

#### How to get through your studies in QST: legal aspects and specific information

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**Professional Profile Physics** 

Academic Administration



# Academic Counseling @ studium@nat.tum.de



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Appointments for

consultations [3]

With learning

Tel.: +49 (89) 289 - 12596

# Information About the Degree Program (I/II)

#### Link QST Website



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#### Master's Program Quantum Science & Technology

In the Quantum Science & Technology program students learn to directly translate current results from research and development in science (e. g. Physics, Chemistry), Mathematics and Engineering (e. g. informatics, electrical engineering) into applications, such as quantum sensors, quantum algorithms, and quantum computers, which exploit quantum phenomena – especially superposition and entanglement.

#### Curriculum

The first year of this interdisciplinary Master's program focuses mainly on fundamental introductory lectures and lab courses, while the second year focuses on the research within the framework of the Master's thesis.

#### 1. and 2. Semester - Study Phase

During the study phase, students attend mandatory courses and, additionally, some







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# Information About the Degree Program (I/II)

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Homepage

Curriculum

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#### Student Academic Advisor M.Sc. QST

8

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# Information About the Degree Program (II/II)





# Academic and Examination Regulations (FPSO)

The Academic and Examination Regulations (FPSO) are, together with the General Academic and Examination Regulations (APSO), the contract you signed with the university at the time of enrolment. It is very important that you are familiar with the contents of these regulations. => Link

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#### Legal Basis

for the Master's degree program Quantum Science & Technology

The legal basis for the study program is regulated in the degree-specific examination and study regulations (FPSO). These are based on the general statutes of the TUM (in particular the APSO).

In addition, we provide the program documentation, in which the degree program is described in detail as part of the TUM quality management system. These are supplemented by the descriptions of the individual modules in the module handbook.

Academic and examinations regulations for degree programs and doctoral studies are laid down in the statutes of TUM. English versions are not legally binding documents, only the German versions are available.

Examination Board Quantum Science & Technology



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#### Curriculum - Overview

	Semester	CURRICULUM					
lase	1.	QST Theory: Quantum Information		QST Experiment: Quantum Hardware		Two focus areas Experimental Quantum Science & Technology or Theoretical Quantum Science & Technology	30
d >		10 CP		10 CP		10 CP	
Study	2. Mobility window	Advanced Practical Training mandatory 6 CP	General education subjects elective 4 CP	Two focus areas: Experimental Quan Theoretical Quantu elective 20 CP	tum Science & Tech m Science & Techno	Special Topics	30
earch phase	3.	Master's Seminar mandatory 15 CP			Master's Work Expe mandatory 15 CP	erience	30
Rese	4.	Master's Thesis 30 CP					
Legend:		light grey = required mo dark grey = General ed light blue = Electives ca dark blue = Research y	odules semester ucation subjects atalogue with two ear (Master's se	r 1 and 2 o focus areas minar, Master's prac	tical training and Ma	ster's thesis)	



#### **Curriculum - Overview**

Semester		CURRICULUM					
ohase	1.	QST Theory: Quantum mandatory	Information	QST Experiment: Q mandatory	uantum Hardware	Two focus areas Experimental Quantum Science & Technology or Theoretical Quantum Science & Technology elective	30
ا کل		10 CP		10 CP		10 CP	
Stuc	2. Mobility window	Advanced Practical Training mandatory	General education subjects elective	Two focus areas: Experimental Quan Theoretical Quantu elective	tum Science & Tech m Science & Techno	nology or blogy Special Topics	30
		6 CP	4 CP	20 CP			
arch phase	3.	Master's Seminar mandatory 15 CP			Master's Work Expe mandatory 15 CP	erience	30
ese	<b>.</b>			Master	s Thesis		
Å,		30 CP					
	Legend:	ight grey = required modules semester 1 and 2 Jark grey = General education subjects ight blue = Electives catalogue with two focus areas Jark blue = Research year (Master's seminar, Master's practical training and Master's thesis)					



# Mandatory Modules (graded)

	Semester	CURRICULUM					
tse	1.	QST Theory: Quantum Information	QST Experiment: Quantum Hardware	Two focus areas Experimental Quantum Science & Fechnology or Theoretical Quantum Science & Technology	30		
y ph		mandatory 10 CP	mandatory 10 CP	ective €0 CP			
Stud	2. Mobility window	<u>NAT3035</u> Quantum Informat	ion (10 CP)	blogy or bgy Special Topics	30		
arch phase	3.	NAT3034 Quantum Hardware (10 CP)					
Rese	4.						
Legend: I		light grey = required modules semester dark grey = General education subjects light blue = Electives catalogue with two dark blue = Research year (Master's se	1 and 2 focus areas minar, Master's practical training and Ma	ster's thesis)			

#### Credit Limit

- There is a credit limit for the mandatory modules
- you must pass two mandatory modules within the first two semesters, otherwise you will be disenrolled by end of the second semester.
- That means you have to pass one of the two modules within the first exam (winter semester 2024/25) or the repeat exam (summer semester 2025). There is no in person-teaching during the summer semester.

MAXIMILIANS-UNIVERSITÄT

Pass 1/2

mandatory modules

by end of 2nd

Semester



### Focus Areas (graded)

	Semester	CURRICULUM					Credits
ly phase	1.	QST Theory: Quantum mandatory 10 CP	Information	QST Experiment: Q mandatory 10 CP	uantum Hardware	Two focus areas Experimental Quantum Science & Technology or Theoretical Quantum Science & Technology elective 10 CP	30
Stud	2. Mobility window	Advanced Practical Training mandatory 6 CP	General education subjects elective 4 CP	Two focus areas: Experimental Quan Theoretical Quantu elective 20 CP	tum Science & Tech m Science & Techno	nnology or ology + Special Topics	30
earch phase	3.	Master's Seminar mandatory 15 CP			Master's Work Exp mandatory 15 CP	erience	30
Rese	4.			Master 30	s Thesis CP		30
Legend:		light grey = required mo dark grey = General ed light blue = Electives ca dark blue = Research y	odules semester ucation subjects atalogue with two rear (Master's se	r 1 and 2 o focus areas minar, Master's prac	tical training and Ma	uster's thesis)	



# Focus Areas (I/II)

> You have to do minimum 30 credit points in the focus areas.

- There are two (three) focus areas:
  - Experimental Quantum Science & Technology
  - Theoretical Quantum Science & Technology
  - Special Topics in QS&T

All offered modules are listed on the website

You may choose **freely** from the focus areas Experimental and Theoretical. To ensure a broad coverage of topics a consultation by a mentor is recommended and required to enter the research phase. => For Special Topics: see next slide!



# Focus Areas (II/II)

maximum.

From the catalog Special Topics in QST you may choose one module

Module code	Title	Module responsible	
NAT5006m	Quantum Semiconductor Nanostructures and Devices		€
NAT5008m	Current Topics in Quantum Networks	Reiserer, Andreas	€
NAT5018m	Entanglement in Many-Body System	Pollmann, Frank	€
NAT5020m	Advanced Topics in the Theory of Quantum Matter	Knap, Michael	€
NAT5027m	Entanglement and Correlations in Multipartite Systems	Kraus, Barbara	€
NAT5029m	Quantum Science and Technology in Solids: spins, microwaves, and optomechanics	Hübl, Hans- Gregor	€
NAT5030m	Cavity-, Circuit- and Waveguide QED	Rabl, Peter	€
NAT5032m	Verification and Characterization of Quantum Devices	Kraus, Barbara	€
NAT5040m	Seminar: Topics of Quantum Computing (IN2107,IN2183,IN0014)	Huang, Qunsheng	€
NAT7019	Modern Topics in Condensed Matter Physics		€
PH1322	Superconducting Quantum Circuits	Gross, Rudolf	€



# Mentor Counseling

- Make sure you have an idea of which of the modules you are interested in before contacting a mentor. A mentor will help you to review the individual study plan you have considered (selected modules).
- > Take the counseling within the first weeks of lecture time
- The discussed individual curriculum is not definitive, you can change your choice of modules later. You also might change your mentor during your studies.
- Choose a mentor, your mentors are listed on our <u>website</u>
- You must submit a Mentor-Consulting Interview Form when you register for the research phase



### APT / General Education Subjects

	Semester	CURRICULUM					
se	1.	QST Theory: Quantum Information		QST Experiment: Quantum Hardware		Two focus areas Experimental Quantum Science & Technology or Theoretical Quantum Science & Technology	30
pha		mandatory		mandatory		elective	
<u>7</u>		10 CP		10 CP		10 CP	
Stud	2. Mobility window	Advanced Practical Training mandatory 6 CP	General education subjects elective 4 CP	Two focus areas: Experimental Quan Theoretical Quantu elective 20 CP	wo focus areas: xperimental Quantum Science & Technology or heoretical Quantum Science & Technology lective 0 CP		30
earch phase	3.	Master's Seminar mandatory 15 CP			Master's Work Expe mandatory 15 CP	prience	30
Rese	4.	Master's Thesis 30 CP					30
Legend:		light grey = required modules semester 1 and 2 dark grey = General education subjects light blue = Electives catalogue with two focus areas dark blue = Research year (Master's seminar, Master's practical training and Master's thesis)					



# APT – Advanced Practical Training (pass/fail)



- a selection of tasks offered and supervised by the experimental and theoretical research groups participating in the QST Master's program.
- gaining some familiarity with the research interests of the associated research groups, thus facilitating future decisions regarding choices of specialization or topics for Master's theses.
- Depending on its topic and scope, a task is worth either 1 or 2 units. The corresponding contact hours are 10 hours and the total workload are 30 hours per unit.
- Students have to complete tasks with a combined value of 6 units. At least 2 units must stem from experimental tasks and at least 2 from theoretical ones.

For further information, please have a look on the module description - >  $\underline{\text{Link}}$ See also our website ->  $\underline{\text{Link}}$ 



# General Education Subjects (pass/fail)

- > At least 4 credit points
- Elective courses please see our <u>website</u>

choose for example from TUM School of Managment, the Carl-von-Linde Academy or the Language Center

- > To take an exam: register in TUMonline!
- Those who still have to prove their knowledge of German can take a German course at the TUM Language Center or LMU, which can also be considered a general education subject.



# Mobility Window

	Semester	CURRICULUM					
Se	1.	QST Theory: Quantum Information		QST Experiment: Quantum Hardware		Two focus areas Experimental Quantum Science & Technology or Theoretical Quantum Science & Technology	30
pha		mandatory		mandatory		elective	
<u>&gt;</u>		10 CP		10 CP		10 CP	
Stud	2. Mobility window	Advanced Practical Training mandatory 6 CP	General education subjects elective 4 CP	Two focus areas: Experimental Quan Theoretical Quantu elective 20 CP	tum Science & Tech m Science & Technc	nology or ology	30
earch phase	3.	Master's Seminar mandatory 15 CP			Master's Work Expe mandatory 15 CP	prience	30
Rese	4.	Master's Thesis 30 CP					30
Legend:		light grey = required mo dark grey = General ed light blue = Electives ca dark blue = Research y	odules semester ucation subjects italogue with two ear (Master's se	r 1 and 2 9 focus areas minar, Master's prac	tical training and Ma	ster's thesis)	

### **Going Abroad**



#### Dr. Maria Eckholt

International students, going abroad General courses' issues and soft skills

@: <u>studium@nat.tum.de</u> Tel.: +49 (0)89 289 14461 Office: PH 2053 Tue. and Thu. 9:30 – 11:30 am



Detailed Information about possibilities for a stay abroad (for example ERASMUS, TUMexchange)

https://academics.nat.tum.de/en/global/out-ph

TUMexchange application deadline October 31 (10 a.m.)

Erasmus+ SMS and SEMP application deadline usually January 15

- To follow international activities of the TUM NAT: <u>https://collab.dvb.bayern/display/TUMnat/Study+Abroad</u>
- For QST students, there is also financial support from MQV and Rohde-Stiftung



#### **Research Phase**

	Semester	CURRICULUM					
Se	1.	QST Theory: Quantum Information		QST Experiment: Quantum Hardware		Two focus areas Experimental Quantum Science & Technology or Theoretical Quantum Science & Technology	30
ha		mandatory		mandatory		elective	
7		10 CP		10 CP		10 CP	
Stud	2. Mobility window	Advanced Practical Training mandatory 6 CP	General education subjects elective 4 CP	Two focus areas: Experimental Quan Theoretical Quantu elective 20 CP	Two focus areas: Experimental Quantum Science & Technology or Theoretical Quantum Science & Technology elective 20 CP		30
earch phase	3.	Master's Seminar mandatory 15 CP			Master's Work Expe mandatory 15 CP	erience	30
Rese	4.			Master' 30	s Thesis CP		30
	Legend:	light grey = required mo dark grey = General ed light blue = Electives ca dark blue = Research y	odules semeste ucation subjects atalogue with two ear (Master's se	r 1 and 2 o focus areas minar, Master's prac	tical training and Ma	ster's thesis)	



### **Research Phase**

- Full time => 60 Credit Points in total => 40 hours per week, 12 months
- One inseparable entity (only formally divided into parts)
- One year of research in a group of or in a specialist field. Find a supervisor during the first year. Please, see also the list of possible thesis supervisors on the <u>website</u>.

#### Register once you start it!

You can start your research phase also within the semester, you do not have to wait until the beginning of your third semester. Also, your study phase can be longer than two semesters in total.

Additional information event every summer semester. You will get informed about this meeting via e-mail.

It is possible to do the research phase or parts of it in industry or other research insitutes or universities. Please, mind <u>our FAQ</u>.



# Academic progress check (FPSO)

- 1. You must pass two of the mandatory modules within the first two semesters
- 2. You must achieve the following minimum number of credit points in the specified semesters: Only modules minimum needed for your degree program count! No additional ones.
  - 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 one exemption, in case you do not have 120 CP by the end of the 6<sup>th</sup> semester another 7<sup>th</sup> semester is granted within which you have to finalize your studies! This exemption does not apply for the earlier semester!



APC

30

60

90

120

120 (!)

# Academic progress check (FPSO)



In case you elongate your study phase longer than the third semester and until the end of your forth semester, you have to finalize all modules from the study phase until the end of your fourth semester and you have to register immediately your research phase at the end of your forth semester or right in the beginning of your fifth semester. => come for consultation with Marianne Köpf as soon as you think you might get in trouble!

#### If you do not meet the APC, you will be disenrolled.

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Please check regularly your grade report within TUMonline yourself and let us know if there are unassigned exams.



#### At TUM one credit point values one ECTS credit point. => For a 10 CP module the workload is 300 hours!





#### Registration for lectures and excercises

- Not mandatory, but useful.
- Lecturers can contact students.
- Course will appear in your TUMonline-schedule.
- Access for online material may be coupled to registration.

#### Exams

- Exams are individual to each module. Have a look into the module description.
  - Non passed modules are not part of the transcript of records.
  - The number of attempts is not part of the final documents.
  - => Therefore, deregistration is not possible after the deregistration period.
  - Retake exams are done at the following exam period or within the following semester.
- Written exams, often 60 to 90 minutes duration
   If you failed an exam, go to the review of the exams. This might help you to improve.
- Oral exams, often 20 to 45 minutes duration In case you cannot go for the oral exam, please contact the examiner and let her/him know!
- Presentations, Project work, and others
   Talk to your examiner so you might get to know, what is expected for these exams.







# Registration for exams

#### To take an exam you must register in TUMonline! even for LMU exams!

Five weeks after the start of the lecture period, you will receive an information e-mail that you can register for the exams. Registration is required for seminars or other course work as well!

- Best way to register to an exam is via "Curriculum".
- Only passed exams will be listed in the final transcript.
- There is no limit to the number of attempts for failed exams within the academic progress checks.
- Once passed, exams cannot be repeated.

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#### How to... register for courses and exams

#### Courses

TUM: <u>TUMonline</u> LMU: <u>LSF</u>

The LMU-registration period for courses is from 01.10.2024 - 24.10.2024.

#### Exams

TUM+LMU: via Study Status/Curriculum in <u>TUMonline</u>  $\rightarrow$  This is important!

For "Freifächer/Optional Courses (not part of QST)" <u>TUMonline</u> (only here via "exam")

**TUMonline Manual Registration Exams** 



# Additional requirement for integrative German skills

- Those who still have to prove their knowledge of German might take a German course at the TUM Language Center or LMU, which can also be considered a general education subject. Please register to it as a general education subject, it then will count automatically for the requirement as well.
- Also, other certificates are accepted. If you already have a certificate stating your level of German language knowledge, please send it as a pdf to master@ph.tum.de
- > The A1.1 level is sufficient.

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# **Additional Courses**

- You might take other modules (optional courses) than mentioned in your curriculum or more than needed.
- > They do not count into your degree program! Neither the grades nor the amount of CP
- > They will be listed in the appendix of your transcript of records
- Modules you take additional to the minimum of modules you have to do in the elective areas will be handled like additional courses. The less good ones will appear in the appendix. And so, they do not count for the academic progress check!

For example:

9+6+5 CP of Experimental QS&T,
5+5+6 CP of Theoretical QS&T
5 CP of Special Topics in QS&T



# Deadlines – I/II

#### **Exam registration periods**

- Examinations normally take place accompanying the corresponding semester of study. Each module has two examination dates within an academic year.
- Regularly there are two time periods for module exams at TUM. The first follows immediately the lecture period, the second is just before the lecture period of the following semester begins. The exact dates for the current and following semesters are given on the <u>Website TUM NAT</u>.
- The registration periods are defaults please keep in mind that there might be small deviations and possibly different dates in other departments
- There will be an information e-mail when the registration periods starts for TUM NAT.



#### Deadlines – II/II

**Re-registration** 

> Do not forget to **re-register for the next semester** 

Deadlines: February 15 for summer semester August 15 for winter semester



# Key Websites

Wiki:

https://collab.dvb.bayern/display/TUMnat/Quantum+Science+and+Technology -> "beobachten"

School of Natural Sciences: <a href="https://www.nat.tum.de/">https://www.nat.tum.de/</a>

https://academics.nat.tum.de

TUMonline: https://campus.tum.de



#### Some more information/advices/etc.

Our Advice and Counselling Network: Studierendenwerk München Oberbayern (studierendenwerk-muenchen-oberbayern.de)

https://www.nat.tum.de/en/nat/about/diversity/

https://www.zv.tum.de/en/diversity/home/



# **Upcoming Events**

#### Welcome Event

October 11, 09.00-11.30 a.m. - in person on site! <u>PH HS3</u> (lecture hall no 3) Prof. Alexander Holleitner and MCQST will welcome you at TUM, campus Garching. We will have time for a get-together. Please register here:

https://www.mcqst.de/news-and-events/events/masters-welcome-event-2024.html



#### Welcome Event and Lecture Hans or the Physics Building





#### Questions?

If you have questions or problems...

Let us know!

study@nat.tum.de





Please, include the shortcut "QST" within the subject and within the text your number of enrollment.

Do not write to several e-mail adresses. The people answering them are the same.





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Office: 5606.01.036 (Mathematics/Informatics building)

**Consultation Hour:** 

Please schedule an appointment via Moodle <u>https://www.moodle.tum.de/course/view.php?id=90475</u>



#### Open Day 2024









Forschungscampus Garching

