

# MSc ISoSySc Study Advice

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## I. INTRODUCTION

The module groups A3 (Seminar and Project) and A4 (Master's Thesis) are the key elements of the research-led MSc ISoSySc degree programme. From your bachelor's studies you are familiar with academic research conducted in a proactive and self-organised fashion. In the A3 and A4 module groups you have the opportunity to deepen your knowledge by independent graduate level research in various forms and to further improve your skills in oral presentation and academic writing. With the internship option in module group A5 (International Experience) you can apply your knowledge in the engineering industry and acquire important practical skills that we cannot provide in the academic teaching context.

The MSc ISoSySc degree programme is designed as a direct continuation (*konsekutiver Studiengang*) of bachelor studies in Software Systems Science which, too, comprises seminars, projects and a bachelor's thesis. Therefore, it is assumed that you have acquired the necessary basic skills in research and writing at undergraduate level already. At master's level you will use these skills to explore the current state of the art in various fields related to Software Systems Science. The focus lies on acquiring mastership of specialised methodologies from the latest developments in the academic world and research-based industries.

The teaching and research groups in the Computer Science Section of the faculty are (in alphabetical order of research area) the following:

- Algorithms and Complexity Theory (AlgoK, Prof. Dr. Isolde Adler)
- Communication Services, Telecommunication Systems, and Computer Networks (KTR, Prof. Dr. Udo Krieger)
- Data Engineering (Jun. Prof. Maximilian Schüle)
- Distributed Systems Group (DSG, Prof. Dr. Guido Wirtz)
- Informatics Theory Group (GDI, Prof. Michael Mendler, PhD)
- Mobile Systems (MOBI, Prof. Dr. Daniela Nicklas)
- Privacy and Security in Information Systems Group (PSI, Prof. Dr. Dominik Herrmann)
- Software Technologies Research Group (SWT, Prof. Dr. Gerald Lüttgen)
- Systems Programming (SYSNAP, Prof. Dr. Michael Engel)

## II. SEMINAR & PROJECTS

Seminars, projects and master's theses are offered by our faculty on a regular basis on topics of interest in the respective teaching group's current research interest. Although the academic research groups will typically publicise available seminars, projects and theses through their web pages, you are expected to select your topic and arrange supervision yourself:

- Inform yourself about available seminars and projects one semester before you attend these courses, and before the start of the semester. Many seminars and project classes have *firm registration deadlines*. Do not forget that you need to register *both* for participation (at the beginning of the semester) *and* for taking the examination (deadline: 4-6 weeks into the semester).
- Seminars may be published via UnivIS. They may also be announced through the individual teaching groups' web pages. There are some centrally-organised seminars with registration via the VC page "WIAI Projekt- und Seminarinformation" at <https://vc.uni-bamberg.de/course/view.php?id=24052>. It is your responsibility to search for suitable seminar offerings.

- There are some centrally-organised projects with registration via the VC page “WIAI Projekt- und Seminarinformation”. However, most projects are decentrally organised. You register directly with the teaching groups.
- The number of available places in seminars and projects is limited. The places are allocated according to a selection procedure that is determined by the teaching and research group. Plan carefully and take into account that you may not get a place in every class you apply for.
- There is no guarantee that you will get a place in your favourite seminar or project class in a specific semester. Therefore, apply early! If it is important for you to complete a seminar and project in a specific semester then apply for a place in several classes to have options. It may be prudent to accept a place in a class of your second or third choice rather than risking continued rejection in a class that is sought after by too many students.
- To obtain supervision for a master’s thesis you must contact potential supervisors yourself and negotiate topic and methodologies with them directly. Most lecturers will expect you to have attended their classes. A lecturer may refuse to take you as a master’s thesis student if you have not attended any class with them and thus lack the required background knowledge.

### III. INTERNSHIP

In module group A5 you can opt to conduct an internship plus extra course electives or study at some university abroad for a full semester. If you are an international student, we strongly recommend you do the internship, since it is a great opportunity to get in touch with German and international companies.

We recommend you schedule the internship either in the lecture-free period or during a leave of absence (<https://www.uni-bamberg.de/en/studies/currently-enrolled/study-organization/leave-of-absence/>), which you can apply for at the enrolment office.

Naturally, it is important for your internship in M.Sc. ISOsySc that it has a focus on software systems development. To avoid misunderstanding and possible unexpected rejection please talk to the Helpdesk before you start the internship. Your internship **must be approved** by us **before you start** it. The internship approval process consisting of three important documents:

- **Internship agreement form:** This form can be found in the M.Sc. ISOsySc VC and is filled out by you and sent to us before starting the internship. It must contain a description of your planned tasks during the internship. If these match the criteria (remember: focus on software development!), the planned internship will be approved and the agreement signed by us.  
The internship agreement is very important: It helps us to understand what you have planned and—if it is necessary—we can intervene before you start something which cannot be approved as an internship afterwards. Thus, the agreement provides a safety net for you, too.
- **Internship report:** This report must be at least four written pages long and describe in your own words what you have done and what you have learned during your internship.  
The tasks laid down in the internship agreement and the tasks finally conducted and described in the report should match. Otherwise, you must explain convincingly why the agreement and the report differ. Note that the internship report is an academic exam paper like every other written exam paper. It is marked as pass or fail and has to meet academic quality standards. In particular, the report is checked on plagiarism. Do not copy from company web pages or company documents! It is helpful to make notes regularly during your internship, so you can hand in an adequate report about what you have achieved.
- **Internship certificate:** This certificate is issued by the company where you did your internship. It must state how long you have been there and what you did there (“*Praktikumszeugnis*” in German). A certificate just stating you are working or conducting an internship (“*Arbeitszeitbescheinigung*” in German) will not suffice.

If you are working on a regular basis, concurrently with your studies, e.g. as a *Werkstudent* (“working student”), this can be accepted as an internship, too. However, note that full-time study plans are not designed to leave room for work employments during the teaching semester. If you need to work for your living expenses, we strongly

recommend to change your studies to a part-time status in this case. See <https://www.uni-bamberg.de/studium/interesse/studienformen/teilzeitstudium/>.

If you are done with your internship and you have handed in all three documents, you will get your internship approved by the examination board of M.Sc. ISoSySc and the ECTS credit points will be added to your study records.

#### IV. SPECIAL CONSIDERATIONS – TEACHING GROUPS

Seminars, projects and master's theses provide research-led training. They are supervised by the teaching groups in their specific research areas and following pertinent research methodologies. Therefore, the prerequisite for being admitted to a teaching group's research training is the

- successful completion of a minimum number of *research field introduction classes*

that are taught by the group as part of the MSc ISoSySc degree programme. The current degree regulations account for some of these prerequisites as part of the 24 ECTS compulsory credits in module group A1. However, note the following:

- Some of these compulsory classes in A1 depend on undergraduate level courses that you may not have covered if your bachelor is not from Bamberg University. In that case you may need to attend these undergraduate classes first. The study regulation allocates a maximum of 12 ECTS for this purpose in A1 (see §40(2) of the StuFPO).
- Some of the research field introduction classes are not part of the 24 ECTS compulsory package. In that case you should take these classes as part of the 30 ECTS electives in A1, or as credits within module group A5.

In addition, as mentioned above, the MSc ISoSySc degree programme assumes that you have acquired skills for academic research and writing as part of your undergraduate degree. Specifically, if you have not done independent research, academic writing e.g., as part of a bachelor's thesis you are strongly advised to attend the module

- **SSS-SRW-M: Scientific Research and Writing for Master's Students**

which is normally offered each semester. This module is an extra-curricular offering that does not provide credits. However, you can obtain a certificate for successful completion and many teaching groups (see below) will require you to have done the SSS-SRW-M class (or equivalent) as a prerequisite to seminars and master's theses. Your thesis supervisor is not obliged to provide research training.

The following sections will provide more details regarding these prerequisites. Make sure you plan your studies to satisfy as many of these prerequisites as possible. Otherwise, your corridor of choices for seminars, projects and thesis may become too narrow. Specifically, as indicated above, consider that the demand is high for seminars and projects in some research and teaching areas while the available places are limited.

##### A. *AlgoK: Algorithms and Complexity*

The teaching and research group is currently being installed. The teaching portfolio will be established over the course of the next semesters. The current course offerings are

- AlgoK-TAG (Tree Decomposition, Algorithms and Games, 6 ECTS)

This course provides an introduction to the special teaching and research of the AlgoK group. Since it is currently only mentioned in the BSc degree programme, you need to fill a *learning agreement* as per section §40(2) of the degree study regulations.

If you are interested in AlgoK courses please contact the teaching group directly. Please see the UnivIS portal regarding classes and register via FlexNow for the examination.

##### B. *KTR: Communication Services, Telecommunication Systems and Computer Networks*

The current course offerings are

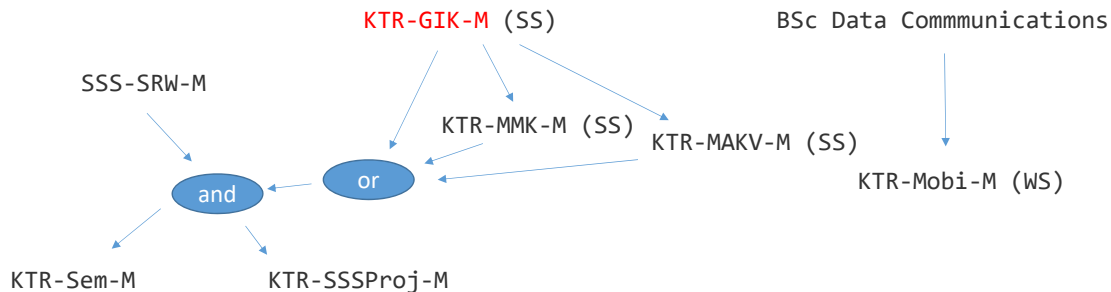
- **KTR-GIK-M<sup>1</sup>** (Foundations of Internet Communication, 6 ECTS, SS+WS)

<sup>1</sup>compulsory module

- KTR-MAKV-M (Modeling and Analysis of Communication Networks and Distributed Systems, 6 ECTS, SS)
- KTR-MMK-M (Multimedia Communication in High Speed Networks, 6 ECTS, SS)
- KTR-Mobi-M (Mobile Communication, 6 ECTS WS)
- KTR-Sem-M (Seminar, 3 ECTS)
- KTR-SSSProj-M (Project, 9 ECTS)
- KTR Master's Thesis

The research field introduction class for KTR is the module *KTR-GIK-M*.

- The seminar KTR-Sem-M is announced on the VC and registration is made with the teaching group during the first week of each semester.
- The project KTR-SSSProj-M is announced on the VC and registration is made with the teaching group during an introductory meeting as specified in the VC.



### C. Data Engineering

The teaching and research group is currently being installed. The teaching portfolio will be established over the course of the next semesters. If you are interested in data engineering courses please contact the teaching group directly. Please see the UnivIS portal regarding classes and register via FlexNow for the examination.

### D. DSG: Distributed Systems Group

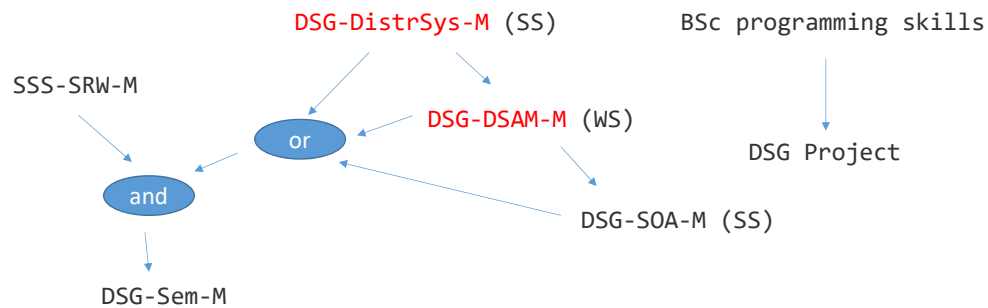
The current course offerings are

- **DSG-DSAM-M<sup>2</sup>** (Distributed Systems Architecture and Middleware, 6 ECTS, WS)
- DSG-DistrSys-M (Distributed Systems, 6 ECTS SS)
- DSG-SOA-M (Service-oriented Architectures and Web Services, 6 ECTS SS)
- DSG-SRDS-M (Selected Readings in Distributed Systems, 3ECTS WS+SS)
- DSG-Sem-M (Seminar)
- DSG Project
- DSG Master's Thesis

The central research field introduction class for DSG is *DSG-DistrSys-M*. This is a prerequisite for DSG-DSAM-M and DSG-SOA-M. The modules DSG-DistrSys-M and DSG-SOA-M can exceptionally both be taken in the same semester, though you may find this quite demanding because of the direct dependency between these modules. The special prerequisites for DSG are:

- For the seminars (DSG-Sem-M) you must have participated in at least one DSG module and also completed the class SSS-SRW-M on Scientific Research and Writing. The seminar registration is handled through the central VC course "WIAI Projekt- und Seminarinformation".
- DSG projects require *strong programming skills* (e.g., Java) acquired in the bachelor's degree.
- MSc thesis students must have participated in at least one DSG module.

<sup>2</sup>compulsory module



### E. GdI: Informatics Theory Group

The current course offerings are

- GdI-FPRS-M (Functional Programming of Reactive Systems, 6 ECTS, SS)
- GdI-Sem-M (Seminar)
- GdI-Proj-M (Project)

The research field introduction class for GDI is *GdI-FPRS-M* (Functional Programming of Reactive Systems). This module presupposes basic knowledge of functional programming such as provided by the bachelor's module GdI-IFP-B. If you have not had any functional programming before, you are strongly advised to attend the module

- ***GdI-IFP-B* (Introduction to Functional Programming, 6 ECTS, WS)**

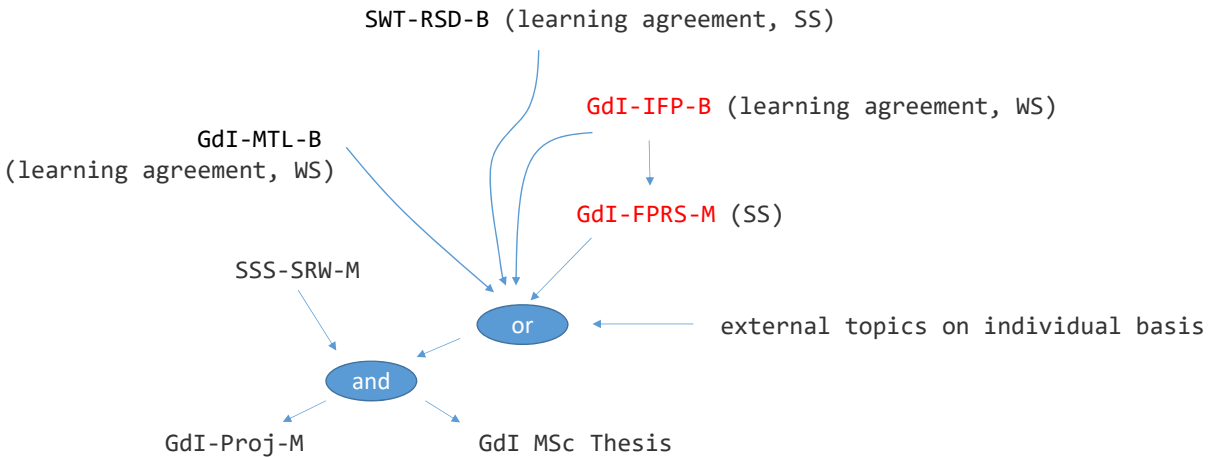
which is offered each winter semester. For this you need to fill a *learning agreement* as per section §40(2) of the degree study regulations. Excellent preparation for projects and seminars in the GdI group is also provided by the classes

- *GdI-MTL-B* (Modal and Temporal Logic, 6 ECTS, WS)
- *SWT-RSD-B* (Reactive System Design, 6 ECTS, SS)

which count as a general prerequisite for the Software Analysis and Verification specialisation area S2. Both classes GdI-MTL-B and SWT-RSD-B can also be taken on the basis of a learning agreement, as credits towards the A1 module group.

The GdI group offers seminars or projects on demand rather than a regular scheduled basis. These GdI-Sem-M seminars are offered on varying topics and normally open to all without registration restrictions.

- The seminars GdI-Sem-M will be announced in the UnivIS and VC at the beginning of each semester.
- Possible topics for MSc theses and individual projects are listed on the VC pages of the GdI group:  
<https://www.uni-bamberg.de/gdi/teaching/bscm-sc-theses-and-projects/>
- The projects GdI-Proj-M are arranged on special request and on an individual basis. There is no registration deadline. Since these projects are supervised individually or in small groups there is only a limited number of places available each semester.
- For a GdI master's thesis you must have successfully completed the class SSS-SRW-M on Scientific Research and Writing.
- GdI Projects and master's theses are typically related to the research interest of the group. It is assumed that you have successfully passed at least one module of the GdI teaching offerings. Where topics are arranged on an individual basis, you must have an adequate background to conduct the research under guidance.



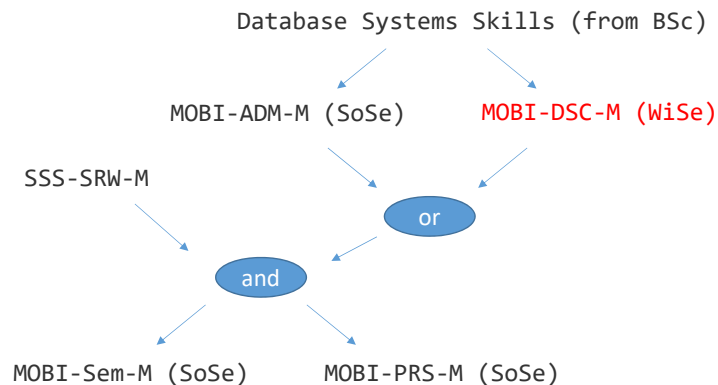
### F. MOBI: Mobile Systems

The current course offerings are

- **MOBI-DSC-M<sup>3</sup>** (Data Streams and Complex Event Processing, 6 ECTS, WS)
- MOBI-ADM-M (Advanced Data Management, 6 ECTS, WS)
- MOBI-Sem-M (Seminar, 3 ECTS)
- MOBI-PRS-M (Project, 9 ECTS)
- MOBI Master's Thesis

The central research field introduction class for MOBI is the module *MOBI-DSC-M*.

- Registration for both the seminar MOBI-SEM-M and the project MOBI-PRS-M is handled centrally via the VC course "WIAI Projekt- und Seminarinformation".



### G. PSI: Privacy and Security in Information Systems Group

The current course offerings are

- PSI-Adva-SP-M (Advanced Information Security and Privacy, 6 ECTS, SS)
- PSI-Sem-M (Seminar, 3 ECTS)
- PSI-Proj-CAD-M (Project, 9 ECTS)
- PSI-ProjectSP (Project, 9 ECTS)
- PSI Master's Thesis

The research field introduction class for PSI is the module *PSI-AdvaSP-M*.

- For the seminar PSI-Sem-M you must have participated in either PSI-IntroSP-B or PSI-AdvaSP-M. It suffices that the exam has been attempted or bonus exercises have been worked on and submitted. Also, participation

<sup>3</sup>compulsory module

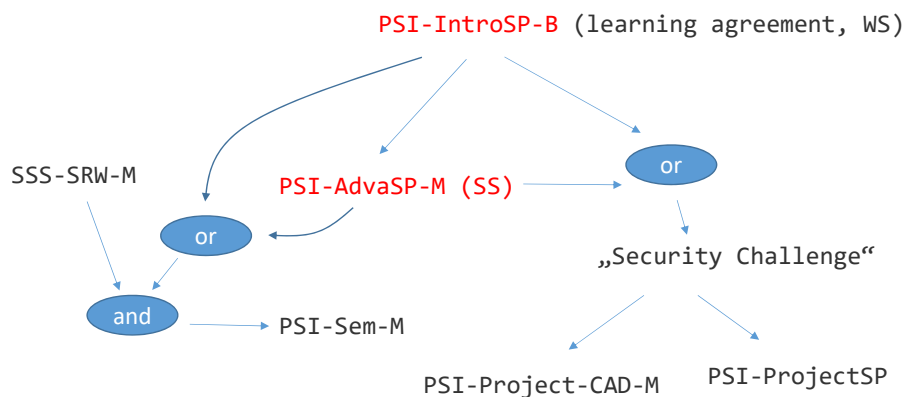
requires undergraduate level knowledge of computer architecture and operating systems.

- The teaching and research group offers the projects PSI-Project-CAD-M (Complex Attacks and Defenses) and PSI-ProjectSP (Security and Privacy Research). Before registration you must pass a small “security challenge” entry test to demonstrate your basic understanding of cryptography and elementary IT security. The necessary knowledge is typically acquired in undergraduate classes such as PSI-IntroSP-B. Also you need to be able with Linux command line (or similar) and working knowledge of at least one programming language. The deadlines for the security challenge and registration are published on the VC.

To be able to follow the PSI track of modules successfully, undergraduate knowledge of basic cryptography and IT security is mandatory. If you have not done any IT security in your bachelor’s degree, then you are strongly advised to attend the module

- **PSI-IntroSP-B (Introduction to Security and Privacy, 6 ECTS, WS)**

which is offered each winter semester. For this you need to fill a *learning agreement* as per section §40(2) of the degree study regulations. The recommended sequence of study is



#### H. SWT: Software Technologies Research Group

The current course offerings (from academic year 2020/21) are

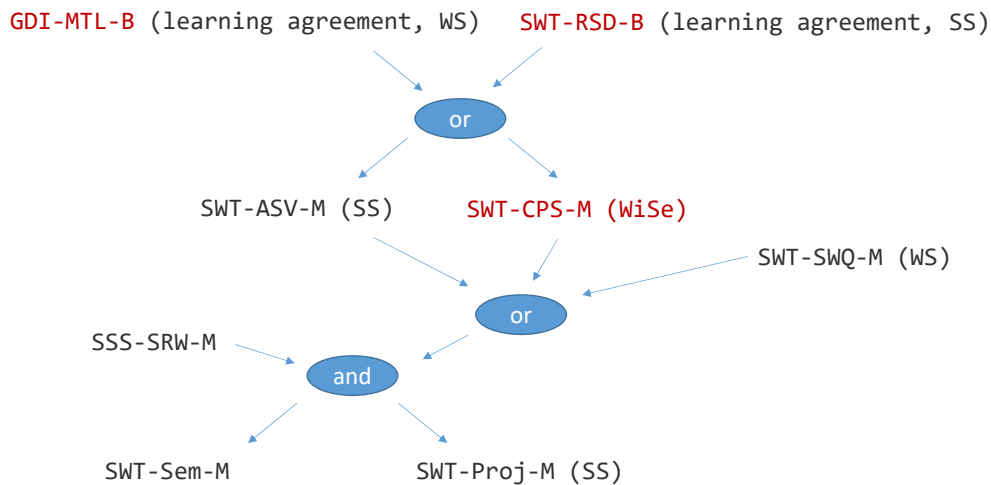
- **SWT-CPS-M<sup>4</sup>** (Cyber-physical Systems, 6 ECTS, WS, compulsory)
- **SWT-SWQ-M** (Software Quality, 6 SS) – new from winter 2021-22
- **SWT-ASV-M** (Applied Software Verification, 6 ECTS SS)
- **SWT-Sem-M** (Seminar, 3 ECTS)
- **SWT-Proj-M** (Project, 9 ECTS)

The central research field introduction class for SWT is *SWT-CPS-M*. To be able to follow the SWT track of modules successfully, undergraduate knowledge of logic and automata theory is mandatory. If you have not covered this background in your bachelor’s degree, then you are strongly advised to attend one of the modules

- **SWT-MTL-B** (Modal and Temporal Logic, 6 ECTS, WS)
- **SWT-RSD-B (Reactive System Design, 6 ECTS, SS)**

which are offered each winter and summer semester, respectively. For this you need to fill a *learning agreement* as per section §40(2) of the degree study regulations. The recommended sequence of study is

<sup>4</sup>compulsory module



Special requirements for SWT are as follows:

- The seminar SWT-Sem-M is announced on the VC and registration is made with the teaching group during the first week of each semester. Strict registration deadlines apply. *You cannot participate in the seminar if you have not registered in time.*

The SWT-Proj-M projects typically follow on from the topics covered in SWT-CPS-M but otherwise have no special prerequisites.

### I. SYSNAP: Systems Programming

The teaching and research group is currently being installed. The teaching portfolio will be established over the course of the next semesters. Currently the following course offerings are available:

- SYSNAP-OSE-M Operating Systems Engineering (6 ECTS)
- SYSNAP-Virt-M Virtualisation (6 ECTS)
- Seminars, Projects
- MSc Theses

If you are interested in these courses please contact the teaching group directly. Please see the UnivIS portal regarding classes and register via FlexNow for the examination.

## V. GENERAL STUDY ADVICE

The process of teaching and learning at graduate level is different from what you have experienced as a bachelor. Do not be surprised if some classes may seem difficult to you. It will take some effort to get used the graduate level learning which is demanding. Lectures are much more about giving guidance for self-study rather than spelling out everything on a fixed set of slides and tutorial exercises. You are expected to study the academic literature—specifically textbooks and research articles—in a self-motivated and self-organised fashion. The class work may require you to read up and explore further topics you have not covered during your bachelor degree or covered during the master’s lectures either. You are encouraged to adopt a *research oriented frame-of-mind*, in which you discover an important topic in depth over and above what the lecturer can communicate during a session.

- The **most important piece of advice**: Try to **attend every single lecture and every single tutorial**. Participate in the classes regularly and make an attempt to solve the lab or tutorial assignments. Team up and cooperate with your class mates. If you show you take it seriously, class mates and lecturing staff are be more likely to be willing to help you along mastering the difficulties. If you stay away this will be misunderstood as neglect or indifference.
- It is **not possible to take a second project or a second seminar**. You cannot improve your grade.



- Even if projects are “practical” be aware that many will contain a lot of methodological depth and may require a significant research effort.
- Even if projects are conducted in teams, the grade will be based on your individual contribution. So, take your fair share and do not piggyback on your team mates’ work. Do not be surprised if team members receive different grades from you. You are expected to be able to explain and reproduce *each part of the team’s joint project* work, not just your own task.
- Each semester you must decide again which modules you want to take exams in, because this is not automatic. Make sure you do not miss the **FlexNow deadlines to register for your exams!**
- **If you fail** an exam that you have registered for and you **do not wish to repeat the exam** the following semester, you must **contact the examination office and ask the module to be removed from your examination list** before the next examination period. Otherwise, you are assumed to resit the exam, and FlexNow can block you from registering for other modules.
- The start of the **master’s thesis must be formally registered** with the examination office. This registration involves fixing the topic of the thesis, your supervisor’s name and the start date. Only once this registration has happened, the supervisor has committed to supervising you.
- You must **submit your thesis within 6 months** from the registered start date and before your maximum study period (3 years) expires. If you miss the deadline you fail the thesis. You can repeat, but then you must choose a different topic and start from square one.
- The **topic of the master’s thesis** is normally **proposed by your supervisor**, typically chosen in the context of the teaching group’s **current academic research projects**. The format of an “co-supervised industrial thesis” (more familiar from Universities of Applied Sciences) does not exist within our regulations. Only in very rare circumstances will lecturers agree to supervise a topic that is arranged within an industrial internship placement and outside of their teaching and research field.  
The degree regulations give you a guarantee that you can do your thesis with one of the research groups on a topic **proposed by them**, and provided you make an effort to fulfill their **learning prerequisites** as part of your studies. Ask teaching chairs for open thesis topics and chose among those. If you limit your options to a single topic from an industrial internship and you keep experiencing no one is willing to supervise it, you do so at your own risk. When you run out of study time, the examination board will assign you a professor and the professor will assign you a topic that you must take. So, our advice is to keep a broad interest in topics, look around early and hedge your options.

## VI. ADDITIONAL ADVICE

### A. General

- Join the VC-courses “MSc International Software Systems Science”, “Aktuelle Informationen der Fachschaft WIAI”, “Zentrale WIAI-Projektanmeldung”, “Jobbörse WIAI” (for internship).
- Explore the web services of the University of Bamberg: “UnivIS”, “Virtueller Campus (VC)”, “Online-Dienste der Studierendenkanzlei”, “Prüfungsausschuss”.
- Read your StuFPO and APO thoroughly and highlight important parts. If you have questions ask the Helpdesk.
- Learning agreements do not imply any exam registration. You must apply for the exams separately.

### B. *Scientific Research & Writing*

- In case you need help with study-related texts in English, contact the “Schreibwerkstatt.”
- Attend the (ECTS-free) course module on “Scientific Research and Writing for MSc Students.”
- Plagiarism is taken very seriously in Germany. Provide explicit citations and literature references whenever you copy-in material from other sources in seminar essays, project reports or your thesis. Even single phrases cannibalised from other publications or from the internet must be clearly referenced.

### C. *Seminars & Projects*

- Inform yourself about seminars and projects one semester before you attend these courses before the start of the semester.
- Seminars may be published via UnivIS. They may also be announced through the individual teaching groups’ web pages. It is your responsibility to find suitable seminar offerings.
- There are some centrally-organised projects registrations via “Zentrale WIAI-Projektanmeldung.” However, most projects are decentrally organised. You register directly with the teaching groups.
- It is not possible to take a second project or a second seminar. You cannot improve your grade.
- Even if projects are “practical” be aware that many will contain a lot of methodological depth and may require a significant research effort.
- Even if projects are conducted in teams, the grade will be based on your individual contribution. So, take your fair share and do not piggyback on your team mates’ work. Do not be surprised if team members receive different grades.

### D. *Exams*

- Read carefully the information provided on the Virtual Campus course page for the MSc ISoSyc.
- Do not miss the exam registration in FlexNow! Note that the registration in FlexNow! for some seminars and some lectures (in particular language classes) is necessary **in addition to** the registration as for exams.
- For oral exams you must also register with the examiner’s secretary for the actual exam date & exam time. Your FlexNow! registration does not include date & time.
- Most exams do not permit any auxiliary material to be carried and used. In particular, no mobile phones, smart watches etc. Read carefully the instructions on the cover sheet of the exam paper. If an exam admits auxiliary materials make sure your notes match the specifications exactly. For instance, if the exam rules permit you may bring one page of double-sided hand-written notes, then if your notes are two pages written on only one side, or if they contain computer-printed text, you may fail the exam.
- If you copy from your neighbour in the exam, this counts as plagiarism (“Unterschleif”) and will result in failure.
- Always bring your passport along with you. The student ID is not enough.

### E. Academic Ambition

- Graduate level studies at German Universities are research focused. The classes will typically train innovative methodology rather than technology. Expect to see a lot of formal logical structures and mathematics.
- If you are more interested in industry-related and technology-oriented classes consider moving to one of the Universities of Applied Sciences (“Fachhochschulen”) which are typically more application-oriented.
- You are in the right place if you consider yourself as a junior researcher who is self-motivated and willing to explore recent academic research results in unfamiliar fields of studies.
- You are in the right place if you are self-reliant and keen to conduct your studies with an individual focus, based on the lecturers’ suggestions for reading and experimentation, even outside of the formal teaching classes. You check your own progress continuously and do not need forced continuous assessment.

### F. Bamberg/Germany Survival

- Admissions for dormitories take more than two semesters after an application. For this reason, take a closer look at shared flats or accomodation in the immediate environment of Bamberg.
- Use opportunities to network with other apartment-hunters in order to find and rent a shared flat yourself.
- Without work permission foreign students are allowed to work 120 days full-time or 240 days part-time.
- The university of Bamberg has a legal adviser (Rechtsberatung), counseling (Seelsorge), IT-support, parenthood advice (Eltern-Service-Büro)
- Get in touch with sport clubs or other social clubs where you can inexpensively meet and explore German culture.
- Be proactive.
- Be upfront in your communication: Do not pretend “*yes, I will do*” unless you are absolutely sure and you are determined to fulfil the promise. It is perfectly ok to admit “*no, I do not have time just now*” or “*no, unfortunately, I do not feel I am up to it. Can you please advise?*” There is no advantage in delaying an embarrassment to a later time. It will only make matters worse and you risk losing your credibility.