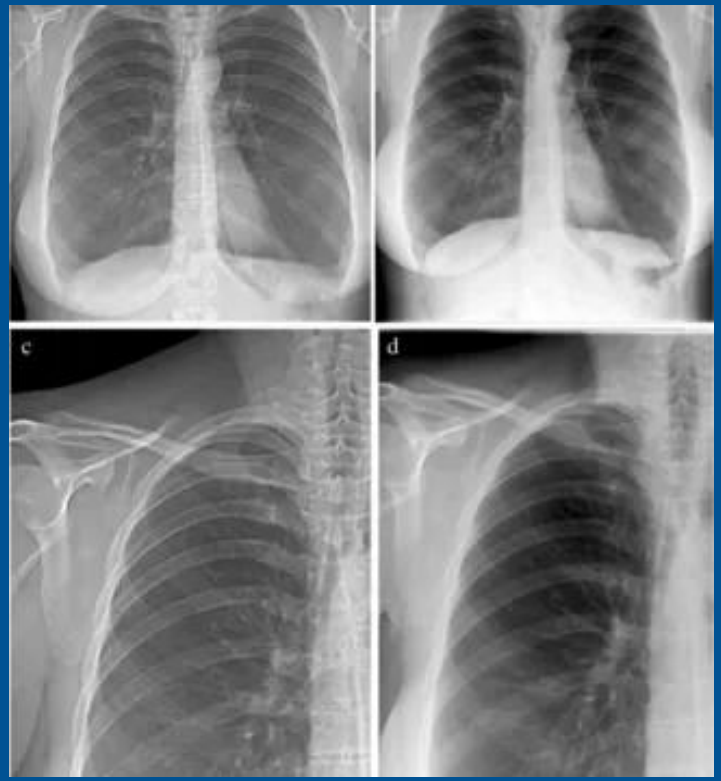
1. Candidates come forward and **briefly** themselves
2. Each person has two votes, which are cast by a show of hand
3. The two candidates with the most votes are elected, provided they accept the election

Your Fachschaft wishes you lots of fun in the new semester

Biomedical Physics

Biomedical Physics

Florian Schaff und Alex Gustschin

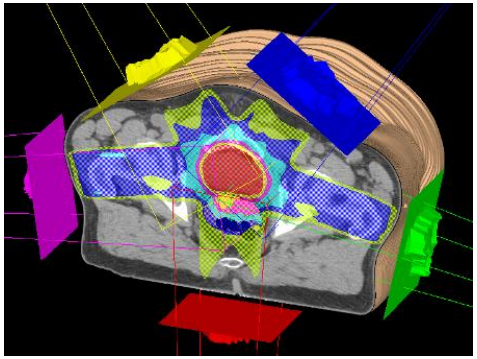


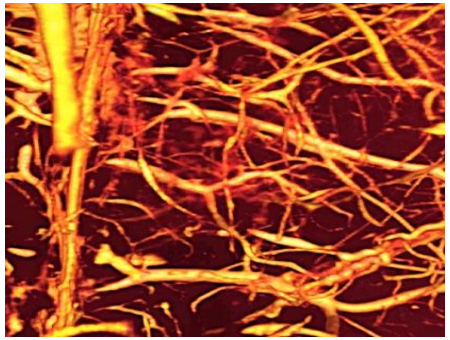
Contents

Biomedical Physics I

Contents

Biomedical Physics II



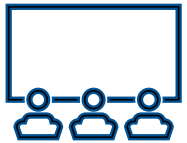


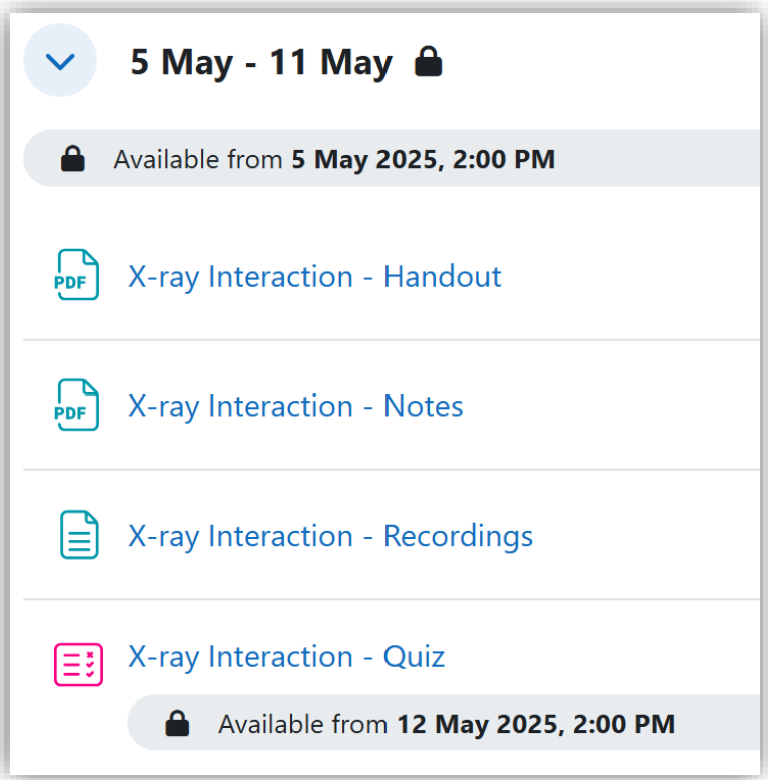
Hybrid Format

Lecture content online

Discussion on Campus

“Exercise” in TUMOnline





Frequently asked questions

Do I need to attend BMP1 before attending BMP2?

No, BMP2 does not require knowledge from BMP1. Both lectures are offered in summer and winter terms simultaneously.

How often can I attempt the BMP1/2 exams?

Unlimited attempts until you pass, within BEMP study progress checks. Exams for BMP1/2 are offered after every semester.

Is attendance to the discussion rounds mandatory?

Although highly recommended, there is no attendance requirement for the discussion rounds.

Does BMP1/2 replace specialized lectures on specific topics?

BMP1/2 provides a basic introduction to a wide range of topics and won't be as detailed as lectures dedicated to single topics.

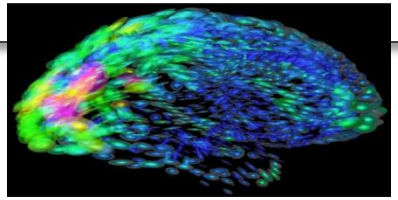
Introduction to Bioengineering

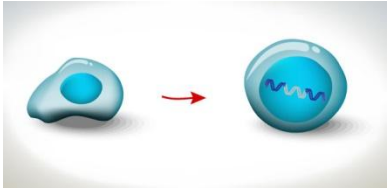
Dominik Selzner & Erik Riedel

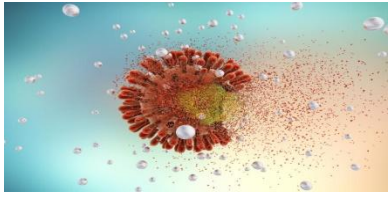
Introduction to Bioengineering 2026

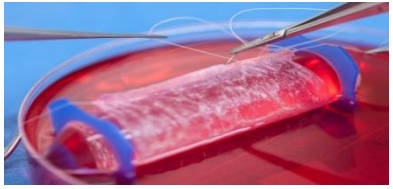
Date / Time: Monday 16:30 – 18:00
Location : TranslaTUM Auditorium

Topic Diversity

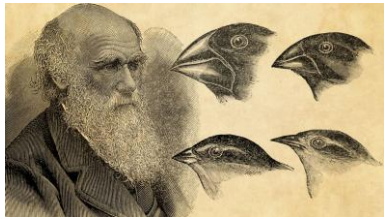


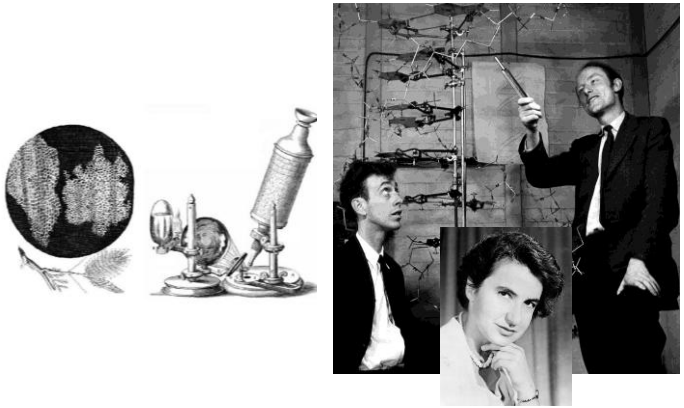


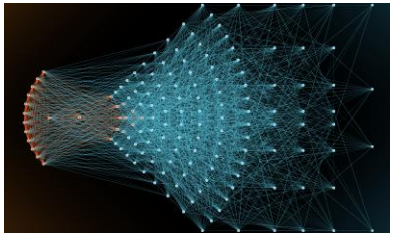




Bioengineering







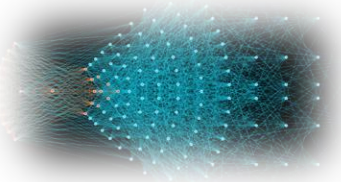
Observation & Discovery

Engineering of solutions

Basic elements of class structure

Observation / Technology

Analysis / Computation



Effectuation

engineering of

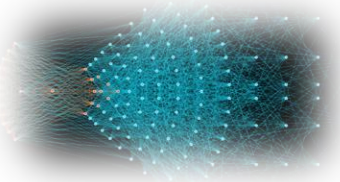
physical systems
i.e. technology driven life-sciences and medicine

biological systems
i.e. protein, gene, cell-engineering (synthetic biology)

Basic elements of class structure

Observation / Technology

Analysis / Computation



Effectuation

Introduction
Philosophy and Basics of Bioengineering and Biomedical Engineering

Primer: Cell Biology
Cell components ,Transcription / Translation, Regulation, Compartments

Primer: Signaling & Physiology
Endocrine, Nervous systems, Cellular signaling & Computing, Electrophysiology.

Biomedical signal detection I / II
Sensing and analysis of biomedical signals

Biological laboratory techniques
Instrumentation and methods for biology

Omics- technologies
Sequencing, Genomics, Proteomics

Protein & Cell engineering
Methods, Example, computational techniques

Gene editing
Classic methods, CRISPR-Cas

Microscopy
Methods, Applications

The student ...

... builds basic terminology in life sciences
... refreshes basic knowledge on **bio- / physiological structures** and processes

... understands biomedical signals and basic methodologies that can acquire them and analyze them

... understands techniques to acquire **OMICS information**

... understands basic biological laboratory techniques from an engineering perspective

... understands major challenges in biology and medicine and the need for advanced solutions / engineering

... is introduced to modern medical concepts including early detection and prevention
…is introduced to the big data needs of modern biology interrogations

... knows the fundamental principles how to **engineer proteins, cells and genes** and the necessary data and tools

... knows the strategies for **bioengineered drug design**

... grasps the magnitude of **future** perspectives & future questions and can **orient** in the relevant disciplines and technologies
... understands the **ethic implications**

Structure

Lectures: 13 x 90 min – at least 50% contribution to exams

In class practice : 13 x 60 min - up to 50% contribution to exams

Homework: To enhance comprehension

- Bonus: 0.3 grade improvement (if exam passed)

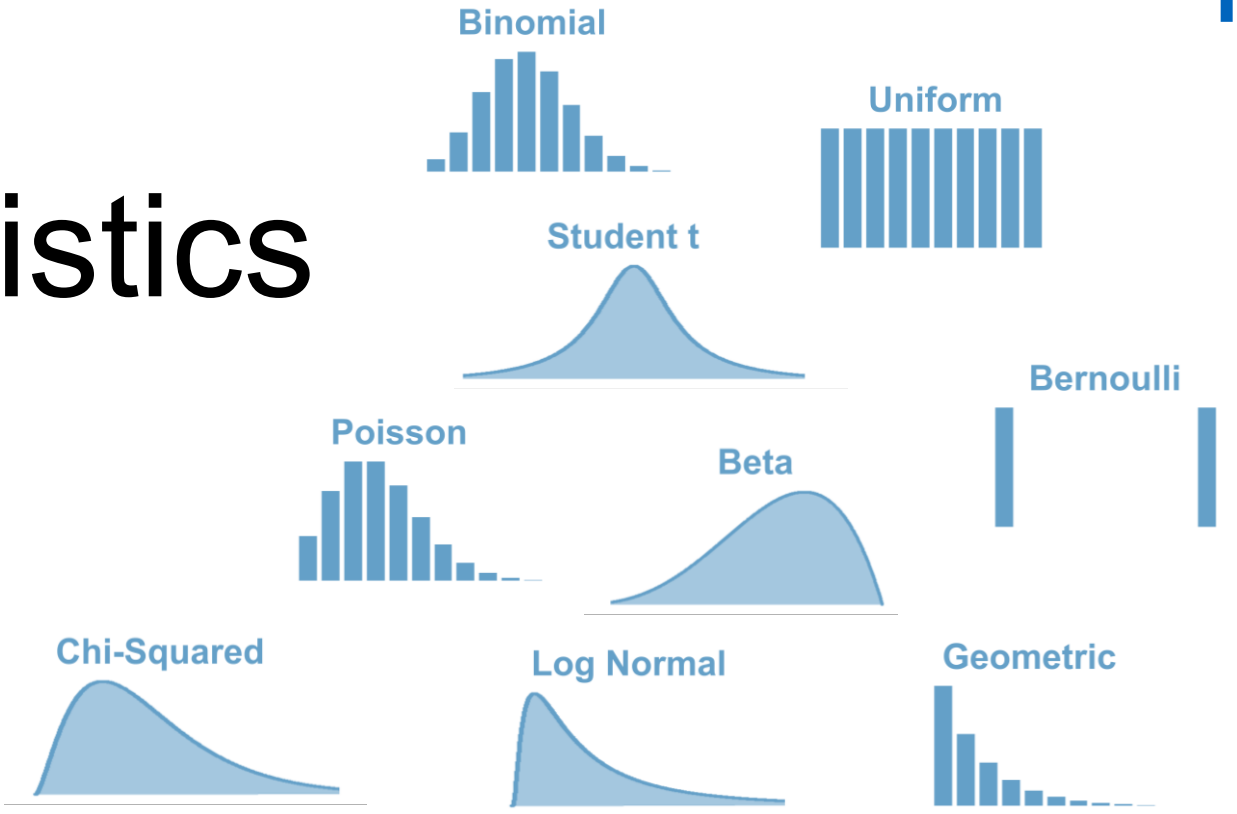
Date	Lecture (16:30 – 18:00)	Exercise (18:15 – 19:00)
13.04.2026	Introduction	Introduction to the Research Groups at TUM
20.04.2026	Introduction Cell Biology	Extended Lecture / Discussion / Case Study
27.04.2026	Introduction Physiology / Signaling	Extended Lecture / Discussion / Case Study
04.05.2026	Biomedical Sensing I	Introduction to Data Acquisition
11.05.2026	Biomedical Sensing II	Basic Data Processing (Fourier Analysis I)
18.05.2026	Laboratory Methods I	Advanced Data Processing (Fourier Analysis II)
25.05.2026	***— Whitsun Break —***	*— Whitsun Break —*
01.06.2026	Laboratory Methods II	Fourier Analysis: Applications
08.06.2026	Protein / Cell Engineering	Basics of Literature Research
15.06.2026	Computational Protein Engineering	Protein Structures
22.06.2026	Genomics	Intro to AlphaFold / Rosetta
29.06.2026	Gene Editing	Databases
06.07.2026	Microscopy	Microscopy
13.07.2026	Wrap Up	Statistics for Your Research

Biostatistics

Bernhard Gleich & Thorsten Sellerer

Biostatistics

Bernhard Gleich
Thorsten Sellerer
Gregor Breitenhuber



Lecture Contents

Before lectures start

Part 0

Online Precourse in Moodle – this content is required for the lecture

Lecture Contents

Before lectures start

Part 0

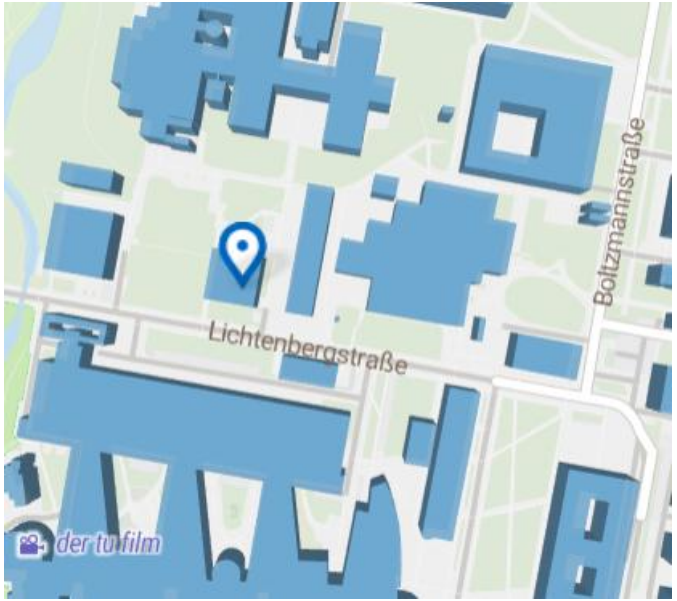
Online Precourse in Moodle – this content is required for the lecture

Lecture + Exercise:

- Tuesday, 14:00 - 17:00
- Interims II (5416.01.003)

Q&A Session:

- Wednesday, 13:00 - 14:00,
- E.126, Hörsaal MIBE (5701.EG.026)



Lecture Contents

Before lectures start

Part 0

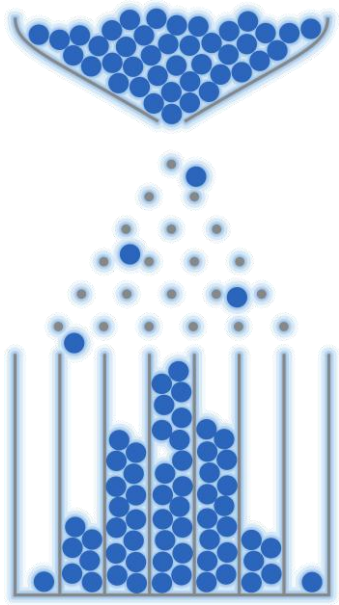
Online Precourse in Moodle – this content is required for the lecture

Part 1

Week 1

1. Advanced Distributions I

Week 8



Lecture Contents

Before lectures start

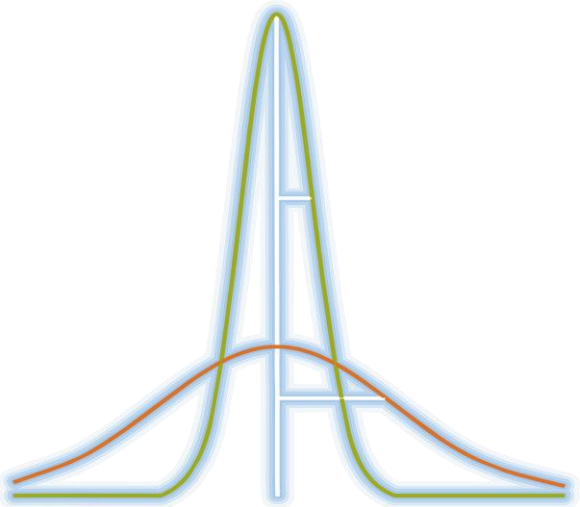
Part 0

Online Precourse in Moodle – this content is required for the lecture

Part 1

Week 1

1. Advanced Distributions I
2. Advanced Distributions II



Week 8

Lecture Contents

Before lectures start

Part 0

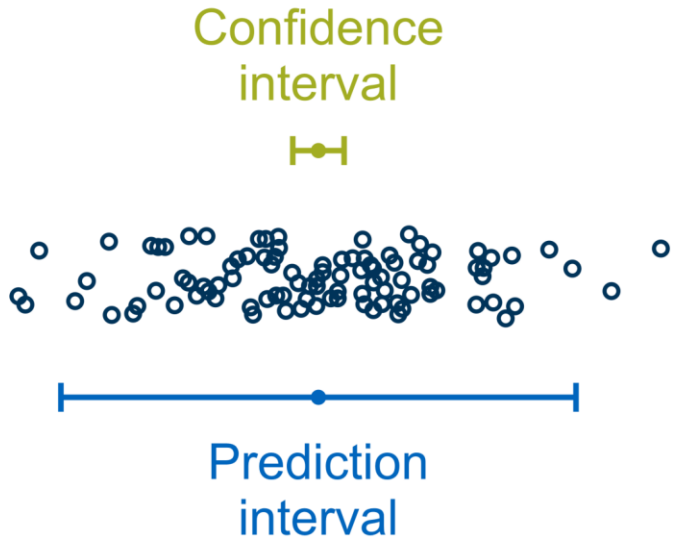
Online Precourse in Moodle – this content is required for the lecture

Part 1

Week 1

1. Advanced Distributions I
2. Advanced Distributions II
3. Estimations

Week 8



Lecture Contents

Before lectures start

Part 0

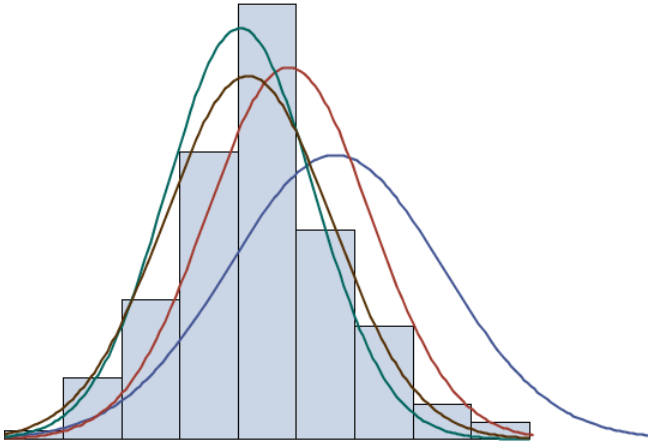
Online Precourse in Moodle – this content is required for the lecture

Part 1

Week 1

1. Advanced Distributions I
2. Advanced Distributions II
3. Estimations
4. Maximum Likelihood Estimation I
5. Maximum Likelihood Estimation II

Week 8



Lecture Contents

Before lectures start

Part 0

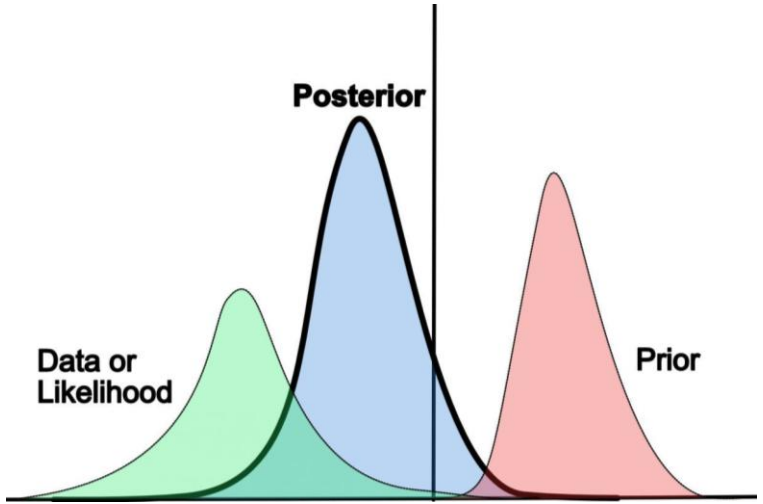
Online Precourse in Moodle – this content is required for the lecture

Part 1

Week 1

1. Advanced Distributions I
2. Advanced Distributions II
3. Estimations
4. Maximum Likelihood Estimation I
5. Maximum Likelihood Estimation II
6. Baysian Statistics I
7. Baysian Statistics II

Week 8



Lecture Contents

Before lectures start

Part 0

Online Precourse in Moodle – this content is required for the lecture

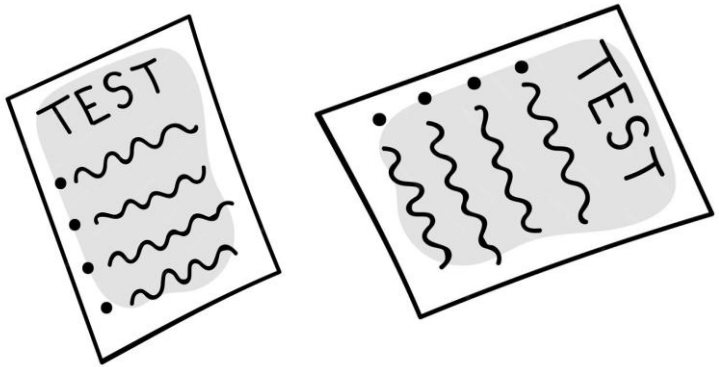
Part 1

Week 1

1. Advanced Distributions I
2. Advanced Distributions II
3. Estimations
4. Maximum Likelihood Estimation I
5. Maximum Likelihood Estimation II
6. Baysian Statistics I
7. Baysian Statistics II

Week 8

8. Mid-Term Exam (11.12.2025)



50% of all credits or better

→ 0.3 bonus to passed final exam

Lecture Contents

Before lectures start

Part 0

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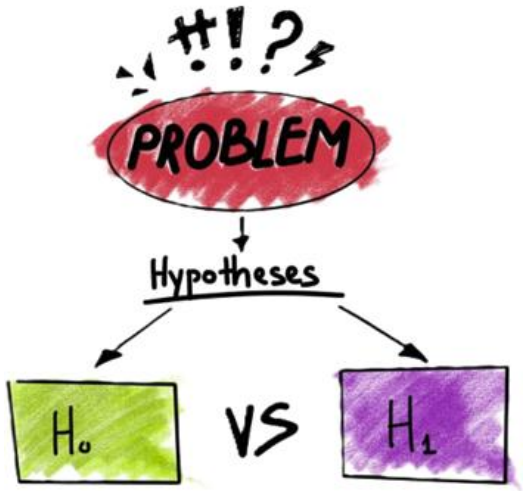


Week 9

Week 10-11

Part 2

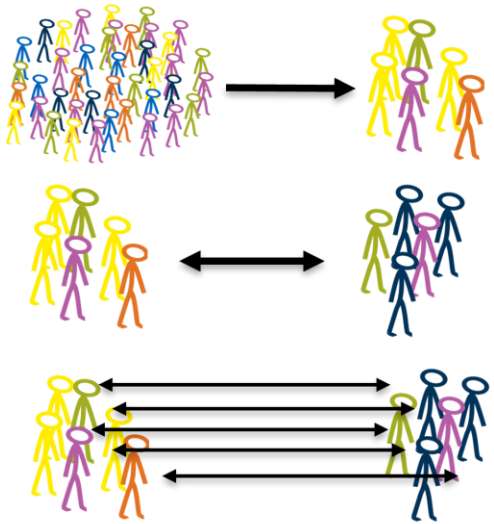
8. Hypothesis Testing

Lecture Contents

Before lectures start

Part 0

Online Precourse in Moodle – this content is required for the lecture



Week 9

Week 10-11

Part 2

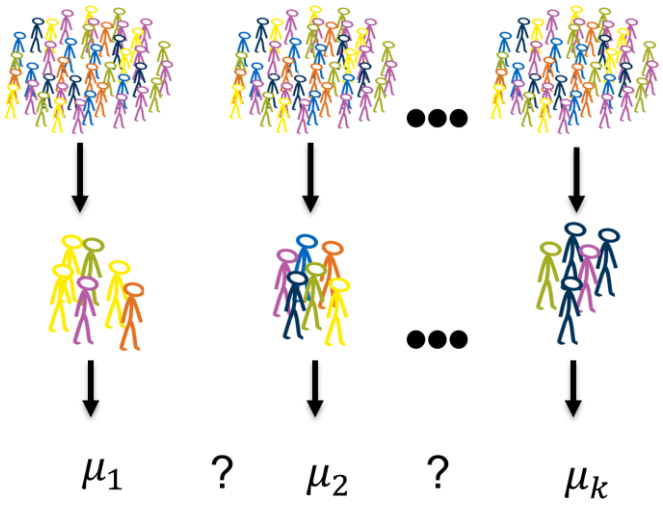
8. Hypothesis Testing
9. One-and Two Sample Tests

Lecture Contents

Before lectures start

Part 0

Online Precourse in Moodle – this content is required for the lecture



Week 9

Week 10-11

Part 2

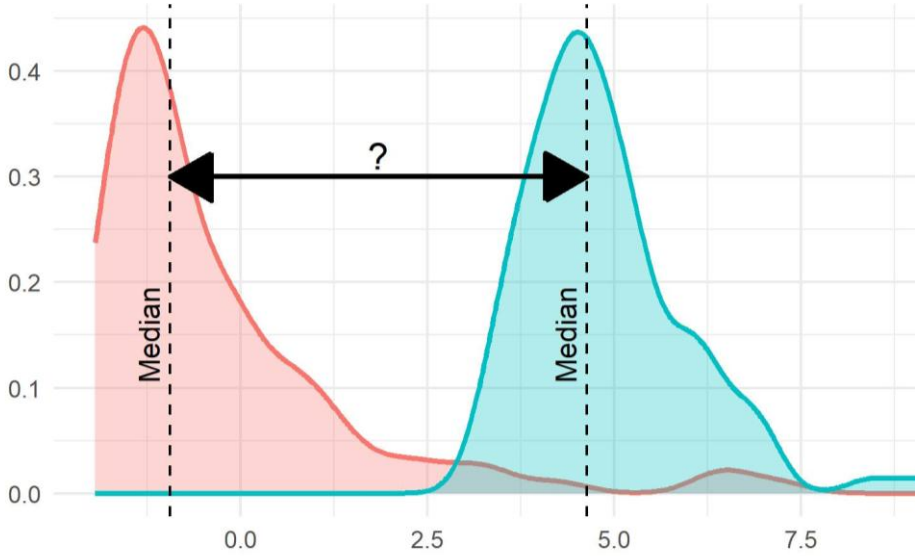
8. Hypothesis Testing
9. One-and Two Sample Tests
10. Multi-Sample Inference

Lecture Contents

Before lectures start

Part 0

Online Precourse in Moodle – this content is required for the lecture



Week 9

Week 10-11

Part 2

8. Hypothesis Testing
9. One-and Two Sample Tests
10. Multi-Sample Inference
11. Rank Tests

Lecture Contents

Before lectures start

Part 0

Online Precourse in Moodle – this content is required for the lecture

Hair Color			
Eye Color	Blonde	Brown	Black
Green	4	2	1
Blue	7	4	2
Black	2	18	5
Brown	1	2	2

Week 9

Week 10-11

Part 2

8. Hypothesis Testing
9. One-and Two Sample Tests
10. Multi-Sample Inference
11. Rank Tests
12. Categorical Data

Lecture Contents

Before lectures start

Part 0

Online Precourse in Moodle – this content is required for the lecture

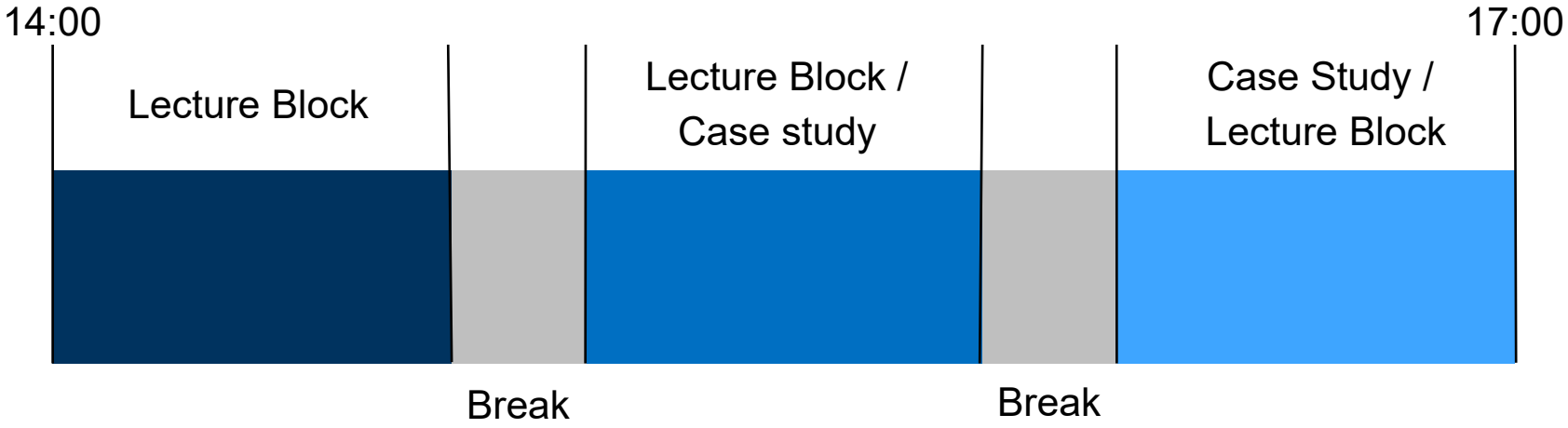
Preparation for the exam:

- Attend each lecture (from the start)
- Practice the provided exercise sheets
- Attend voluntary tutorials regularly
- Use the Moodle forum to ask questions

Part 2

8. Hypothesis Testing
9. One-and Two Sample Tests
10. Multi-Sample Inference
11. Rank Tests
12. Categorical Data
13. Repetition Lecture
14. Final Exam (10.08.2026)

Lecture Format



Case Study