M.Sc. Embedded Systems Engineering (ESE)

Faculty of Engineering
University of Freiburg

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Who am I?

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I'll show you…

1. How to organize your studies
2. Some administrative things
3. Some important rules regarding exams
4. Where you can get information and help

Part 1

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Syllabus / Study Plan

New exam regulations introduced in WS 2021/22 (PO version 2021)

- New version of exam regulations with new syllabus since winter semester 2021/22
  (So some of the lecturers are not used to all the new details, yet…)
- Quite a few differences to previous regulations;
  be carefull when talking to other ESE Master students without knowing, which regulations they follow!

Vocabulary you should know… part 1

Modules = building blocks of the syllabus

- Consist of various elements (different symbols/icons in study planner)
- Credits are given for complete module, no „partial credits“

Courses in the ESE program:

- Lectures – Vorlesung (V)
- Exercises – Übung (Ü)
- Lab courses – Praktikum / Praktische Übung (Pr)
- Seminars – Seminar (S)
- Projects – Projekt (*also* Pr)

Vocabulary you should know… part 2

Graded assessments or pass/fail:

- Coursework or pass/fail assessments (“Studienleistungen”, SL)
  - Part of module or final assessment
  - May be graded, or only “pass” or “fail”
  - Not part of the final grade
  - No negative consequences if failed (apart from having to repeat → “time penalty”)
- Graded assessments /Exams (“Prüfungsleistungen”, PL)
  - Always graded
  - Always counts into the final grade
  - Strict rules/regulations and very limited number of attempts

Syllabus: General structure

18 ECTS
(3 lectures)
from
Essential Lectures in Computer Science

18 ECTS
(3 lectures)
from
Advanced Micro-systems Engineering (MSE)

18 ECTS
from
Elective Courses in Computer Science
Specialization Courses
(6 ECTS each)
and/or up to
2 Seminars
(3 ECTS each)
or 1 Study project
(18 ECTS)

18 ECTS
from
one of the
Concen-tration Areas in Micro-systems Engineering

For optional specialization in one of the areas (AI, CPS, Circuits and Systems, Materials and Fabrication, Biomedical Engineering, Photonics):
at least 30 ECTS from according courses (not project) + Master Thesis with related topic

18 „flexible“ ECTS: courses chosen from one or more of the 4 areas above *and/or* from the so-called **Customized Course Selection**

30 ECTS Master Thesis + Colloquium

Syllabus: Rules

- 4 mandatory areas with 18 ECTS each
  - 2 Computer Science (Essential Lectures in CS + Elective Courses in CS)
  - 2 MSE (Advanced MSE + Concentration Area in MSE)
- Remaining 18 ECTS have to be distributed among
  - Either one or more of the above mentioned areas
  - And/or the Customized Course Selection
    (Note: This is not the name for these 18 „flexible“ credits!)
- You are not allowed to take more courses than necessary, to meat these requirements
- In general, you have to plan so you hit the 90 credits exactly (no „overshooting“ of credits)

Essential Lectures in Computer Science

Module (take courses up to at least 18 ECTS)	**ECTS**	**Semester** (recommended) when starting in winter semester
Algorithm Theory (course type: advanced lecture)	6	1 or 3
Cyber-Physical Systems – Discrete Models (course type: specialization course)	6	1 or 3
Databases and Information Systems (course type: advanced lecture)	6	1 or 3
Introduction to Embedded Systems (course type: specialization course)	6	1 or 3
Machine Learning (course type: advanced lecture)	6	1 or 3
Computer Architecture (course type: advanced lecture)	6	1 or 3
Foundations of Artificial Intelligence (course type: advanced lecture)	6	2
Image Processing and Computer Graphics (course type: advanced lecture)	6	2
Software Engineering (course type: advanced lecture)	6	2

Advanced Microsystems Engineering (MSE)

Module (take courses up to at least 18 ECTS)	**ECTS**	**Semester** (recommended) when starting in winter semester
Assembly and Packaging Technology	6	1, 2 or 3
Micro-electronics	6	1 or 3
Micro-mechanics	6	1 or 3
Micro-optics	6	1 or 3
Modelling and System Identification	6	1 or 3
MST Technologies and Processes	6	1 or 3
Sensors	6	1 or 3
Signal Processing	6	2
Probability and Statistics (This **can't** be taken as part of the 18 mandatory credits, only if you opt to do more ECTS in this area!)	6	1 or 3

Elective Courses in Computer Science

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You have to take courses up to at least 18 ECTS.
The maximum (if you do not take more than the bare minimum 18 ECTS anywhere else) would be 36 ECTS.

You can choose from

- Specialization Courses in Computer Science (6 ECTS each)
- *And/or* up to 2 Seminars (3 ECTS each)
- *And/or* 1 Study project (18 ECTS)
  (Please be aware that you cannot surpass the 36 ECTS here or the 90 ECTS overall, so plan carefully if you intend to take the study project!)

Concentration Areas in MSE

You have to choose **one** area and complete courses up to at least 18 ECTS. If you choose to take more than this, the surpassing courses can be from another area. (The maximum would, again, be 36 ECTS, if you do no courses in any other area.)

The 4 Concentration Areas are:

- **Circuits and Systems** (includes the old areas *Circuits & Systems* and *Sensors & Actuators*)
- **Biomedical Engineering** (includes the old areas Biomedical Eng. and Lab-on-a-Chip, the courses were available in the *personal profile*)
- **Materials and Fabrication** (includes the old areas *Design & Simulation* and Materials, courses were available in the *personal profile*)
- **Photonics** (courses were available in the *personal profile*)

Customized Course Selection

Instead of completing some or all of the 18 „flexible“ credits by taking courses in one or more of these 4 areas, you can take some courses (max. 18 ECTS) in the so-called Customized Course Selection.

Here, you can choose from

- Pass/fail courses *(Studienleistungen*) from Computer Science or MSE (like lab courses in CS, scientific writing or project management in MSE)
- **One** language course (esp. German courses from SLI for international students)
  (please note: **not** from the „Zentrum für Schlüsselqualifikationen“ / BOK area!)
- Selected courses from other departments / faculties, like from the Economics Department
  (not in planner of studies – application required)

Be aware that the rules regarding the Customized Course Selection are different in the MSE study program, when talking to other students or lecturers!

Optional specialization

You can choose to do a specialization in your study program (which will be shown on the final documents). There are 6 specializations available:

- Artificial Intelligence (AI) *(courses see according table on website)*
- Cyber-Physical Systems (CPS) *(courses see according table on website)*
- Circuits and Systems (i.e. the MSE Concentration)
- Materials and Fabrication (i.e. the MSE Concentration)
- Biomedical Engineering (i.e. the MSE Concentration)
- Photonics (i.e. the MSE Concentration)

The requirements are:

- You have to take courses with **at least 30 ECTS** from the according specialization category
  (please note: study project, seminars or lab courses do not count in CS)
- You have to do a **Master Thesis** with a related topic

Courses belonging to AI resp. CPS specialization

Lectures belonging to the specialization area Cyber-Physical Systems	Lectures belonging to the specialization area Artificial Intelligence
Advanced Lectures	Advanced Lectures
• Rechnerarchitektur / Computer Architecture • Softwaretechnik / Software Engineering	• Image Processing and Computer Graphics • Foundations of Artificial Intelligence • Machine Learning
Specialization Courses	Specialization Courses
• Advanced Algorithms • Algorithms for Wireless Communication • Automated Machine Learning • Blockchain and Cryptocurrencies • Compiler Construction • Cyber-Physical Systems – Discrete Models • Cyber-Physical Systems – Program Verification • Debugging and Fuzzing • Einführung in Embedded Systems / Introduction to Embedded Systems • Formale Methoden für Java / Formal Methods for Java • Funktionale Programmierung / Functional Programming • Hardware Security and Trust • Modellbildung und Systemidentifikation / Modelling and System entification • Numerical Optimization • Numerical Optimal Control in Science and Engineering • Quantitative Verifikation / Quantitative Verification • Real-Time Operating Systems and Worst-Case Execution Times • State Space Control Systems • Test und Zuverlässigkeit / Test and Reliability • Verteilte Systeme / Distributed Systems ***As Professor has left, unclear if offered in future.***	• Advanced Computer Graphics • Advanced Deep Learning • Artificial Intelligence Planning • Automated Machine Learning • Bioinformatics I • Bioinformatics II • Computer Vision • Dynamische Epistemische Logik / Dynamic Epistemic Logic • Einführung in die Multiagentensysteme / Introduction to Multiagent Systems • Foundations of Deep Learning • Information Retrieval • Introduction to data driven life sciences • Introduction to Mobile Robotics • Prinzipien der Wissensrepräsentation / Knowledge Representation • Programm Verifikation in Isabelle/HOL • Reinforcement Learning • Robot Mapping • SAT Solving • Simulation in Computer Graphics • Social Robotics • Spieltheorie / Game Theory • Statistical Pattern Recognition

Master thesis

- Master thesis (27 ECTS) graded
- Colloquium (= Presentation / Defense) (3 ECTS) graded
- Admission to thesis:
  at least 72 ECTS credits
  (plus conditional courses from admission, if applicable)
- Duration: 6 months

More information:
https://www.tf.uni-freiburg.de/en/studies-and-teaching/a-to-z-study-faq/thesis

Part 2

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Administrative things

Some practical advice, general facts and recommendations

- Most courses are offered every other semester
  (i.e. once a year); some can be held more irregularly;
  should be mentioned in the module handbook
  (see HISinOne or PDF)
- Overlapping courses...
  With the amount of courses and the flexible curriculum,
  this just happens.
  Basically: Deal with it!
  (Meaning: Choose one course for this semester, do the other one in year)
- Be aware that you might need to adapt your original study plan

Some practical advice, general facts and recommendations

- Usually no dependencies regarding order of courses
  - Nevertheless, check with lecturers for appropriate combinations or recommended order of courses
- Most prerequisites stated in the course catalog are recommendations, they are not mandatory;
  well, some are…
  Just read what is said in the description!

Conditional admission: What does this mean?

- Conditions have to be fulfilled in addition to the normal Master‘s curriculum → likely to extend your study time
- You have to complete the required modules by the end of the second semester.
  They should be your top priorities!
  (Especially in case of course collisions/overlaps)

- You will be automatically registered for these courses, but have to register for the exams yourself
  → Registration for these exams has to be done via email to the examination office (subject: registration for condiational course exam XY, with your matriculation number etc.)
- Exams required for conditional admission can only be repeated once.

Advice for your next steps

- Study the course catalog / planner of studies
  (What courses are offered right now?)
- Generally, check out a few more courses than you intend to complete in the given semester
- Register (via HISinOne→ “Booking of courses”) for the courses you want to take as soon as possible
- Information on dates and deadlines for course booking:
  https://www.tf.uni-freiburg.de/en/studies-and-teaching/calendar-dates
  → Booking deadlines for Bachelor and Master courses
- **Read the official exam regulations!**
  (= terms and conditions of your study program)

Registering for/ Booking of courses

- Have a look at your *planner of studies* https://campus.uni-freiburg.de
- Follow instructions from short demonstration here
- If you have questions or made a mistake while booking: **Contact** Ms. Moses in the Dean‘s office: moses@tf.uni-freiburg.de or myself
  (Screenshots are really helpful)

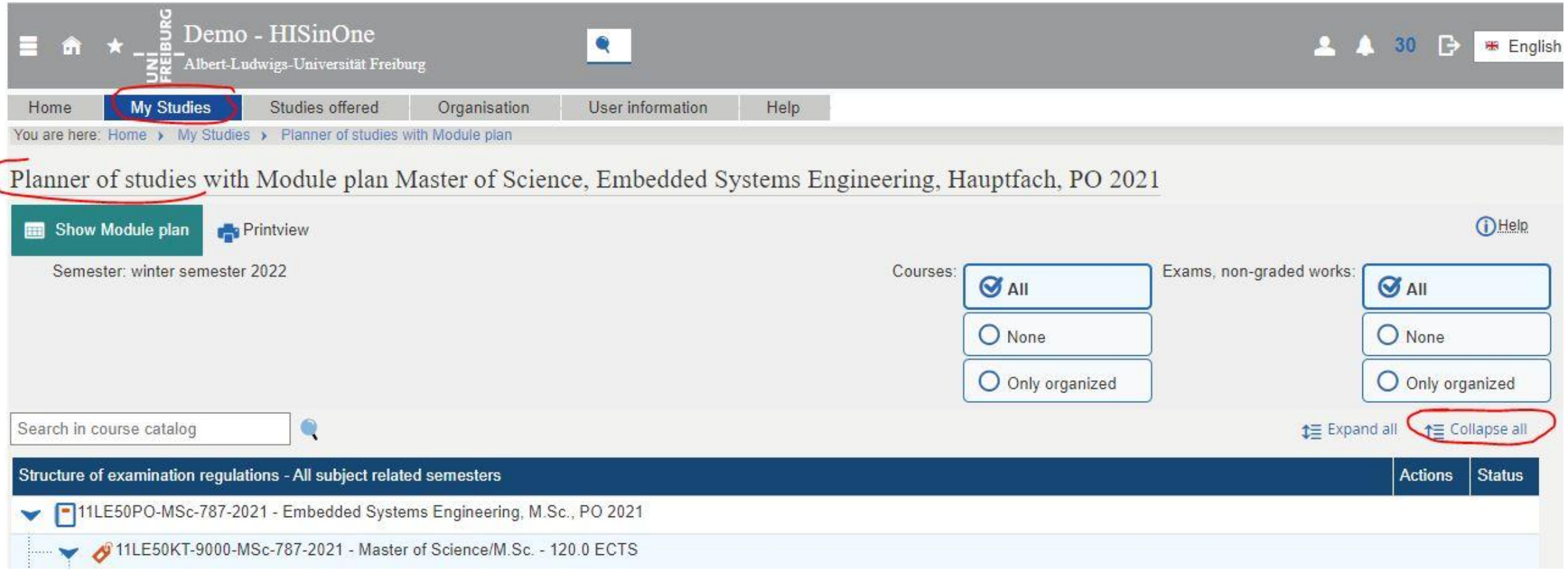
Be aware: Different course types have different deadlines!

If you forgot to book a course:

- Contact the lecturer and ask if there are still seats available and if it generally makes sense to start late
- The examination office **can‘t** help you with this!

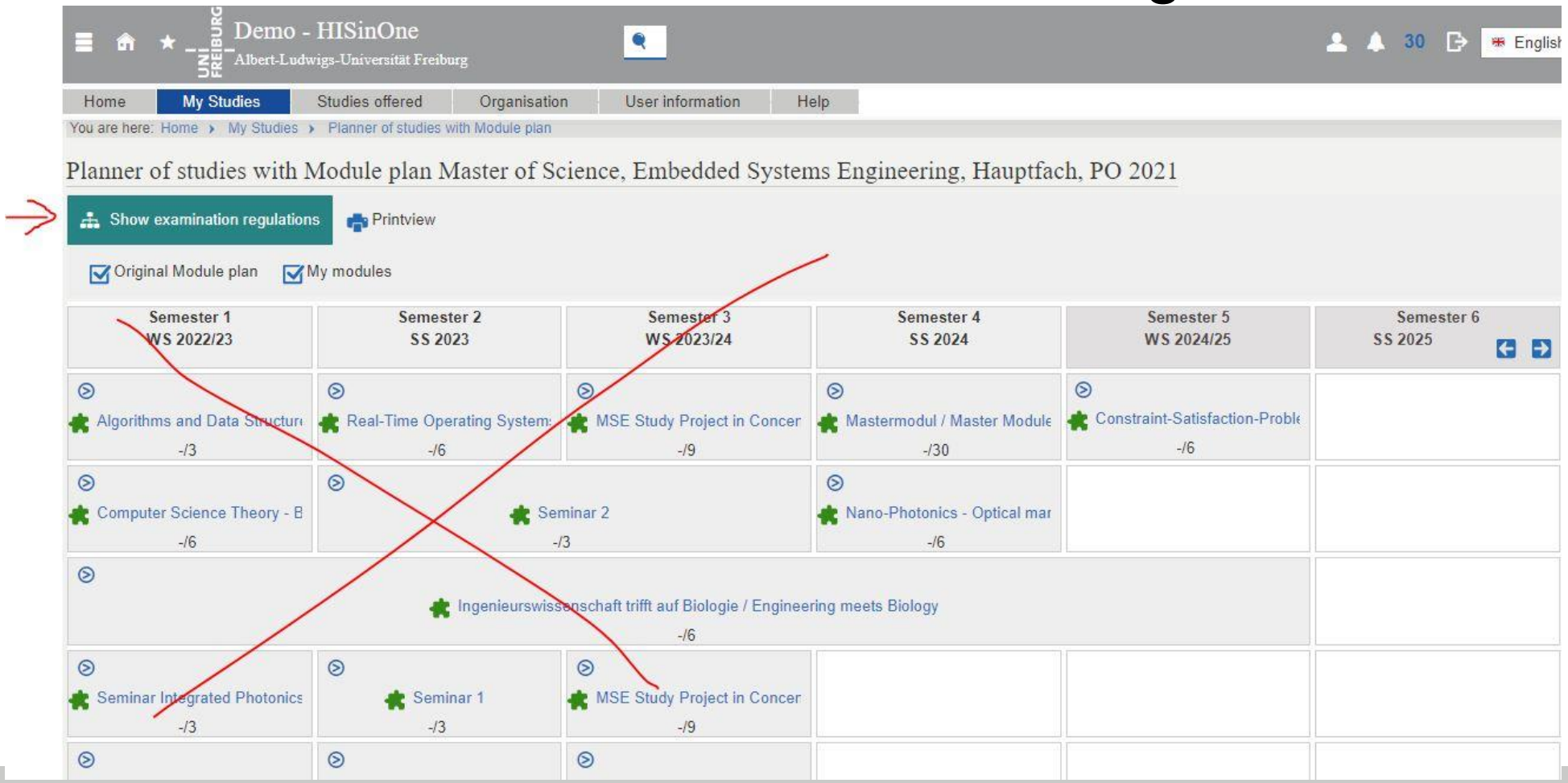
HISinOne Demo: Login and Planner of Studies

- Login to https://campus.uni-freiburg.de/

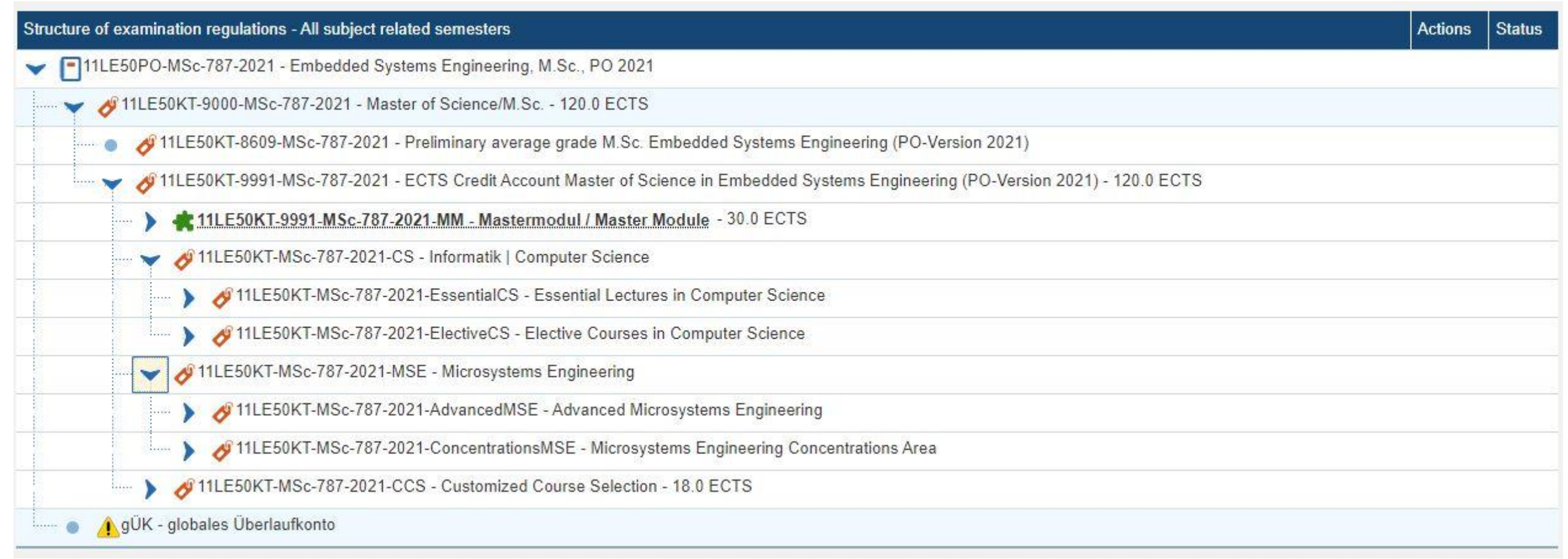


HISinOne Demo:
Planner of Studies – Different views

- Use the correct view: Examination regulations



HISinOne Demo: Examination regulations structure

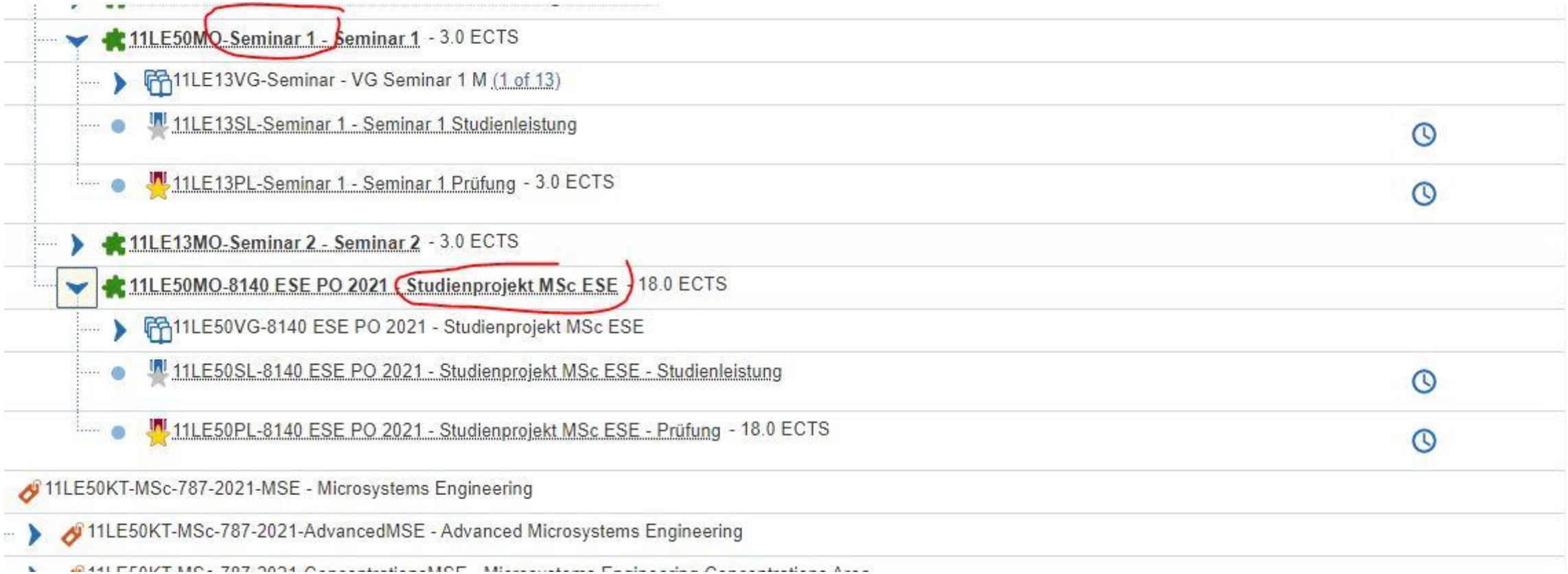


HISinOne Demo: Module – Courses – Assessments

HISinOne Demo: Registration procedure for seminar or project

- Check out how to book seminars and how to register for projects!

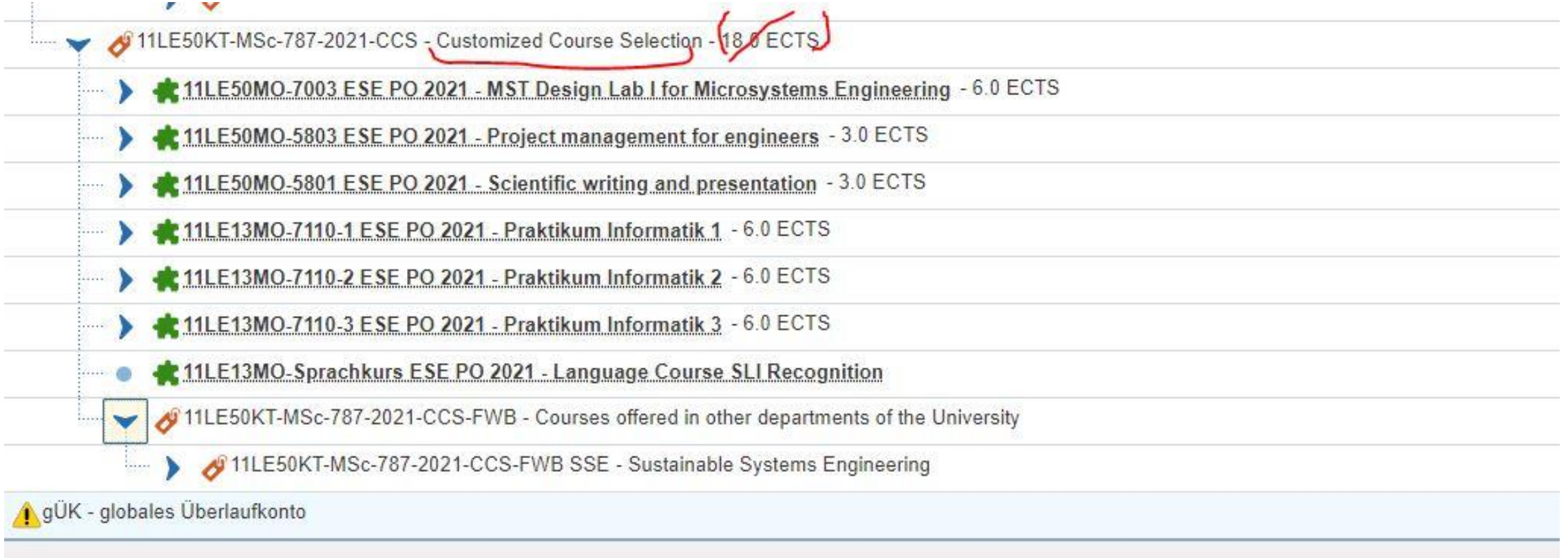
https://www.tf.uni-freiburg.de/en/studies-and-teaching/a-to-z-study-faq/booking-of-pro-seminars-in-computer-science
https://www.tf.uni-freiburg.de/en/studies-and-teaching/a-to-z-study-faq/registering-for-projects



HISinOne Demo:
Advanced MSE and Concentrations

HISinOne Demo: Customized Course Selection

- Optional; only courses completing with pass/fail assessments



HISinOne Demo: Multi-connected Elements

- Green and red arrows? Don‘t panic!

Part 3

Rules regarding examinations

More details will be offered by the examination office team in a presentation in a few weeks.

You‘ll receive an invitation e-mail in time…

Registration for exams / graded assessments (PL)

- It's a second, independent step from booking the course.
  It's **not** done automatically!
- The procedure is *similar* to booking the courses. For a how-to, see https://www.tf.uni-freiburg.de/en/studies-and-teaching/a-to-z-study-faq/examinations
  Deadlines for the registration (and de-registration) for exams are also mentioned on this website.
- Without registering for an exam you are not allowed to take it, so **do not forget!**
- To make sure you are correctly registered, we recommend saving/printing the pdf of the in HISinOne → My studies → My course enrollments and exam registrations

How to proceed if you failed an exam

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- Number of attempts are limited:
  - 2 attempts for every exam / graded assessment (if needed)
  - **2 oral or written exams** can be attempted **3 times**
- You are registered automatically for the repetitison(s) and **cannot sign off** !
- Repetition exam will take place in the next semester.
- You can replace 1 course (in CS or MSE) you failed the exam / graded assessment with another one (but it has to be done after the **first** failed attempt)

Improvement of a grade

- Repeating an exam that you have passed, to improve your mark, is possible in one module you did in your first year of studies here
- This rule applies only to written or oral exam (not other kinds like homework or presentations)
- You have to take the „repetition“ exam directly in the following semester
- The examination with the better grade will be considered official

Missing an exam: Unexcused or authorized withdrawels

- If you do not attend an exam that you registered for, it counts as failed, unless you have a valid excuse.
- Valid excuses can be
  - Due to illness
    → Doctor‘s note required, see https://www.tf.uni-freiburg.de/en/studies-and-teaching/a-to-z-study-faq
  - Due to emergencies in family etc.
    (please contact examination office immediately)
  - In this semester, it will still be possible to withdraw up to 48 hours before the exam date due to the Corona virus situation.

Intellectual honesty / plagiarism

- Plagiarism is:
  - Using someone else's texts, pictures, reports, data, solutions, whatever….
  - ... without citing the **source**
- Sources include:
  - Books, the internet, colleagues, …
- To make it clear: Plagiarism is illegal!

- The simple „if...then“ loop:
  - If you plagiarize (once) → then you fail the course
  - If you plagiarize repeatedly (twice) → then you are thrown out of the program and your academic career is over
- Intellectual honesty is important!

Part 4

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Finding information and help

Students are responsible to stay informed

- You are independent persons, expected to (mostly) self-organize and self-motivate.
  There is no service establishment catering to all your needs.
- We provide the necessary information through different sources:
  - Websites
  - Introductory events
  - Official documents (like exam regulations)
  - Information e-mails
    (Make sure to have access to your faculty user account and forward or use that e-mail address!)

If you don‘t find the information, maybe try using a search engine…

- Reading is essential! Please read! The whole text, all the lines in an email, the complete instructions in exercise or exam sheet…
- *„I did not know!“ is not an acceptable excuse!*

Check out the information on our websites

- For new students: https://www.tf.uni-freiburg.de/en/studies-and-teaching/a-to-z-study-faq/freshers-info
- Dates and deadlines: https://www.tf.uni-freiburg.de/en/studies-and-teaching/calendar-dates
- A to Z – Study FAQs (especially useful for information about examination related things): https://www.tf.uni-freiburg.de/en/studies-and-teaching/a-to-z-study-faq
- Website for your study program https://www.tf.uni-freiburg.de/en/study-programs/embedded-systems-engineering/m-sc-embedded-systems-engineering
- Contacts for advisory services etc.: https://www.tf.uni-freiburg.de/en/study-programs/counseling

When writing a mail to an advisor or the examination office…

- Use a sensible subject
- Assume we do not know you, and we are not clairvoyant.
  So, please sign the email with your full name; your matriculation number can also be helpful, and maybe even mention your study program…
- Use full names of professors, supervisors or lecturers
  (we are not on first name base with everyone at the faculty)
- For a question about a new topic:
  Write a new mail and address it (correctly) yourself.
  Don’t “answer” to older information mails from us.
- If it is urgent, indicate this in the subject line - our responses to mails not classified as urgent can take quite a while and we try to prioritize.