Introduction seminar for new students

Prof. Dr. Thomas Pertsch
Scientific Coordinator of the Master Program

www.asp.uni-jena.de and www.acp.uni-jena.de

Welcome to Jena – City of Optics

Abbe Center of Photonics | JENA
Friedrich-Schiller-Universität

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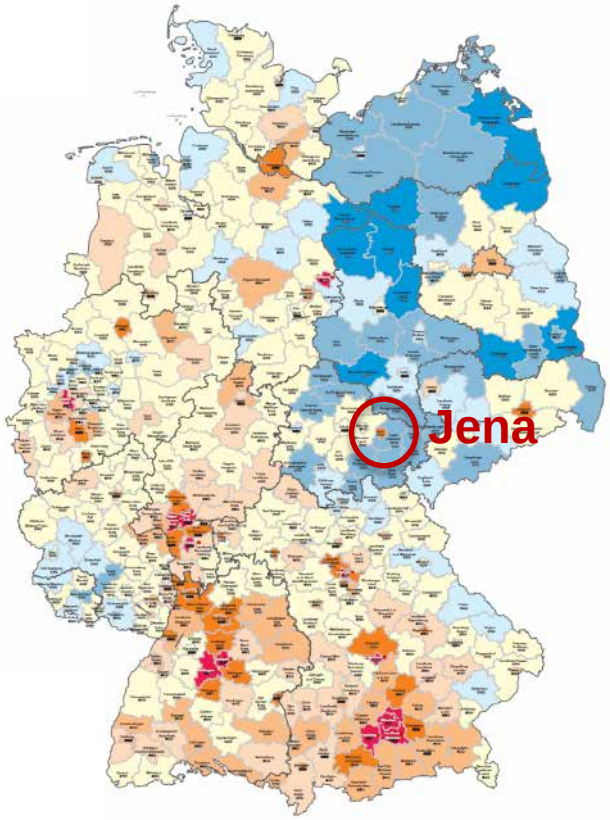
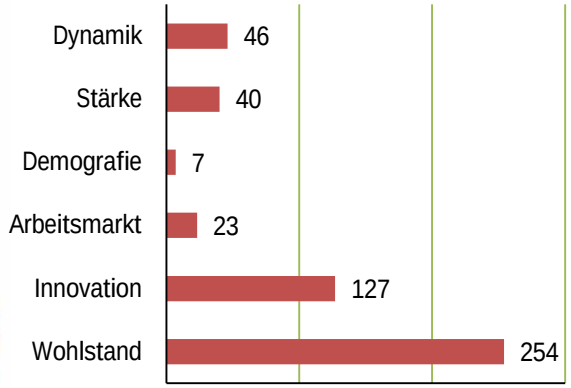
Top 4 of Germany‘s High-Tech-Cities “ (JobLift-Ranking 2018)

„One of the top-ten demographic areas in Germany, very high dynamics, excellent job and digitalization chances“ (Prognos 2019)



Jena, Stadt | Rang 29 von 402 im Jahr 2019



Regionen und - ihre Zukunftschancen

- beste Chancen
- sehr hohe Chancen
- hohe Chancen
- leichte Chancen
- ausgeglichene Chancen und Risiken
- leichte Risiken
- Hohe Risiken
- sehr hohe Risiken

Welcome to Jena – City of Optics

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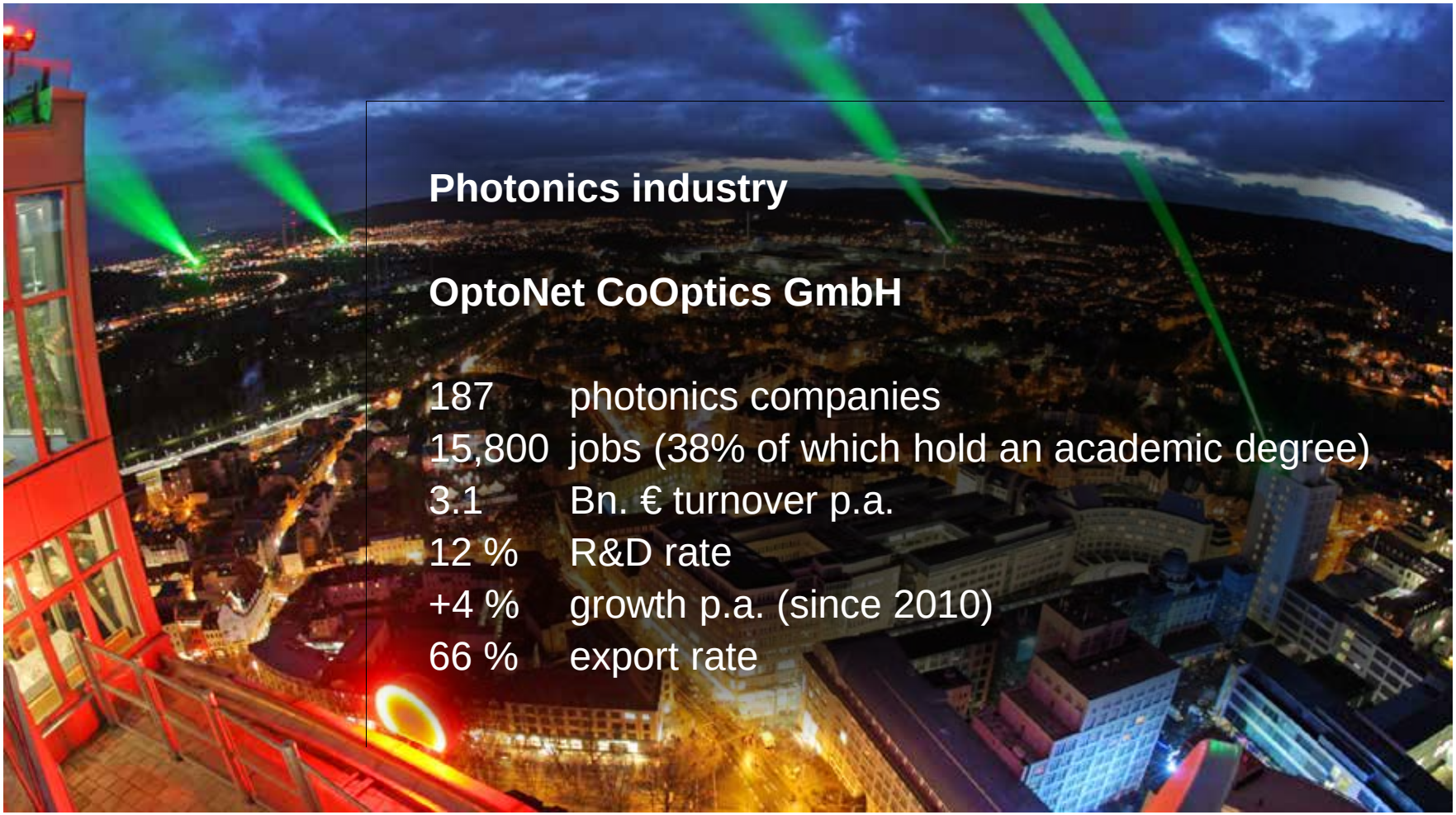
Jena – Germany‘s city of light



Photonics industry

OptoNet CoOptics GmbH

187	photonics companies
15,800	jobs (38% of which hold an academic degree)
3.1	Bn. € turnover p.a.
12 %	R&D rate
+4 %	growth p.a. (since 2010)
66 %	export rate

Source: OptoNet survey 2017

Optics & Photonics in Jena
A bright future based on a strong tradition

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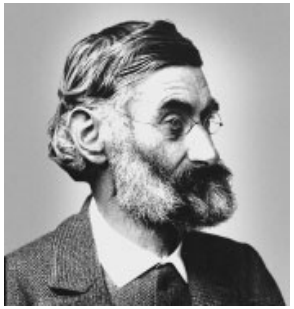
Friedrich-Schiller-Universität

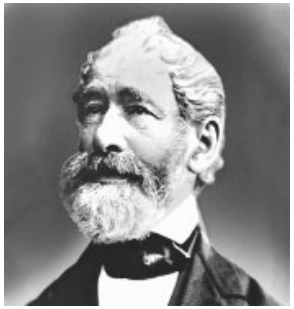
Strong tradition in optics

- Traditional business area for Jena and the surrounding region
- Main focus at Faculty of Physics and Astronomy is on education



Ernst Abbe
(1840-1905)

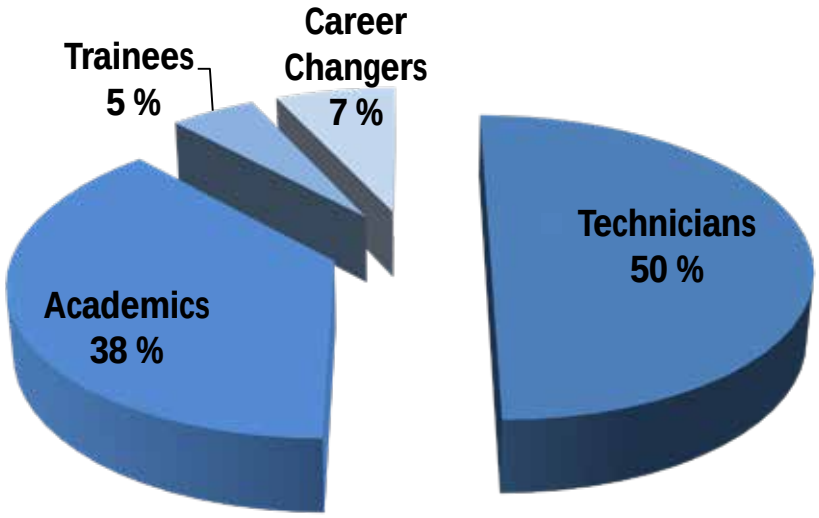
Otto Schott
(1851-1935)



Carl Zeiss
(1816-1888)

Perspective in Optics & Photonics

- Interdisciplinary field linking multiple Faculties: Physics & Astronomy, Chemistry & Earth Sciences, Biological Sciences, Medicine, and Mathematics & Computer Science
- Companies in and around Jena strongly interested in highly educated employees
- **Jena is a European center of photonics research and education**



Optical industry employee qualification

Source: OptoNet Survey 2015

Welcome to Jena – City of Optics

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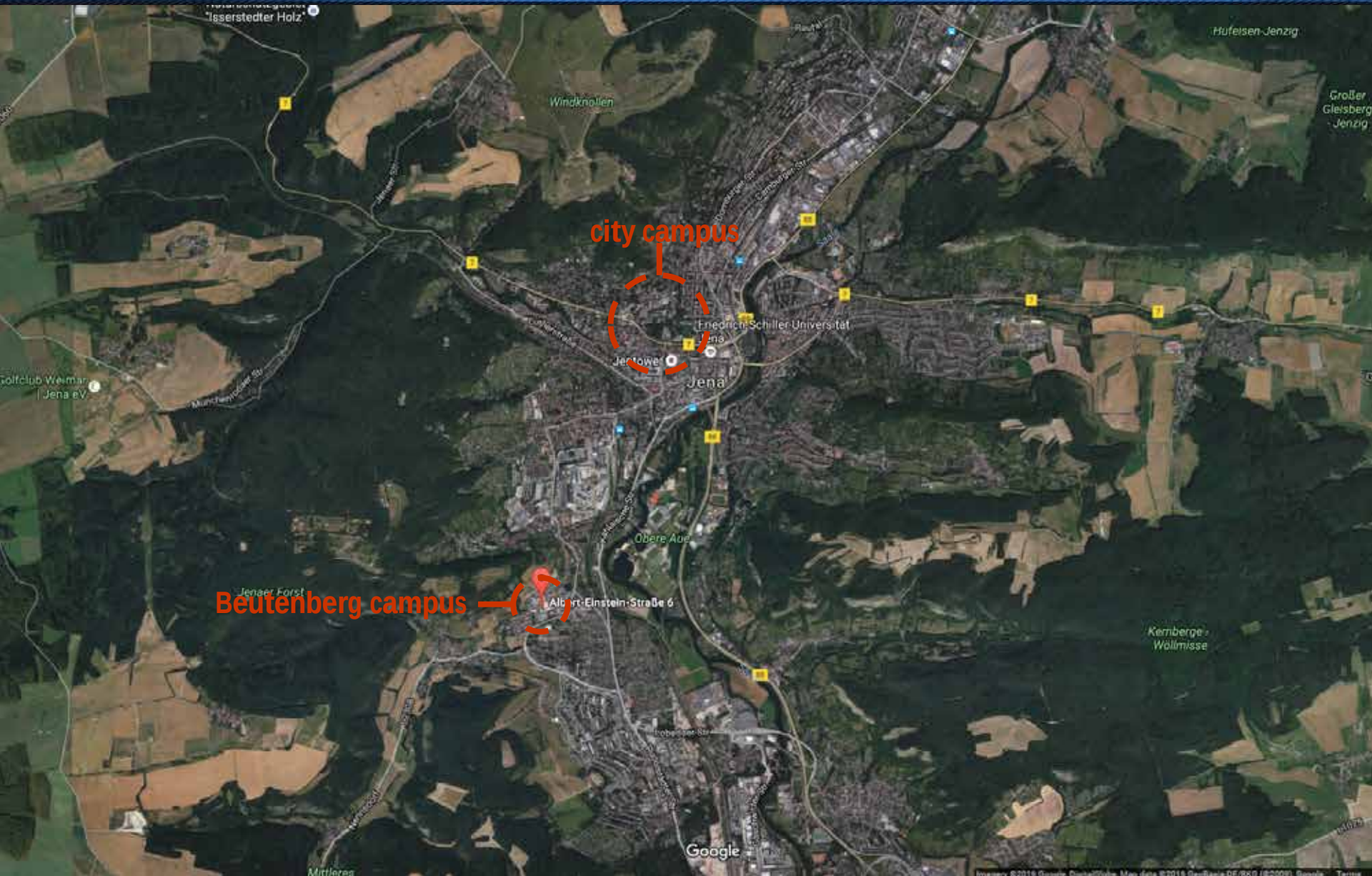

Campus Beutenberg
Light & Life research campus

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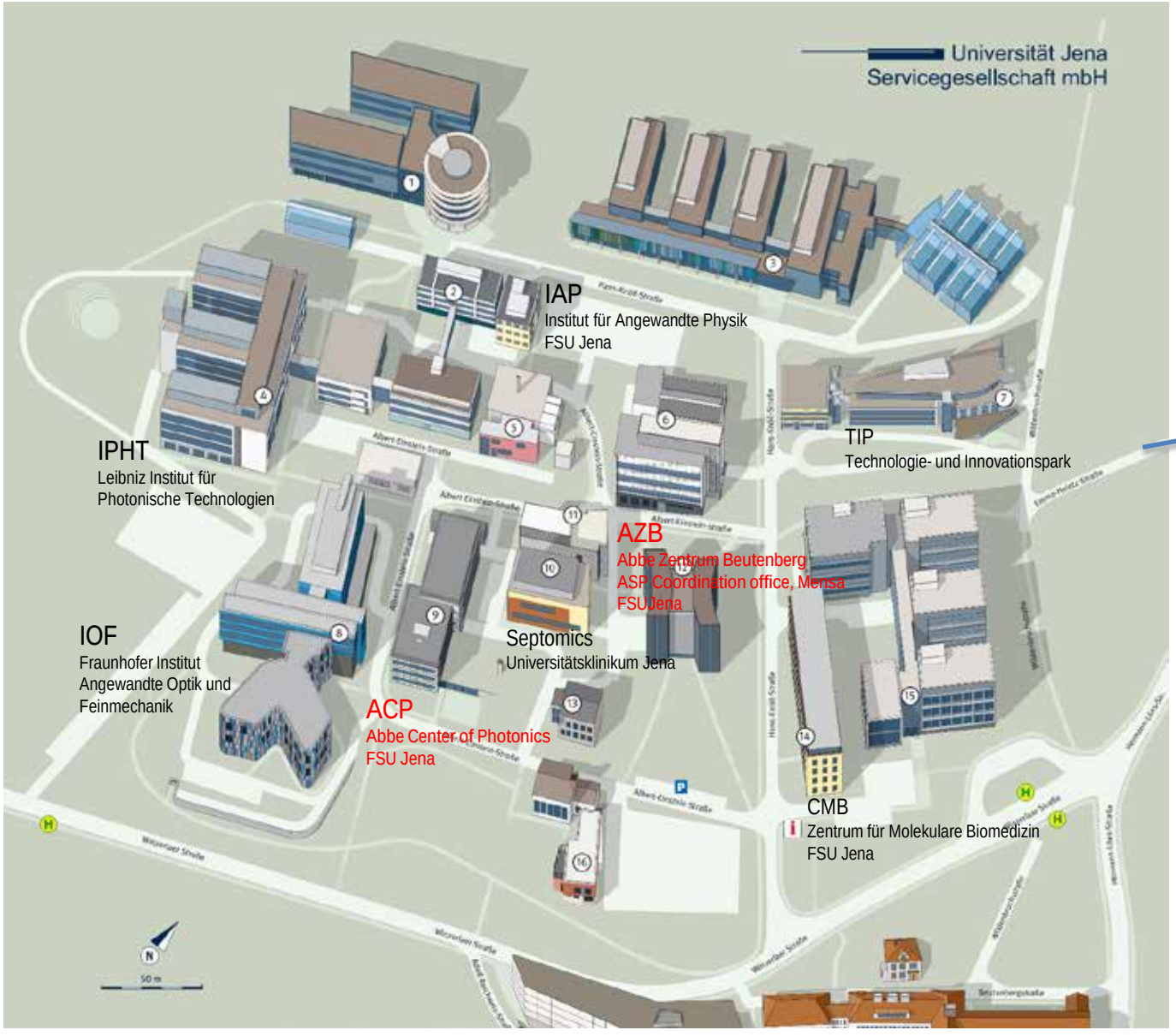


Zeiss-Mensa, 10‘ walk

Abbe Center of Photonics

Interfaculty center for optics and photonics

Abbe Center of Photonics JENA
Friedrich-Schiller-Universität

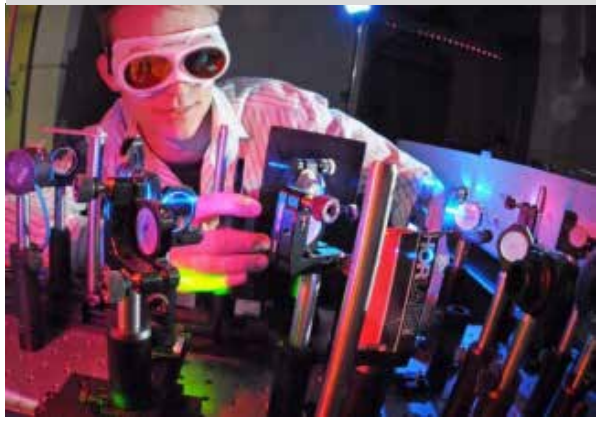
Faculty of Biological Sciences
Faculty of Chemistry and Earth Sciences
Faculty of Medicine
Faculty of Physics and Astronomy

Light,
Life, Liberty

Fraunhofer IOF

ultra optics

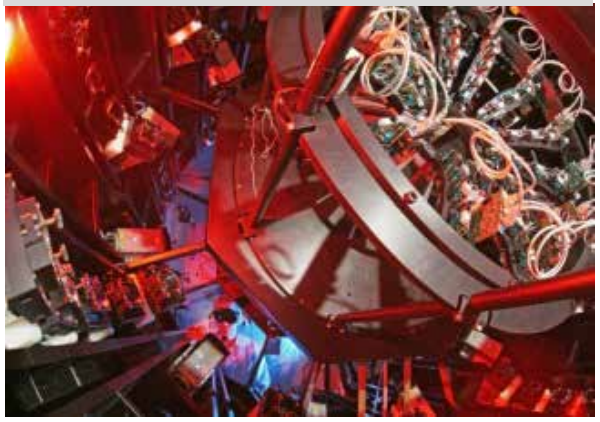
- **laser physics**
- **nanooptics**
- **photonic materials**
- **optical systems**
- **quantum technologies**



Helmholtz Institute Jena

strong field physics

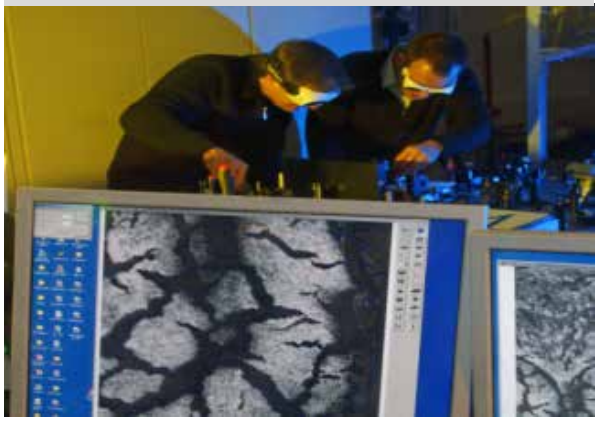
- **ultrahigh peak power lasers**
- **nonlinear and relativistic laser physics**
- **x-ray optics**



Leibniz Institute IPHT

biophotonics

- **novel spectrosc. techn.**
- **bioimaging and biospectroscopy**
- **chip-based analytics and diagnostics**



Abbe Center of Photonics

Interfaculty center for optics and photonics

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Friedrich-Schiller-Universität

Faculty of Biological Sciences
Faculty of Chemistry and Earth Sciences
Faculty of Medicine
Faculty of Physics and Astronomy

Light,
Life, Liberty

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Leibniz Institute IPHT

biophotonics

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- **chip-based analytics and diagnostics**

Abbe School of Photonics JENA

Master‘s degree program

~ 50 students in M.Sc. Physics with specialization Optics
~150 students in M.Sc. Photonics
more students in M.Sc. Chemistry,
and in M.Sc. Medical Photonics

Doctoral program

~260 doctoral students in Optics & Photonics

Guest professorship program

> 40 foreign guest professors

Optics & Photonics at the University

Principal Scientists

Abbe School of Photonics JENA
Friedrich-Schiller-Universität

Faculty physics +chemistry +biology +medicine +other areas +external institutes +external funding

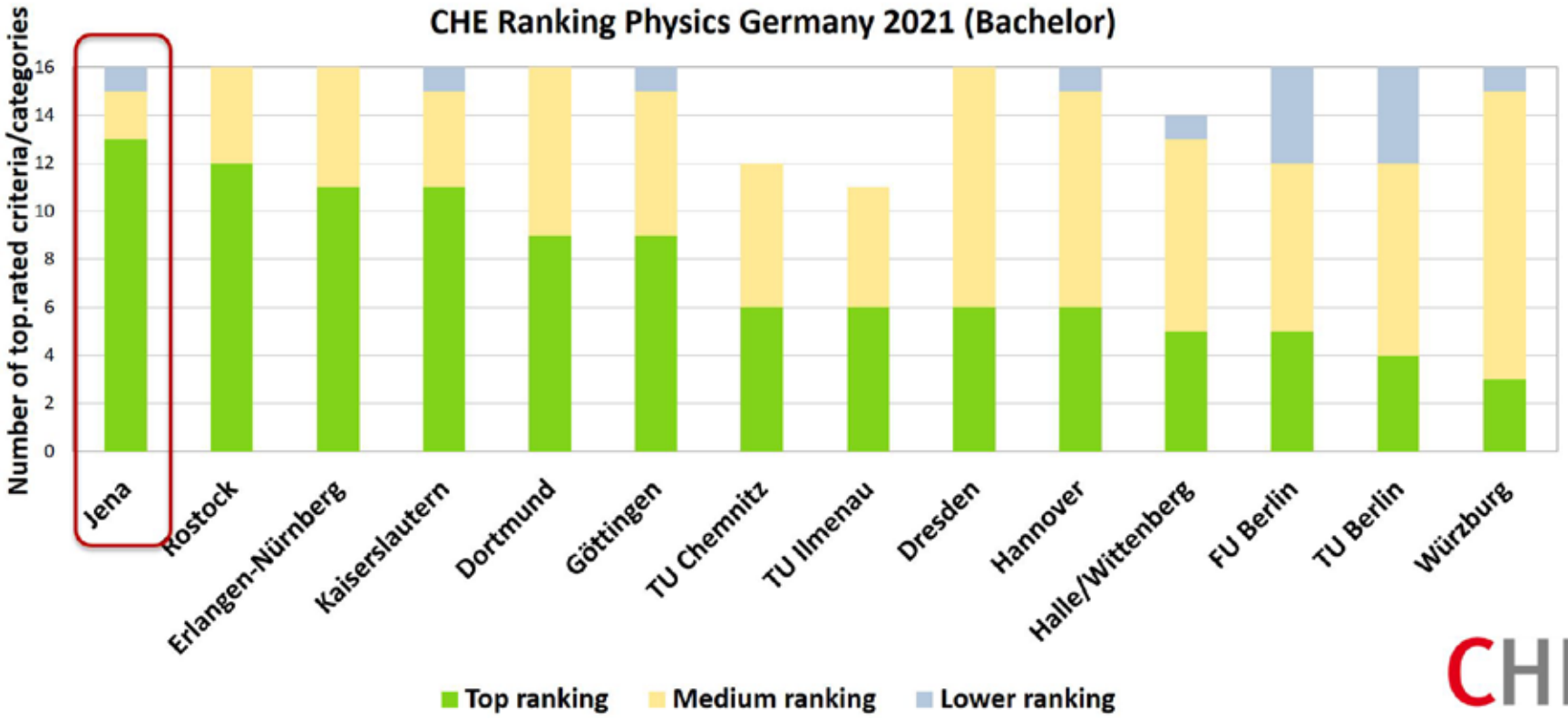
42 professors, 2 junior professors, 13 (junior) group leaders

Quality of education program
National university ranking for Physics

Abbe School of Photonics JENA
Friedrich-Schiller-Universität

Final evaluation mark for undergrad course in physics (averaged over all criteria) obtained by university

Teaching quality in several criteria (= students' satisfaction)

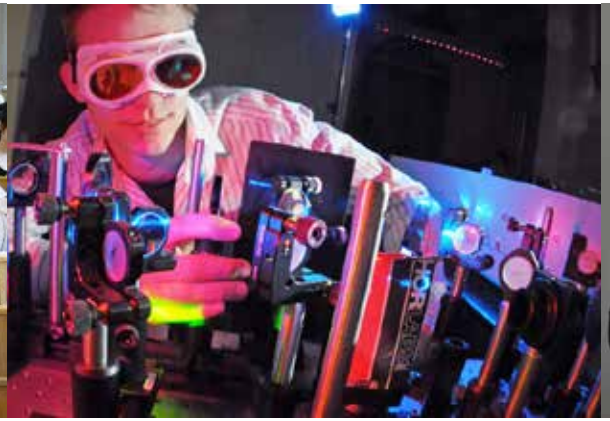


CHE Ranking 2021

Abbe School of Photonics

Internationalization at all levels

	iMaster	iDoc	iStaff
Incoming **Mobility**	> 90 % non-German > 40 nationalities Scholarship programs	Competitive research profile, central application system	Guest professors Int. junior groups International calls
Outgoing **Mobility**	Mobility windows Exchange programs	IRTG 2101 Scholarship programs (Erasmus Mundus, DAAD)	Research mobility Internat. career service
Institutional **Internationalization**	Joint degree programs	Global research network	Internat. management



International Master‘s degree program

Abbe School of Photonics JENA
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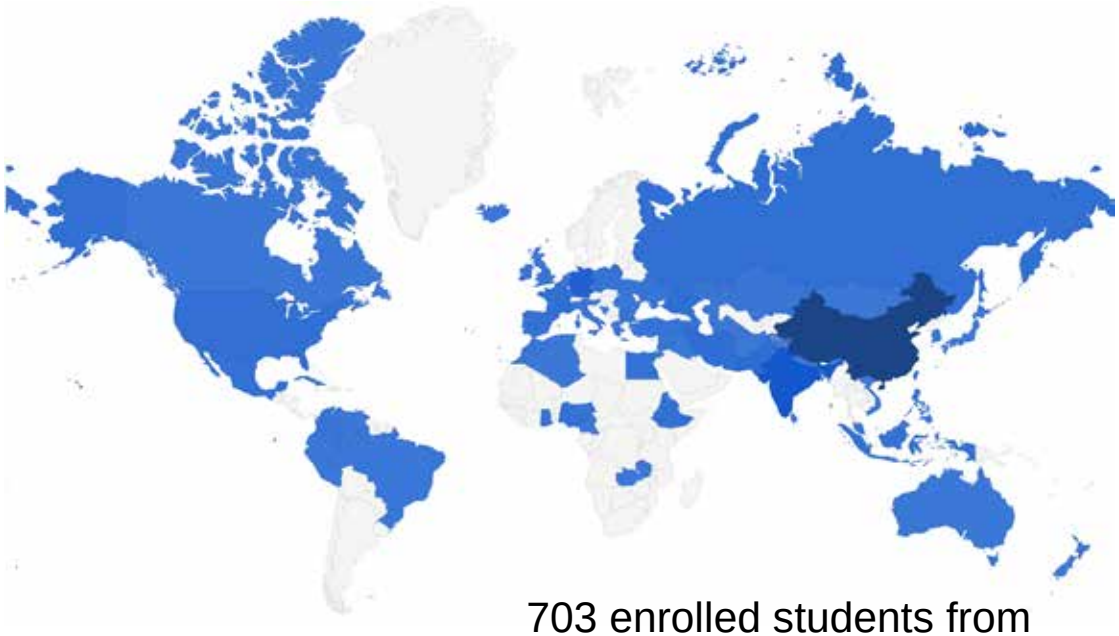
International Master‘s degree program

Countries of origin of students



703 enrolled students from
65 different countries (2009-2021).
www.asp.uni-jena.de/map2021

Australia	1
Afghanistan	2
Algeria	1
Armenia	1
Azerbaijan	5
Bangladesh	23
Belgium	1
Bosnia and Herzegovina	1
Brazil	4
Bulgaria	5
Cameroon	2
Canada	2
China	178
Colombia	8
Cuba	1
Czech Republic	1
Ecuador	2
Egypt	16
Eritrea	2
Ethiopia	20
France	22
Germany	58
Ghana	10
Greece	2
Iceland	1
India	83
Indonesia	13
Iran	24
Iraq	1
Ireland	5
Israel	1
Italy	5
Japan	1

Jordan	2
Kazakhstan	5
Lebanon	1
Malaysia	3
Morocco	3
Mexico	17
Mongolia	2
Nepal	4
Netherlands	2
New Zealand	1
Nigeria	14
Pakistan	26
Peru	1
Philippines	4
Poland	11
Portugal	3
Romania	1
Russia	21
Slovenia	1
South Korea	5
Spain	14
Sri Lanka	2
Syria	3
Taiwan	8
Turkey	12
Turkmenistan	1
Ukraine	7
United Kingdom	3
United States	20
Venezuela	1
Vietnam	2
Zambia	1

International Master‘s degree program

Student mentoring program

Abbe School of Photonics JENA
Friedrich-Schiller-Universität

Senior students act as tutors to support new students
Providing help to understand e.g. cultural differences in education and life

International Master‘s degree program

Professional intercultural trainings

Abbe School of Photonics | JENA
Friedrich-Schiller-Universität

§ Fast adaption of new foreign students
§ Training of ASP staff and student tutors

Register now! (see Dorit’s Email soon)

International education program

with a perspective beyond the university

Abbe School of Photonics JENA
Friedrich-Schiller-Universität

Professional career development

- Courses on German business and working culture
- Courses on soft and transferable skills
- Language courses
- Job Fairs, interview sessions
- Application workshops and coaching
- Excursions

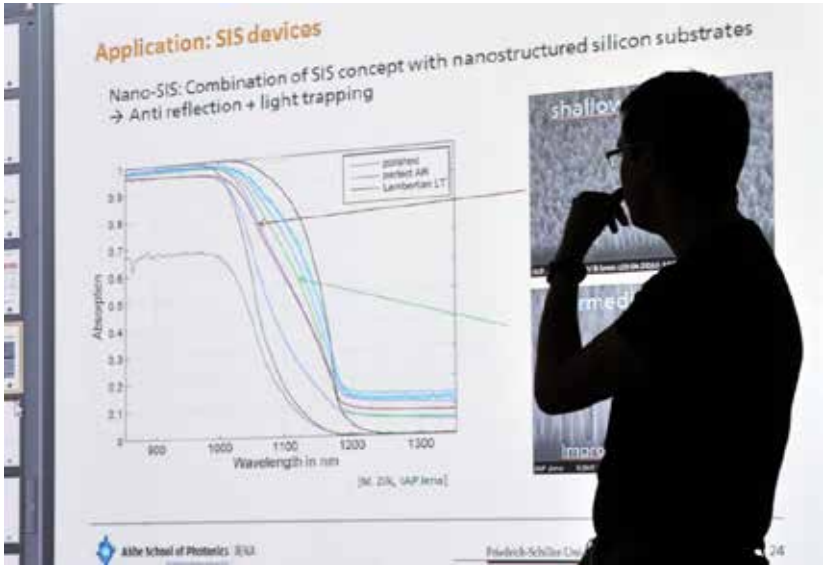
Workshop at Carl Zeiss AG in 2012.

Job interview with industry partner in 2012.

International Master‘s degree and Doctoral program

Master‘s degree program

- M.Sc. Photonics (currently >150 students)
- >500 applications per year
- Intake of 50-70 students per year
- Output of ~40 M.Sc. Photonics per year



Doctoral program

- Currently ~260 doctoral students (40 females, 16 foreign students) in Optics & Photonics
- Researching in over 11 research institutes

International Master‘s degree program

Abbe School of Photonics JENA
Friedrich-Schiller-Universität

B.Sc. in Phys. / Chem. / Eng. / Math.

ADJUSTMENT
Fundamentals of modern optics, Structure of matter, Condensed matter physics, Semiconductor physics, Quantum mechanics

FUNDAMENTALS
Optical metrology and sensing, Optical modeling and design, Laser physics, Optics training laboratory

SPECIALIZATION
Computational photonics, Micro- & nanotechnology, Nanooptics, Image processing, Nonlinear optics, Nanomaterials, Optoelectronics, Photovoltaics, Biophotonics, etc.

INTERNSHIP
Practical training in photonics industry

RESEARCH
Optics training in advanced research labs

MASTER’S THESIS
Research thesis in university laboratories, Industry research departments, Fraunhofer Institute for Applied Optics and Precision Engineering (IOF), Institute of Photonic Technology (IPHT) and Helmholtz Institute Jena (HIJ)

Language courses
German and English

ASP Tutor System
Individual student guiding and counseling

ASP Trainings
Block courses, guest lectures on photonics, economy, patents, management and law

MSc. in Photonics Σ 4 semesters

MSc Photonics

Course schedule

Abbe School of Photonics JENA
Friedrich-Schiller-Universität

1. Semester Fundamentals & Adjustment — 30 ECTS

Fundamentals	16 ECTS
Opt. metrology & sensing	
Setzpfandt	Comp.
2 L+ 1 E	4 ECTS
Introduction to optical model.	
Wyrowski	Comp.
2 L+1 E	4 ECTS

Adjustment	16 ECTS
Fundamentals of modern optics	
Pertsch	Adv.
4 L+ 2 E	8 ECTS
Structure of matter	
Stenzel	Adv.
4 L+2 E	8 ECTS
Theoretic. solid state physics*	
Botti	Adv.
4 L+2 E	8 ECTS
Advanced quantum theory*	
Bernuzzi	Adv.
4 L+2 E	8 ECTS

Module Experimental Optics	
Nolte	6 ECTS
Experimental Optics	
University	Comp.
6 Lab	6 ECTS

Extra Curricular Courses

Language course	
4 h German/English	---

2. Semester Fundamentals & Specialization I — 30 ECTS

	16 ECTS
Laser physics	
Limpert/Jauregui	Comp.
4 L+2 E	8 ECTS

Specialization I	12 ECTS
(each module: 2 L+1 E=4 ECTS)	
Analytical instrumentations	
Szeghalmi/Tünnermann	Elect.
Applied laser technology I	
Cizmar/Eggeling	Elect.
Biophotonics	
Täuber/Heintzmann/Ehricht	Elect.
Biomedical imaging - nonioniz. rad.	
Reichenbach/Förster	Elect.
Computational photonics	
Pertsch	Elect.
Design & corr. of opt. systems	

Module Internship	
Nolte	10 ECTS
Internship	
University/(Industry)	Comp.
10 Lab	10 ECTS

Language course	
4 h German/English	---

3. Semester Specialization II & Research — 30 ECTS

Specialization II	12 ECTS
(each module: 2 L+1 E=4 ECTS)	
Active photonic devices	
Schmidt	Elect.
Applied laser technology II	
Eggeling/Cizmar	Elect.
Biomedical imaging - ionizing radiation	
Förster/Reichenbach	Elect.
Computational imaging	
Lötgering/Heintzmann	Elect.
Diffractive optics	
Wyrowski	Elect.
Graphene: Electronic and optical propert.	
Soavi	Elect.
High-intensity/relativ. optics	
Kaluza	Elect.
Image processing	
Heintzmann	Elect.
Imaging and aberration theory	
Gross	Elect.
Interact. of high-energy radiat. with matter	

Module Research Lab	
Pertsch	18 ECTS
Research Lab	
University/Industry	Comp.
18 Lab	18 ECTS

Language course	
4 h English/German	---

4. Semester Research — 30 ECTS

Module Master's Thesis	
Pertsch	30 ECTS
Master's Thesis	
University/Industry	Comp.
30 Lab	30 ECTS

Language course	
4 h English	---

Version 03.10.2021

Comp. - Compulsory course
Adv. - Advised course
Elect. - Elective course

ECTS - ECTS credits
L - Lecture (hours/week)
E - Exercise (hours/week)
Lab - Laboratory (hours/week)
G - Course may be given in German
* - in consultation with Prof. Pertsch only

MSc Photonics

Weekly lecture schedule for 1st semester 2022/2023

Abbe School of Photonics JENA
Friedrich-Schiller-Universität

M.Sc.Photonics 1.Sem.

	Monday	Tuesday	Wednesday	Thursday	Friday
08:00-09:00	Fund. of Mod. Optics (L) Pertsch Auditorium ACP	Structure of Matter (E) Auditorium ACP; Structure of Matter (E) SR 1, ACP		Fund. of Mod. Optics (L) Pertsch Auditorium ACP	Structure of Matter (E) Auditorium ACP; Structure of Matter (E) SR 1, ACP
09:00-10:00					
10:00-11:00	Fund. of Mod. Optics (E) Romashkina SR 1, ACP; Fund. of Mod. Optics (E) Abasifard Auditorium ACP	Structure of Matter (L) Stenzel Auditorium ACP	Introduction to Opt. Modeling* (L) Wyrowski, Zeitner Auditorium ACP	Structure of Matter (L) Stenzel Auditorium ACP	Introduction to Opt. Modeling* biweekly (E) Widholz PC Pool ACP
11:00-12:00					
12:00-13:00	Introduction to Opt. Modeling* biweekly (E) PC Pool ACP	Optical Metrology & Sensing (L) Setzpfandt Auditorium ACP		Optical Metrology & Sensing biweekly (E) Auditorium ACP	Optical Metrology & Sensing biweekly (E) Auditorium ACP
13:00-14:00					
14:00-15:00	Fund. of Mod. Optics (E) Lam; Fund. of Mod. Optics Online (E) Ramakrishna Auditorium ACP	Fund. of Mod. Optics (E) Tanaka SR 1, ACP	Fund. of Mod. Optics (T) Auditorium ACP		
15:00-16:00					
16:00-17:00					
17:00-18:00					
18:00-19:00					
19:00-20:00					
20:00-21:00					

13.10.2022 12:31:44

(*) - Please also refer to Friedolin! Wahlangebot/Elective course, V/L - Vorlesung/Lecture, Ü/E - Übung/Exercise, S - Seminar, T - Tutorium, P - Praktikum/Lab

- lectures and seminars: duration of 90 minutes in an interval of 120 minutes
  ct (cum tempore) =15 min after the defined time; st (sine tempore) = sharp
- for seminars separation into several groups of 10-20 students (stay with your group)
- language courses must be scheduled by each student individually with the Language Center of the University
- fill up your days with regular individual studies (lecture scripts, books, problem solving, study groups, …)
- registration for each lecture via the online tool Friedolin, according to the deadlines given there
- additional materials, tasks, chat via moodle: https://moodle.uni-jena.de/

Online studies

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Gather.town

- *Some of the **online exercises** will take place in Gather.town. Please test it beforehand!*
- ***Link:** https://gather.town/invite?token=duZWmCi6TCC1Zj7kIHc_flGuAdDQZoMh*
- ***pw:** Photonics_2022*
- ***Help:** https://support.gather.town/help/movement-and-basics*
- ***Online** participants can follow the **lecture** using the streaming link https://online.mmz.uni-jena.de/acp.html*

MSc Photonics

Friedolin for 1st semester

Open all submenus ← **and apply 5x** ☐

moodle.uni-jena.de

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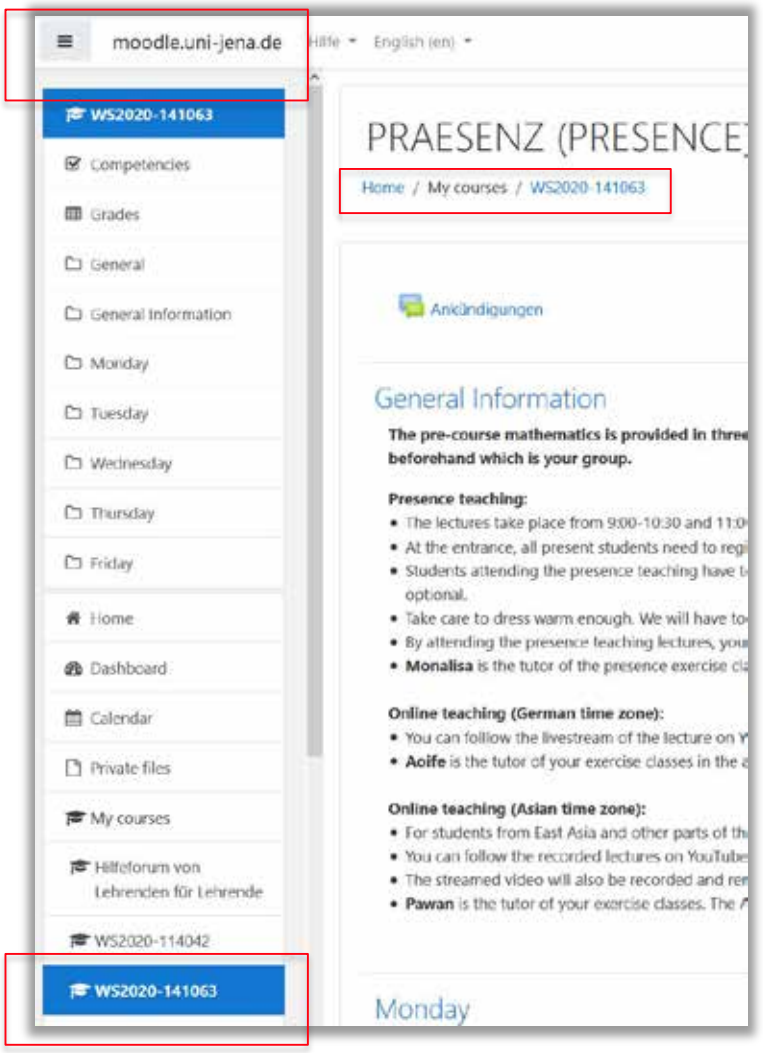
Register with your computer center ID

Follow „my courses“

https://www.youtube.com/channel/UCXFVdoSG3pwmn3_OlziQpuw/videos



Study and examination regulations
Friedolin timeline

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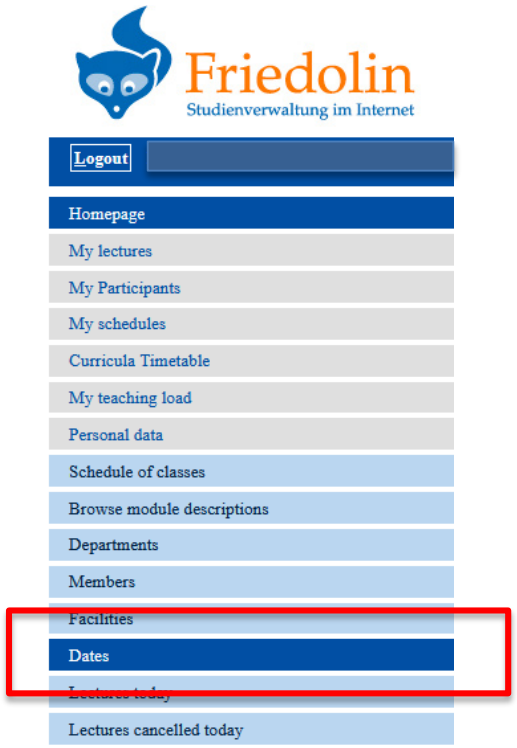
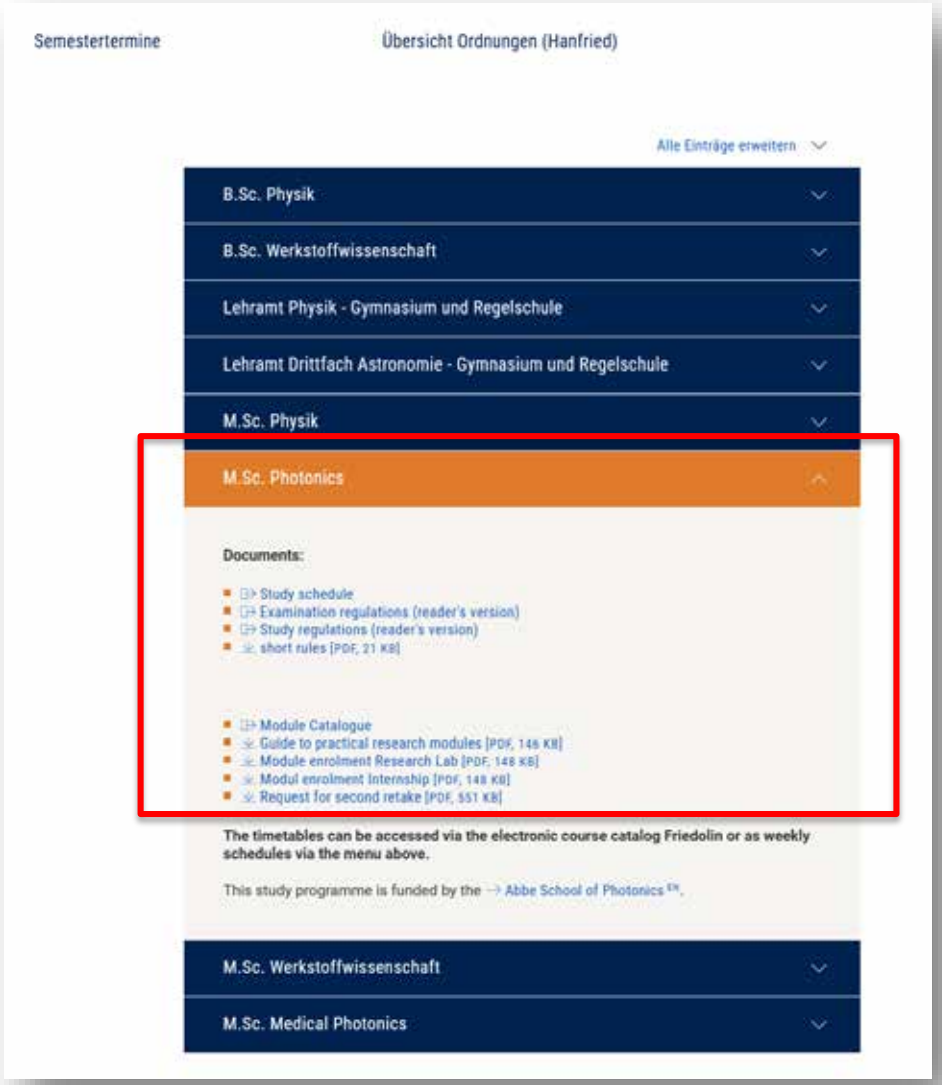
You must read:

- https://www.physik.uni-jena.de/module-inhalte





Language classes
registration deadline passed

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- If you got a DAAD voucher, please use it for payment.
- If not, the ASP will pay the fees for one course per semester per student (ignore the payment requests of the language center!)

MSc Photonics

Optics training laboratory

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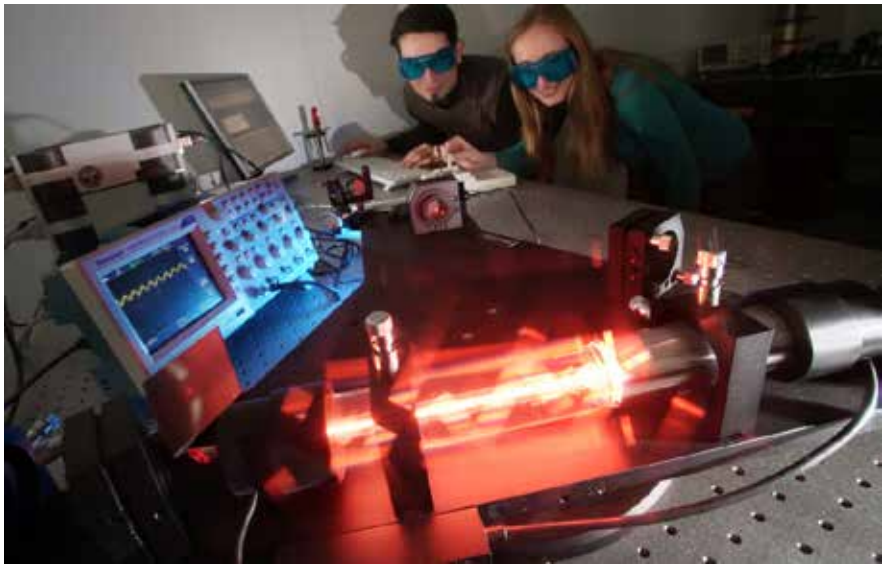
- § Basics of Optics
- § Fabry-Perot interferometer
- § Michelson Interferometer
- § Linear & nonlinear spectroscopy
- § Optical Gyroscope
- § Helium-Neon Laser
- § Neodymium:YAG Laser
- § Optical Tweezers
- § Adaptive Optics
- § Optical Time Domain Reflectometry (ODTR)

Dr. Roland ACKERMANN

Introductory lecture: **02 December 2022**, 14:00-16:00, Auditorium ACP
Lab "Fundamentals“: 3 x January 2023, rooms E009-E012 ACP
Block course: February 2022 – March 2022, rooms E009-E012, ACP
Participation in all lectures/labs is **compulsory.**



Support for international students

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- Set all & only necessary people in cc.
- When you reply or resend emails, keep the complete email history in the email.

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