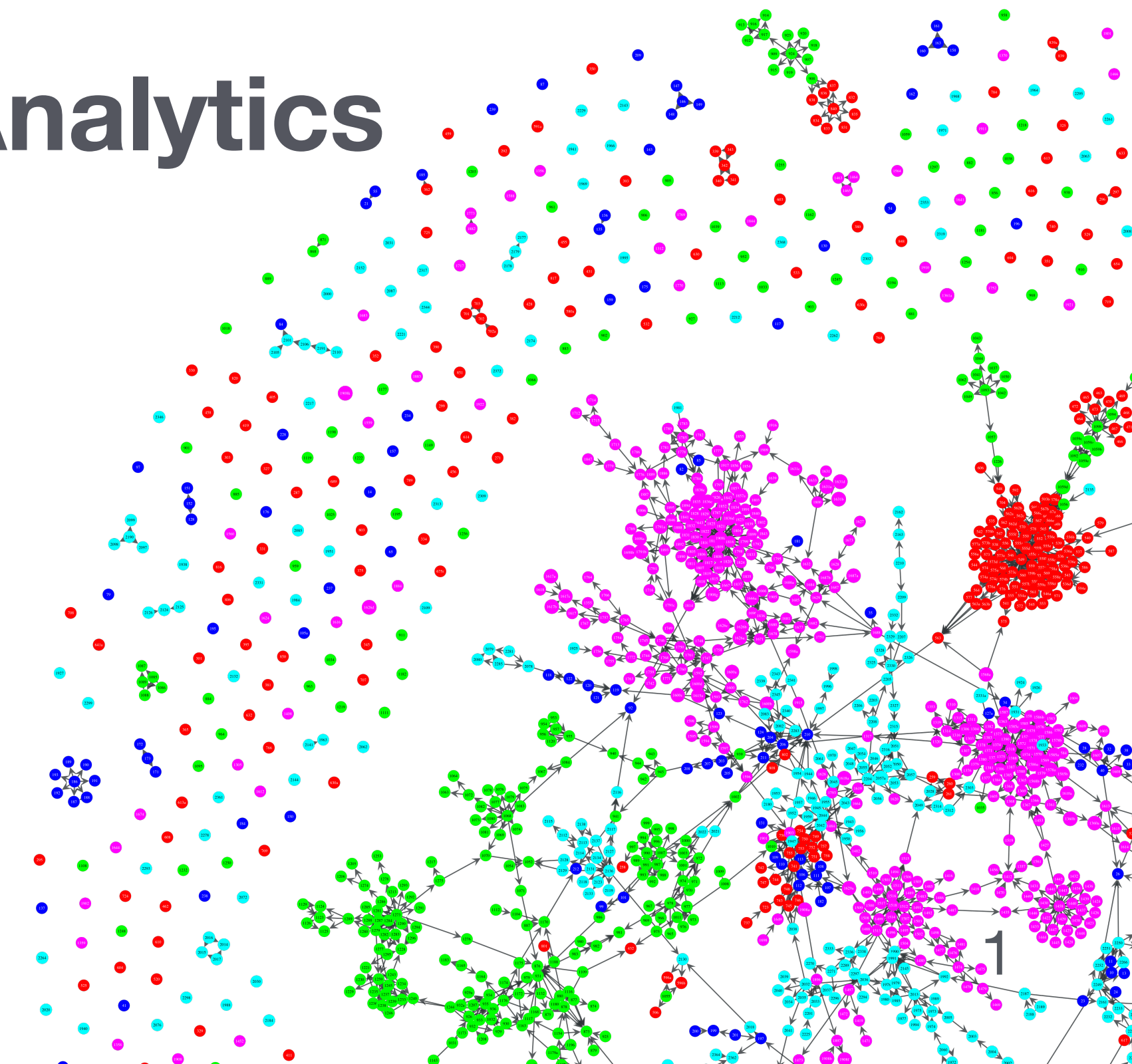




Introduction to FPSO

Master Data Engineering and Analytics

Alexander Beischl



Who? Where? What?

Academic Student Advisors

- Vivija Simić
- Dr. Sandra Kemler
- Sibylle Roden-Kinghorst
- Imme Proske



International Student Advisor

- Lena Krone

Secretary of the Examination Board

- Huda Hossain

Program Coordinator

- Alexander Beischl





Website

Links all relevant information

- Curriculum structure
- FPSO (examination regulations)
- APSO (TUM general regulations)
- Guided research
- Application project
- Thesis information

<https://www.cit.tum.de/en/cit/studies/degree-programs/master-data-engineering-and-analytics/>

International

+

Research

+

School

+

During the degree program

The master's degree program in Data Engineering and Analytics broadens and deepens existing knowledge. It also offers the possibility of individual specialization in one or more specialist areas. The qualification profile of the master's program in Data Engineering and Analytics is made up of the individual modules. In the course of study, you must contribute a total of 120 credits. These consist of:

- Required Modules (31 ECTS)
- Elective Modules (53 ECTS)
- Support Elective Modules (6 ECTS)
- Final Thesis (30 ECTS)

Explanations can be found below.

dokumentation →

Master Data Engineering and Analytics

News and Updates

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Module Catalog Updates

Since catalog changes have to be entered into TUMOnline, it may take some time until the latest changes are visible in the module catalog. Therefore, you can find the latest changes under [ChangesDEA.pdf](#). We update the file every semester as soon as all changes have been compiled. (Last update 05.04.2023)

Future Modules

Starting summer semester 2023, we will introduce a mathematics module "Applied Statistics and Data Analysis" [CIT5130001] (5 ECTS) for the Data Analyses (B3) catalog. The modul is only available for the master program Data Engineering and Analytics, not for Mathematics in Data Science. The module is available in TUMOnline.

Required Modules

+

Elective Modules

+

Application Project

+

Guided Research

+



Curriculum Structure

Mandatory and Elective Modules

Listed on our [website](#)

Current Students

→ Master's Programs

→ Data Engineering and Analytics

→ Compulsory-, Elective-, ... Modules

→ FPSO 2018

Required Modules

The following required modules must be completed in the Data Engineering and Analytics Master's program:

[IN2326](#) Foundations in Data Engineering (winter semester)

[MA4800](#) Foundations in Data Analysis (summer semester)

[IN2107](#) Advanced Seminar Course

[IN2106](#) Advanced Practical Course

Elective Modules

A total of at least 53 ECTS must be completed from the Elective Modules in the areas listed below and the Elective Modules in Informatics. You must meet the following requirements:

You have to take modules of at total of at least 15 ECTS from the three areas "Data Engineering", "Data Analytics" and "Data Analysis", with at least one module from each of the three areas.

You have to take modules of at total of at least 25 ECTS from the two areas "Advanced Topics in Data Engineering" and "Special Topics in Analytics", and have to take at least one of the modules [IN2169](#) "Research Work under Guidance" or [IN2328](#) "Application Project".

The list of all modules can be found in TUMonline in your [study plan](#) .

Special regulations for individual modules

In Data Analytics, only one of the following three modules can be counted towards your degree:

[IN2028](#) Business Analytics and Machine Learning

[IN2339](#) Data Analysis and Visualization in R

[IN2030](#) Data Mining and Knowledge Discovery

If you started your studies before October 2019, you can also take module [IN2323](#) in the area of Data Analytics.

In Special Topics in Data Analytics, only one of the following three modules can be counted towards your degree:

[IN2364](#) Advanced Deep Learning for Computer Vision



Curriculum Structure

Overview

A: Modules are mandatory

B: Catalog of elective modules from different areas

- ➔ Choose modules (with small constraints)
- Columns have a different focus

C: Interdisciplinary modules

Master's Thesis

A: Mandatory Modules (31 Credits)

Computer Science

Mathematics

Foundations in
Data Engineering

Foundations in
Data Analysis

Master's Seminar

Master's Practical
Course

B: Elective Modules (53 ECTS)

Computer Science

Mathematics

B1.1 Data
Engineering

B2.1 Data
Analytics

B3 Data Analysis

Elective Modules
of the Master
Informatics

B1.2 Advanced
Topics in Data
Engineering

B2.2 Special
Topics in Data
Analytics

C: Elective Interdisciplinary Modules (6 ECTS)

C1 Support Electives Master Informatics

C2 Social and Political Aspects of Data Science

Master's Thesis (30 ECTS)



Curriculum Structure

Mandatory Modules

- Foundations in Data Engineering (IN2326, 8 ECTS)
 - Foundations in Data Analysis (MA4800, 8 ECTS)
 - Master's Seminar (IN 2107, 5 ECTS)
 - Master's Practical Course (IN2106, 10 ECTS)
-
- Listed in the FPSO in: *A Mandatory Modules*

A: Mandatory Modules (31 Credits)

Computer Science

Mathematics

Foundations in
Data Engineering

Foundations in
Data Analysis

Master's Seminar

Master's Practical
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Master's Thesis (30 ECTS)



Curriculum Structure

Elective Modules - Electives 1

- Earn at least *15 ECTS* in core groups
- Complete at least one module in each group

Listed in the FPSO in: *B Elective Modules*

A: Mandatory Modules (31 Credits)

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Master's Thesis (30 ECTS)



Curriculum Structure

Elective Modules - Electives 2

- Earn at least 25 *ECTS* in advanced/special groups
- Includes *Guided Research* or *Application Project*
- Complete at least *Guided Research* or *Application Project*

Listed in the FPSO in: *B Elective Modules*

A: Mandatory Modules (31 Credits)

Computer Science

Mathematics

Master's Seminar

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Data Engineering

Foundations in
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Master's Thesis (30 ECTS)



Curriculum Structure

Elective Modules - Electives 3

For the remaining 13 ECTS of *B: Elective Modules*

- Additional modules from B1.1, B1.2, B2.1, B2.2, B3
 - Elective modules of the Master Informatics
- ➔ **Sum** of taken modules from:
B1.1, B1.2, B2.1, B2.2, B3, Elective modules of the Master Informatics **≥ 53 ECTS**

Listed in the FPSO in: *B Elective Modules*

A: Mandatory Modules (31 Credits)

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Master's Thesis (30 ECTS)



Curriculum Structure

Electives Interdisciplinary

Modules

Earn at least 6 Credits:

- **3 ECTS** Support Electives Master Informatics
 - Module catalogue of Master Informatics or
 - Language courses or
 - Courses from the Carl-von-Linde-Academy
- **3 ECTS** Social and Political Aspects of Data Science

Listed in the FPSO in: *C Interdisciplinary Elective Modules*

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Curriculum Structure

Module Catalog - Website

B Elective Modules :

B1.1 "DATA ENGINEERING":

| ID | Title | Term | Contact Hours | Credits | Language |
|------------------------|--|------|---------------|---------|----------|
| IN2219 | Query Optimization | WS | 3V+2Ü | 6 | EN |
| IN2073 | Cloud Computing | WS | 2V+1Ü | 4 | EN |
| IN2118 | Database Systems on Modern CPU Architectures | SS | 3V+2Ü | 6 | EN |
| IN2140 | Advanced Concepts of Distributed Databases - Programming Database Web Applications | WS | 1V+2P | 4 | DE/EN |
| IN2013 | High Performance Computing - Programming Paradigms and Scalability | SS | 2V+1Ü | 4 | DE/EN |
| IN2209 | IT Security | WS | 4V+1Ü | 7 | DE |
| IN2147 | Parallel Programming | SS | 2V+2Ü | 5 | EN |
| IN2259 | Distributed Systems | WS | 3V+1Ü | 5 | EN |

B1.2 "ADVANCED TOPICS IN DATA ENGINEERING":

| ID | Title | Term | Contact Hours | Credits | Language |
|------------------------|---|-------|---------------|---------|----------|
| IN2328 | Application Project | WS/SS | | 10 | DE/EN |
| IN2018 | Augmented Reality | SS | 3V+2Ü | 6 | EN |
| IN2169 | Guided Research | WS/SS | | 10 | EN |
| IN2158 | Advanced Network and Graph Algorithms | WS | 4V+2Ü | 8 | DE/EN |
| IN2097 | Advanced Computer Networking | WS | 3V+1Ü | 5 | EN |
| IN2190 | Programming of Supercomputers | WS | 3P | 5 | EN |

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Master's Thesis (30 ECTS)



Curriculum Structure

Module Catalog - Website

B2.1 "DATA ANALYTICS":

| ID | Title | Term | Contact Hours | Credits | Language |
|------------------------|--|------|---------------|---------|----------|
| IN2023 | Image Understanding I: Machine Vision Algorithms | SS | 2V | 3 | DE |
| IN2062 | Techniques in Artificial Intelligence | WS | 3V+1Ü | 5 | DE/EN |
| IN2133 | Principles of Computer Vision | WS | 3V | 4 | EN |
| IN2124 | Basic Mathematical Methods for Imaging and Visualization | WS | 2V+2Ü | 5 | EN |
| IN2026 | Visual Data Analytics | WS | 3V+1Ü | 5 | EN |
| IN2071 | Knowledge-based Systems for Industrial Applications | WS | 3V | 4 | EN |

Additionally you can elect ONE (not more) of the following modules in Data Analytics:

| ID | Title | Term | Contact Hours | Credits | Language |
|------------------------|--------------------------------------|------|---------------|---------|----------|
| IN2028 | Business Analytics | WS | 2V+2Ü | 5 | EN |
| IN2339 | Data Analysis and Visualization in R | WS | 2V+4Ü | 6 | EN |
| IN2030 | Data Mining and Knowledge Discovery | WS | 2V | 3 | EN |

Furthermore you can elect ONE (not more) of the following modules in Data Analytics:

| ID | Title | Term | Contact Hours | Credits | Language |
|------------------------|---|------|---------------|---------|----------|
| IN2064 | Machine Learning | WS | 4V+2Ü | 8 | EN |
| IN2332 | Statistical Modeling and Machine Learning | SS | 4V+4Ü | 8 | EN |

If you started your studies BEFORE October 2019 (but NOT afterwards) you can elect IN2323 in B2.1 too

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Master's Thesis (30 ECTS)

Credit Requirements over Time

- Until the end of the 2nd semester: at least one module from section A or B
- Until the end of the 3rd semester ≥ 30 ECTS Credits
- Until the end of the 4th semester ≥ 60 ECTS Credits
- Until the end of the 5th semester ≥ 90 ECTS Credits
- Until the end of the 6th semester 120 ECTS Credits

If You are **about to fail** one of the requirement deadlines:

Please talk to the academic student advisors. In coordination with them, contact the chairman of the examination committee in written form and state the reasons.

If such a failure can be foreseen: contact one of the **academic student advisors** immediately.

Bridging Courses

Non-computer-science and non-mathematics bachelors:

- Please note that the **bridging courses MUST ALL** be passed in your first year of study!

Be careful:

- Some courses and exams are only offered in either winter or summer semester.
- Please take bridge courses seriously: Plan your schedule so that you have enough time for bridge courses. Reduce load in the rest of the curriculum.

Please note, that those of you that **did not provide proof** of basic german skills:

- This obligation is automatically lifted after you complete the **first module at TUM**.

Student Code of Conduct

Compilation of TUM rules on

- **Plagiarism** and
- **Cheating**

Meant as

- good advice and
- help to avoid mistakes

Please read the full document on your own on our website: <http://www.in.tum.de/en/current-students/administrative-matters/student-code-of-conduct.html>

Student Code of Conduct

(June 22, 2016)

The purpose of examinations and coursework is to monitor advancements in skills and expertise. They also document that TUM graduate students have acquired methodological competence and master scientific fundamentals in their area of expertise (§2 (3) APSO). Our students therefore learn to work self-reliantly and use allowed resources only. It is important to correctly cite any resources to avoid plagiarism¹ or only suspicion thereof. This applies to both seminar papers and final theses as well as any kind of homeworks and (programming) exercises.

To offer our students the best education possible we support our students to avoid such mistakes and point to the following basic rules of citation:

1. Short text passages of another's work may be cited.
 - Citations must be clearly marked. Complete and comprehensible documentation of all sources is required.
 - Literal citations of text passages, parts of a sentence, or terms and definitions must be quoted. The respective source must be stated directly before or after a citation.
 - An unreflected concatenation of citations is not considered a personal contribution.
2. Non-literal paraphrases², e. g. explanations or essays in own words, must also be marked as someone else's contribution by stating the original sources directly before or after the respective text passages.
 - Additional references might be necessary although the respective source has previously been cited, e. g. referring to somebody else's contributions and results.
 - The same rules apply to source code that is self-written but based on existing implementations.
3. Using materials of someone else such as images, data, tables, source code etc., requires special attention. This also applies to content retrieved from the internet:
 - The authorship of all material must be completely documented and traceable, e. g. by listing original source inline in source code.
 - Ideas, outlines etc. that are based on contributions of another person must be clearly marked and documented.
 - Usage of images or graphics require citations. In certain cases, an explicit permission of the original's author may be required.
 - This also applies to graphics that are "re-drawn".
4. List all sources in a bibliography at the end of your written work and refer to specific entries in your text when used (§18 (9) APSO).
5. Try to cite scientific sources only and refer to primary sources³ whenever possible.
6. If explicitly allowed by the lecturer, coursework may be provided in collaborative team effort. In this case the individual contributions must be visible and assessable (§18 (9) APSO).

Student Code of Conduct

Quick Overview

Course achievements and examinations have to be performed self-reliantly and on the basis of allowed resources only.

Short text passages may be cited, but

- clearly marked
- literal citations must be quoted

Non-literal paraphrases must be quoted clearly, immediately, and reproducibly.

Use a full bibliography and primary sources.

Cheating leads to failing with only one possibility of retake.

Student Code of Conduct

(June 22, 2016)

The purpose of examinations and coursework is to monitor advancements in skills and expertise. They also document that TUM graduate students have acquired methodological competence and master scientific fundamentals in their area of expertise (§2 (3) APSO). Our students therefore learn to work self-reliantly and use allowed resources only. It is important to correctly cite any resources to avoid plagiarism¹ or only suspicion thereof. This applies to both seminar papers and final theses as well as any kind of homeworks and (programming) exercises.

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 - Additional references might be necessary although the respective source has previously been cited, e.g. referring to somebody else's contributions and results.
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 - Ideas, outlines etc. that are based on contributions of another person must be clearly marked and documented.
 - Usage of images or graphics require citations. In certain cases, an explicit permission of the original's author may be required.
 - This also applies to graphics that are "re-drawn".
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5. Try to cite scientific sources only and refer to primary sources³ whenever possible.
6. If explicitly allowed by the lecturer, coursework may be provided in collaborative team effort. In this case the individual contributions must be visible and assessable (§18 (9) APSO).



Examination

You can pass each module **only once**, no retake for grade improvement.

Most modules are only offered in summer or winter term

- Regular exam period
- Retake exam period

If you are caught cheating:

- Exam is graded "5.0 U"
- Only one attempt to pass the exam remaining

Staying Abroad

Please read all about it on <https://www.cit.tum.de/en/cit/studies/international/informatics-outgoing/>

Then, talk to Martina v. Imhoff for guidance.



For each module from abroad that you want to use towards your degree:

- For modules that have sufficient similarities with an **existing module** from TUM: contact the **respective TUM Professor**.
- Or, if it is in the spirit of the catalogue, try a free recognition.

For non-TUM Bachelors:

- You need to complete one full semester before going abroad.



Tips from Guidance Counselors

Please talk to the academic advisors for

- Advice on your study plan
- Internships or thesis abroad
- Examination Regulations
- Learning Methods
- Any issues you may have here at TUM

Contact: advising@in.tum.de

Website: <https://www.cit.tum.de/en/cit/studies/students/advising/informatics/tips-for-successful-studies/>



Welcome at TUM and Successful Studies!