Please note that this document is a non-binding convenience translation. Only the German version of the document entitled "Prüfungsordnung der Universität Heidelberg für den Master-Studiengang Biomedical Engineering", dated 11 November 2009 (published in the President's bulletin [Mitteilungsblatt des Rektors] of 12 January 2010, p. 21), has legal validity.

Heidelberg University Examination Rules and Regulations for the Master's degree programme in *Biomedical engineering*

as of 11 November 2009

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Section I: General provisions

§ 1 Purpose of the academic programme and examination

(1) The Master's degree programme in Biomedical Engineering provides the students with professional knowledge and practical skills in the field of biomedical technology, which encompasses the diagnostic and therapeutic application of ionising and non-ionising radiation techniques.

(2) Successful completion of the Master's degree programme in Biomedical Engineering leads to conferment of the academic title, "Master of Science" (M.Sc.), qualifying students to enter this profession. Prospective students wishing to apply for the Master's degree programme in Biomedical Engineering must have completed a Bachelor's degree in Physics (with a minor in Computer Science) or Computer Science (with a minor in Physics). The Master's programme focuses on the knowledge in the field of medical physics and computer engineering for medical applications the students have gained in their Bachelor's programme. Applicants with other relevant degrees, e.g. in biomedical technology, will also be considered suitable for the Master's degree programme in Biomedical Engineering.

(3) The purpose of the Master's examinations is to assess whether students have mastered the interrelationships between the individual disciplines of their subject, are able to apply advanced scientific methods and findings, and are able to work independently, employing scientific principles.

(4) The requirements for admission to this degree programme are set forth in the Admission Regulations, published separately.

§ 2 Master's degree

Upon successful completion of the Master's examination, Heidelberg University, represented by the Medical Faculty Mannheim, will confer the academic degree of "Master of Science" (abbreviated "M.Sc.").

§ 3 Standard period of study, programme structure and range of courses offered

(1) The standard period of study for the Master's degree programme is four semesters, including the Master's thesis.

(2) Lectures and courses run for three semesters; the Master's thesis is to be completed within the fourth semester. The total workload required for successful completion of the Master's degree programme comprises a total of 120 ECTS credits (based on the European Credit Transfer System).

(3) The language of instruction and examinations is English.

§ 4 Examinations board

(1) The examinations board is responsible for the organisation of examinations and the tasks required by the examination rules and regulations. It is made up of three professors or associate professors and a student representative, who serves in an advisory capacity. The members of the examinations board and their deputies are appointed by the faculty council. The examinations board student member is appointed by the faculty council based on a proposal from the departmental student committee. The chairperson must be a professor. The members are appointed for three years; the student member is appointed for one year. Members may be re-elected.

(2) The examinations board ensures that the examination rules and regulations are upheld. The board ensures that course assessments can be completed and subject examinations taken within the timeframes stated in the examination rules and regulations. The board reports to the faculty on a regular basis regarding changes to examinations, study periods (including actual processing times for Master's theses), subject grades and overall grades. Furthermore, the board provides recommendations for further improving the curriculum and the examination rules and regulations. This report is published in a suitable form. The examinations board appoints examiners and observers. The board may be called upon for all questions regarding examinations.

(3) The chairperson manages the business of the examinations board, prepares and chairs meetings and, in the event of a tie vote, has the deciding vote.

(4) The examinations board may confer further responsibility on its chairperson, or another person authorised by the Institute, provided this does not violate applicable law. Such a decision may be revoked at any time. The examinations board must be informed on a regular basis about the execution of these tasks.

(5) Members of the examinations board have the right to attend examinations.

(6) Members of the examinations board, examiners and observers are obligated to maintain professional confidentiality. Members who are not civil servants are sworn to secrecy by the chairperson.

(7) The candidate must be informed of negative decisions of the examinations board immediately and in writing; the reasons for the decision must be stipulated and information on the procedure for appeal must be provided.

§ 5 Examiners

(1) In general, examinations which are not completed during the course of study may only be carried out by professors, associate professors, or research associates who, due to longstanding teaching experience, have been granted the right to conduct examinations. Research assistants, research associates, adjunct lecturers and lecturers with special responsibilities may only be appointed to conduct examinations under exceptional circumstances, when there is not enough qualified faculty personnel available to conduct examinations.

(2) If external examiners are to conduct examinations, their rank must be equivalent to that of German professors and associate professors.

(3) Observers must have sat the corresponding Master's examination or equivalent.

(4) The chairperson of the examinations board ensures that candidates are given sufficient advance notice of examiners' names.

§ 6 Recognition of study periods, course credits and examination results

(1) Study periods, course credits and examination results obtained in degree programmes at German universities or at a comparable institution of higher education will be recognised, provided there is equivalence. Equivalence will be recognised if the majority of the periods of study, course credits and examination results obtained correspond, in terms of their content, scope and requirements, to the Master's programme in Biomedical Engineering at Heidelberg University. Programmes will not be compared schematically, but rather will be considered and assessed in their entirety.

(2) When recognising periods of study, as well as course credits and examination results obtained outside the Federal Republic of Germany, Equivalency Agreements and agreements between partner universities approved by the Conference of German Ministers of Education (Kultusministerkonferenz, KMK) and German Rectors' Conference (Hochschulrektorenkonferenz, HRK) must be taken into account.

(3) For examination prerequisites completed and results obtained at state-recognised universities of cooperative education and distance learning institutions, paragraph 1 applies accordingly.

(4) If examination prerequisites and results are recognised, grades, provided that the grading systems are similar, must be transferred and used when calculating the overall grade in accordance with these examination rules and regulations. If grading systems are not comparable, examination prerequisites and results are graded as a "pass". This recognition can be indicated in the diploma.

(5) The examinations board renders decisions in the matters outlined in paragraphs 1 to 4. Students must submit all documents necessary for recognition.

(6) If a student requests recognition of more than half of all course credits, the final oral examination, or the Master's thesis, then recognition of individual portions of the Master's examination may be denied.

(7) Courses and examinations that have already been taken as a part of the Bachelor's programme will not be recognised. The same applies for other degree programmes required for admission to this Master's programme. Should the programme rules and regulations require a course to be taken a second time, it may be possible to earn credit for the repeated course. Approval must be granted by the examinations board.

§ 7 Unexcused absence, withdrawal, exceeding of deadlines and deception

(1) An examination is graded as "failed" (5.0) if a candidate fails to appear without being able to state a valid reason for their absence, or, if the candidate withdraws after the examination has started. The same applies if the candidate fails to provide a written examination by the established deadline.

(2) Reasons for withdrawal or absence according to paragraph 1 must be plausible and must immediately be submitted in writing to the examinations board. If the candidate, or a child for whom the candidate is generally the sole caregiver, is ill, a medical certificate must be provided. In the event of doubt, a medical certificate from a designated physician may be required. If the reasons stated are accepted, a new examination date will be scheduled. In this case, examination results that are already available will be taken into account.

(3) When deciding whether the candidate is responsible for exceeding the deadline for registering and taking an examination, or for registering and submitting the Master's thesis, the examinations board must respect the provisions stated in the Maternity Protection Act and the legal regulations concerning parental leave, and allow candidates to make appropriate use of these provisions.

(4) If the candidate tries to influence the examination results through deception or by using unauthorised aids, the examination will be graded as "failed" (5.0). If a candidate disrupts the proper course of the examination, the examiner or examination supervisor may not allow them to continue the examination, in which case the examination result will be graded as "failed" (5.0). In extreme cases, the examinations board may exclude the candidate from all further examinations.

(5) With regard to paragraph 4, sentences 1 and 2, within a period of 7 days, the candidate may request that the decision be validated by the examinations board. The

candidate must be informed of negative decisions immediately and in writing; the reasons for the decision must be stipulated and information on the procedure for appeal must be provided.

§ 8 Types of examinations

(1) The examinations are:
1. written examinations in the modules completed during the course of study
2. oral examinations in the modules completed during the course of study
3. Master's thesis, including presentation and defence.

(2) If candidates provide a medical certificate that plausibly proves that they are not able to take examinations in the form prescribed, whether completely or partially, due to permanent or chronic health problems, the examinations board may allow them to take an equivalent examination. The same applies for other course requirements.

§ 9 Written examinations

(1) In written examinations, candidates should be able to prove that they are able to recognise problems relating to their subject and find solutions for them using subject-specific methods and within limited time and resources.

(2) In accordance with § 8, paragraph 1, number 1, a written examination in a module lasts between 90 and 180 minutes. Multiple choice questions are permitted.

(3) If a written examination is taken in the form of a term paper, candidates must assure that they are the authors of their work and have used no sources or aids other than those indicated.

§ 10 Oral examinations

(1) In oral examinations, candidates should be able to prove that they are able to identify interrelationships within the examination subject matter and relate specified problems to these interrelationships. Furthermore, candidates should demonstrate that they have adequate fundamental knowledge relating to their academic programme.

(2) Generally, oral examinations are carried out by two examiners, or an examiner and a qualified observer.

(3) An oral examination lasts between 30 and 60 minutes.

(4) The topics examined and the results of the oral examination must be recorded in a

written report. Following the oral examination, candidates must be notified of examination results.

§ 11 Assessment of examinations

(1) Grades for the individual examinations are determined by the respective examiners. The following grades must be used for assessment of examinations:

1 = very good	= an outstanding performance;
2 = good	= performance which is substantially above average requirements;
3 = satisfactory	= performance which fulfils average requirements;
4 = sufficient	= a performance which, despite deficiencies, still meets the requirements;
5 = failed	= a performance which, due to considerable deficiencies, does not meet the requirements.

For more detailed assessment of examination results, grades may be further differentiated by increasing or decreasing the individual grades by 0.3; however, the grade 0.7 and incremental grades above 4.0 may not be used.

(2) In accordance with § 18, paragraph 2, the overall grade of the Master's examination is calculated as the average of the grades of the individual examinations. The overall grade is determined as follows:

average of up to and including 1.5	very good
average of between 1.6 and up to/including 2.5	good
average of between 2.6 and up to/including 3.5	satisfactory
average of between 3.6 and up to / including 4.0	sufficient

If all components of the Master's examination are passed with the grade 1.0, the degree will be conferred with the notation: "with distinction".

(3) When calculating the overall grade, only the first decimal after the point is taken into account. The other decimals are dropped without rounding.

(4) In addition to the German-system grades, students who have passed the examinations will also be awarded a letter grade according to the following scale:

A for the top 10 %
B the subsequent 25 %
C the subsequent 30 %
D the subsequent 25 %
E the subsequent 10 %

The relative grades are calculated based on the examination results of the total

graduating class, as well as the graduating classes from two or more previous years, depending on the number of students in the current graduating class.
For degree grades, the ECTS grade must be included. For individual modules, the ECTS grade may be listed when possible and necessary.

Section II: Master's examination

§ 12 Master's examination admission requirements

Admission to the individual examinations for the Master's examination will only be authorised for those who:

1) hold a general higher education entrance qualification, a relevant subject-related higher education entrance qualification, or an equivalent university entrance qualification legally recognised by the relevant authorities, and provide documentation of the completion of an academic degree comprising a minimum of 180 ECTS,
2) are enrolled at Heidelberg University for the Master's degree programme in Biomedical Engineering,
3) have not lost their entitlement to take the final examinations in the Master's degree programme in Biomedical Engineering.

The application for admission to the Master's thesis must include documentation of successful participation in the modules set forth in Appendix 1.

§ 13 Master's examination admission procedure

(1) The application for admission to the examination must be made in writing, and addressed to the chair of the examinations board. The application must include the following documents:

1) evidence of fulfilment of the admission requirements in accordance with § 12,
2) candidates' declarations stating whether they have already failed their final attempt at the Master's examination in the Master's degree programme in Biomedical Engineering and whether they are currently undergoing an examination procedure.

(2) If candidates are unable to provide such evidence, the examinations board may allow other documents of proof to be accepted.

(3) The application is the basis for the examinations board's decision as to whether the candidate may be admitted to the examination. Denials must be made in writing, stating the reasons and providing information on the procedure for appeal.

(4) The application for admission to the examination may only be denied if:

1) conditions are not fulfilled in accordance with § 12, or
2) documents set forth in paragraph 1 are not complete, and have not been completed upon request, or
3) candidates have failed their final attempt at the Master's examination in Biomedical Engineering or have lost the entitlement to take the final examinations, or
4) the candidate is currently involved in examination procedures in such a degree programme.

§ 14 Scope and nature of the Master's examination

(1) The Master's examination consists of:
1. successful completion of the modules set forth in Appendix 1,
2. the Master's thesis
3. the oral presentation and defence of the Master's thesis.

(2) The examinations referred to in paragraph 1, number 1 are taken as an integrated part of the respective lectures or courses. In accordance with § 9 and §10, they may be in written or oral form.

§ 15 Master's thesis

(1) The purpose of the Master's thesis is for candidates to prove that they are able to work independently, within a given period of time and using academic methods, to address a problem from the field of Biomedical Engineering.

(2) The topic of the Master's thesis will be determined by the chairperson of the examinations board. The candidate is permitted to propose topics; however, this does not constitute entitlement to a particular topic. The date of assignment must be recorded.

(3) In accordance with § 13, paragraph 1, number 1, the candidate must begin work on the Master's thesis no later than four weeks following successful completion of the last examination component, or, must have by that time submitted an application to the chairperson of the examinations board for the assignment of a topic. If the deadline is not met, the Master's thesis will be graded as "failed" (5.0), unless the candidate is not at fault for exceeding the deadline.

(4) The deadline for submission of the thesis is six months following assignment of the topic. In exceptional cases, the examinations board, in consultation with the supervisor, may extend this deadline by up to two months. If the deadline is not met,

the Master's thesis will be graded as "failed" (5.0) unless the candidate is not at fault for exceeding the deadline.

(5) The topic, task and scope of the Master's thesis must be limited in such a way that the candidate should be able to complete the thesis within the given time frame. The topic may only be rejected once, and only within the first month after the date of assignment.

(6) The Master's thesis must be written in English.

§ 16 Submission and assessment of Master's thesis

(1) Three hard copies of the Master's thesis and one digital version (e.g. a PDF file) provided on a data storage device must be submitted to the examinations board prior to the established deadline; the submission date must be recorded. The thesis must contain brief summary (not exceeding two pages).

(2) When submitting a Master's thesis, candidates must certify in writing that they are the authors of their work and have used no sources or aids other than those indicated.

(3) The Master's thesis will be assessed by two examiners, one of whom must be a professor, who are appointed by the examinations board. One of the examiners must be the supervisor of the thesis. The candidate is permitted to make a proposal; however, this does not constitute entitlement to be examined by a particular examiner. The assessment period should not exceed six weeks.

(4) The grade is calculated as the mean of both assessments; § 11, paragraph 2 applies accordingly. If the two assessments differ by more than one grade, the examinations board will determine the grade for the Master's examination after consulting both examiners. In such cases, a third examiner may be consulted.

(5) 30 ECTS credits are awarded for the Master's thesis.

§ 17 Presentation and defence of Master's thesis

(1) The Master's thesis will be presented in a non-public oral presentation before the assigned examiners and be defended in a subsequent non-public academic discussion, which will last approximately 30 minutes (the Master's thesis, thus, includes the oral examination). Fifty percent of the defence will focus on the topic of the Master's thesis, and the other fifty percent on the entire content of the modules taken.

(2) The presentation of the Master's thesis must take place no later than eight weeks

following submission of the document. The date is scheduled by the examinations board. The candidate is informed of the date no later than two weeks before the presentation.

(3) The grade for the presentation and defence will be calculated as the mean of the individual grades given by the examiners; § 10 applies accordingly.

(4) The topics examined and the results of the oral examination must be recorded in a written report, which must be signed by the chairperson of the examinations board.

§ 18 Passing the examination

(1) The Master's examination is passed when all examinations have been graded as "sufficient" (4.0) or higher.

(2) When calculating the overall grade in accordance with § 11, paragraph 2, the grades of the modules completed during the course of study, in accordance with § 14, paragraph 1, number 1, will be added together. This will constitute 50% of the overall grade; the grade for the Master's thesis constitutes the remaining 50%.

(3) The overall grade of the Master's thesis is calculated from the grades earned for the written thesis and the oral presentation with its defence. The grade for the written thesis is weighted by a factor of three; the grade for the oral presentation and defence is not weighted.

§ 19 Retaking an examination and deadlines

(1) If examination components are not passed, they may be retaken once. This includes failed examinations taken at other universities. A second re-examination is permitted only under exceptional circumstances and only for a maximum of two examinations; a second re-examination is not permitted for the Master's thesis. Approval must be granted by the examinations board.

(2) Retaking an examination that has been graded as passed is not permitted.

(3) Failed examinations must be retaken no later than during the following semester. If candidates fail to meet this deadline, they will lose entitlement to take this examination, unless they are not at fault for the deadline being exceeded.

§ 20 Master's diploma and certificate

(1) Once the Master's examination in the degree programme in Biomedical Engineering has been passed, a diploma will be issued. This will list all individual modules with

their respective grades and ECTS credits, as well as the topic and grade for the Master's thesis and the overall grade. The diploma will be dated with the date of the last examination component. It must be signed by the chairperson of the examinations board and the dean of the Medical Faculty Mannheim.

(2) A Diploma Supplement and a Transcript of Records, in English, will also be provided.

(3) A bilingual Master's certificate in German and English is issued with the diploma, bearing the same date as the diploma. It certifies conferment of the academic degree "Master of Science". The certificate is signed by the chairperson of the examinations board and the dean of the Medical Faculty Mannheim, and bears the university seal.

(4) If the Master's examination in the degree programme in Biomedical Engineering is failed on the final attempt or is considered not to have been passed, the chairperson will issue a written notification, providing information on the procedure for appeal. A certificate will be issued upon request, and upon presentation of documentation of proof and a certificate of withdrawal, listing passed examinations and their grades, missing examinations required for obtaining the Master's degree, and a statement that, on the final attempt, the Master's examination has not been passed.

Section III: Final provisions

§ 21 Invalidity of examinations

(1) If a candidate has cheated on an examination component and this is not discovered until after the diploma has been issued, the examinations board maintains the right to alter the grade awarded for all examination components concerned, and declare the examination partially or completely failed.

(2) If the requirements for admission to the examination were not fulfilled, but without any intent on the candidate's part to cheat, and this is not discovered until after the diploma has been issued, the passed examination will be considered as compensation for this shortcoming. If the candidate intentionally gained admission to the examination through deceit, the examinations board will make a decision on the matter.

(3) Before a decision is made, candidates will be given the opportunity to provide an explanation.

(4) Fraudulent examination diplomas will be confiscated and, if necessary, a new diploma will be issued. If the examination has been graded as "failed" due to cheating or deceit, the Master's certificate will be confiscated along with the fraudulent examination diploma. The statute of limitations for rendering a decision such as described in paragraph 1 and paragraph 2, sentence 2, is five years from the date on the examination diploma.

§ 22 Access to examination documents

After the examination procedure has been completed, the candidate has the right to request access to examination documents within a reasonable period of time. Requests must be made in writing and within a period of up to three months after completion of the examination process. The chairperson of the examinations board will decide when and where such access will be given.

§ 23 Coming into force

These examination rules and regulations will come into force on the first day of the month following publication in the President's bulletin (Mitteilungsblatt des Rektors).

Appendix 1: Modules with proof of attendance

International Master of Science in Biomedical Engineering

Joint degree University of Heidelberg and Shanghai Jiao Tong University

The contents of the program cover all aspects of the innovative field of computational bio-photonics i.e. all aspects of the diagnostic and therapeutic use of photons in medicine supported by advanced computing.

The students are in Mannheim/Heidelberg during Year I.
Year II will be completely studied in Shanghai. Alternatively, either the Elective Courses II and/or the Master's thesis can be performed in Mannheim/Heidelberg.
To receive a joint degree diploma, students have to be at least half a year in different countries/institutions.

Thus, the students can choose out of one of four different tracks:

Semester I	Semester II	Semester III	Semester IV
Option A	Lab Project	Option A	Master Research
Option A	Lab Project	Option A	Master Research Shanghai
Option B	Lab Project	Option B	Master Research
Option B	Lab Project	Option B	Master Research Shanghai
Option A or B	Lab Project	Option C	Master Research Shanghai
Option A or B	Lab Project	Option C distinction in Neurosciences Computer Engineering Imaging/Biomedical Optics	Master Research Mannheim

	in Mannheim
	in Shanghai

Additionally, students should visit a selection of social skills courses, which are:

General Science Skills Courses:

Mandatory (1 ECTS):

Ethical aspects in science Patents
Presentation skills

How to write a paper
Gene Safety (Gensicherheitsgesetz)
Animal Experiments (Versuchstierkunde)

Elective (minimal: 2; 1 ECTS):
Library and literature search I
Literature search II
Web & e-learning
Word, Excel, and Powerpoint
EndNote
Statistics
German language skills (Deutsche Sprachprüfung für Hochschulbereich DSH)

Course Overview:

YEAR I (60 ECTS)	Mannheim/Heidelberg	**ECTS**
Introductory Courses I		9
	M0: Biomedical Engineering (2) M1: Biophysics (2) M2: Genetics (1) M3: Mathematical Modelling (2) M4: Basic Medical Science (2)	
Introductory Courses II		9
	M5b: Radiation Protection (1) M6b: Basic Radiation Oncology/Radiation Physics (3) M5a: Basic Optics (2) M6a: Adaptive Optics I (1.5) M7a: Adaptive Optics II (1.5)	
Elective Courses I		14
	Option A M7b: Diagnostic Radiology (1) M8b: Radioth. Treatm. Planning/ Dosimetry/Qual Ass. (4) M9b: Special Radiotherapy Techniques (3) M10b: Nuclear Medicine (2) M11b: Advanced Digital Image Data Analysis (2) M12b: Biophysics and Radiobiology (1) M13b: Image Guided Radiotherapy (IGRT) (1) **Option B** M8a: Aberrometry and Wavefront Analysis (3) M9a: Biomedical Optics (2) M10a: Medical Lasers (1) M11a: Novel Diagnostic Methods in Ophthalmology (1) M12a: Optics in Biophysics and Ophthalmology (3) M13a: Vision Science and Ophthalmology (4)	
Lab Rotations		10
	Short Lab rotations **Option A** M14b: Basic cellular biology/radiobiology (2) M15b: Image Processing (2) M16b: MR radiology (2) M17b: Radiation protection & quality assurance (2) M18b: Diagnostic radiology/Image management (2) **Option B** M14a: Heidelberg Engineering lab (2) M15a: Laser lab Mannheim (2) M16a: Adaptive optics lab (2) M17a: Eye clinics Mannheim (2) M18a: Nanoscopy lab (2)	
	M19: Specialized Lab Project	16
General Science Skills	Mandatory and elective courses from General Science Skills Courses list	2

YEAR 2 (60 ECTS)	Mannheim/Heidelberg or Shanghai	ECTS
Elective Courses II		30
	Option A (Mannheim) Mandatory courses: 7 ECTS M21: Basic Statistics (1) M7c: Physics of Medical Imaging (2) M22: Scientific Visualization (4) + election of courses that amount to 21 ECTS Aberrometry and Wavefront Analysis (3) Biomedical Optics (2) Medical Lasers (1) Novel Diagnostic Methods in Ophthalmology (1) Optics in Biophysics and Ophthalmology (3) Vision Science and Ophthalmology (4) Broadband information technology (FH) 1 Sensor electronics (FH) (1) Embedded Systems (FH) (1) Signal processing/Telecommunications technology (FH) (1) M23: Bioinformatics (2) M24: Medical Simulators (6) M25: Im. and Navigation Guided Med. Interv. (FH) (1) Organic Electronics (KA) (10) + election of lab rotations that amount to 2 ECTS Heidelberg Engineering lab (2) Laser lab Mannheim (2) Adaptive optics lab (2) Eye clinics Mannheim (2) Nanoscopy lab (2) **Option B** (Mannheim) Mandatory courses: 7 ECTS M21: Basic Statistics (1) M7c: Physics of Medical Imaging (2) M22: Scientific Visualization (4) + election of courses that amount to 21 ECTS Broadband information technology (FH) 1 Sensor electronics (FH) (1) Embedded Systems (FH) (1) Signal processing/Telecommunications technology (FH) (1) M23: Bioinformatics (2) M24: Medical Simulators (6) Diagnostic Radiology (1) Rad.th. Treatment Planning/ Dosimetry/Quality Ass. (4) Special Radiotherapy Techniques **(3)** Nuclear Medicine (2) Advanced Digital Image Data Analysis (2) Biophysics and Radiobiology (1) Image Guided Radiotherapy (IGRT) (1) M25: Im. and Navigation Guided Med. Interv. (FH) (1)	

	Basic cellular biology/radiobiology (2) Image Processing (2) MR radiology (2) Radiation protection & quality assurance (2) Diagnostic radiology/Image management (2) **Option C** (Shanghai), choose 30 ECTS from one the following distinctions (C1-C3) that complement those in the first year: **C1: Neurosciences 30 ECTS** Nanotechnology (3) BioMEMS (3) Biomaterials (3) Neurobiology (3) Structure & Function of Biomacromolecules (4.5) Theoretical Neurosciences (4.5) Experiments of modern lab animal science (1.5) Bioheat & Mass Transfer (4.5) Neuroinformatics (3) **C2: Computer engineering 30 ECTS** Application of Computers in Life Sciences (3) Signal processing (4.5) Digital signal processing (3) Bioinfomatics (3) 3D image processing & volume visualization (3) Adaptive filtration (3) Biomedical image processing (4.5) TMS320 digital signal processor (3.75) Random signal processing (4.5) Opt. estimation theory & system identification (4.5) Computer graphics (4.5) Wireless communication & sensor networks (3) Mobile & wireless networking (4.5) **C3: Imaging/Biomed. Optics 30 ECTS** Physical therapy technology (4.5) Biomedical ultrasound (4.5) Medical imaging (3.75) New Technology in Medical Imaging (3) Biomedical Sensors (4.5) Laser medicine & biophotonics (3) Frontier problems of optics (4.5) Non-linear optics of optical fibers (4.5) Modern optics (4.5) Optoelectronics (3) Semiconductor devices (3) Processing of optical information (3) Principle & technology of laser (4.5) Non-linear optics (4.5) Engineering optics (4.5)	
Master's thesis	Including oral presentation and examination	30

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