

**UK 066/461**

CURRICULUM FOR THE  
MASTER'S PROGRAM IN  
**PHYSICS.**



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## § 1 Qualification Profile

The objective of the Master's program "Physics" is to impart the ability to independently solve problems using methods developed in physics, whether in basic or applied research, in industry, or as an independent entrepreneur. Moreover, completion of the Physics Master's program qualifies the student for a relevant doctoral program.

Advanced courses in the Master's program "Physics" deepen the knowledge acquired in the Bachelor's program "Technische Physik". The courses will introduce students to new physics concepts and explore the current frontiers of research in selected subfields of physics.

The Master's program - primarily through the completion of a Master's thesis - will enable students to understand current challenges in research and/or industrial development and to solve these challenges by developing experimental and/or theoretical work programs. Advanced physics courses will be taught in English to provide significant opportunities to develop a professional level of English. Spending a semester abroad is encouraged and supported by specific exchange programs and by an appropriate credit recognition system.

Graduates of the Master's program "Physics" will possess a broad and comprehensive understanding of fundamental physics specifically in condensed matter physics, statistical physics, photonics, computational physics and advanced metrology and (nano-) fabrication techniques.

Through selected examples, students will acquire the ability to engage with current research and explore new scientific fields. This will enable students to master the experimental and/or theoretical methods of modern physics and apply them in a wide context.

Overall, the Master's program "Physics" aims to provide students with a good understanding of the nature and methodology of physics research, as well as, the translation of research results into technology and practical applications. Students will graduate with a broad knowledge in physics, providing employment opportunities in diverse fields and highly interdisciplinary teams. Graduates have learned to understand and communicate current scientific findings to the public and implement ideas into research and industrial applications with a broad view on the impact and benefit for society as a whole. Graduates will be able to follow current developments in method and content of the subject and provide expert advice on possible applications.

## § 2 Admissions

(1) In accordance with § 54 para. 1 UG the Master's program "Physics" belongs to the category of natural science degrees and is taught in English.

(2) The Master's program "Physics" is based on the Bachelor's program "Technische Physik" (033/261). Graduates of this Bachelor's program are to be admitted to the Master's program without any restrictions.

(3) In addition, the following studies are equally eligible for admission to the Master's program "Physics":

- Bachelorstudium Physik, Universität Innsbruck
- Bachelorstudium Physik, Universität Wien
- Bachelorstudium Technische Physik, Technische Universität Wien
- Bachelorstudium Physik, Universität Graz
- Bachelorstudium Physik, Technische Universität Graz

(4) In addition, graduates of subject-related Bachelor's programs or other subject-related programs at a recognized national or international postsecondary educational institution of at least the same level of higher education are entitled to admission, provided that substantial subject-based discrepancies can be compensated by prescribing supplementary examinations of a maximum of 40 ECTS, which have to be completed by the end of the second semester of the Master's program.

(5) Furthermore the Bachelor's program "Naturwissenschaftliche Grundlagen der Technik (NaWi-Tec)" of JKU qualifies as a subject-related program for admission to the Master's program "Physics", provided that the major field of studies in physics ("Studienschwerpunkt Physik", subject code: 320STPH20) has been completed within the Bachelor's program. To compensate for substantial subject-related differences, the following supplementary examinations must be completed by the end of the second semester of the Master's program:

Code	Type of course	Name	ECTS
TPBPBVOGRU4	VO	Grundlagen der Physik IV	6.0
TPBPBUEGRU4	UE	Grundlagen der Physik IV	1.5
261GRPHEFKV20	VO	Einführung in die Festkörperphysik	6.0
261GRPHEFKU20	UE	Einführung in die Festkörperphysik	1.5
261THPHTQ1V16	VO	Theoretische Quantenmechanik I	6.0
261THPHTQ1U16	UE	Theoretische Quantenmechanik I	3.0

In addition, a seminar worth 3 ECTS credits from the subject Physics Seminars (subject code 261PSEM12) of the Bachelor's program "Technische Physik" must be successfully completed and the ECTS credits can be counted within "General and Elective Subjects" according to § 5.

### § 3 Structure and Outline

(1) The Master's program "Physics" covers four semesters and consists of 120 ECTS, which are distributed among the following subjects:

Subjects	ECTS
Major Fields of Studies	21–45
General and Elective Subjects	18–42
Elective Courses related to the Master's Thesis	15
Master's Thesis	33
Master's Examination	3
Free Electives	6
Total	120

(2) A total of 63 ECTS must be completed within the subjects "Major Fields of Studies" and "General and Elective Subjects".

(3) For "Free Electives" the students have to pass examinations (including course examinations) amounting to 6 ECTS, which can be chosen from any recognized national or international postsecondary educational institution in Austria and abroad. The free electives shall provide additional skills beyond the subject area of this Master's program. They can be taken anytime during the Master's study.

(4) The recommended study plan is listed in annex 1. This recommendation is based on a full-time program. With certain restrictions, the program can also be completed by students with flexible working schedules or with care obligations. In most courses, especially lectures, attendance is not compulsory, but attendance is recommended. In other courses, such as exercises or lab courses, attendance is usually compulsory; however, efforts are made to offer courses that are offered more than once at alternative times. In the case of exams, there is no guarantee that they can be taken digitally or at a time outside regular working hours. In the case of employment or care obligations, an extended study time is to be expected - depending on the amount of other obligations and time flexibility.

## § 4 Major Subject(s)

(1) The following major subject has to be completed successfully:

Code	Name	ECTS
461MFOS23	Major Fields of Studies	21-45

(2) If courses from the “Major Fields of Studies” have already been completed or recognized in the Bachelor’s program which has justified the admission to this Master’s program, courses from the “General and Elective Subjects” or courses according to § 5 para. 4 must be completed instead. In total, these courses must have at least the same ECTS value.

(3) The major subject “Major Fields of Studies” contains four different fields of study out of which one or two have to be completed. These are:

Code	Name	ECTS
461CMPH23	Condensed Matter Physics	21-45
461QPAP23	Quantum Physics and Photonics	21-45
461BACM23	Bioinspired and Complex Matter	21-45
461NAAT23	Nanomaterials and Technology	21-45

(4) Each field of study within the major subject “Major Fields of Studies” is divided into the following fields of studies:

Name	ECTS
Core Subjects	9
Core Elective Subjects	6-15
Additional Elective Subjects	3-27

(5) In cases where two “Major Fields of Studies” are selected, the student has to complete at least 21 ECTS in each of these “Major Fields of Studies”. In cases where courses appear in both selected “Major Fields of Studies”, they can only be counted in one “Major Fields of Studies”. For the other “Major Fields of Studies” they have to be substituted with other courses from that second “Major Fields of Studies”.

## § 5 General and Elective Subjects

(1) The following elective subjects have to be completed:

Code	Name	ECTS
461GAES23	General and Elective Subjects	18-42
461MBSM23	Elective Courses related to the Master's Thesis	15

(2) The "General and Elective Subjects" are divided into the following fields of studies:

Code	Name	ECTS
461GTPH23	Theoretical Physics	4.5
461GAPC23	Advanced Practical Course	4.5
461GCTS23	Computational and Technological Skills	4.5-9
461GACT23	Additional Computational and Technological Skills	0-21
461GGPH23	General Physics	0-18
461GSPT23	Special Topics	0-24
461GPHS23	Physical Seminars	0-3
461GEND23	Gender Studies	0-3

(3) Students may only select courses from "General and Electives Subjects" that were not completed in the Bachelor's program that qualified them for the Master's program.

(4) Instead of courses from "General and Elective Subjects", courses can also be chosen from:

- all courses from non-selected Major Fields of Studies,
- mandatory or elective courses of the Master's program "Biophysik", which are not courses from the Master's program "Physics",
- physics or physics-related elective courses of a doctoral program at the Faculty of Engineering and Natural Sciences of the Johannes Kepler University Linz,
- elective courses of the Bachelor's program "Technische Physik", provided that these courses, or equivalent, were not completed within the study program that qualified for the Master's program.

(5) It is expected that courses amounting to 3 ECTS are chosen from "Gender Studies".

(6) The "Elective Courses related to the Master's Thesis" are divided into the following subjects. The subject that matches the topic of the Master's thesis must be chosen.

Code	Name	ECTS
461MAPH23	Applied Physics	0/15
461MBSM23	Biomolecular and Selforganizing Matter	0/15
461MBPH23	Biophysics	0/15
461MSMA23	Soft Matter Physics	0/15
461MSEP23	Semiconductor Physics	0/15
461MSSP23	Solid State Physics	0/15
461MSNA23	Surface and Nano Analytics	0/15
461MSSC23	Surface Science	0/15

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Code	Name	ECTS
461MTHP23	Theoretical Physics	0/15

## § 6 Courses

(1) The names and types of all courses of the subjects according to §§ 4 and 5, as well as their ECTS, their duration in hours per week, their codes, their registration requirements, and their admission procedures (in case of limited availability of places) are described in the study handbook of JKU ([studienhandbuch.jku.at](http://studienhandbuch.jku.at)).

(2) The possible types of courses, as well as the examination regulations are described in §§ 13 and 14 of the JKU statute (section "Studienrecht").

## § 7 Replacement of Subjects and Courses

Subjects according to §§ 4 and 5, as well as courses according to § 6 para. 1, may be replaced to a total extent of 18 ECTS by other study specific subjects and courses upon student's request. This is provided that the purpose of academic professional preparatory training is not affected and the choice of the proposed subjects and courses seems reasonable with regard to the defined aims in the qualification profile, the academic context, as well as to the addition to the professional preparatory training. The application for the replacement of subjects and courses has to be filed to the Vice-Rector of Academic Affairs.

## § 8 Master's Thesis

(1) Students of the Master's program "Physics" must complete a Master's Thesis according to § 81 UG and § 36 of the JKU statute (Section "Studienrecht").

(2) The Master's Thesis (33 ECTS) has to be completed in written form and in English.

(3) Prerequisite for the registration of the Master's Thesis is the successful completion of at least 45 ECTS credits of this Master's program, including at least 18 ECTS from one of the subjects chosen within the "Major Fields of Studies" according to § 4.

(4) The Master's Thesis serves as a proof that graduates are able to perform scientific work independently and accurately in terms of method and content. The topic of the thesis must be taken from the major subjects listed in § 4 para. 3 and/or from the chosen elective subjects listed in § 5 and must permit completion within a period of 6 months.

(5) The Master's Thesis is assessed by the supervisor and by a second evaluator who can be a professor or lecturer with a relevant teaching qualification ("Lehrbefugnis"). The second evaluator is appointed by the Vice-Rector for Academic Affairs. If the two grades for the thesis assessment differ, the two proposed evaluations must be added together, the result divided by two, and rounded to an integer. A result greater than x.5 must be rounded up.

(6) The Study Commission may issue general layout guidelines for Master's Thesis.

## **§ 9 Examination Regulations**

(1) The regulations for subject examinations and course examinations are described in the study handbook ("Studienhandbuch") of JKU.

(2) The Master's program „Physics“ is concluded with a Master's Examination.

(3) The Master's Examination consists of two parts: The first part is the successful completion of the subjects according to §§ 4 and 5.

(4) The second part of the Master's examination is a comprehensive oral examination (3 ECTS) conducted by an examination committee. Prior to being admitted to the second part, students must complete the first part of the Master's Examination, the Master's Thesis, and the Free Electives.

(5) The second part of the Master's Examination starts with a presentation and a defense of the Master's Thesis, followed by an oral exam that covers theoretical and experimental aspects of the content of the Master's Thesis in relation to the content of the respective subject(s) in the "Major Fields of Studies" according to § 4 para. 3. One subject can also be taken from the "General and Elective Subjects" according to § 5 para. 1.

(6) The examination committee consists of three members and is formed by the Vice-Rector of Academic Affairs. The candidate may propose the committee members. In general, the supervisor of the Master's Thesis is a member of the examination committee. The head of the committee suggests the assessment of the presentation and defense of the Master's Thesis. The other two examiners suggest the assessment of the examinations in their respective subjects.

## **§ 10 Academic Degree**

(1) Graduates of the Master's program "Physics" are awarded the academic degree „Diplom-Ingenieurin/Diplom-Ingenieur“ abbreviated "Dipl.-Ing." / "Dipl.-Ing. (JKU)" or "DI" / "DI (JKU)".

(2) The certificate, confirming the academic degree, is issued in German and in English translation.

## **§ 11 Legal Validity**

(1) This curriculum comes into effect on October 1, 2023.

(2) The curriculum of the Master's program "Technische Physik" in the version published in the official newsletter of Johannes Kepler University Linz on June 9, 2022, 30<sup>th</sup> piece, item 456 expires by the end of September 30, 2023. Transitional provisions shall remain in force as long as they still apply in scope and content.



## § 12 Transitional Provisions

(1) Students who have passed examinations within the curriculum of the Master's program "Technische Physik" in a previous version will continue their studies according to the curriculum of the Master's program "Physics".

(2) For students who have passed examinations within the curriculum of the Master's program "Technische Physik" or "Nanoscience & -technology" in a previous version, the equivalences listed in the study handbook of JKU (studienhandbuch.jku.at) apply.

(3) In addition to the mentioned equivalences given in the study handbook of JKU, the following equivalence table applies to students who have passed examinations within the curriculum of the Master's program "Technische Physik"

<b>Subjects / lectures in Master „Technische Physik“ 2021</b>	<b>Equivalent subjects / lectures in Master „Physics“ 2023</b>
461TPHY18: Technische Physik (27 ECTS)	461CMPH23: Condensed Matter Physics (27 ECTS) <i>or</i> 461QPAP23: Quantum Physics and Photonics (27 ECTS)
461ALWA18: Allgemeine Wahlfächer (36 ECTS)	461GAES23: General and Elective Subjects (36 ECTS)
TPMPTPRFOPR: PR Fortgeschrittenenpraktikum (4.5 ECTS)	<i>6 practical courses from:</i> 461GAPCEAPP23: PR Experiment in Applied Physics (0.75 ECTS) 461GAPCEBSP23: PR Experiment in Biomolecular and Selforganizing Matter (0.75 ECTS) 461GAPCEIBP23: PR Experiment in Experiment in Biophysics (0.75 ECTS) 461GAPCECTP23: PR Experiment in Current Topics in Physics (0.75 ECTS) 461GAPCEPSP23: PR Experiment in Physics of Soft Matter (0.75 ECTS) 461GAPCESPP23: PR Experiment in Semiconductor Physics (0.75 ECTS) 461GAPCESSP23: PR Experiment in Solid State Physics (0.75 ECTS) 461GAPCESNP23: PR Experiment in Surface and Nano Analytics (0.75 ECTS) 461GAPCESCP23: PR Experiment in Applied Physics (0.75 ECTS) 461GAPCETPP23: PR Experiment in Theoretical Physics (0.75 ECTS)

(4) In addition to the mentioned equivalences given in the study handbook of JKU, the following equivalence tables apply to students who have passed examinations within the curriculum of the Master's program "Nanoscience & -technology"

<b>Subjects in Master „Nanoscience &amp; -technology” 2021</b>	<b>Equivalent subjects in Master „Physics” 2023</b>
460NATE15: Nanoscience and -Technology (31.5 ECTS)	461NAAT23: Nanomaterials and Technology (31.5 ECTS)
460WANA15: Allgemeine Wahlfächer (31.5 ECTS)	461GAES23: General and Elective Subjects (31.5 ECTS)
460WBMA12: Wahlfächer mit Beziehung zur Masterarbeit (15 ECTS)	461MBSM23: Elective courses related to the Master’s Thesis (15 ECTS)

## Global map of study subjects - Master's Program Physics

1 <sup>st</sup> Semester (WS)		2 <sup>nd</sup> Semester (SS)		3 <sup>rd</sup> Semester (WS)		4 <sup>th</sup> Semester (SS)	
Subject/Course	ECTS	Subject/Course	ECTS	Subject/Course	ECTS	Subject/Course	ECTS
<b>Major Field of Studies</b> Condensed Matter Physics <i>or</i> Quantum Physics and Photonics <i>or</i> Bioinspired and Complex Matter <i>or</i> Nanomaterials and Technology	21	<b>Major Field of Studies</b> Condensed Matter Physics <i>or</i> Quantum Physics and Photonics <i>or</i> Bioinspired and Complex Matter <i>or</i> Nanomaterials and Technology	27	<b>Master's Thesis</b>	10,5	<b>Master's Thesis</b>	22,5
<b>General and Elective Subjects</b>	<b>General and Elective Subjects</b>			6			
<b>General and Elective Subjects</b> <b>Theoretical Physics</b> Statistical Physics I	4,5			<b>General and Elective Subjects</b>	12		
<b>General and Elective Subjects</b> <b>Advanced Practical Course</b>	3	<b>General and Elective Subjects</b> <b>Advanced Practical Course</b>	1,5	<b>Master's Examination</b>		3	
Free Electives	1,5	Free Electives	1,5	Free Electives	1,5	Free Electives	1,5
<b>30</b>		<b>30</b>		<b>30</b>		<b>30</b>	