

Examination regulations for the Master's Programme in Physics in the department of Physics at the Freie Universität Berlin

Preamble

On the basis of Section 14 paragraph 1 no. 2 of the Partial University Constitution (Trial version) of the Freie Universität Berlin of 27 October 1998 (FU Mitteilung [Gazette of the Freie Universität Berlin] 24/1998), the Faculty Council of the Faculty of Physics of the Freie Universität Berlin issued the following examination regulations for the Masters Programme in Physics on 30 January 2013:¹

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¹ The executive board of the Freie Universität Berlin confirmed these regulations on 26 August 2013.

Section 1

Area of application

These regulations supplement the framework study and examination regulations of the Freie Universität Berlin (RSPO) and apply to the requirements and procedures for attainments in the Master's Programme in Physics in the department of Physics at the Freie Universität Berlin (Master's programme).

Section 2

Examination committee

The examination committee appointed by the Faculty Council of the Faculty of Physics of the Freie Universität Berlin for the Master's programme in Physics is responsible for organising the examinations and other tasks listed in the RSPO.

Section 3

Usual period of study

The usual period of study for the Master's programme is four semesters.

Section 4

Scope of attainments in the Master's programme

(1) A total of 120 credit points must be attained in examinations and study (attainments) of which

1. 60 CP in the advanced phase, of which 15 CP in the compulsory area in accordance with section 4 paragraph 2 no. 1 of the study regulations, 20 CP in the compulsory elective area in accordance with Section 4 paragraph 2 no. 2 of the study regulations and 25 CP in the elective area in accordance with Section 4 paragraph 2 no. 3 in the study regulations, and
2. 60 CP in the research phase in accordance with Section 4 paragraph 3 of the study regulations of which 30 CP are allocated to the master's thesis with accompanying seminar in accordance with Section 6.

(2) Information on the examination attainment to be achieved in the course of individual modules, the admission requirements to the individual modules, the obligation to attend the teaching and learning units regularly and the credit points allotted to each module can be found in Annex 1.

Section 5

Scope of attainments in the Double Master's programme

(1) A total of 120 credit points must be attained of which

1. 60 CP in the advanced phase, of which 15 CP in the compulsory area in accordance with Sections 5 paragraph 3 no. 1 and 4 paragraph 2 no. 1 of the study regulations, 20 CP in the compulsory elective area in accordance with Sections 5 paragraph 3 no. 2 and 4 paragraph 2 no. 2 of the study regulations and 25 CP in the elective area in accordance with Sections 5 paragraph 3 no. 3 and 4 paragraph 2 no. 3 of the study regulations
2. 60 CP in the research phase in a M2 programme at the École Polytechnique in Palaiseau, of which 30 CP are allocated to the Master's thesis with accompanying seminar.

(2) Information on the examination attainment to be achieved in the course of individual modules, the admission requirements to the individual modules, the obligation to attend the

teaching and learning units regularly and the credit points allotted to each module can be found in Annex 1. For the attainments to be achieved in the scope of the modules in the research phase, students are referred to the regulations at our partner university École Polytechnique in Palaiseau, France (École Polytechnique).

Section 6 Master's thesis

(1) The Master's thesis is intended to demonstrate that the student is capable of working independently on an issue in the field of theoretical or experimental physics at an advanced scientific level using scientific methods and to present the findings in an appropriate form, to place them in their scientific context and to document them.

(2) Students are admitted to the Master's thesis on application. The application for admission to the Master's thesis is to be submitted to the examination committee simultaneously with the application for admission to the research phase in accordance with Section 4 paragraph 3 no. 3 of the study regulations. Admission to the Master's thesis is not possible if the student has irrevocably failed to achieve the required attainment or has irrevocably failed the examination or is in a pending examination procedure at another university in the same programme of studies or in a module which is identical to or comparable with a module to be taken in the Master's programme and for which the grade is to be included in the overall grade.

(3) The application must include a statement that none of the cases according to paragraph 2 clause 3 applies to the applicant. The relevant examination committee will decide on the application. The application must also include written confirmation by an authorised examiner of his/her willingness to take on the supervision of the master's thesis. If not, the examination committee will appoint a supervisor. The students have the opportunity to suggest their own topic; the right to take this topic is not guaranteed.

(4) The examination committee sets a topic for the Master's thesis in agreement with the supervisor; the topic content must be coordinated with the modules of the research phase. The topic and scope of work must be such that they can be completed within the time permitted. Issue of the topic and compliance with the completion deadline must be recorded.

(5) The master's thesis is to be completed within six months. It should comprise about 60 pages, including footnotes and bibliography.

(6) The date for the beginning of work on the master's thesis is the date on which the topic was issued by the examination committee. The topic may be returned once within the first four weeks and is considered not to have been issued in this case.

(7) Alongside the master's thesis, a seminar comprising 2 semester hours per week is held in which each student holds one talk of approx. 30 minutes on the progress of his/her master's thesis.

(8) Three bound copies and a digital copy of the master's thesis are to be submitted by the completion deadline. When they submit their thesis, students must also confirm in writing that they have written the thesis personally and independently and have used no aids other than the sources and aids listed. One copy of the master's thesis may be taken into the Institute's library on completion of the programme with the student's agreement.

(9) The master's thesis is to be evaluated by two authorised examiners appointed by the examination committee. One of the two authorised examiners should be the supervisor of the master's thesis. At least one of the authorised examiners should be a professor in the Faculty of Physics at the Freie Universität Berlin.

(10) If the examination committee agrees, the master's thesis may also be carried out externally in a suitable company or scientific institution, on condition that the scientific supervision is guaranteed by an examiner as in paragraph 9.

(11) The master's thesis of participants in the German-French Double Master's programme at the École Polytechnique is to be evaluated by an examiner from the Freie Universität Berlin in accordance with paragraph 9 and by an examiner from the École Polytechnique. It is possible to work on a thesis simultaneously in collaborative research groups at the École Polytechnique and at the Freie Universität Berlin, if the topic selected is suitable.

(12) A master's thesis which has not reached at least the grade "sufficient" may be repeated once.

Section 7 Retaking examinations

Examinations in the form of a written examination passed with the grade "sufficient" (4.0) or better may be retaken once to improve the grade in a later examination which is to take place at the beginning of the following semester at the latest. The better grade will be taken into account. In the case of repeat examinations, it is not possible to improve the grade.

Section 8 Final degree

(1) The prerequisite for the award of the final degree is proof that the attainments required in accordance with Section 4 of the study regulations in conjunction with Section 4 of these regulations or in accordance with Section 5 of the study regulations in conjunction with Section 5 of these regulations have been achieved.

(2) The final degree cannot not awarded if the student has irrevocably failed to achieve the attainment or has irrevocably failed the examination or is in a pending examination procedure at another university in the same programme of studies or in a module which is identical to or comparable with a module to be taken in the Master's programme and for which the grade is to be included in the overall grade.

(3) The application for confirmation of the final degree must include proof of the fulfilment of the requirements according to section 1 and a statement that none of the cases according to paragraph 2 applies to the applicant. The relevant examination committee will decide on the application.

(4) The grades for the examinations taken for Double Master's programme in accordance with Section 5 of the study regulations at our partner university will be passed on by the responsible office in the form of an average grade and the grade for the master's thesis to the examination committee at the Freie Universität Berlin. The following grade conversion table applies:

10	4.0
French grading scale, partner university	Grading scale, Freie Universität Berlin
≤10	>4.0 (deficient)
16, 17, 18, 19, 20	1.0
15	1.3
14	1.7
13	2.0
12.5	2.3
12	2.7
11.5	3.0
11	3.3
10.5	3.7

The overall grade is the arithmetic average from the overall grade for the part of the

programme taken at the Freie Universität Berlin comprising 60 CP and the part taken at the École Polytechnique comprising 60 CP.

(5) Students who have passed the examinations receive a report and a certificate (Annexes 2 and 3) and a diploma supplement (in English and German versions). A further diploma supplement with information on individual modules and their parts (transcript) will also be issued. English versions of the report and certificate will also be issued on application.

(6) Students of the Double Master's programme in accordance with Section 5 of the study regulations who have passed the examinations receive

1. a report and a certificate from the partner university École Polytechnique
2. a report and a certificate from the Freie Universität Berlin (Annexes 4 and 5) and
3. a joint diploma supplement in English, German and French. For the rest, paragraph 5 applies.

Section 9

Coming into effect and interim regulations

(1) These regulations come into effect on the day after their publication in the FU Mitteilung [Gazette of the Freie Universität Berlin].

(2) At the same time the examination regulations for the Master's programme from 31 March 2009 (FU Mitteilung [Gazette of the Freie Universität Berlin] No. 36/2009 p 569) expire.

(3) These regulations apply to students who enrol in the Master's programme at the Freie Universität Berlin after these regulations come into effect. Students who were enrolled in the Master's programme at the Freie Universität Berlin before these regulations came into effect complete their attainments on the basis of the examination regulations in accordance with paragraph 2, unless they apply to the responsible examination committee to complete their attainments on the basis of these regulations. On the occasion of their re-registration following their application, the examination committee decides to what extent the modules completed or started at the time of the application will be taken into account or how they are to be credited as attainments in accordance with the attainments to be credited according to these regulations, whereby the requirements of protection of confidence and non-discrimination will be observed. The decision cannot be revised.

(4) It will be possible to gain a degree on the basis of the study regulations in accordance with paragraph 2 up to the end of the winter semester 2015/16.

Annex 1: Attainments, admission requirements, attendance obligation and credit points

Explanation:

The following gives information about the modules for the Master's programme in Physics on:

- Admission requirements for each module
- The examination forms
- Regular attendance obligation
- Credit points allocated to each module.

Where obligatory regular attendance at the teaching and learning units is stipulated in the following, it is a requirement for the attainment of the credit points for each module alongside active participation in the learning and teaching units and successful completion of the examination. Regular attendance entails at least 85% attendance at the learning and teaching units in the module for which attendance is obligatory. If regular attendance at a module's learning and teaching units is not obligatory, it is nevertheless strongly recommended. Lecturers may not specify obligatory attendance for learning and teaching units if participation in these is merely recommended in the following.

The credit points allotted to a module are determined by the total number of study hours estimated to be necessary to complete the module successfully. This includes both hours of attendance and phases of individual study (preparation and follow-up, examination preparation etc.). One credit point is equivalent to approximately 30 hours.

The module examination must be taken for each module where an examination is scheduled.. The module examination must be related to the module's qualification aims and tests a sample of these aims. The examination scope is limited to the amount necessary to do this. In modules where alternative forms of examination are scheduled, the lecturer responsible for the module must specify the examination form for each semester at least one week before the registration deadline.

Credit points are awarded for the successful completion of the whole module – after regular active participation at learning and teaching units and successful completion of the module examination. For modules where no examination is required, active participation and regular attendance at the teaching and learning units are the prerequisites for the award of the credit points allotted to the module.

Information on contents and qualification aims, module teaching and learning units, the student workload estimated as necessary to complete the module successfully, forms of active participation, the usual module duration and the frequency with which it is offered may be found in Annex 1 of the Study Regulations of the Master's programme.

1. Compulsory area

Module: Advanced Laboratory Course for Master Students		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Practical	none	yes
Seminar		yes
Credit points: 10		

Module: Selected Topics in Physics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Seminar	none	yes
Credit points: 5		

2. Compulsory elective area

2.1. Modules from the field of theoretical Physics

Module: Advanced Quantum Mechanics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 10		

Module: Statistical Physics and Thermodynamics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 10		

Module: Advanced Statistical Physics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 10		

Module: Quantum Field Theory and Many-Body Physics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 10		

2.2. Modules from the field of experimental Physics

Module: Advanced Solid State Physics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 10		

Module: Advanced Atomic and Molecular Physics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 10		

Module: Advanced Biophysics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes)	Attendance recommended
Practical		yes
Credit points: 10		

3. Elective area

Module: Theoretical Solid State Physics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 10		

Module: Advanced Theoretical Biophysics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written report (approx. 30 pages) or written examination (90 minutes) or oral examination (approx. 30 minutes)	Attendance recommended
Practical		yes
Credit points: 8		

Module: Nanophysics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: Ultrafast Spectroscopy and Nonlinear Optics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: Spectroscopy with Synchrotron Radiation		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written report (approx. 30 pages) or written examination (90 minutes) or oral examination (approx. 30 minutes)	Attendance recommended
Practical		yes
Credit points: 8		

Module: Photobiophysics and Photosynthesis		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: Semiconductor Physics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: General Relativity		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: History of Physics/Geschichte der Physik		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: Advanced Topics in Theoretical Condensed Matter Physics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended

Credit points: 5

Module: Special Topics in Magnetism		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: Special Topics in Molecular Physics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: Special Topics in Molecular Biophysics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: Advanced Astronomy and Astrophysics		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture 1	Oral examination (approx. 30 minutes)	Attendance recommended
Lecture 2		Attendance recommended
Practical		yes
Credit points: 12		

Module: Modern Methods in Theoretical Physics A		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: Modern Methods in Theoretical Physics B		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 8		

Module: Modern Methods in Theoretical Physics C		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 10		

Module: Modern Methods in Experimental Physics A		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 5		

Module: Modern Methods in Experimental Physics B		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or	Attendance recommended

Practice seminar	term paper (approx. 15 pages)	Attendance recommended
Credit points: 8		

Module: Modern Methods in Experimental Physics C		
Admission requirements: none		
Teaching and learning units	Module examination	Attendance obligatory
Lecture	Written examination (90 minutes) or oral examination (approx. 30 minutes) or term paper (approx. 15 pages)	Attendance recommended
Practice seminar		Attendance recommended
Credit points: 10		

4 Research phase

Module: Scientific Specialization		
Admission requirements: Successful completion of the module “Advanced Laboratory Course for Master Students” (10 CP) and one module in theoretical physics from the compulsory elective area comprising 10 CP and additional Master’s programme modules comprising at least 25 CP.		
Teaching and learning units	Module examination	Attendance obligatory
Project work	Scientific lecture (approx. 30 minutes) with subsequent discussion (approx. 30 minutes)	yes
Seminar		yes
Credit points: 15		

Module: Methodology and Project Planning		
Admission requirements: Successful completion of the module “Advanced Laboratory Course for Master Students” (10 CP) and one module in theoretical physics from the compulsory elective area comprising 10 CP and additional Master’s programme modules comprising at least 25 CP.		
Teaching and learning units	Module examination	Attendance obligatory
Project work	none	yes
Practical (experimental theoretical) or		yes
Credit points: 15		



Freie Universität Berlin
Department of Physics

Certificate of Academic Record

Ms./Mr. ,first name/surname,

born on ,day/month/year, in ,place of birth,

has successfully completed the Master's programme

Physics

in accordance with the examination regulations of 31 January 2013 (Zus. Mitteilungen No. ,xx, /year)
with the the
final grade

,grade as number and text,

The examination attainments were graded as follows:

areas of study	credit points	grade
modules of the advanced phase	14 (15)	
module of the research phase	31 (35)	
Master's thesis	31 (31)	

The topic of the Master's thesis was: ,xx,

Berlin, ,day/month/year,

(seal)

Dean

Chair of the
Examination Committee

grading scale: 1.0 - 1.5 very good; 2.0 - 2.5 good; 3.0 - 3.5 satisfactory; 4.0 - 4.5 sufficient; 5.0 - 5.5 insufficient

The credit points comply with the European Credit Transfer and Accumulation System (ECTS)

Not all achievements are graded; the credit points listed in brackets denote those credit points taken into consideration in the final grade.

Annex 3: Degree certificate



(sample)

Freie Universität Berlin
Department of Physics

Degree certificate

Mr/Ms ,first name/surname,

born on ,day/month/year, in ,place of birth,

has successfully completed the master's programme in

Physics

in accordance with the examination regulations of 31 January 1973 (Verordnungen No. ,xx,/year)

the university degree of

Master of Science (M.Sc.)

is hereby awarded.

Berlin, ,day/month/year,

(seal)

Dean

Chair of the
Examination Committee

**Annex 4: Certificate of Academic Record
(sample-Double Master)**



Freie Universität Berlin
Department of Physics

Certificate of Academic Record

Ms/Mr, first name/surname

born on, day/month/year in, place of birth

has successfully completed the German-Chinese Double Master's programme with the title of Bachelor in Science

Physics

in accordance with the examination regulations of 31 January 2013 (Zus. Mitteilungen No. 100/2013/year) with the final grade the

grade as number and text

The examination attainments were graded as follows:

areas of study	credit points	grade
modules of the advanced phase	18 (18)	
modules of the research phase at the Bachelor's degree	30 (30)	
Master's thesis	30 (30)	

The topic of the Master's thesis was: 100

Berlin, day/month/year

(seal)

Dean

Chair of the
Examination Committee

grading scale: 1.0 - 1.3 very good; 2.0 - 2.3 good; 2.5 - 2.7 satisfactory; 3.0 - 3.5 sufficient; 4.0 - 4.5 insufficient
The credit points comply with the European Credit Transfer and Accumulation System (ECTS)
not all achievements are graded; the credit points listed in brackets denote those credit points taken into consideration in the final grade.

**Annex 5: Degree Certificate
(sample-Double Master)**



Freie Universität Berlin
Department of Physics

Degree Certificate

Mr./Mrs. ,first name/surname_

born on ,day/month/year_ in ,place of birth_

has successfully completed the German-Chinese double master's programme

Physics

with the title of Master of Science in Physics.

in accordance with the examination regulations of 31 January 1973 (Verordnungen Nr. 1/XX/Year)

the university degree of

Master of Science (M.Sc.)

is hereby awarded.

Berlin, ,day/month/year_

(seal)

Dean

Chair of the
Examination Committee