

**Study and Subject Examination Regulations
for the International Software Systems Science
Master's Degree Programme
at the University of Bamberg
of 6 March 2015**

2nd Regulation changes on 30.09.2016: <http://www.uni-bamberg.de/fileadmin/www.abt-studium/amtliche-veroeffentlichungen/2016/2016-60.pdf>

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*Please note that this English translation is provided merely as a reference aid. It is not a legally binding document. In all official administrative and legal matters, and in cases of dispute, the original German document takes precedence.

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In accordance with Article 13 Paragraph 1 Clause 2 in conjunction with Article 58 Paragraph 1 Clause 1 and Article 61 Paragraph 2 Clause 1 of the Bavarian Higher Education Act, the University of Bamberg issues the following

Study and Subject Examination Regulations

I. General regulations

§29 Scope of application

- (1) These study and subject examination regulations comprise specific regulations for the International Software Systems Science master's degree programme.
- (2) The International Software Systems Science master's degree programme is a consecutive, advanced master's degree programme that follows and builds upon a bachelor's degree in computer science, software systems science or another closely related degree programme comprising at least 180 ECTS points.
- (3) The study and subject examination regulations supplement the general examination regulations (APO) for bachelor's and master's degree programmes in the University of Bamberg's Faculty of Information Systems and Applied Computer Science (§§1 through 28).

§30 Programme duration and credit scope

- (1) ¹The standard programme duration in the International Software Systems Science master's degree programme, including completion of all module examinations and module examination segments, is four semesters of study. ²At least 120 ECTS points are required for successful completion of the degree programme.
- (2) The maximum permitted duration of study in the International Software Systems Science master's degree programme is six semesters.

§31 Related degree programmes

¹As defined by §§5, 6, 15 APO, degree programmes related to the International Software Systems Science programme are in general all degree programmes situated in the computer science subject field (particularly bioinformatics, computer and communications technology, computer science, computational and computer engineering, media informatics, medical informatics, information systems). ²With regard to §33 Paragraph 1 and §33 Paragraph 3, closely related degree programmes are those which, in addition to basic mathematical principles, comprise extensive core studies in computer science and its fundamental principles (at least 117 ECTS points including a final thesis in computer science or applied computer science). ³In individual cases, the examining board shall decide whether a degree programme is considered to be related or closely related.

[§32 omitted]

II. Master's examination

§33 Programme admission requirements and admission to the master's examination

- (1) Admission to the International Software Systems Science master's degree programme stipulates that candidates possess a degree from an institution of higher education or an equivalent degree comprising at least six semesters of study and 180 ECTS points with a final mark of 2.7 or better from a closely related degree programme or a programme in the same field of study.
- (2) ¹In exceptional cases, the examining board may allow commencement of studies prior to the verification of the admission requirements stipulated in Paragraph 1, provided the admission requirements are fulfilled within a maximum of one year after enrolment. ²Enrolment is limited to two semesters. ³The limitation shall be officially removed upon verification of fulfilled admission requirements. ⁴Should the admission requirements not be fulfilled within the time limit, the student's enrolment in the master's degree programme shall be terminated. ⁵Until such time as all admission requirements are conclusively verified, course and examination credit is awarded on a strictly conditional basis.
- (3) ¹Furthermore, admission to the International Software Systems Science master's degree programme requires verification of English language proficiency at a level suitable for a master's degree programme taught in English. ²English proficiency is to be verified by the secondary school certificate/restricted university entry qualification or equivalent documentation as being, at minimum, at the UNiCert C II, Common European Framework of Reference for Languages B2, IELTS 6.5 or TOEFL (internet-based) 90 level.
- (4) Admission to the master's thesis in the International Software Systems Science master's degree programme requires completion of at least 60 ECTS points from the master's curriculum.

§34 Subject matter and degree purpose

¹The master's examination in the International Software Systems Science degree programme leads to a second, advanced academic degree in the field of Software Systems Science. ²The master's examination is intended to determine whether an examination candidate has gained advanced knowledge and specialised expertise, has a firm understanding of the context of the subject and possesses the skills required to apply the subject's scientific methods and insights to independently solving complex problems and further developing them through research.

§35 Purpose, subject and completion period of the master's thesis

- (1) ¹The master's thesis is meant to verify that the examination candidate is capable of utilising scientific and scholarly methods in an independent pursuit of the assigned topic. ²The topic of the master's thesis shall be drawn from one of the subject groups specified in Appendix 2.

³Upon the examination candidate's request, the examining board may also approve a topic from another subject group. ⁴In such a case, the examination candidate must satisfactorily show that the content of the proposed topic is drawn from Software Systems Science.

- (2) ¹The master's thesis has a credit value of 30 ECTS points. ²The allotted completion period for writing the master's thesis is six months.
- (3) ¹The mark for the master's thesis is calculated from two parts, whereby 2/3 of the total derives from the assessment of the written thesis and 1/3 from the assessment of a 20 to 60-minute colloquium in which the principal findings of the thesis are defended. ²The colloquium may take place either prior to or after assessment of the master's thesis. ³In this matter, the students have a right to choose.

§36 Specialisation field

¹Within the scope of the options available in the module groups, students may choose an individual, specialised focus pursuant to Appendix 1B. ²Upon a student's request, the specialisation field shall be indicated in the final examination certificate as per §21 APO provided that the A4 master's thesis module group, a seminar or project in the A3 module group and at least an additional 18 ECTS points from the A1 and A2 module groups were completed in the specialisation field. ³Courses in the A1 and A2 module groups are classified by specialisation field as established in Appendix B1. ⁴Prior to commencement, classification of the master's thesis and the projects shall be established by the examiner who has assigned the topic. ⁵Seminar classification shall be established and announced by the instructor prior to course commencement.

§37 International Experience

- (1) ¹In the course of master's studies in International Software Systems Science, it is possible to pursue at least one semester of structured studies abroad and/or to complete an internship in an international context. ²The internship or stay abroad should take place after at least one semester of study. ³An internship should be chosen based on its ability to satisfy the programme objectives as per §39 Paragraph 1. ⁴Each student is responsible for arranging his or her own studies or internship abroad. ⁵The University of Bamberg's International Office provides assistance with the arrangement of foreign studies within the framework of established university partnerships and available aid programmes. ⁶There is no entitlement to placement in a foreign study programme or internship.
- (2) ¹Students participating in structured studies at a foreign university should earn examination and course credit comprising 30 ECTS points. ²The intended examination and course credit is to be arranged with the appropriate examining board in the form of a Learning Agreement prior to going abroad.
- (3) ¹Concerning internships in an international context, students must verify that they have completed a subject-specific internship dealing with the Software Systems Science

occupational field in an international context, and preferably abroad, that comprised at least 360 hours and for which no mark was awarded. ²The internship, which has a credit value of 12 ECTS points, may be completed in a private or public foreign or internationally active domestic organisation (e.g. research institution). ³Verification of the internship shall take the form of a completion certificate including an internship report of at least 4 DIN-A4 pages in length issued by the department or organisational unit in which the internship was completed. ⁴The certificate and report are to be submitted to the examining board. ⁵Students who have obtained their qualifying bachelor's degree fully outside of Germany may, in deviation from Clause 2, also complete the internship in any other private or public domestic organisation (e.g. research institution).

III. Programme prerequisites, objectives and structure

§38 Programme prerequisites

¹Pursuant to these regulations, courses and module examinations shall be held and completed in English.

§39 Programme objectives

- (1) ¹The subject matter of Software Systems Science comprises computer science-based fields of activity required for designing of complex distributed and networked software systems. ²Master's studies in Software Systems Science are meant to provide students with the skills necessary to independently solve any encountered problems using scientific methods, to further develop these scientific methods and also to make a worthy contribution to solving complex computer science problems.
- (2) ¹Over the course of the degree studies, students receive knowledge and learn skills pertaining to the fields of software systems science, computer science and the associated neighbouring and auxiliary disciplines. ²In this context, the integration of these various fields of knowledge and their application to topics in software systems science is of particular significance.
- (3) ¹The programme is both method- and project-oriented and is meant to prepare students for a diverse range of professional opportunities. ²The options available in the core studies provide the opportunity for the development of individual specialisation fields.
- (4) ¹Additionally, the programme is intended to convey the skills required for the continued self-education necessitated by the dynamic nature of the software systems science field. ²Furthermore, the programme is also designed to convey the skills necessary to contribute to

the continued advancement of the field within the context of research and development activities.

- (5) Based on its English-language course offering, the programme also provides the opportunity to utilise existing passive and active language skills in the subject-specific context of software systems science, and to learn the technical English terminology used in this field.
- (6) The International Software Systems Science master's degree programme also aims to further strengthen qualifications for working internationally by providing the opportunity to pursue optional, integrated foreign studies or an optional subject-specific internship in an international context.

§40 Programme structure

- (1) The International Software Systems Science master's degree programme requires that students possess a qualifying degree in computer science, software systems science or a closely related programme comprising at least 180 ECTS points, and it expands on specialised studies in the field of software systems science by, among other things, providing the option to pursue foreign studies or a subject-specific, professionally-oriented internship in an international, software systems science context.
- (2) Students in the International Software Systems Science master's degree programme gain skills and expertise in the following five module groups:
 - A1: Software Systems Science
 - A2: Domain-specific Software Systems Science
 - A3: Seminar and Project
 - A4: Master's Thesis
 - A5: International Experience
- (3) Depending on the current course offering, the A1 module group includes advanced-level modules that may be selected from the fields of computer science foundations, communication systems and computer networks, mobile software systems, software technology and programming languages as well as distributed systems.
- (4) Depending on the current course offering, the A2 module group includes advanced-level modules that may be selected from related computer science fields with a particular connection to software systems science.
- (5) ¹The master's degree programme's A1 and A2 module groups provide the opportunity to specialise in software systems science and related computer science fields. ²Modules from the module groups A2, A3 and A4 of the Software Systems Science bachelor's degree programme that provide required subject-specific prerequisites for modules in the A1 and A2 module groups of the master's degree programme may be selected at a credit value of no

more than 12 ECTS points. ³The decision of whether or not a bachelor's module can be selected is made by the examining board.

- (6) ¹The A3 module group contains seminars and projects that apply and expand on the content of the A1 and A2 module groups. ² The topics addressed in this module group expand on specific issues in the areas of computer science, applied computer science and information systems as they relate to software systems science.
- (7) The A4 module group provides for the in-depth examination of an advanced topic from a subject in the computer science subject group or another subject in accordance with Appendix 2 within the scope of the master's thesis.
- (8) ¹The A5 module group ensures a degree of international experience by providing the opportunities to earn up to 30 ECTS points within the framework of structured software systems science studies abroad, or to earn 12 ECTS points in a subject-specific, professionally-oriented internship in an international context. ²This internship may be completed in a foreign or internationally active domestic organisation (e.g. research institution). ³Points missing from the module group's required 30 ECTS points must be earned in additional, not previously completed modules from A1, A2 or A3 module groups' required elective options in accordance with Appendix 1, or in foreign language modules offered by the University's language department up to 18 ECTS points. ⁴In cases where neither foreign studies nor an internship in an international context are undertaken, all 30 ECTS points from module group A5 shall be earned in foreign language modules offered by the University's language department up to 18 ECTS points, or in previously uncompleted modules in the A1, A2 or A3 module groups in accordance with Appendix 1.

IV. Final provisions

§41 Effective date

These regulations enter into effect on the day of their announcement.

Appendix 1: Module groups and specialisation fields in the International Software Systems Science master's degree programme

¹At least 120 ECTS points, including the master's thesis, must be earned for completion of the International Software Systems Science master's degree programme. ²The International Software Systems Science master's degree programme comprises 5 module groups, A1 through A5. ³In accordance with the character of the degree programme, these module groups are defined as mandatory elective fields that allow students to develop individual areas of specialisation. ⁴The following shall detail how the degree programme's required ECTS points are distributed among the module groups.

A) Module groups in the International Software Systems Science master's degree programme

¹The module groups A1 through A5 are to be selected. ²In compliance with the respective module group's applicable minimum and maximum limits, modules with a combined total of 48 ECTS points are to be completed in the A1 and A2 module groups.

	Module Group	ECTS
A1	Software Systems Science	30-48
A2	Domain-specific Software Systems Science	0-18
A3	Seminar and Project	12
A4	Master's Thesis (topic pursuant to Appendix 2)	30
A5	International Experience	30
	Total	120

In the **A1 Software Systems Science module group**, 30 to 48 ECTS points are required.

ID	Module Titel	ECTS	Examination
DSG-DSAM-M	Distributed Systems Architecture and Middleware	6	term paper (3 months) and colloquium (20 minutes)
DSG-IDistrSys	Introduction to Distributed Systems	6	term paper (3 months) and colloquium (20 minutes)
DSG-SOA-M	Service-Oriented Architecture and Web Services	6	term paper (3 months) and colloquium (20 minutes)
DSG-SRDS-M	Selected Readings in Distributed Systems	3	term paper (4 months) and colloquium (20 minutes)
GdI-CaS-M	Communication and Synchronisation	6	oral (30 minutes)
GdI-IaS-M	Information and Security	6	oral (30 minutes)
GdI-MTL	Modal and Temporal Logic	6	written (90 minutes)
GdI-IFP	Introduction to Functional Programming	6	written (90 minutes)
KTR-GIK-M	Foundations of Internet Communication	6	term paper (4 months) and colloquium (30 minutes)
KTR-MAKV-M	Modeling and Analysis of Communication Networks and Distributed Systems	6	oral (30 minutes)
KTR-MMK-M	Multimedia Communication in High Speed Networks	6	oral (30 minutes)
KTR-Mobi-M	Mobile Communication	6	oral (30 minutes)
MOBI-DSC	Data Streams and Complex Event Processing	6	oral (30 minutes)
MOBI-ADM-M	Advanced Data Management	6	oral (30 minutes)
SWT-FSA	Foundations of Software Analysis	6	term paper (3 weeks) and colloquium (20 minutes)
SWT-ASV-M	Applied Software Verification	6	term paper (3 weeks) and colloquium (20 minutes)

SWT-PCC-M	Principles of Compiler Construction	6	term paper (3 weeks) and colloquium (20 minutes)
The module catalogue may be extended by subject-specific related modules as announced in the module handbook. In case of exceptional circumstances, such as sabbaticals or change of staff, some modules may not be offered during a semester.			

In the **A2 Domain-specific Software Systems Science module group**, 0 to 18 ECTS points are required.

ID	Module Title	ECTS	Examination
EESYS-ES1-M	Energy Efficient Systems I	6	written (90 minutes)
EESYS-DAE-M	Data Analytics in Energy Informatics	6	written (90 minutes)
HCI-MCI-M	Human-Computer Interaction	6	written (90 minutes) or oral (30 minutes)
HCI-US	Ubiquitous Systems	6	written (90 minutes)
ISDL-SOA	SOA-Governance and Evaluation	3	written (90 minutes)
KInf-SemInf-M	Semantic Information Processing	6	written (90 minutes)
KogSys-ML-M	Machine Learning	6	written (90 minutes)
SME-STE-M	Introduction to Knowledge Representation: Space, Time, Events	6	oral (20 minutes)
SNA-OSN-M	Project Online Social Networks	6	term paper (4 months) and colloquium (30 minutes)
The module catalogue may be extended by subject-specific related modules as announced in the module handbook. In case of exceptional circumstances, such as sabbaticals or change of staff, some modules may not be offered during a semester.			

In the **A3 Seminar and Project module group**, both a master's seminar in computer science comprising 3 ECTS points (2 SWS) and a software systems science master's project comprising 9 ECTS points (6 SWS) are required. The seminar's module examination takes the form of a presentation and a written term paper. The project's module examination takes the form of a written term paper and a colloquium. Regular attendance in the selected courses is required for admission to the respective module examination.

The **A4 Master's Thesis module group** requires the production of a master's thesis with a credit value of 30 ECTS points as per §35 whose topic areas are defined in Appendix 2.

The **A5 International Experience module group** requires 30 ECTS points in addition to the contents of the A1 through A4 module groups. This shall occur either within the framework of structured studies abroad in which examination and course credit in the field of software systems science or a closely related field that does not significantly overlap with the content of the A1 and A2 module groups is earned at a foreign university, or in a subject-specific internship in an international context comprising 12 ECTS points. This internship, which should be oriented towards professions in the field of software systems science, is to be completed in a foreign or internationally active domestic organisation (e.g. research institution). No mark is awarded for the internship, but it must be verified with a certificate of completion and a final report. §37 and §40 Paragraph 8 apply accordingly.

Further information concerning modules offered in the A1 and A2 module groups, the concrete module offering in the other module groups and module examinations and examination modalities is presented by the responsible examining board in the module handbook for master's degree programmes in Software System Science. The module handbook regulates all details concerning the content of individual modules. In particular, it provides information on modules' content and objectives, course types, prerequisites for participation, module applicability, requirements for earning ECTS points, volume of work, frequency of course offerings and module durations. As a rule, the examining board approves the module handbook for the coming academic year prior to the end of summer semester courses. Following approval, the module handbook is made available to all university students and staff. Furthermore, the examining board ensures module group continuity and an adequate course offering. Once begun, modules may also be completed.

B) Specialisation fields in the International Software Systems Science master's degree programme

In the International Software Systems Science master's degree programme an individual selection of required elective modules determines one of four specialisation fields:

- S1: Distributed and Mobile Systems
- S2: Software Analysis and Verification
- S3: Service-oriented Architectures
- S4: Communication Systems and Protocols

The table below presents the specialisation field classification of regularly offered modules. Based on a student's request, the examining board shall determine the appropriate specialisation field classification for modules not appearing in the table. In the International Software Systems Science master's degree programme and within the scope of the Learning Agreement, it is also possible for a student to arrange for the specialisation field classification of modules to be completed in the A5 International Experience module group.

Module Classification for the Specialisation Fields S1 to S4:

ID	Module Title	ECTS	S1	S2	S3	S4	Semester
DSG-DSAM-M	Distributed Systems Architecture and Middleware	6	x				WS, annually
DSG-IDistrSys	Introduction to Distributed Systems	6	x		x	x	SS, annually
DSG-SOA-M	Service-Oriented Architecture and Web Services	6			x		SS, annually
DSG-SRDS-M	Selected Readings in Distributed Systems	3	x		x		WS, SS
EESYS-ES1-M	Energy Efficient Systems I	6			x		SS, annually
EESYS-DAE-M	Data Analytics in Energy Informatics	6			x		WS, annually
GdI-CaS-M	Communication and Synchronisation	6	x	x		x	SS, annually
GdI-IaS-M	Information and Security	6	x	x		x	SS, annually
GdI-IFP	Introduction to Functional Programming	6		x			WS, annually
GdI-MTL	Modal and Temporal Logic	6		x			WS, annually
HCI-MCI-M	Human-Computer Interaction	6	x		x		SS, annually
HCI-US-B	Ubiquitous Systems	6	x				WS, annually
ISDL-SOA	SOA-Governance and Evaluation	3			x		WS, annually
KInf-SemInf-M	Semantic Information Processing	6			x	x	WS, annually
KogSys-ML-M	Machine Learning	6			x		WS, annually
KTR-GIK-M	Foundations of Internet Communication	6			x	x	SS, annually (WS as required)
KTR-MAKV-M	Modeling and Analysis of Communication Networks and Distributed Systems	6	x	x		x	SS, annually
KTR-MMK-M	Multimedia Communication in High Speed Networks	6				x	SS, annually

KTR-Mobi-M	Mobile Communication	6	x			x	<i>WS, annually</i>
MOBI-DSC	Data Streams and Complex Event Processing	6	x			x	<i>WS, annually</i>
MOBI-ADM-M	Advanced Data Management	6	x				<i>SS, annually</i>
SME-STE-M	Introduction to Knowledge Representation: Space, Time, Events	6		x			<i>WS, annually</i>
SNA-OSN-M	Project Online Social Networks	6				x	<i>WS, annually</i>
SWT-ASV-M	Applied Software Verification	6	x	x		x	<i>SS, annually</i>
SWT-PCC-M	Principles of Compiler Construction	6		x			<i>WS, annually</i>
SWT-FSA	Foundations of Software Analysis	6	x	x		x	<i>WS, annually</i>

Appendix 2: Master's thesis topics in the International Software Systems Science master's degree programme

The topic of the master's thesis (30 ECTS points) may be drawn from one of the following subjects:

a) Subjects from the Computer Science subject group:

- Foundations of computer science
- Communications services, telecommunications systems and computer networks
- Mobil software systems / mobility
- Software technology and programming languages
- Distributed systems

b) Subjects otherwise related to the International Software Systems Science master's degree programme that have a strong connection to software systems science.

Concerning b) above, an examination candidate's proposed topic must be approved by the examining board. The official proposal to the board should satisfactorily show that the topic exhibits a thematic connection to the content of the International Software Systems Science master's degree programme.

Issued on the basis of the resolution of the Senate of the University of Bamberg of 10 December 2014 and the approval of the University of Bamberg's President on 6 March 2015 pursuant to Article 13 Paragraph 2 Clause 2 in conjunction with Article 61 Paragraph 2 Clause 1 BayHSchG.

Bamberg, 6 March 2015

Prof. Dr. Dr. habil. G. Ruppert

President

The ordinance was laid down on 6 March 2015 at the University of Bamberg; this was made public in the university by posting on the same day. The date of notification is therefore 6 March 2015.