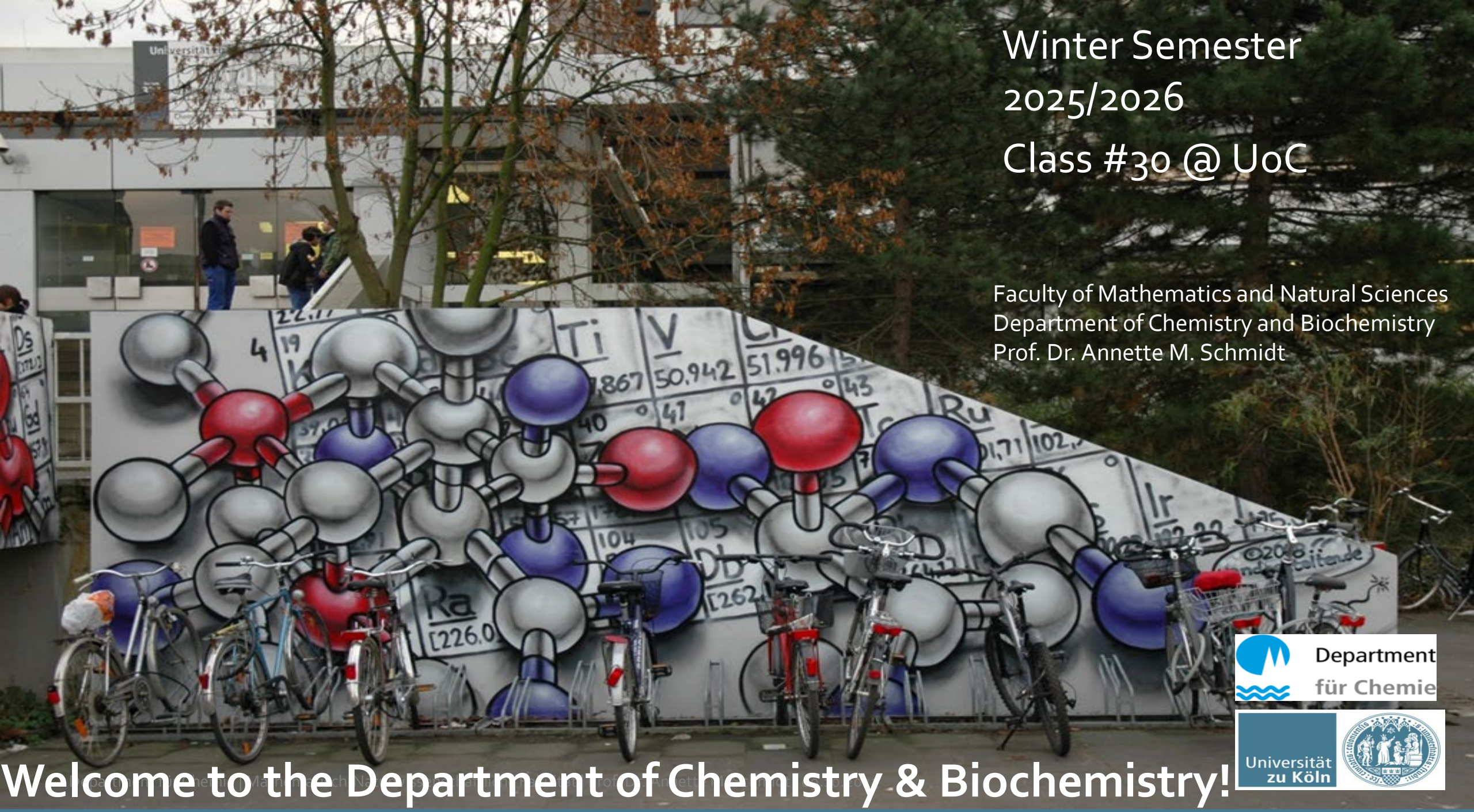

Winter Semester
2025/2026
Class #30 @ UoC

Faculty of Mathematics and Natural Sciences
Department of Chemistry and Biochemistry
Prof. Dr. Annette M. Schmidt

Welcome to the Department of Chemistry & Biochemistry!

Let us introduce ourselves.

Prof. Dr. Annette **Schmidt**

(ILM)
Chairperson Exam. Board

annette.schmidt@uni-koeln.de

Prof. Dr. Axel **Griesbeck**

(Organic Chemistry)
Vice-Chairperson Exam. Board

griesbeck@uni-koeln.de

Dr. Heike **Henneken**

(Administration)
Student Advisory Service,
International Affairs

hhenneke@uni-koeln.de

Jennifer **Hagemann,** M.A.

(Administration)
Examination Office

j.hagemann@uni-koeln.de

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MSc Chemistry @University of Cologne

-> research-focused training and specialization in chemistry

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Program Language = English only!

But:

It is a good advise to fetch up with some German!

(helps e. g. with ordering beer, talking to administrative people, …)

Train your English!

active:

- writing (reports, written exams, …)
- speaking (presentations, oral exams, …)

passive:

- reading (journals, …)
- listening (lectures, …)

Your professors are not native speakers neither!


SUCCESS
I WILL DO IT
I CAN DO IT
I'LL TRY TO DO IT
HOW DO I DO IT ?
I WANT TO DO IT
I CAN'T DO IT

Term-based schedule

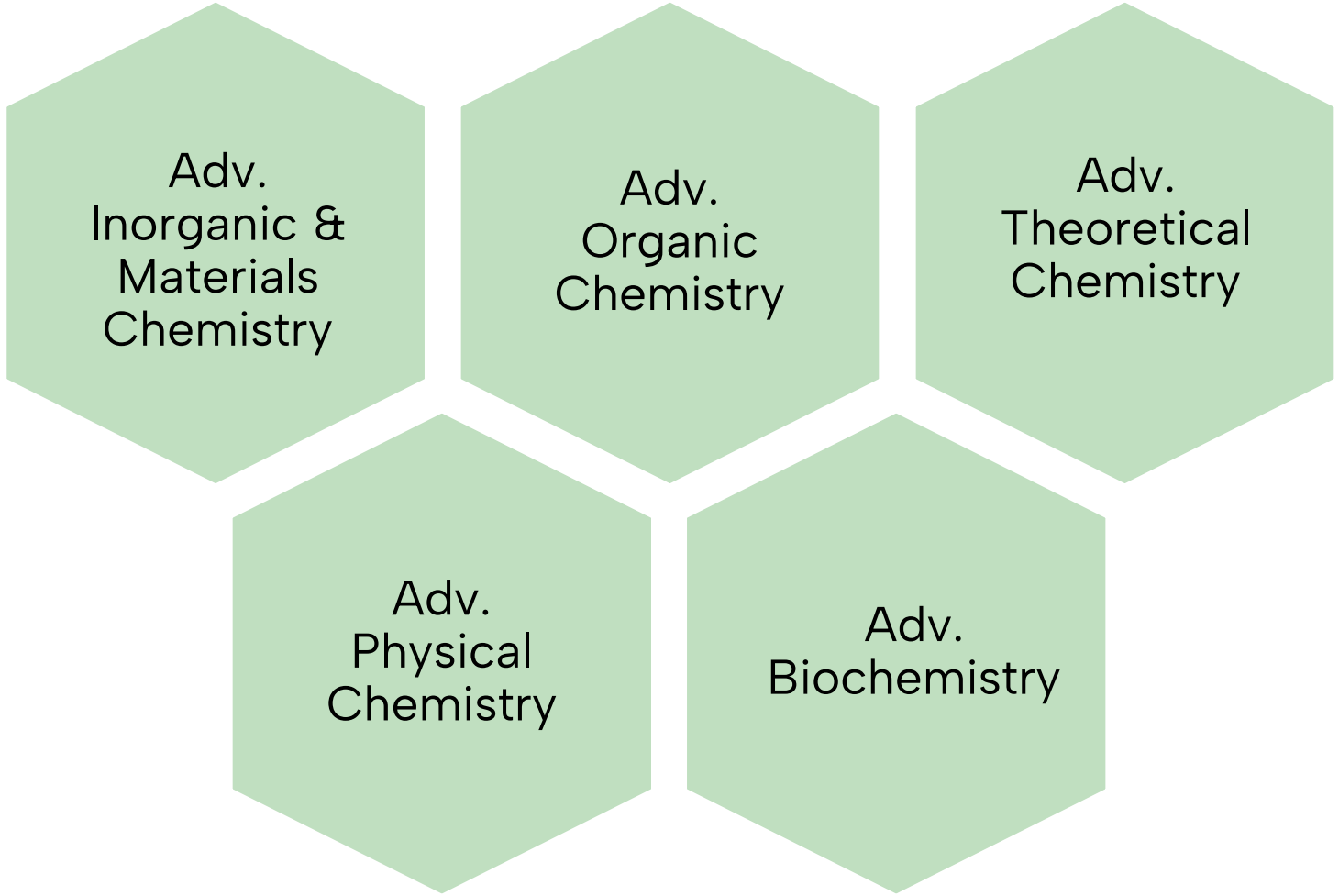
Semester 1	Semester 2	Semester 3	Semester 4
Advanced Module A1 6 CP	Research focus RF2 6 CP	Lab Module LM1 15 CP	Master thesis 30 CP
Advanced Module A2 6 CP	Subject Module SM2 12 CP	Lab Module + Research Proposal LM2 18 CP	
Scientific Literacy SL 9 CP	Subject Module SM1 12 CP		
Research focus RF1 6 CP			
Σ 27 CP	Σ 30 CP	Σ 33 CP	Σ 30 CP

1st Semester

module		h / week (lecture & seminar)	lab course (weeks)	cp
MN-C-A1	Advanced Chemistry 1	4	-	6
MN-C-A2	Advanced Chemistry 2	4	-	6
MN-C-SL	Scientific Literacy	4	3	9
MN-C-RF1	Research Focus 1	4	-	6
				Σ 27

Advanced Chemistry Modules (A-Modules)

- **Choose 2 out of 5:**



Weekly Schedule Start 20.10.2025 (BC-A: 14.10.25)

	Monday	Tuesday	Wednesday	Thursday	Friday
8-9 h		**BC-A VL**	RF ITO	**PC-A VL**	**BC-A VL**
9-10 h	**AC-A Sem**			**PC-A Exerc**	
10-11 h		PC-A VL Schubert	**OC-A VL** Dumele	**AC-A VL** Mathur/Wickleder	**AC-A VL**
11-12 h	**TC-A Exerc**				**TC-A VL**
12-13 h	**TC-A VL** Hanrath	**RF** IOPC		**RF** MSAAC	**RF** ITO
13-14 h			**Scientific Literacy**	**RF** CC	
14-15 h	**RF** MSAAC / **RF** TMC / **RF** M3 Sem	**OC -A Sem** (Intro 22.10.)		**RF** M3 Sem	**RF** M3
15-16 h					
16-17 h					

Advanced Chemistry Modules (A-Modules)

Important: Kick-off dates are obligatory! -> seminar task assignment

MN-C-A-IC	Advanced Inorganic and Materials Chemistry			
	Prof. Dr. Mathias Wickleder Prof. Dr. Sanjay Mathur	mathias.wickleder@uni-koeln.de sanjay.mathur@uni-koeln.de	L: Thu, 23.10.25 S: Mon, 20.10.25	10:00 AC414 09:00 AC414
MN-C-A-OC	Advanced Organic Chemistry			
	Prof. Dr. Oliver Dumele	odumele@uni-koeln.de	L: Wed, 22.10.25 S: Tue 21.10.25	10:00 HS III 14:00 OC 413
MN-C-A-BC	Advanced Biochemistry (ABMM)			
	Prof. Dr. Günter Schwarz	gschwarz@uni-koeln.de	L: Tue, 14.10.2025	
MN-C-A-PC	Advanced Physical Chemistry			
	Prof. Dr. Marcel Schubert	Marcel.schubert@uni-koeln.de	L: Tue, 21.10.25 E: Thu, 23.10.25	10:00 PC 302 09:00 PC 302
MN-C-A-TC	Advanced Theoretical Chemistry			
	Prof. Dr. Michael Hanrath	michael.hanrath@uni-koeln.de	L: Mo, 20.10.25 E: Mon 20.10.25	12:00 HS2 11:00 HS2

Scientific Literacy (SL) Module

- A scientifically literate person is able to
  understand, experiment, reason and interpret scientific facts and their meaning

- **<u>Interactive seminar:</u>** Obligatory kick-off: **22.10.2025, 13:00 h**
  - Principles of Good Scientific Practice & Scientific Methodology
  - Searching and handling of literature, data bases, (AI) tools
  - Collecting, consolidating & managing data,
  - Reporting and presenting scientific results,
  - Innovation management
  - …

- two-week laboratory internship
  - Repeat/deepen/learn important working techniques

scientificandtechnologicalliteracies.weebly.com

Research Focus Modules (RF-Modules) WiSe 2025

- 4 SWS (lecture & seminar) in an actual area of interdisciplinar research

Computational Chemistry

Hanrath, Blunk, Goldfuß

Introduction to Optics

Lindfors, Gather, Schubert

Aspects of Transition Chemistry with Emphasis on Technetium

Wickleder, Strub

From Molcules to Mice to Men

Grüll, Endepols, Kath- Schorr, Neundorf

Mass Spectrometry and its Application to Atmospheric Chemistry

Schäfer, Hanrath, Zorn (FZ Jülich)

Inorganic and Organic Photochestry as Tools for Protecting and Releasing Small Molecules

Griesbeck, Klein

MN-C-RF-CC: Computational Chemistry

- Goal: analyze chemical questions by computational methods
- Contents:
  - Introduction to Unix, HPC environments (logins, scripting, batch jobs, organization of directories, reproducabilty, collect/visualize results)
  - Types of coordinates (cartesian/internal) and calculations (single point, geometry optization (with and without constraints), frequency, properties)
  - Setting up reaction pathways
  - Choice of suitable method and cost estimation
  - Calculating different properties, their difficulties and expectable accuracies
  - Example applications:
    - Large molecules, proteins, molecular dynamics
    - Alder's endo-rule, free energies
- Prerequisites: (very) basic knowledge of TC and OC
- Lecturers: Dirk Blunk, Bernd Goldfuß, Michael Hanrath

INTRODUCTION TO OPTICS

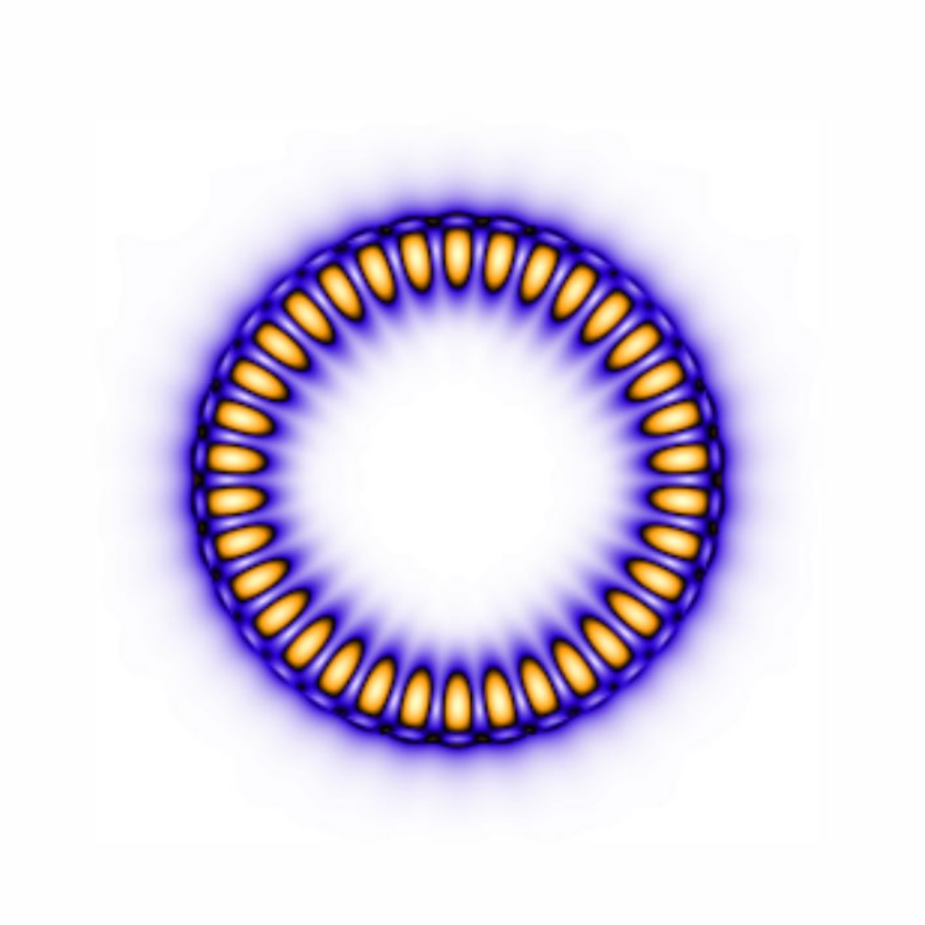
Klas Lindfors, Malte Gather, Marcel Schubert, ILM

Competences gained

- Descriptions of light
- Understanding simple optical instruments
- Familiarity with principles of optical laboratory techniques
- Light-matter interactions

Planned list of topics

- Ray description of light
- Wave phenomena: scalar and vector waves
- Polarization phenomena
- Imaging systems
- Light in matter
- Optical properties of matter
- Basic optical elements
- Laboratory optics
- Methods and tools of spectroscopy
- Advanced microscopy techniques



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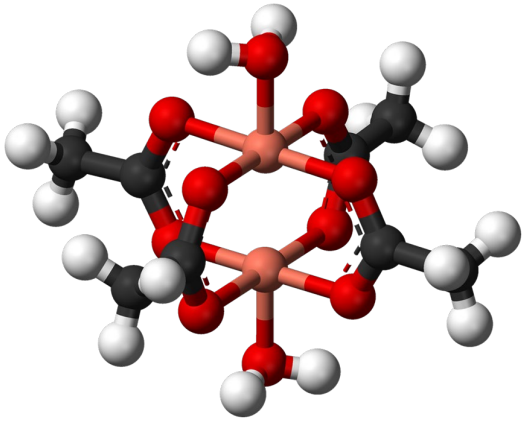
Transition metal chemistry with special emphasis on Technetium

Mathias S. Wickleder (Inorganic Chemistry) Erik Strub (Nuclear Chemistry)

Transition metals

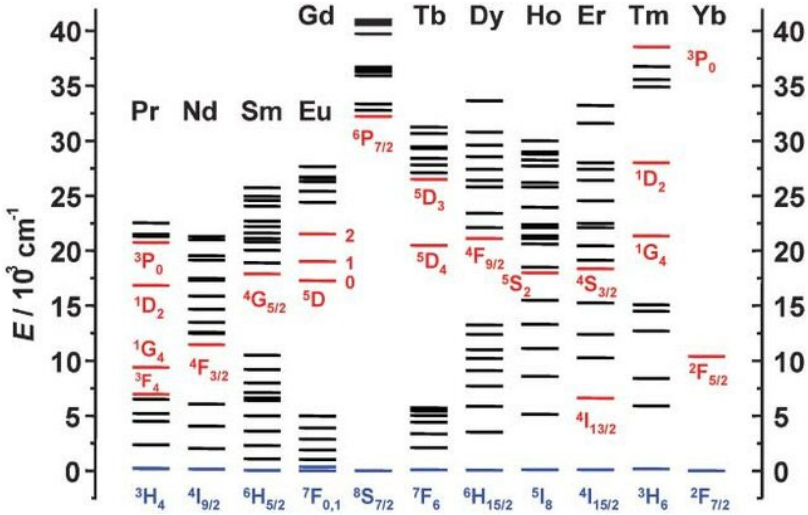
- 30 elements of the *d*-block
  ("outer transition metals")
- 28 metals of the *f*-block
  ("inner transition metals")

- different nature of *d*- and *f*-electrons.
- electronic situation of transition metals
  (orbitals, term symbols)
- electronic situation in compounds
  (crystal field and ligand field theory)
- photophysical and magnetic properties
- applications based on these properties



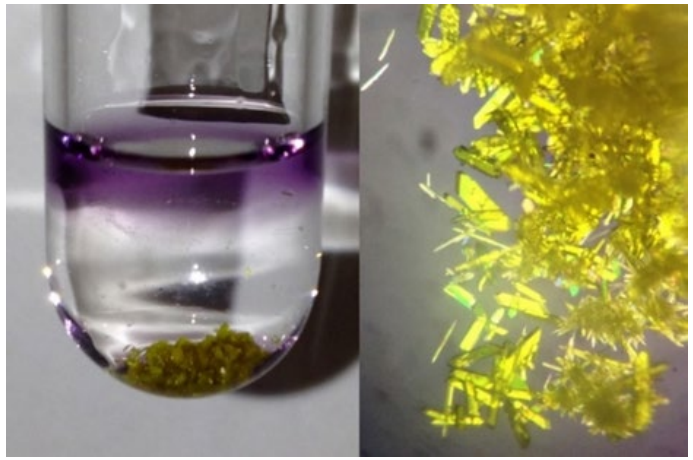
Typical paddle-wheel type complex of transition metals with chelating ligands

Partial energy diagrams for the lanthanide aquo ions.



Special emphasis on the element technetium

- placed in the middle of the d-block
- only radioactive isotopes are known,
- chemistry of isotopes (mainly Tc-99 and Tc-99m)
- role of technetium plays in different chemical disciplines
  (analytics, radiopharmacy, nuclear fuel, environment)



appearance of technetium compounds in strong acid

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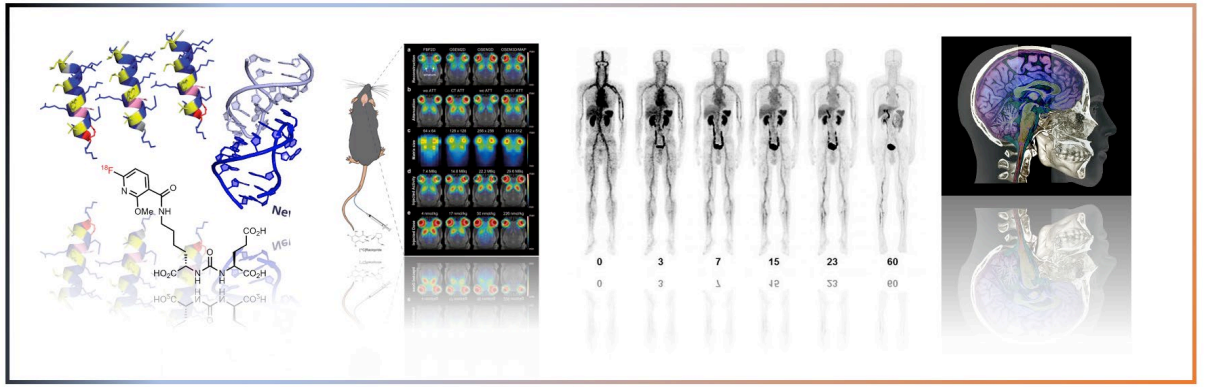
KLIPS 14816.1505

From Molecules to Mice to Men

Research Focus Module by the MUPIC Consortium

Module coordinators: Heike Endepols (Nuclear Medicine), Holger Grüll (Radiology)

Everything you always wanted to know about imaging



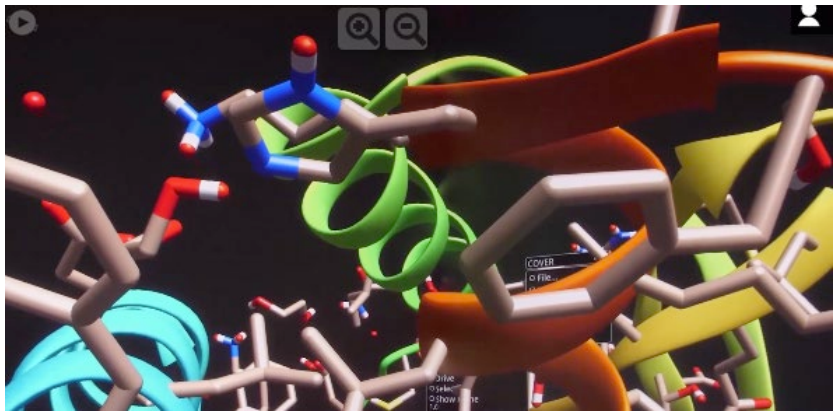
https://mupic.uni-koeln.de

MUPIC = Multimodal Preclinical Imaging Platform University Cologne

1.) Lecture every Friday 1:00–3:00 PM: get the theoretical background
2.) Seminar (5 days in January 2026): present a paper
3.) Hands-on (2 days, arranged individually): see for yourself how imaging works
4.) Oral exam, arranged individually

https://rrzk.uni-koeln.de/hpc-projekte/visualisierung/cave

Highlight: visit the CAVE and walk into your image



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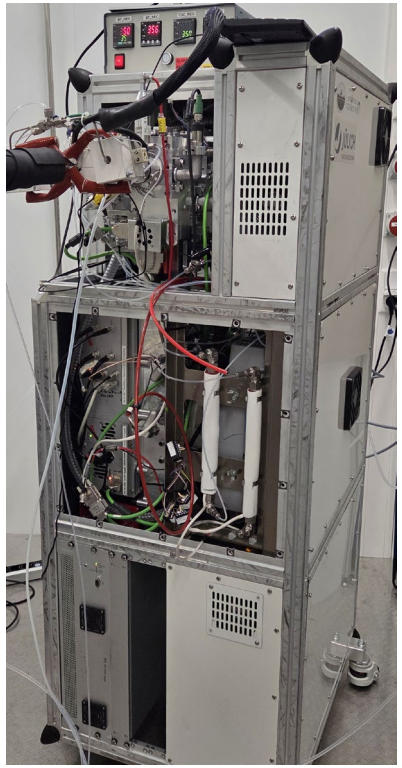
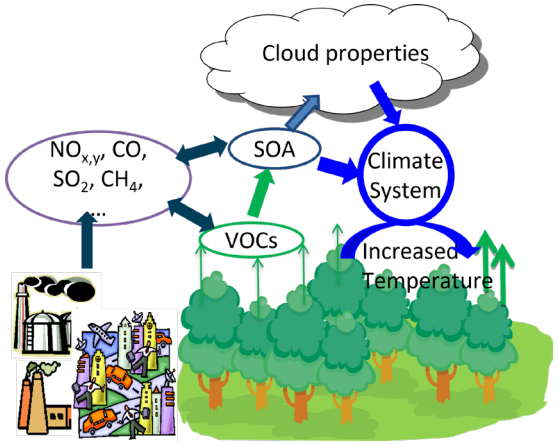
RF MODUL: MASS SPECTROMETRY (MS) AND ITS APPLICATION IN ATMOSPHERIC CHEMISTRY (AAC)

Mathias Schäfer (Organische Chemie – Massenspektrometrie)
Michael Hanrath (Theoretische Chemie)
Sören Zorn (Forschungszentrum Jülich – ICE 3)



- **Motivation**:
  - To understand the **complex chemistry** of the **atmosphere** and how **humans influence** it and the **climate**
- **What you will learn:**
  - The **basics** of **atmospheric chemistry** and physics, which we actually experience every day
  - How (online) **mass spectrometry** became one of the **most important tools** for experimental **atmospheric research**
  - What **challenges** arise from the measuremens and **"big" data** analysis, and how they **can be addressed**



RF MODUL: MASS SPECTROMETRY (MS) AND ITS APPLICATION IN ATMOSPHERIC CHEMISTRY (AAC)

Mathias Schäfer (Organische Chemie – Massenspektrometrie)
Michael Hanrath (Theoretische Chemie)
Sören Zorn (Forschungszentrum Jülich – ICE 3)

- **Throughout the module, you will learn about the following:**
  - The **atmosphere** and its **composition** (biogenic and anthropogenic constituents)
  - **Radical chemistry and secondary organic aerosol (SOA) formation**
  - **Mass spectrometric** methods
  - Different **ionization techniques**
  - **Inlet designs** for atmospheric (online) sampling
  - Application of **mathematic methods** and **clustering** algorithms for **big data** analysis

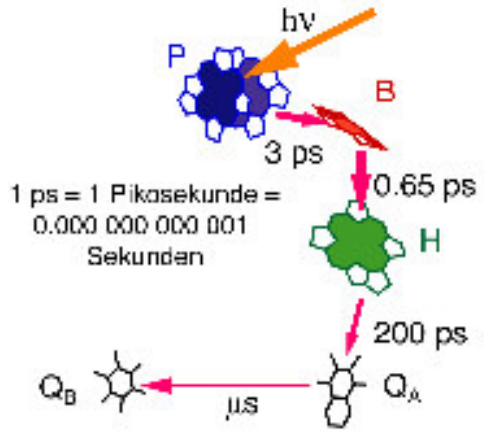
The course will conclude with an excursion to the FZ Jülich, where you will encounter the instruments in person (and the students/scientist working with them)

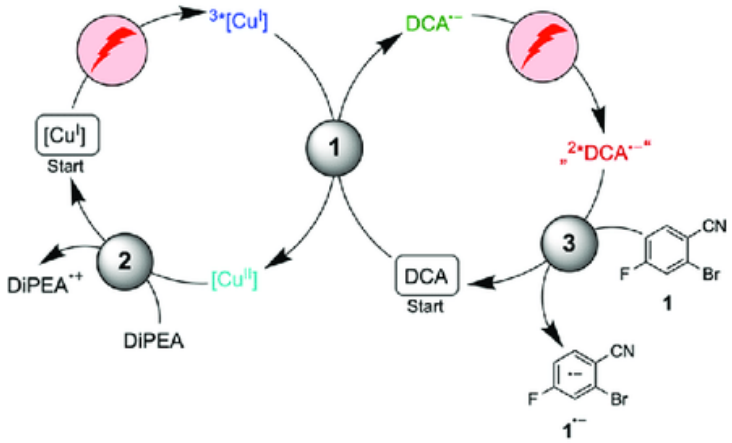
MN-C-RF-IO: Inorganic and Organic Photochemistry

Modern Photoredox-Catalysis with Organic and Metal-containing Catalysts

Prof. Axel Klein (Department of Chemistry and Biochemistry, UzK, Inorganic and Materials Chemistry) https://klein.uni-koeln.de/ and
Prof. Axel Griesbeck (Department of Chemistry and Biochemistry, UzK, Organic Chemistry) http://www.oc.uni-koeln.de/griesbeck/index.html

on the way from natural photosynthesis to synthetic applications…





What you will learn:

- some basic **photochemistry** and advanced photophysics and spectroscopy and quantum theory of excited state behavior, redox chemistry in ground and excited states, Marcus- and Rehm-Weller theory of electron transfer.
- **Catalysis** with ground-state and excited-state catalysts, activation steps of excited catalysts, PET-catalysis, applications of organic and metal-containing
- catalysts, MLCT and LMCT-excited states, properties and applications, selectivity in catalysis; regio- and stereoselectivity (enantioselective PET-catalysis).
- **Biophotocatalysis** and the green / red ***photosynthesis***

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Research Focus Modules (RF-Modules) SoSe 2026 (prelim.)

From basic research to industrial products: Modern Drug Design

Giernoth, Kath-Schorr, Dumele, Hillisch, El Sheikh

Functional Nanostructures and Biomaterials

Maleki, Mathur

Photochemistry and Chirality – Synthesis and Devices

Griesbeck, Meerholz

Introduction to Nano- and Biophotonics

Gather, Schubert

Weekly schedule Start 20.10.2025 (BC-A: 14.10.25)

	Monday	Tuesday	Wednesday	Thursday	Friday
8-9 h		**BC-A VL**	RF ITO	**PC-A VL**	**BC-A VL**
9-10 h	**AC-A Sem**			**PC-A Exerc**	
10-11 h		PC-A VL Schubert	**OC-A VL** Dumele	**AC-A VL** Mathur/Wickleder	**AC-A VL**
11-12 h	**TC-A Exerc**				**TC-A VL**
12-13 h	**TC-A VL** Hanrath	**RF** IOPC		**RF** MSAAC	**RF** ITO
13-14 h			**Scientific Literacy**	**RF** CC	
14-15 h	**RF** MSAAC / **RF** TMC / **RF** M3 Sem	**OC -A Sem** (Intro 22.10.)		**RF** M3 Sem	**RF** M3
15-16 h					
16-17 h					

2nd Semester

- Access to SM after passing SL module + one A module

module		h / week (lecture & seminar)	lab course (weeks)	cp
MN-C-RF2	Research Focus 2	4	-	6
MN-C-SM1	Subject Module 1	2	5	12
MN-C-SM1	Subject Module 2	2	5	12
				Σ 30

Subject Modules (SM)

- Starting 2nd semester – one A module and SL module completed
- 2 SWS (lecture block in 1st semester week – all groups are presented)
- 5 weeks lab internship + report delivered + exam week (1st / 2nd half of semester)
- Results will be presented at common symposium at semester end

- 4 modules (SM / LM) in at least 3 work groups, LMs in different groups
- Max 1 non-chemical module, max 2 external modules

Schedule 1st week

	Mo	Di	Mi	Do	Fr
	13.10.	14.10.	15.10.	16.10.	17.10.
9.00 - 10.15		**Dumele** ExSem1	**Schubert** HS3	**Ruschewitz** ILM 147	**Schmidt** ILM 147
10.30 - 11.45		**Meerholz** ExSem1	**Goldfuß** HS3	**Goldfuß** ILM147	**Milow** ILM 147
13.00 - 14.15	*Master-Wc* *ExSem1*	**Grüll** HS3	*SL*	**Griesbeck** ExSem2	**Mathur** ExSem2
14.30 - 15.00	**Wickleder** ExSem1	**Kath-Schorr** HS3		**Ermert** ExSem2	***SM selection*** ExSem2

3rd/4th Semester

module		h / week (lecture & seminar)	lab course (weeks)	cp
MN-C-LM1	Laboratory 1	1	10	15
MN-C-LM2	Laboratory 2	1	10	18
				Σ 33
MN-C-MT	Master thesis		26	30

Laboratory Modules (LM)

Research practical course in a current subfield of chemistry

- Task assignments for independent project work under guidance of e. g. grad student
- proposed by the scientific supervisor in agreement with the student

Seminar part

- Presentation of topical research results obtained in the context of current literature.

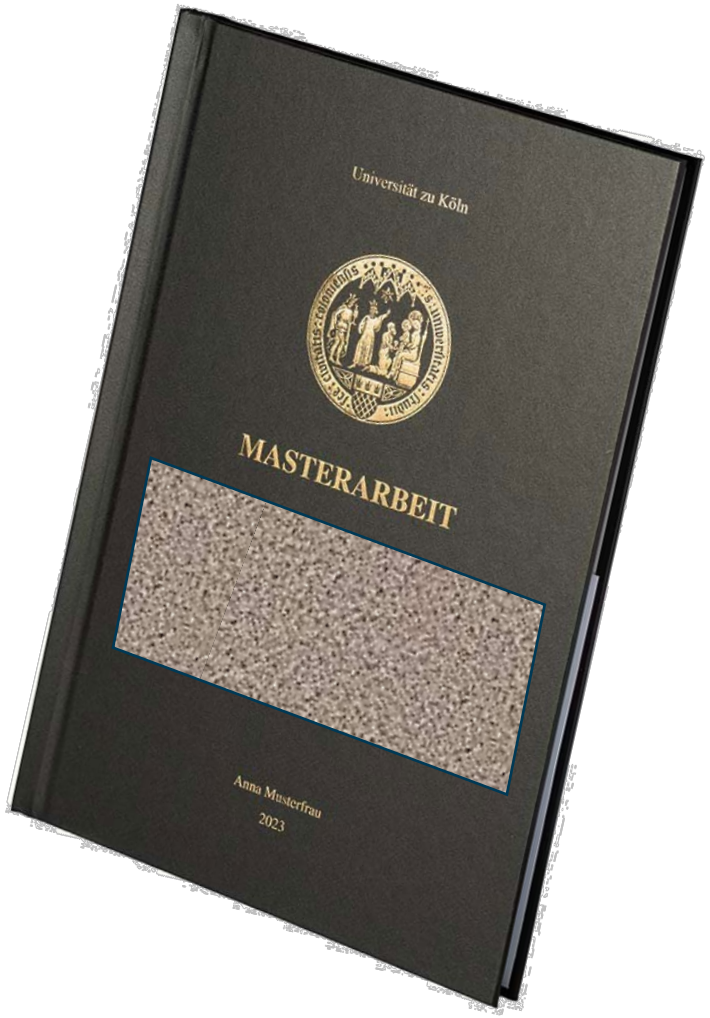
LM2: Research proposal

- Includes (guided) preparation & presentation of a research project proposal

Master (MT) Module

Completition of an individual research project

- Task agreed between supervisor and student
- 6 months of lab work incl. thesis writing with sharp deadline



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Module Enrollment

RF Modules: Please choose 2!

Enrollment period for **SL** Module & **A**dvanced Modules **in KLIPS:**

Oct 13 to Oct 19, 2025

- **Module participation only possible when registered!**
- Registrations are valid only for the actual semester!
- Register only for the modules you plan to study this semester – and de-register, if you change your mind (and inform the examination office)!
- Be fair and do not block places others are waiting for!

Written and oral exams

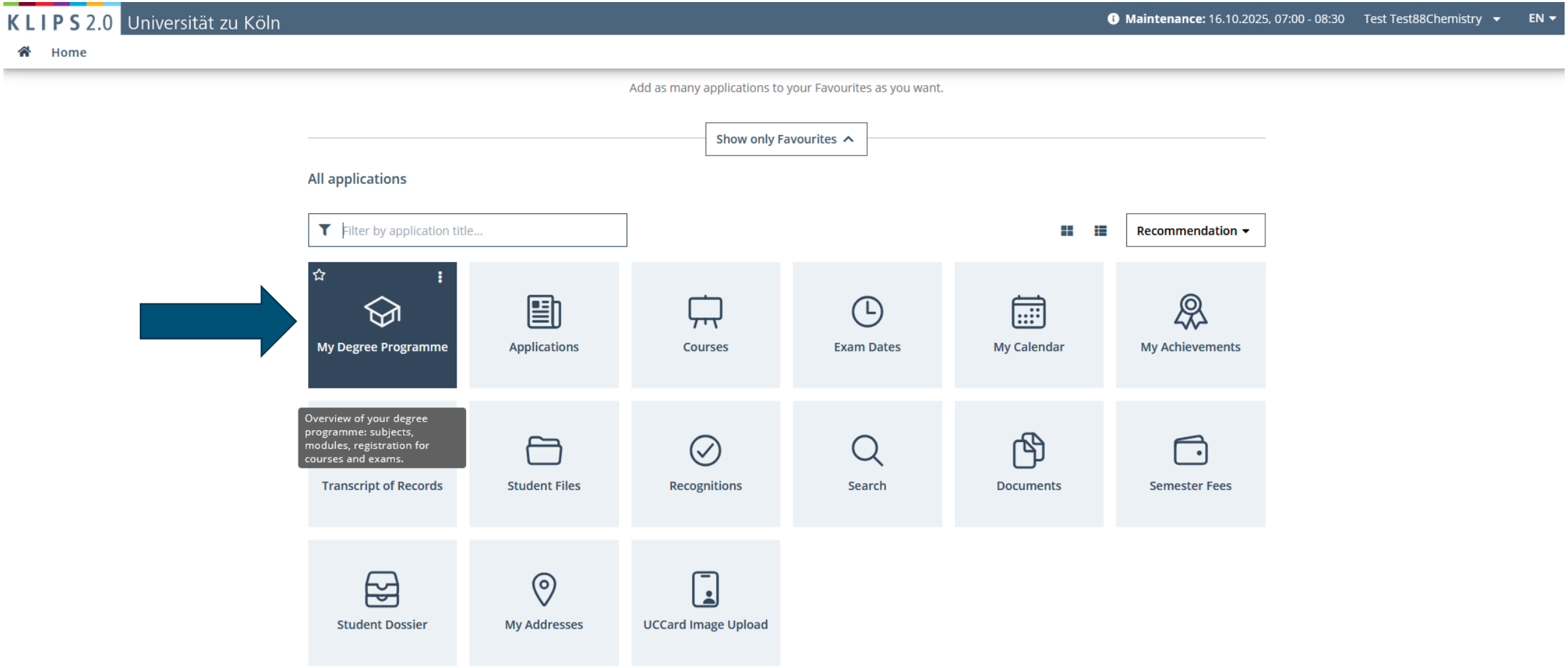
- Registration (**latest 7 days ahead**) is required for all modules & exams!

  Without registration for the exam you cannot participate.

  - Written exams: online registration in KLIPS
  - Oral exams: individial regulations, yet all oral exams have to be **announced 7 days ahead** at the examination office via email (master-chemistry@uni-koeln.de)!

- Absence (without medical attest) -> failed attempt ☹
- some exams are restricted in trial numbers

Online Registration for Modules in KLIPS 2.0



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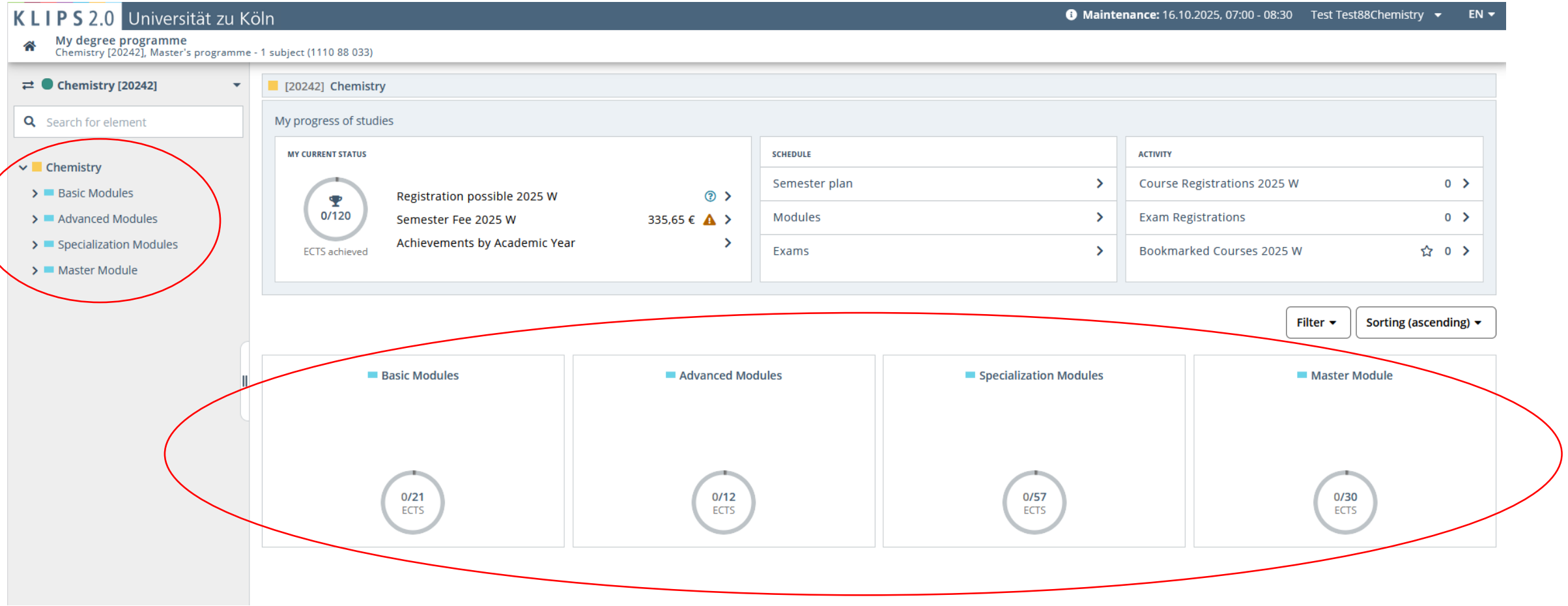
Online Registration for Modules in KLIPS 2.0



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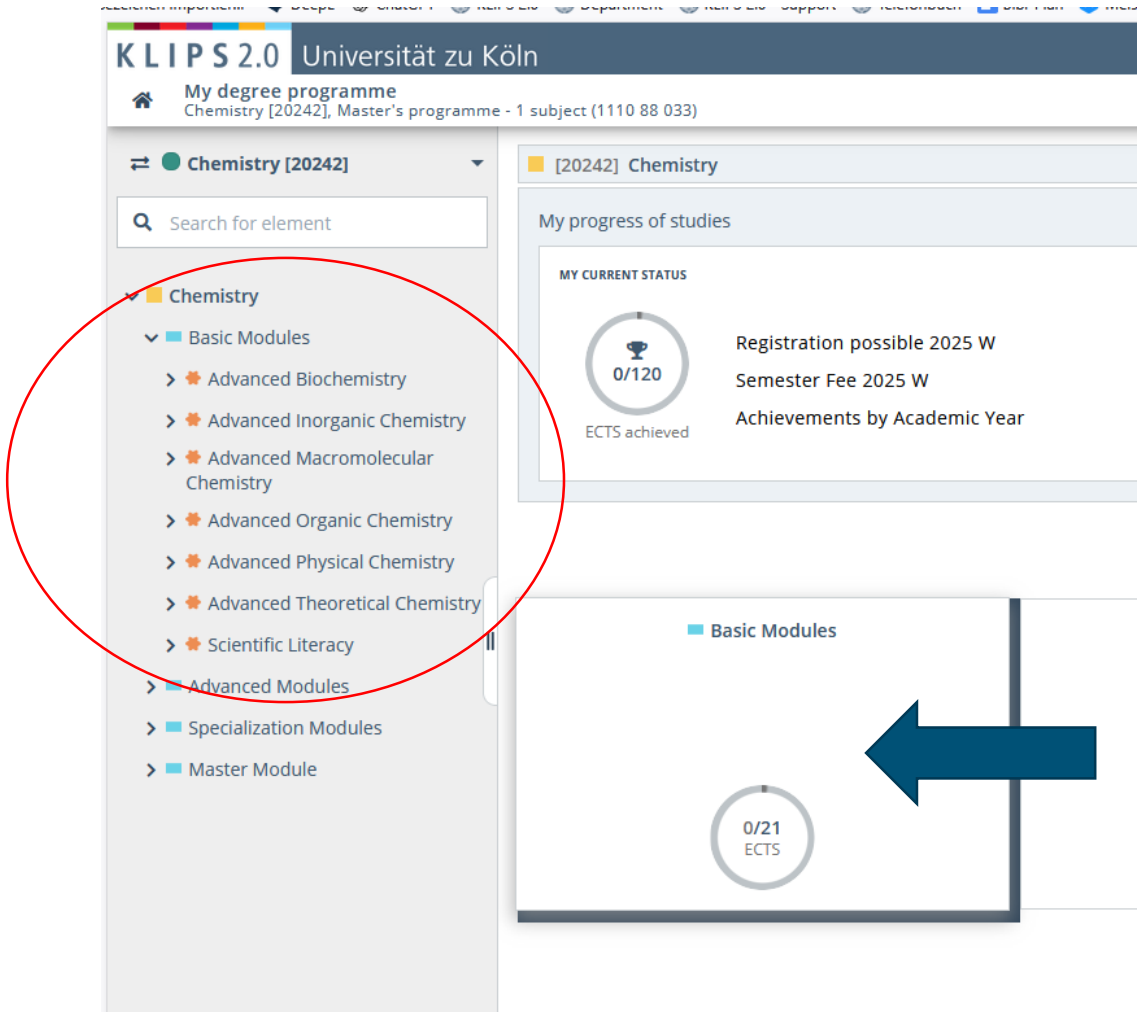
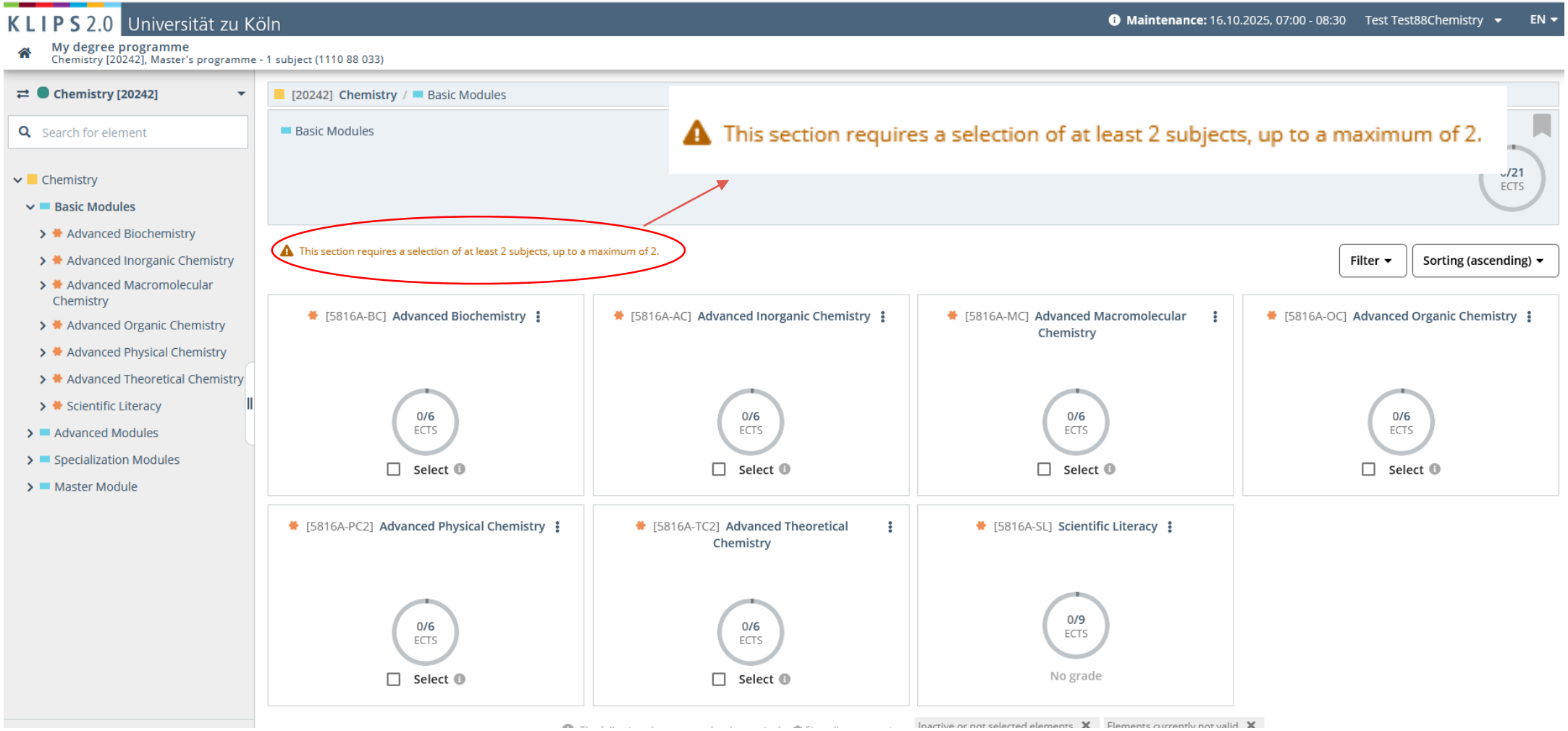
Online Registration for Modules: Example Basic Modules



Online Registration for Modules: Example Basic Modules



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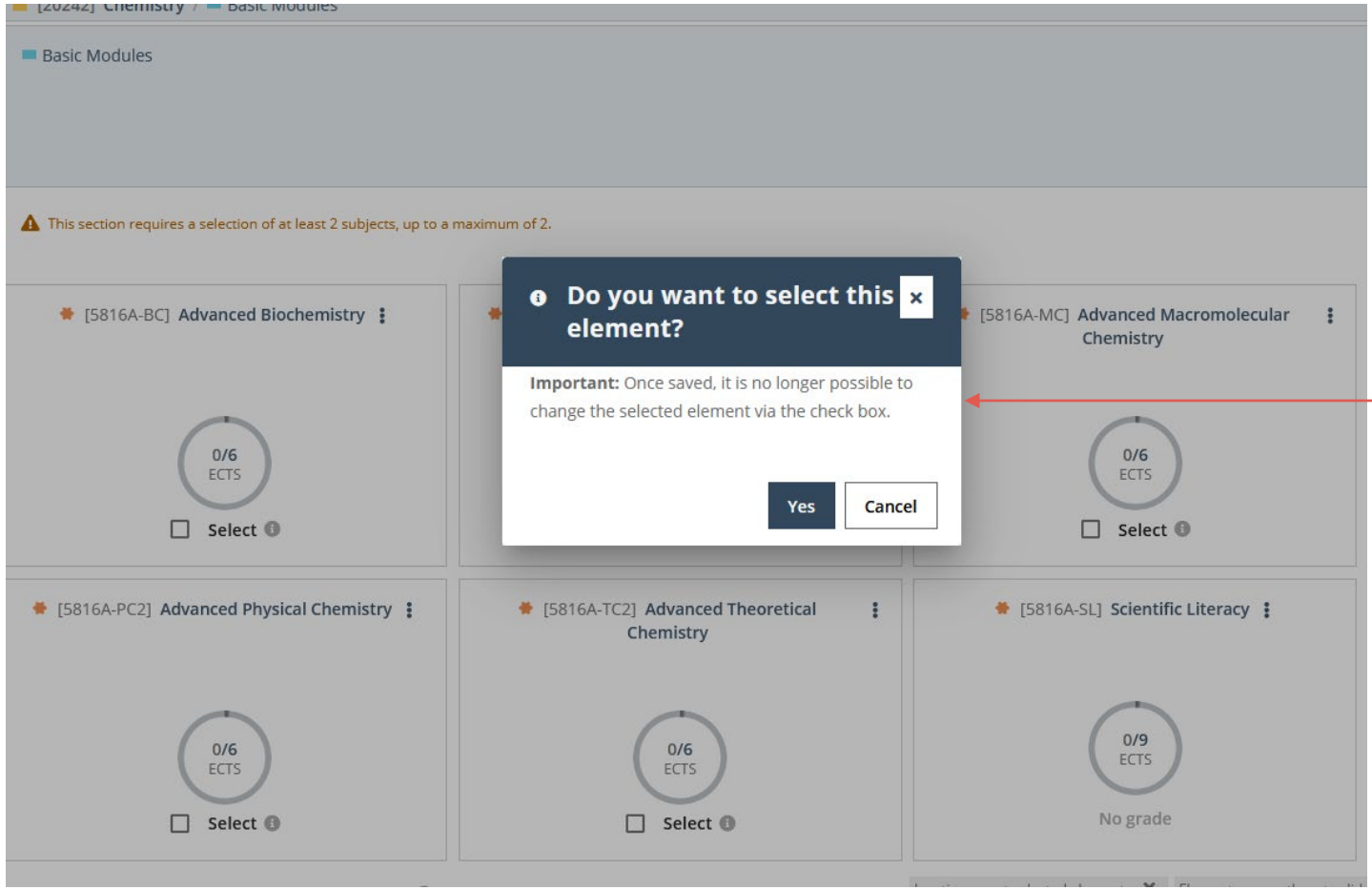
Online Registration for Modules: Example Basic Modules



You must select <u>two</u> basic modules.

Once you have made your selection, you will not be able to change it.

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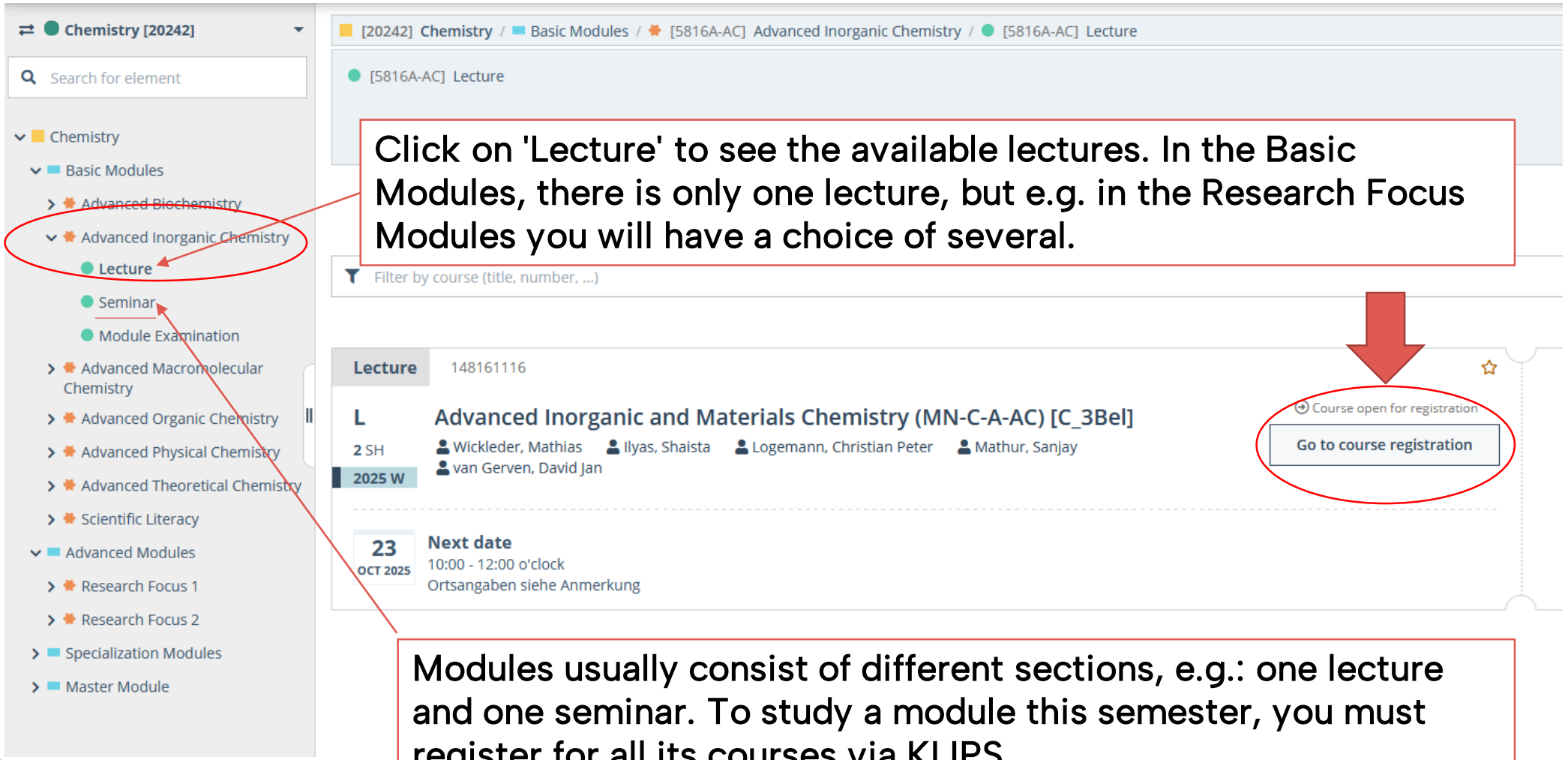
Online Registration for a Lecture: Example Basic Modules (Advanced Organic Chemistry)



Click on 'Lecture' to see the available lectures. In the Basic Modules, there is only one lecture, but e.g. in the Research Focus Modules you will have a choice of several.

Modules usually consist of different sections, e.g.: one lecture and one seminar. To study a module this semester, you must register for all its courses via KLIPS.

Please remember!

- Only choose the modules that you want to study in the current semester.
- If you change your mind, de-register from the courses.
- To deregister from a whole module, please also contact the Examination Office (master-chemistry@uni-koeln.de).
- KLIPS Support also provides useful information on course registration and a variety of other KLIPS-related topics: https://klips2-support.uni-koeln.de/en/students-new-design

Contact: KLIPS 2.0

Problems with registration in Klips 2.0 for modules or exams?
Please contact the **Examination Office**:

Jennifer Hagemann

master-chemistry@uni-koeln.de

Room HS 119

Tel. +49 221 470 3935

ILIAS e-Learning Platform

https://www.ilias.uni-koeln.de

- If subscribed to a course in KLIPS, subscription to the corresponding ILIAS course is automatic.

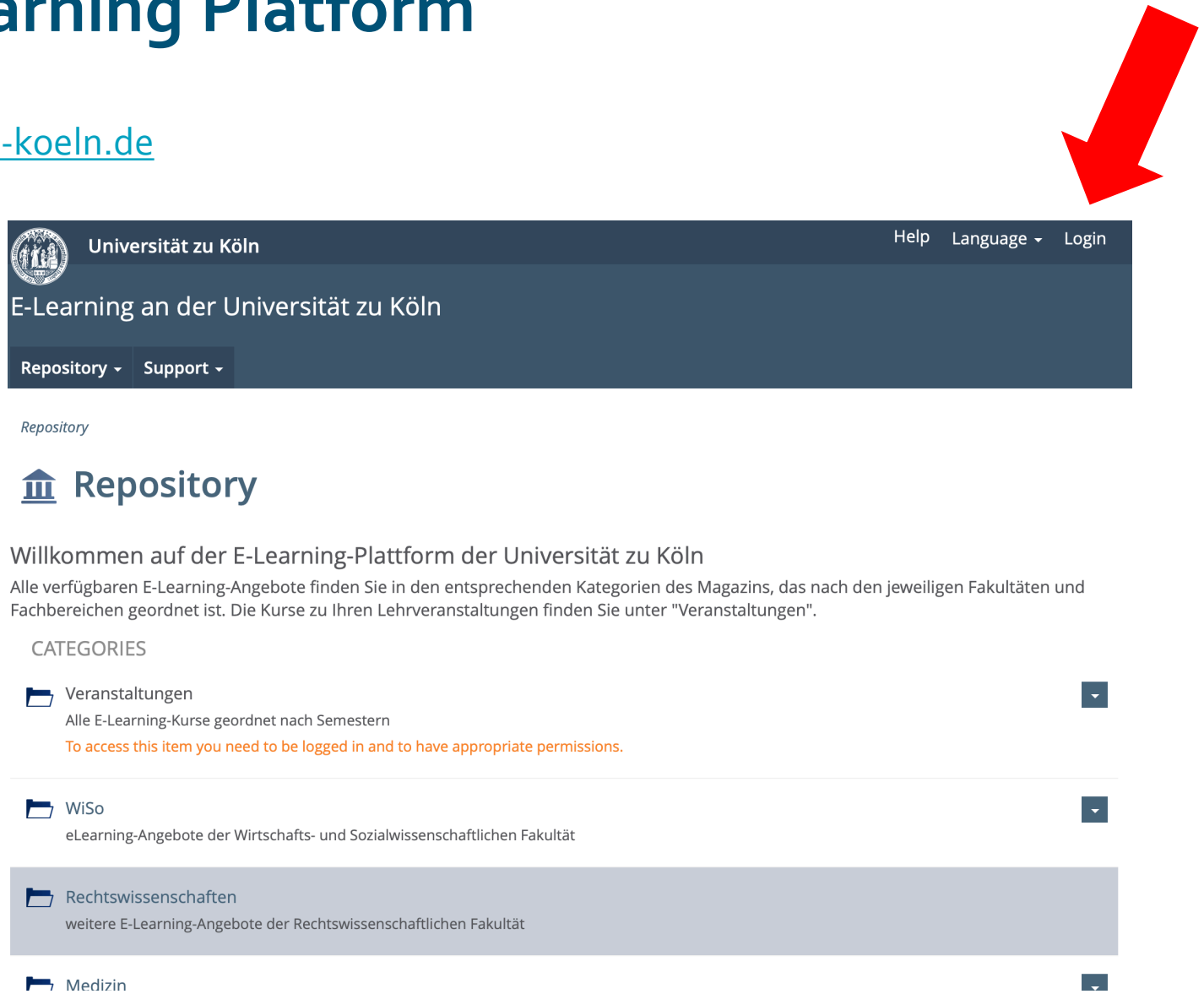
- Stay patient if content is not online (yet)

- ILIAS provides you with information and material relevant for the running courses.

  - Contact your lecturer if you experience any difficulties in finding your course or signing in.

ILIAS e-Learning Platform

https://www.ilias.uni-koeln.de



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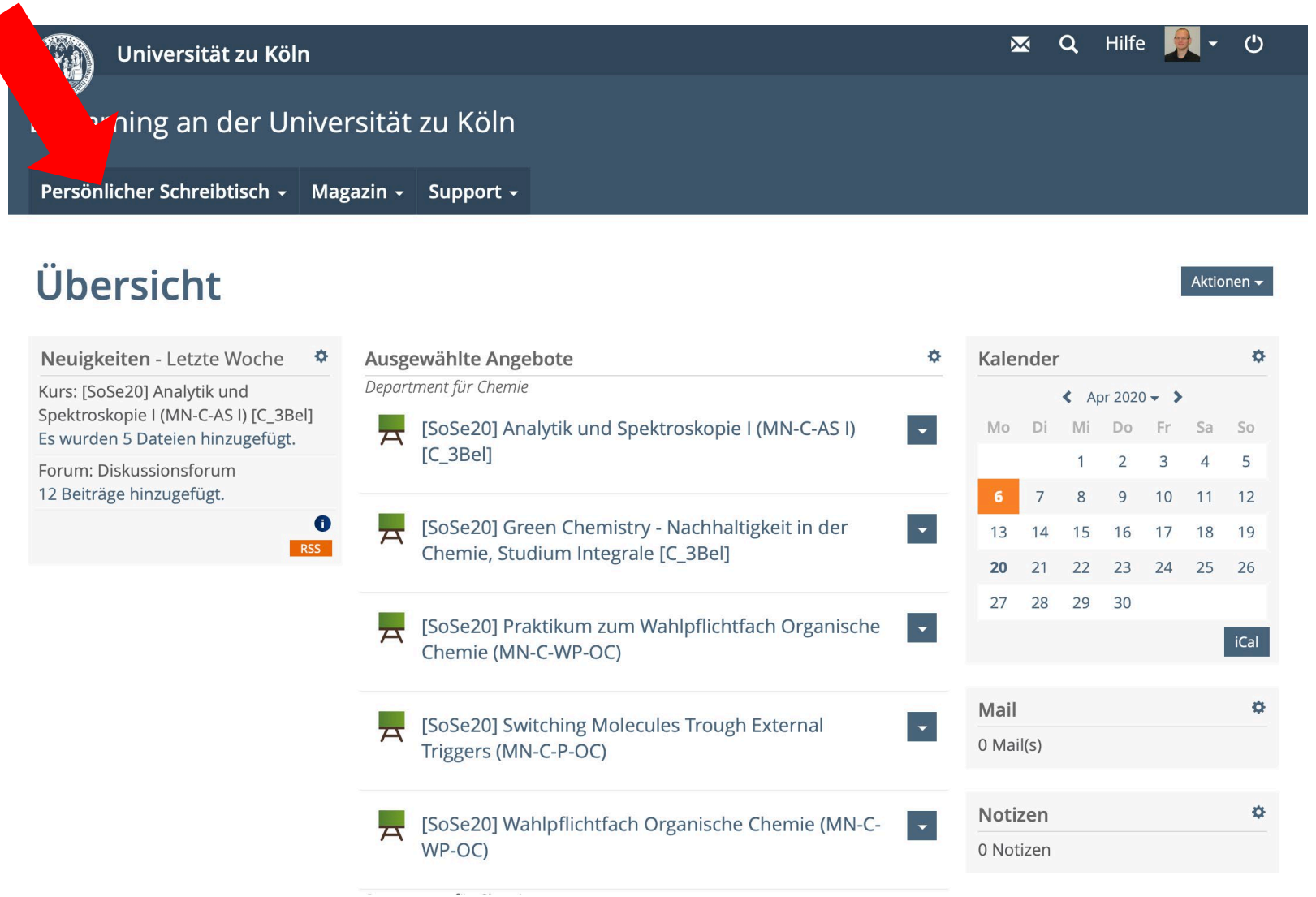
ILIAS e-Learning Platform



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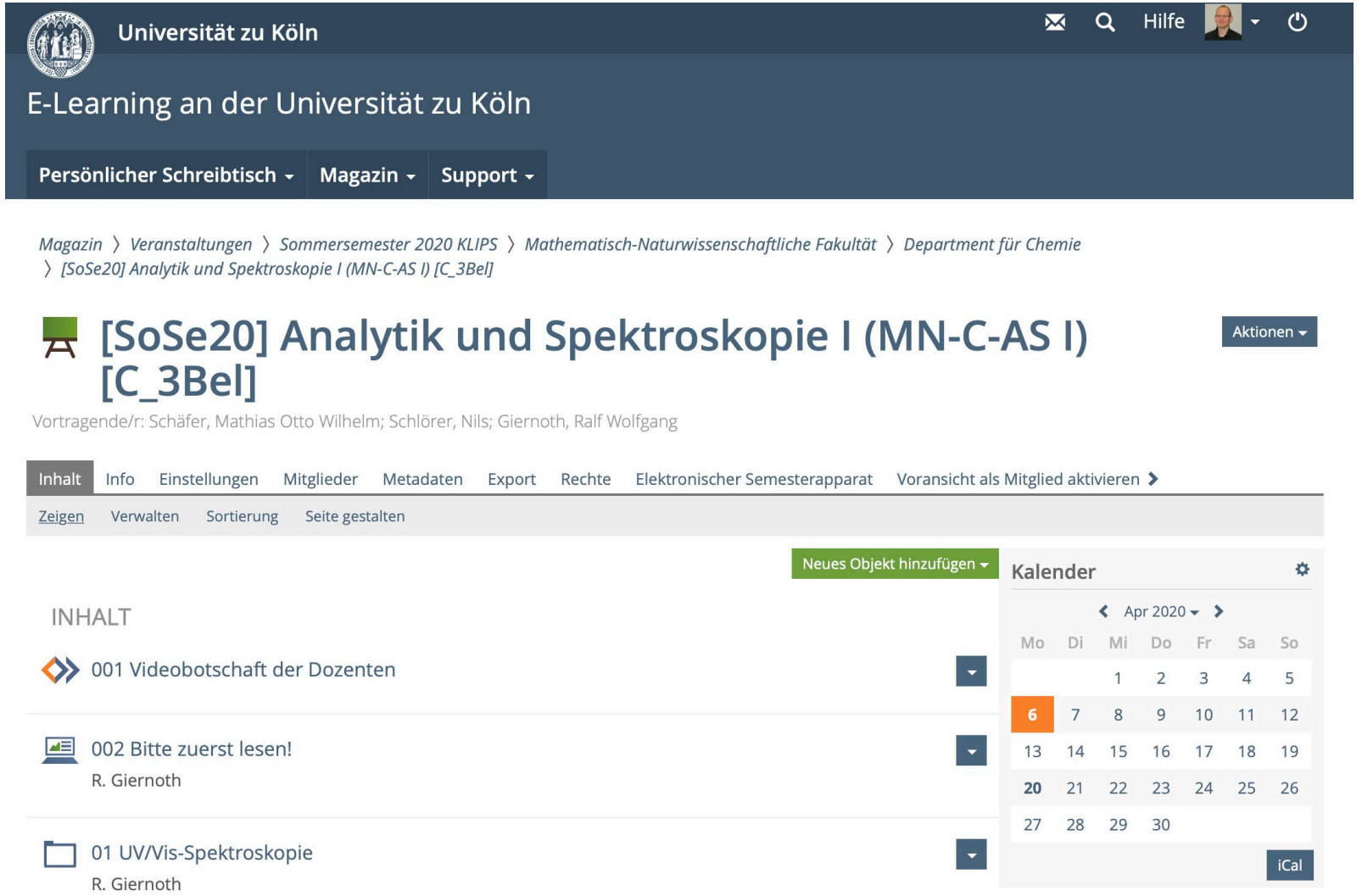
ILIAS e-Learning Platform



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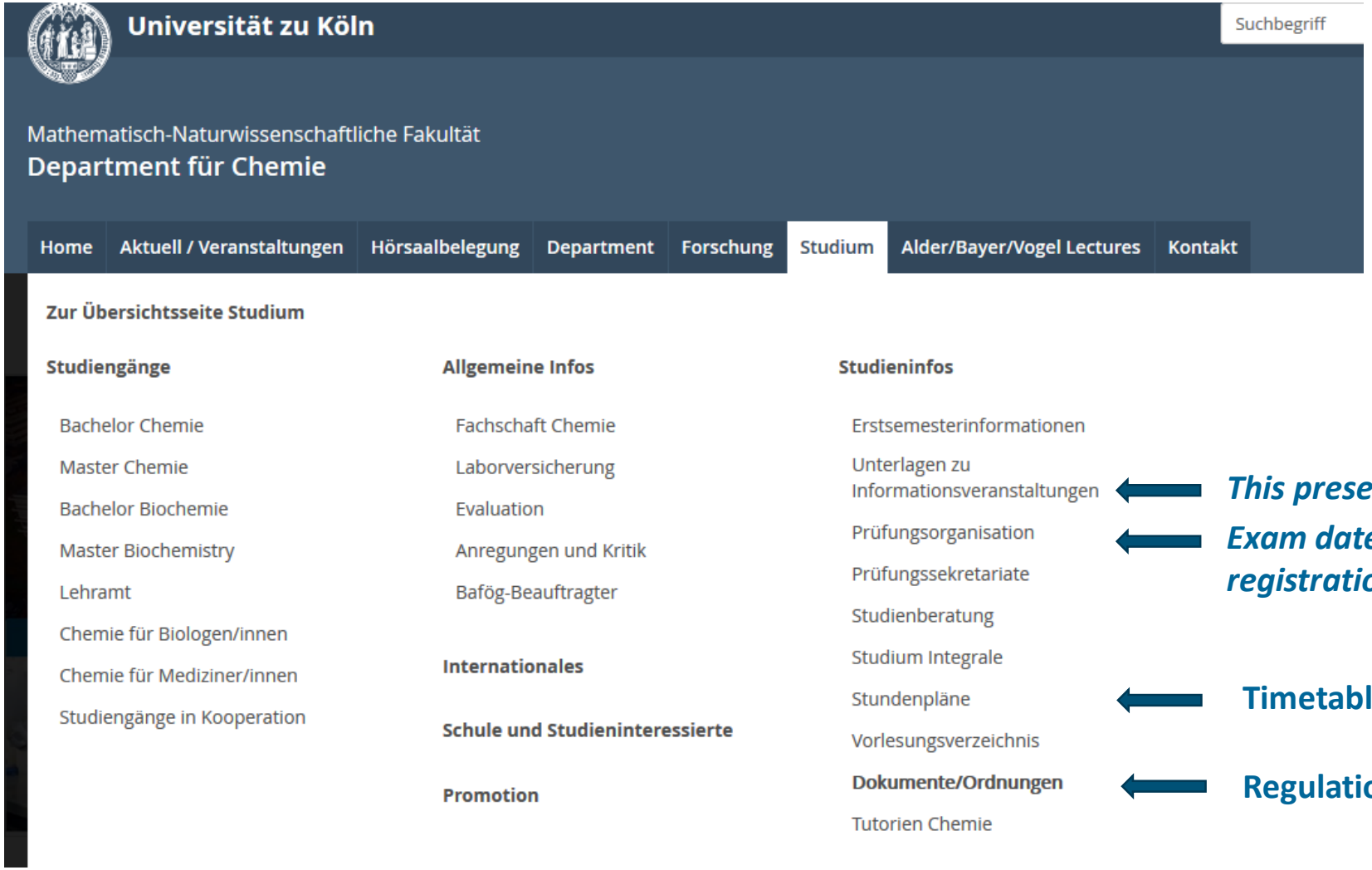
How to find information



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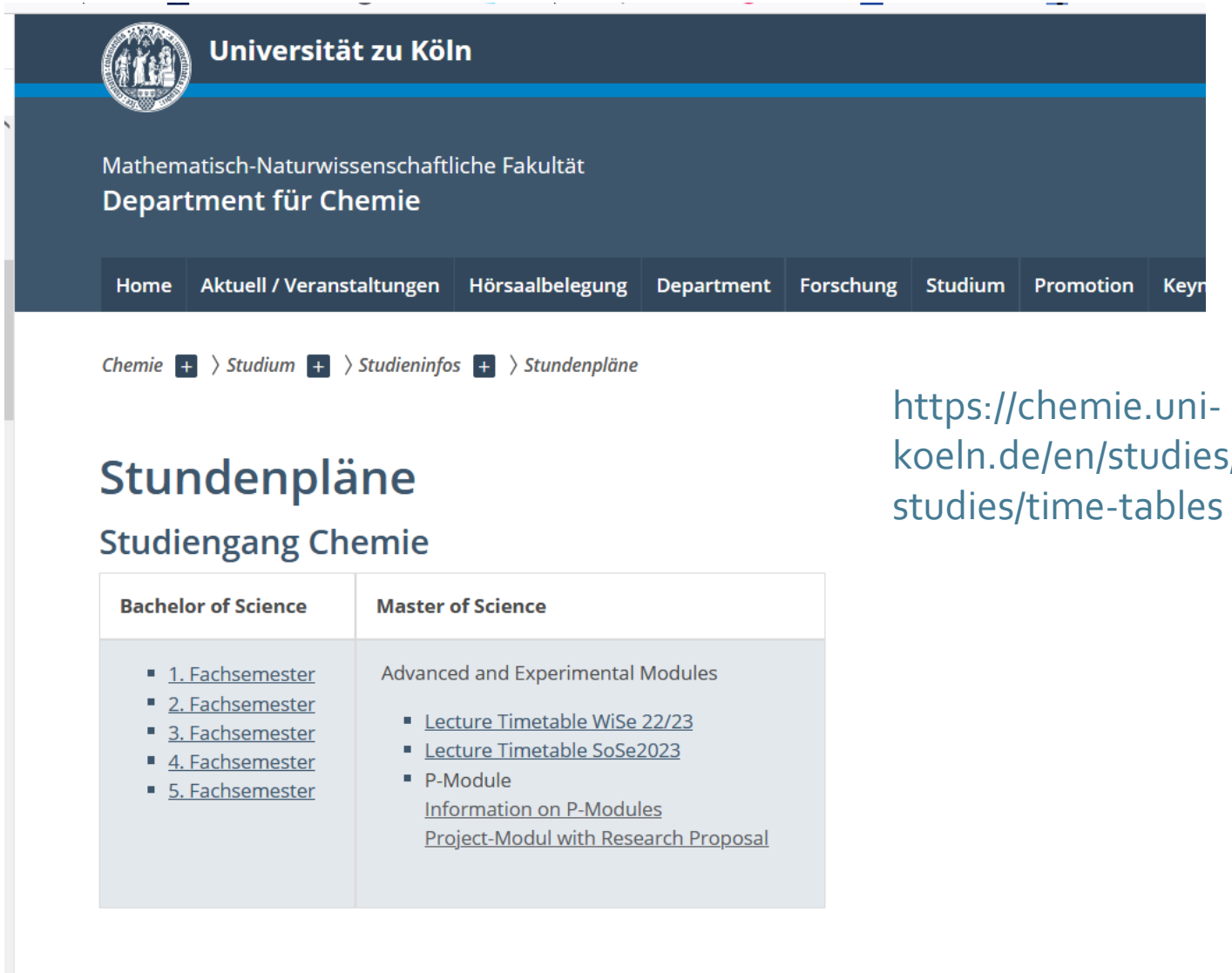
Lecture Timetables



Universität zu Köln

Mathematisch-Naturwissenschaftliche Fakultät

Department für Chemie

Home | Aktuell / Veranstaltungen | Hörsaalbelegung | Department | Forschung | Studium | Promotion | Keyn

Chemie ⊞ 〉 *Studium* ⊞ 〉 *Studieninfos* ⊞ 〉 *Stundenpläne*

Stundenpläne

Studiengang Chemie

Bachelor of Science	Master of Science
▪ 1. Fachsemester ▪ 2. Fachsemester ▪ 3. Fachsemester ▪ 4. Fachsemester ▪ 5. Fachsemester	Advanced and Experimental Modules ▪ Lecture Timetable WiSe 22/23 ▪ Lecture Timetable SoSe2023 ▪ P-Module Information on P-Modules Project-Modul with Research Proposal

https://chemie.uni-koeln.de/en/studies/information-on-studies/time-tables

The Mentor Program

- Each MSc student is assigned to mentor (professor of the Chemistry department)
  - can be contacted for individual study-related counseling
  - first contact for external modules

7451507	Dumele
7405257	Meerholz
7405354	Ruschewitz
7448509	Ravat
7394550	Ruschewitz
7410158	Schubert
7392909	Griesbeck
7377816	Milow
7412192	Meerholz
7434468	Dumele
7446243	Ravat
7382018	Ravat
7432118	Schäfer
7380940	Schubert
7449390	Hanrath
7405419	Ruschewitz
7393274	Griesbeck
7370869	Griesbeck

7340327	Lindfors
7446261	Schäfer
7378444	Wickleder
7393018	Kath-Schorr
7377827	Kath-Schorr
7405167	Gather
7354811	Gather
7377780	Milow
7377824	Dumele
7406495	Kath-Schorr
7392717	Klein
7405680	Klein
7406143	Kath-Schorr
7405321	Milow
7377858	Schäfer
7446597	Hanrath
7367099	Mathur
7378185	Wickleder

Dementoren:

Mentoren:

Fachschaft (student council)

Fachschaft Chemie
Universität zu Köln

https://fs-chemie.uni-koeln.de/

Go abroad!

- Start collecting information and get active at least one year in advance.
- Ideal: SM- or LM-modules at other universities

Contact: Dr. Heike Henneken

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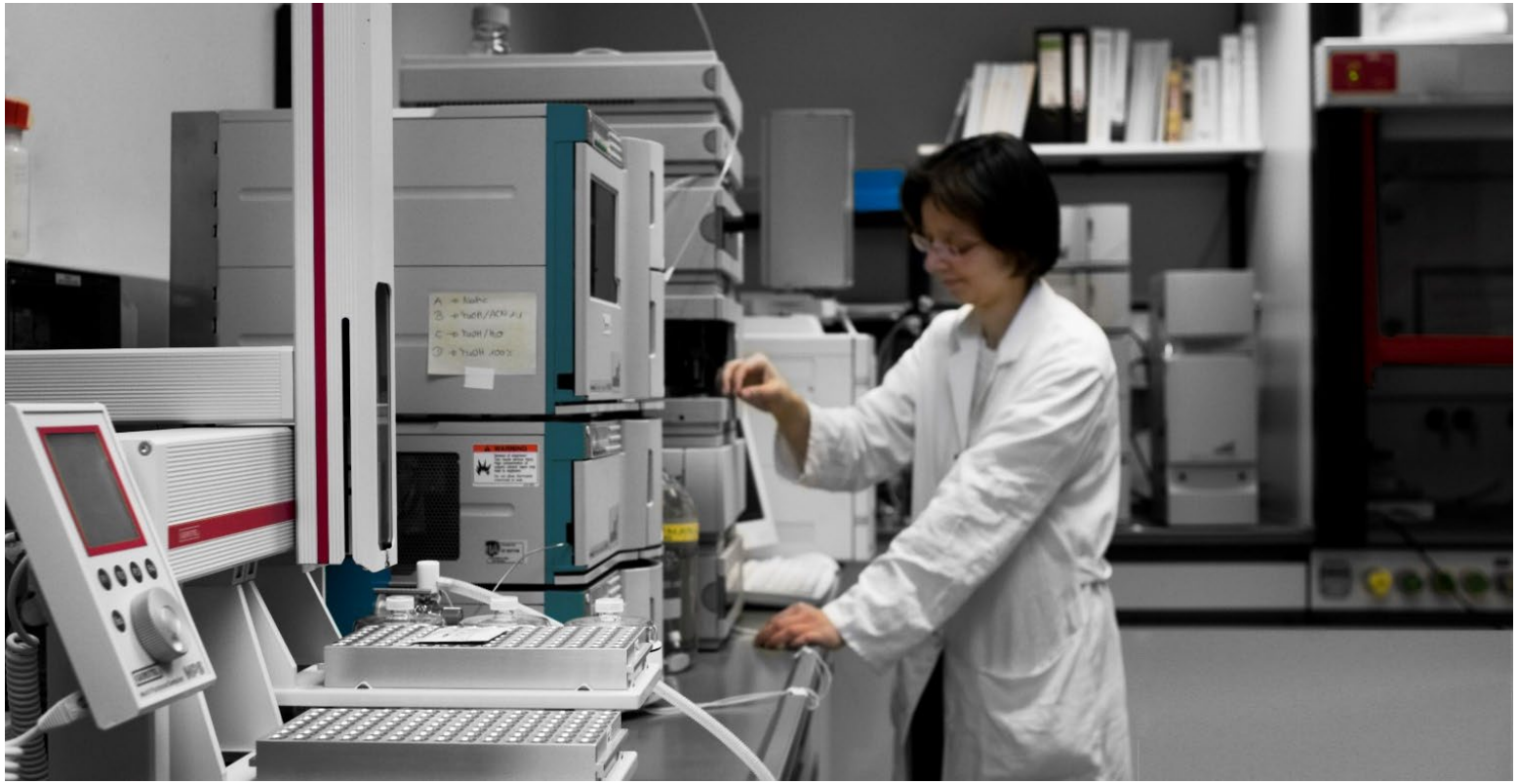
Laboratory liability Insurance



We strongly recommend that all students take out their own private (laboratory) liability insurance or secure insurance cover through their parents.

Find out more:
https://chemie.uni-koeln.de/studium/allgemeine-infos/laborversicherung

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Safety facilities

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Get acquainted to the safety facilities!

WE WISH YOU SUCCESS AND FUN

WITH THE MASTER PROGRAM!

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